Australian Government
Department of Infrastructure, Transport, Regional Development and Communications
Bureau of Infrastructure and Transport Research Economics

Freight vehicle congestion in Australia's five major cities - 2021

Executive Summary

This is the third issue of a planned regular series that uses vehicle telematics data to provide measures of traffic congestion for freight vehicles on 71 selected routes across Australia's five mainland state capital cities—Sydney, Melbourne, Brisbane, Adelaide and Perth. This issue provides congestion measures for 2021.

The selected routes comprise the major motorways, highways and arterial roads within each city that service both passenger and freight vehicles. The data have been used to provide estimates of congestion based on how much longer journeys take (compared to a baseline of free running or uncongested conditions), and uncertainty in travel times (by measuring the variability of trips across each route over the year).

Peak travel times

7 to 9am and 3 to 6pm

Peaks in freight vehicle average travel times coincide with high commuter flows.

Where possible, avoiding travel in peak commuting periods can reduce freight vehicle average travel times and delay.

Congestion higher – 2021

COVID-19 and urban congestion

Freight vehicle congestion increased overall in 2021 relative to 2020 across all cities.

The increases in congestion in 2021 largely represent a reversal of the impact of COVID-19 related lockdowns in 2020.

Largest increases

Melbourne and Sydney

experienced the largest increases in vehicle congestion between 2021 and 2020.

These cities also experienced the most significant COVID-19 lockdowns and largest falls in congestion between 2019 and 2020.

Data sources

Freight telematics data

Data from participating operators in BITRE's freight telematics data project used to derive route travel time measures.

Illustrates the value of vehicle telematics data to aid planning by governments, industry and other parts of the community.

Comparing traffic congestion measures in 2021 with those of 2020 (BITRE 2021b), this report identifies several notable features across the 71 selected urban routes:

- At a city-wide level the improvements in congestion from lockdowns in 2020 have largely been reversed, with freight vehicle congestion returning to 2019 levels.
- Increases in vehicle congestion between 2021 and 2020 were larger in Melbourne (and to a lesser extent Sydney) where lockdown related reductions in congestion observed in 2020 relative to 2019 were larger than other cities.
- At a route level, however, improvements in vehicle congestion observed in 2020 are not clearly related to deterioration in vehicle congestion observed in 2021.
- Renewed lockdowns in Sydney and Melbourne in the third quarter of 2021 saw improved congestion but this was reversed by December 2021.
- The unexplained 'third peak' noted on many surface routes in 2019 and 2020 is still present across many routes. This may be the result of unrepresentative data at these times.

Introduction

This paper, the third of a planned regular series, tracks congestion of selected routes from across Australia's major cities by estimating travel times based on observed speeds of freight vehicles. This report covers calendar year 2021.

The routes comprise motorways, freeways and major arterial roads within each city that service both passenger and freight vehicles. For each route, separate congestion measures are presented for each travel direction. The following section provides an overview of observed heavy vehicle travel times (and congestion measures) across all routes in each city. More detailed route-specific outputs, including median and interquartile range travel times for each route, are provided in Appendix A and a brief summary of the methods is outlined in Appendix B.

The paper presents two 'congestion' measures for each route.

- The first is the Mean Excess Time Ratio (METR), which reflects how much the average expected travel time across the day exceeds the *best* (lowest) expected travel time. These best times are usually in the early morning hours, when network traffic volumes are lowest and are assumed to be close to *free running* conditions.
- The second is the Mean Excess Uncertainty Ratio (MEUR) which reflects how much the average uncertainty – measured as the breadth of the interquartile range, or the middle 50 per cent of trips – exceeds the lowest observed uncertainty.

The lower the uncertainty, and the narrower the interquartile range, the more certainty a firm can have about how long journeys will take and their ability to provide deliveries at agreed times. Because firms are bound by speed limits, this uncertainty usually means more "downside risk", with below average travel time more likely to be slower than above average times are swifter. In the travel time figures presented in this paper, the dark blue lines represent the median travel time over the course of the day, while the light blue bands demonstrate the interquartile range.

These measures are only indicators of congestion and may be prone to 'noise' especially for routes or times of day (such as the early morning) with relatively sparse data. They also do not distinguish between a peak that lasts one hour and a peak that spreads over several.

Composite congestion index results

BITRE has estimated composite indices to represent aggregate changes in congestion across all routes in each city. The influence of each route is weighted by its share of distance and the number of vehicles (as measured by vehicle telematics observations). This ensures shorter routes and those with relatively low freight vehicle volumes, like the M1 in Sydney, do not overly influence results.

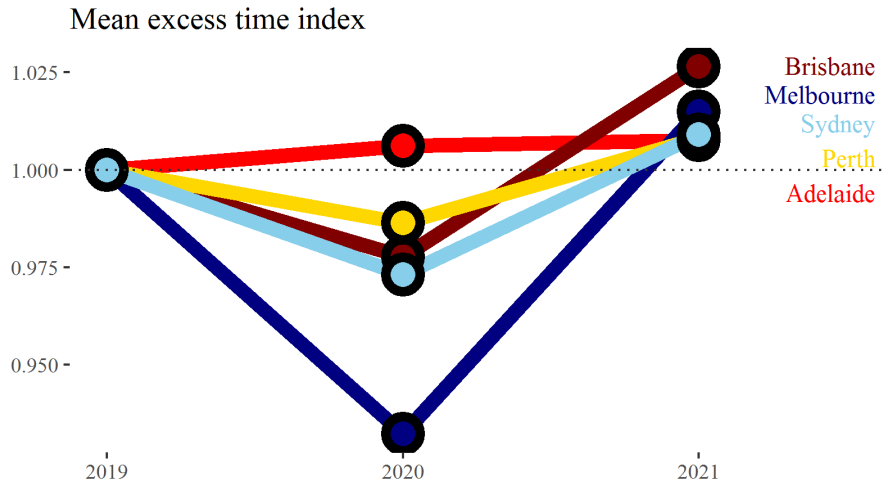
Table 1, and Figures 1 and 2, show the estimated change in freight vehicle congestion, as measured by indexes of the Mean Excess Time Ratio (METR) and Mean Excess Uncertainty Ratio (MEUR), between 2019 and 2021, across each of the five capital cities.

Table 1 Congestion measures of cities studied in this report

City	Excess Time Index			Excess Uncertainty Index		
	2019	2020	2021	2019	2020	2021
Sydney	1.000	0.973	1.009	1.000	0.895	1.027
Melbourne	1.000	0.932	1.015	1.000	0.694	1.190
Brisbane	1.000	0.978	1.027	1.000	1.061	1.445
Adelaide	1.000	1.006	1.008	1.000	1.093	0.842
Perth	1.000	0.986	1.008	1.000	0.069	1.148

Source: BITRE estimates.

Figure 1 Mean Excess Time Ratio (METR), by capital city, 2019 to 2021



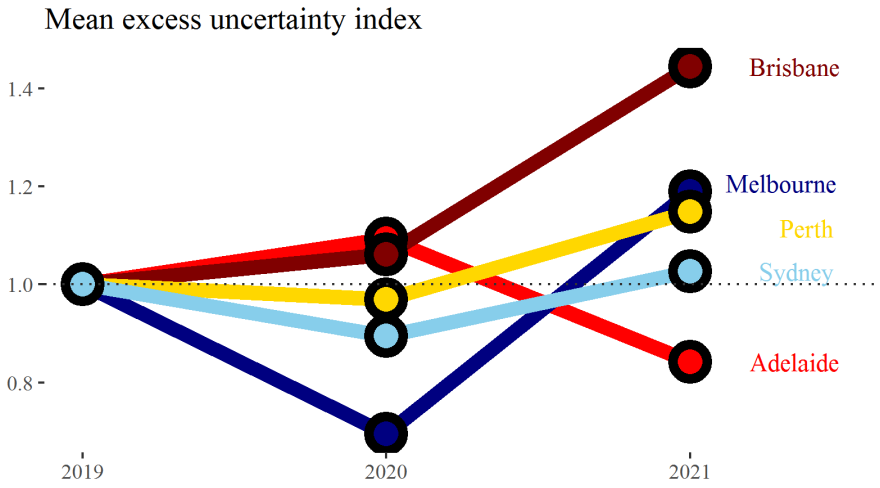
Source: BITRE estimates.

All five cities experienced increases in the city-wide mean excess time index in 2021 compared to 2020 when reductions in commuter traffic during COVID (Figure 1) reduced congestion. In particular Melbourne, which experienced more lockdowns during 2020, had the largest increase and slightly exceeded 2019 levels. In general the increase was proportional to the reduction of the year before.

Sydney, and a lesser extent Melbourne, saw improvements in the third quarter (July to September) because of renewed lockdowns but returned to the levels earlier in the year as these eased.

The mean excess uncertainty index also increased in 4 of the 5 capital cities, with the exception of Adelaide.

Figure 2 Mean Excess Uncertainty Ratio (MEUR), by capital city, 2019 to 2021



Source: BITRE estimates.

Across routes within individual cities, the changes in mean excess time and uncertainty varied, even between directions.

Several additional routes in both Sydney and Melbourne have been included in the 2021 METR and MEUR indices, however indices produced using only routes available in all years produce near identical trends. These alternative indices are available in supplementary materials.

It should be noted the city-wide METR and MEUR indexes, and the METR and MEUR for individual routes, weight all hours in the day equally. This means that were the industry and its clients to shift journeys into more congested parts of the day the measures would not be significantly affected even as congestion experienced by freight vehicle increases. This is to try and limit the measure to factors largely outside the control of participants in the industry – most urban traffic congestion is due to passenger vehicle traffic. However, since most congestion occurs in daylight hours, which is also when the majority of urban freight vehicle operations occur, the magnitude of the measures and the magnitude of increases and decreases year to year would be larger if METR and MEUR were weighted by freight vehicle traffic volumes.

Australian capital city freight vehicle congestion measures

Sydney

Sydney metropolitan area freight vehicle routes cover the following 22 motorway, freeway and/or major arterial road routes:

- 12 - A9 to M7/M7 to A9[1]
- A1 – Artarmon to Wahroonga/Wahroonga to Atarmon[1]
- A22 – Glebe to Liverpool / Liverpool to Glebe
- A28 – Casula to M2 Motorway / M2 Motorway to Casula
- A3 – Blakehurst to Pymble / Pymble to Blakehurst
- A34 – Liverpool to Newtown / Newtown to Liverpool
- A36 – Broadway to Georges River / Georges River to Broadway
- A38 – Dee Why to Roseville/Roseville to Dee Why[1]
- A40 – Baulkham Hills to Rozelle / Rozelle to Baulkham Hills
- A44 – Camperdown to Strathfield/Strathfield to Camperdown[1]
- A6 – Carlingford to Padstow / Padstow to Carlingford
- A8 – M1 to Dee Why/Dee Why to M1[1]
- A9 – Hume Freeway to M4/M4 to Hume Freeway[1]
- M1 (North) – Cahill Expressway to M2 / M2 to Cahill Expressway
- M1 (South) – Cahill Expressway to M5 / M5 to Cahill Expressway
- M2 – M1 to M7 / M7 to M1
- M4 – Glenbrook to Strathfield / Strathfield to Glenbrook
- M4 (East) – A4 to Cahill Expressway/Cahill Expressway to A4[1]
- M5 – Hume Motorway to M1 / M1 to Hume Motorway
- M7 – M2 to M5 / M5 to M2
- M8 – M5 to Mascot/Mascot to M5[1]
- Northconnex-M1 – Brooklyn to M2/M2 to Brooklyn[1]

Figure 3 shows all 22 selected Sydney freight vehicle routes and an index of the median excess travel time ratio (METR) – i.e. the ratio of median travel time to best (shortest) travel time – across each route.

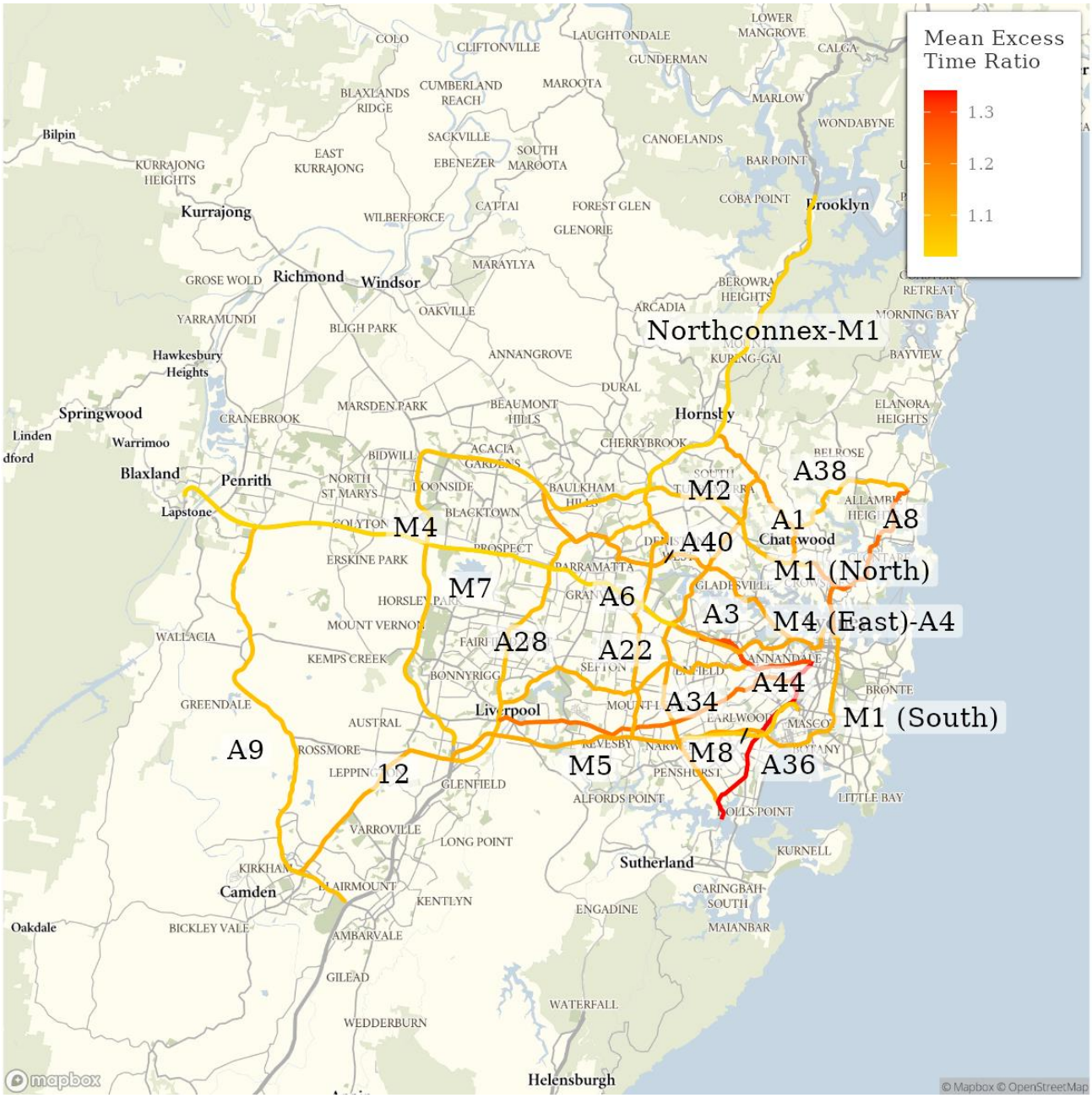
Figure 4 shows changes in the METRs and MEURs between 2020 and 2021 across each of the 22 selected Sydney freight vehicle routes. Whilst the city-wide measure rose many routes experienced declines, which may be the result of differing lockdown conditions across the city.

Decreases in travel time uncertainty rose on average but inconsistently. Large decreases on the M1 (North) are an artifact of the data process.

Many Sydney routes showed improvements in both measures during the third quarter of 2020 when there were renewed lockdowns.

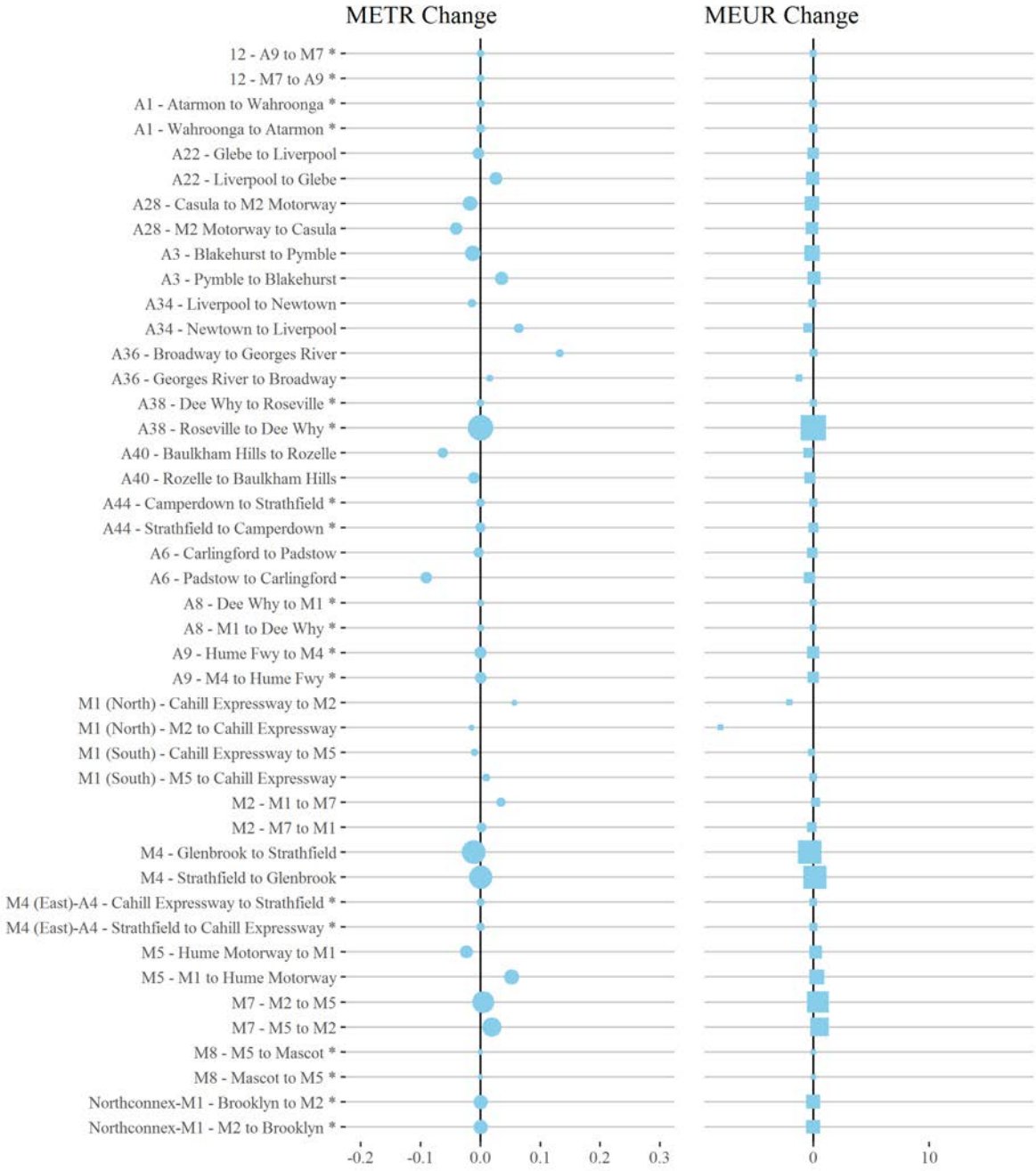
[1] New route introduced in this issue.

Figure 3 Sydney route congestion and median travel time index[a], 2021



Note: Ratio of median travel time to best (shortest) travel time for each route.
Source: BITRE estimates.

Figure 4 Sydney route METR and MEUR changes between 2020 and 2021



Size represents 2021 weights in citywide measure. New routes are shown as zero and marked with asterix (*).

Source: BITRE estimates.

Melbourne

Melbourne metropolitan area freight vehicle routes cover the following 19 motorway, highway and/or major arterial road routes:

- Route 13-19 – Monash Freeway to South Gippsland Freeway[2]
- Route 15 – Beach Road to Surrey Hills[2]
- Route 22 – Ferntree Gully to M1[2]
- Route 3 – Albert Park to Cheltenham[2]
- Route 32 – Derrimut to Montrose / Montrose to Derrimut
- Route 35 – Hume Highway to M80[2]
- Route 40 – M2 to Doncaster[2]
- Route 55 – Hume Freeway to Montague Street / Montague Street to Hume Freeway
- Route 56 – Laverton to Spotswood / Spotswood to Laverton
- Route 58 – Greenvale to Yan Yean Road / Yan Yean Road to Greenvale
- Route 60 – M3 to Southbank[2]
- M1 (West) – City to M80 / M80 to City
- M1 (East) – City to M420 / M420 to City
- M2 – CityLink then Tullamarine / Tullamarine then CityLink
- M3 – Frankston to Hoddle Street / Hoddle Street to Frankston
- M79 – Essendon to Gap Road / Gap Road to Essendon
- M80 – Altona to Greensborough / Greensborough to Altona
- Princes Freeway – Geelong Ring Road to M80[2]
- Western Freeway – Bacchus Marsh to Derrimut / Derrimut to Bacchus Marsh.

Figure 5 shows all 19 selected Melbourne freight vehicle routes and an index of the METR across each route.

Figure 6 shows changes in the METRs and MEURs across each of the 19 selected Melbourne freight vehicle routes. Travel time congestion increased across almost most routes but particularly on surface routes in Northern Melbourne. Motorway routes were more stable despite large reductions in 2020.

Unlike in Sydney, increases in mean excess uncertainty was fairly systematic. It was also noticeable on both freeway and surface routes.

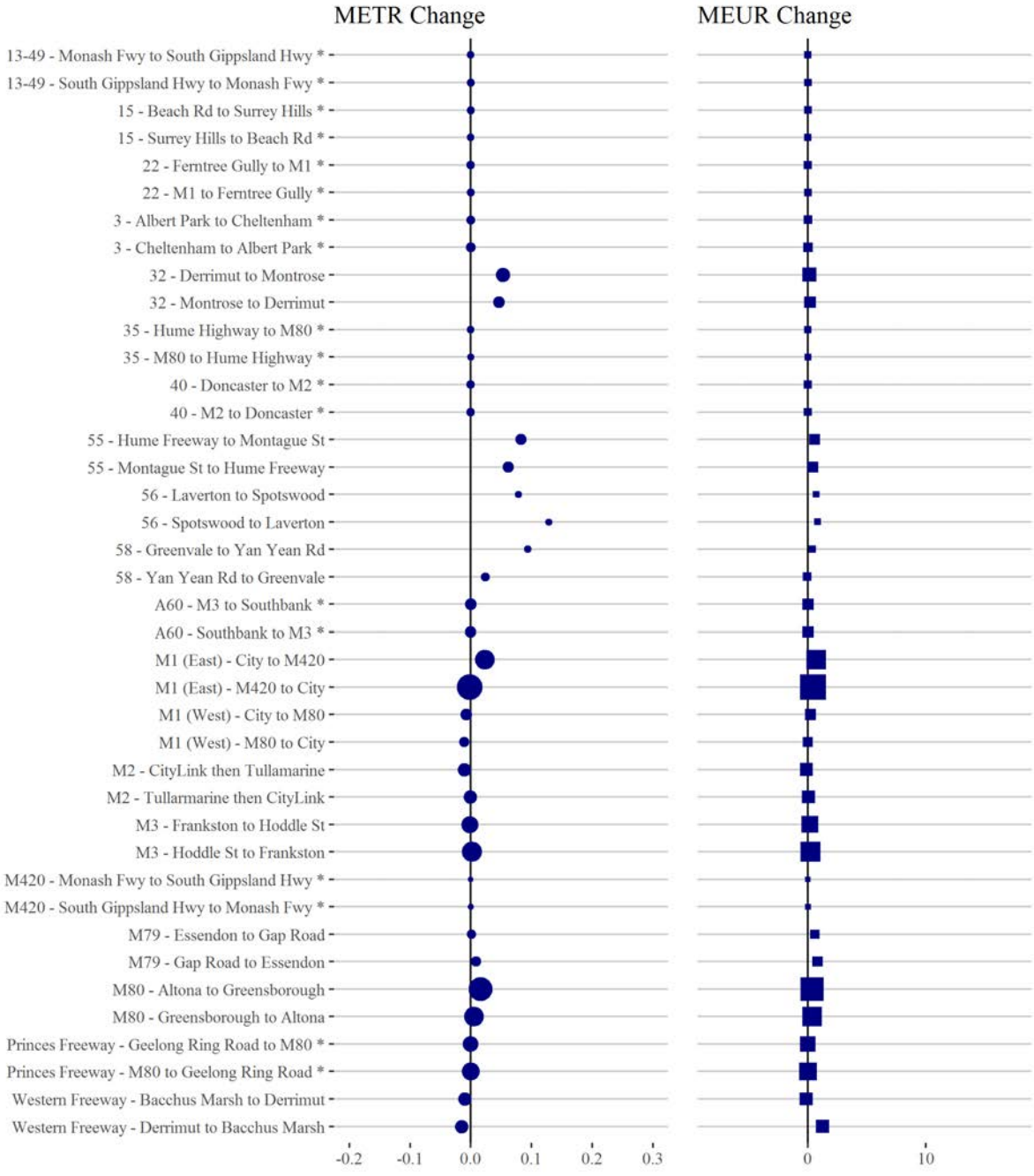
Whilst less pronounced than in Sydney, renewed lockdowns in the third quarter of 2020 saw improvements in congestion across many routes.

[2] New route introduced in this issue.

Figure 5 Melbourne routes congestion and median travel time index[a], 2021

Note: Ratio of median travel time to best (shortest) travel time for each route.
Source: BITRE estimates.

Figure 6 Melbourne route METR and MEUR changes between 2020 and 2021



Size represents 2021 weights in citywide measure. New routes are shown as zero and marked with asterix (*).

Source: BITRE estimates.

Brisbane

Brisbane metropolitan area freight vehicle routes cover the following 10 motorway, highway and/or major arterial road routes:

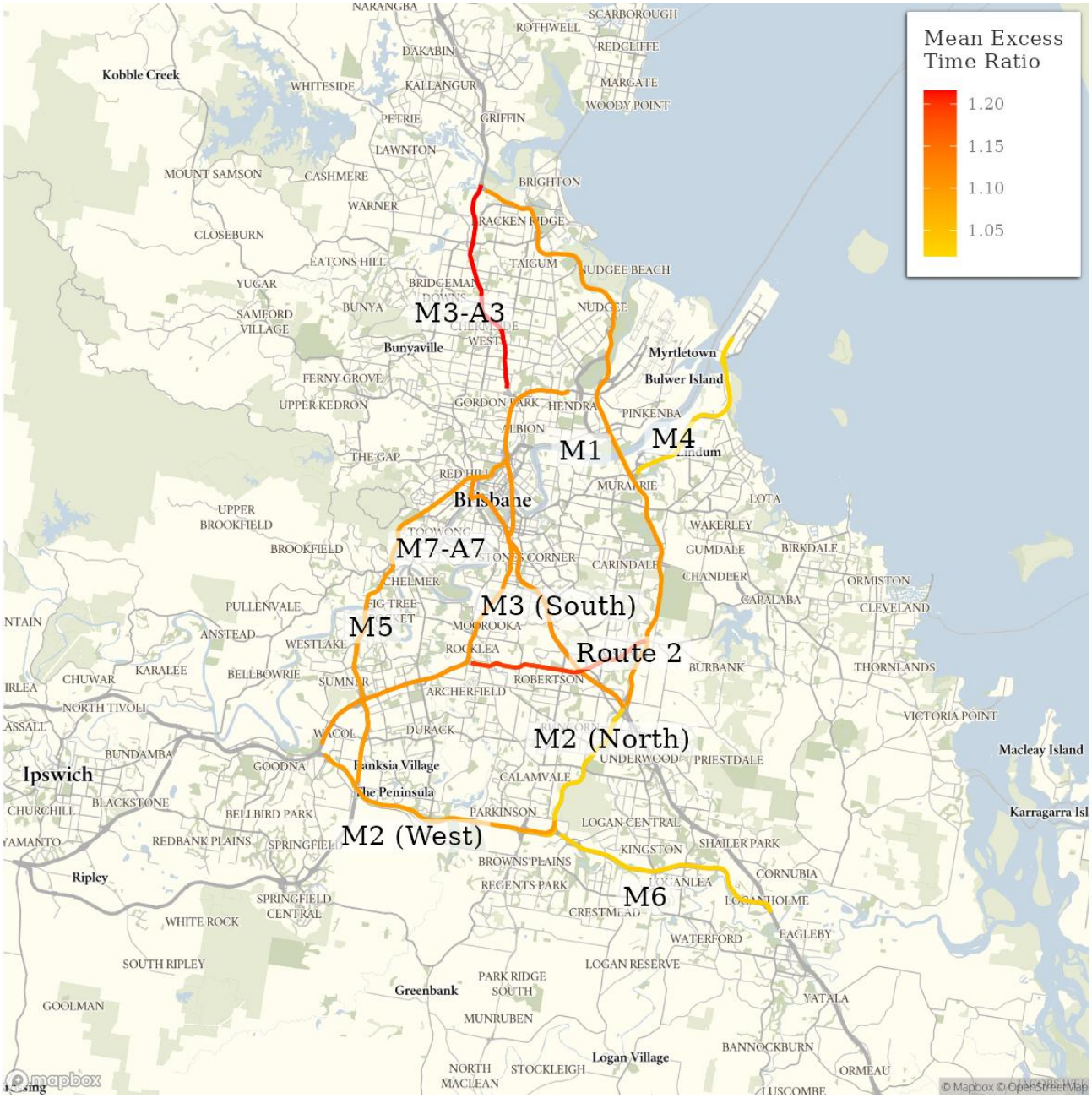
- M1 – Bruce Highway to Pacific Motorway / Pacific Motorway to Bruce Highway
- M2 (North) – Logan Motorway to Pacific Motorway / Pacific Motorway to Logan Motorway
- M2 (West) – Gateway Motorway to Ipswich Motorway / Ipswich Motorway to Gateway
- M3-A3 – Airport Link to M1 / A3 – M1 to Airport Link
- M3 (South) – Inner City Bypass to Pacific Motorway / Pacific Motorway to Inner City Bypass
- M4 – Gateway Motorway to Port of Brisbane / Port of Brisbane to Gateway Motorway
- M5 – Bowen Hills to Logan Motorway / Logan Motorway to Bowen Hills
- M6 – Gateway Motorway to Pacific Motorway / Pacific Motorway to Gateway Motorway
- M7-A7 – Logan Motorway to Southern Cross Way / Southern Cross Way to Logan Motorway
- Route 2 – A7 to Gateway / Gateway to A7

Figure 7 shows all 10 selected Brisbane freight vehicle routes and an index of the METR across each route.

Figure 8 shows changes in the METRs and MEURs across each of the 10 selected Brisbane freight vehicle routes. A majority of routes in Brisbane experienced increases in travel time congestion in 2021. In particular, the highly-weighted M1 experienced increases in both directions reversing reductions observed in 2020.

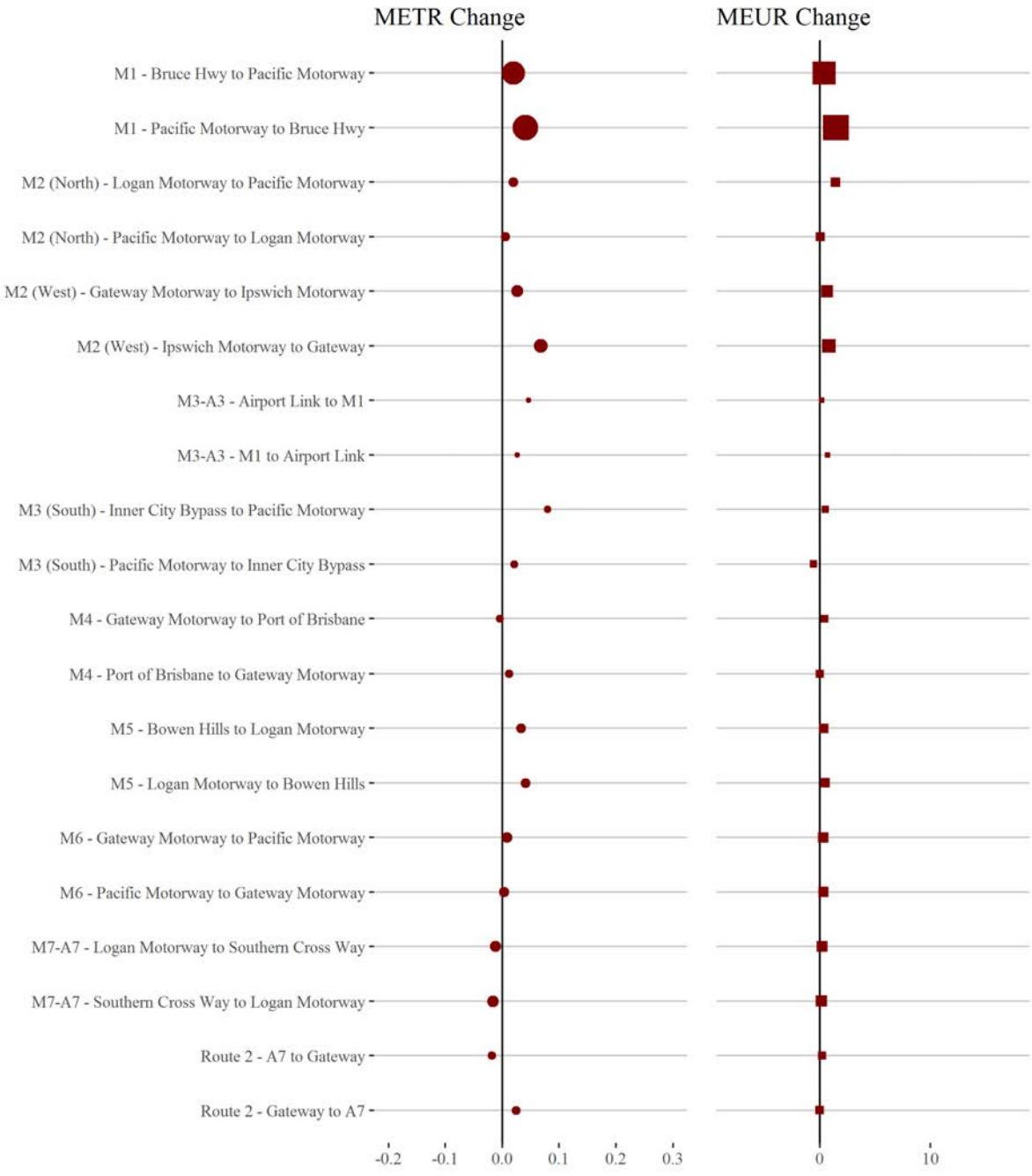
There was fairly consistent increases in congestion uncertainty (MEUR) although increases in the city wide measure were increased largely by the highly weighted M1.

Figure 7 Brisbane route congestion and median travel time index[a], 2021



Note: Ratio of median travel time to best (shortest) travel time for each route.
Source: BITRE estimates.

Figure 8 Brisbane route METR and MEUR changes between 2020 and 2021



Size represents 2021 weights in citywide measure. New routes are shown as zero and marked with asterix (*).

Source: BITRE estimates.

Adelaide

Adelaide metropolitan area freight vehicle routes cover the following 9 highways and major arterial road routes:

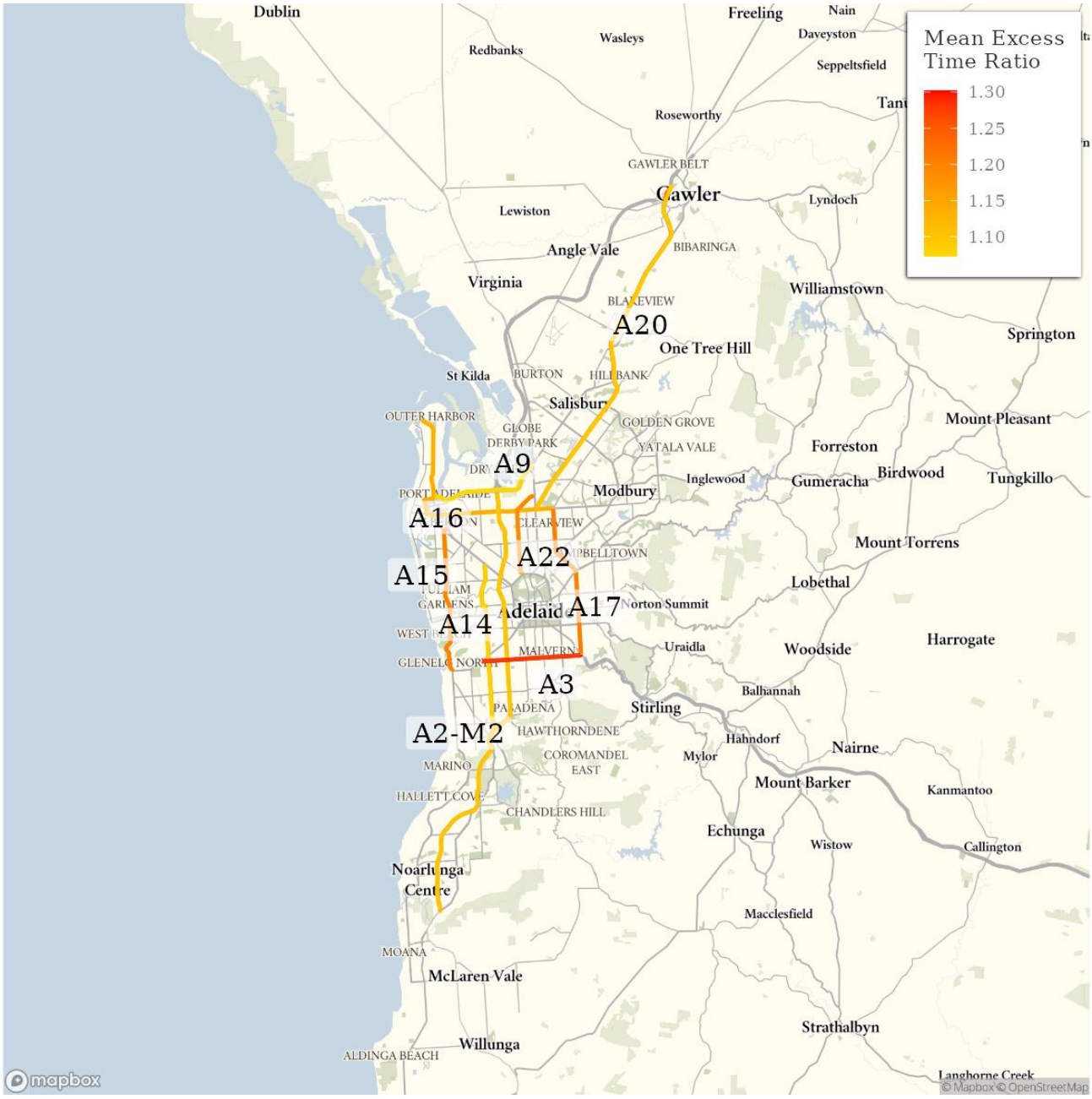
- A14 – Port Road to Southern Expressway / Southern Expressway to Port Road
- A15 – ANZAC Highway to Port Road / Port Road to ANZAC Highway
- A16 – Hampstead Road to Outer Harbor / Outer Harbor to Hampstead Road
- A17 – Grand Junction to South Eastern Freeway / South Eastern Freeway to Grand Junction
- A20 – Grand Junction Road to Sturt Highway / Sturt Highway to Grand Junction Road
- A22 – Park Terrace to Port Wakefield Road / Port Wakefield Road to Park Terrace
- A3 – ANZAC Highway to South Eastern Freeway / South Eastern Freeway to ANZAC Highway
- A9 – Nelson Street to Port Wakefield Road / Port Wakefield Road to Nelson Street
- A2-M2 – Main South Road to Port River Expressway / Port River Expressway to Main South Road.

Figure 9 shows all 9 selected Adelaide freight vehicle routes and an index of the METR across each route.

Figure 10 shows changes in the METRs and MEURs across each of the 9 selected Adelaide freight vehicle routes. Adelaide was alone amongst the 5 capital cities in showing a decrease in mean excess travel time between 2020 and 2021, but showed no distinct pattern across routes with several, including the highly weighted A2-M2, showing both an increase and decrease depending on travel direction.

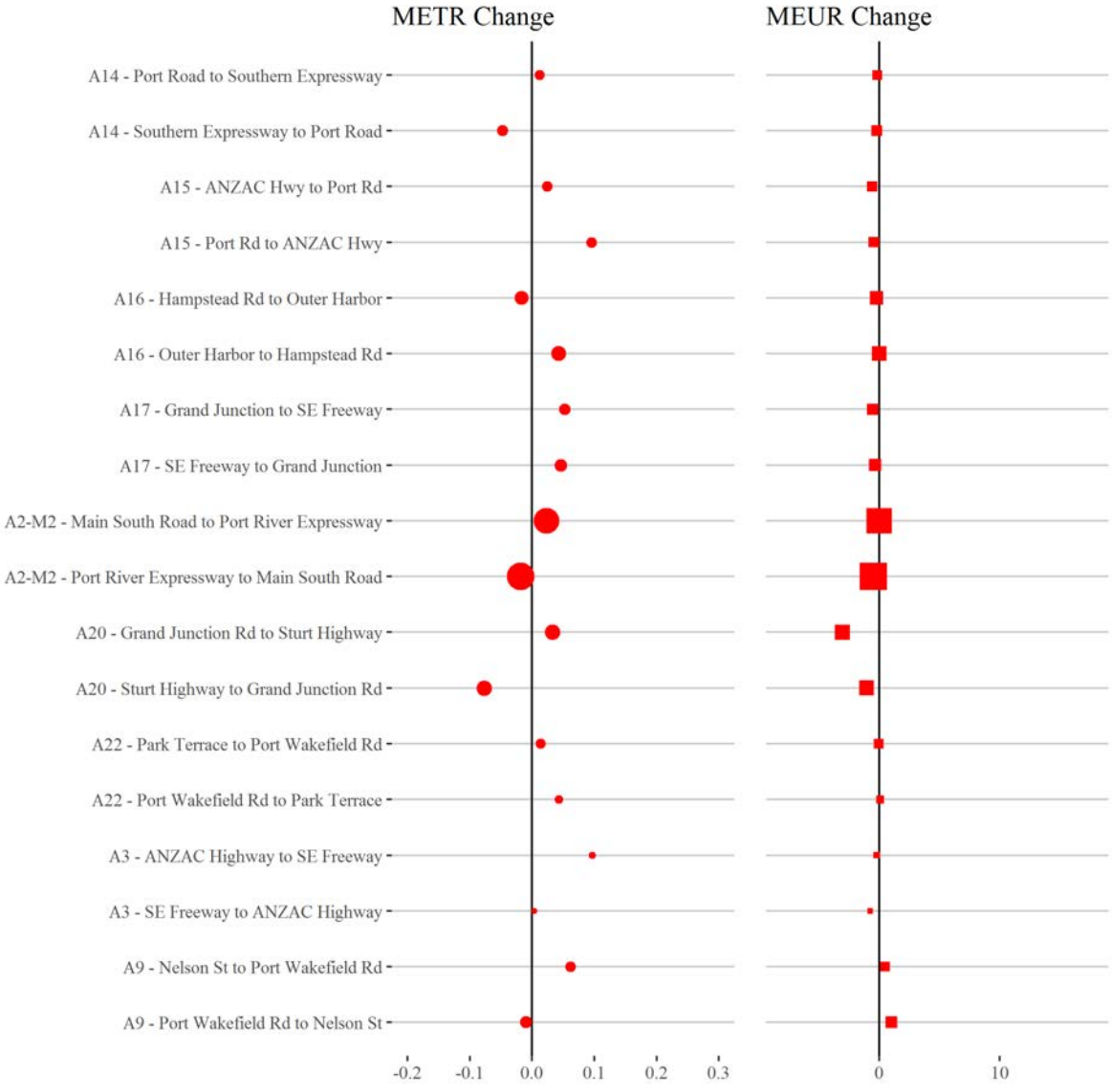
Changes in travel time uncertainty showed fairly consistent falls with changes in the city wide measure driven by the A2-M2.

Figure 9 Adelaide route congestion and median travel time index[a], 2021



Note: Ratio of median travel time to best (shortest) travel time for each route.
Source: BITRE estimates.

Figure 10 Adelaide route METR and MEUR changes between 2020 and 2021



Size represents 2021 weights in citywide measure. New routes are shown as zero and marked with asterix (*).

Source: BITRE estimates.

Perth

Perth metropolitan area freight vehicle routes cover the following 10 freeway, highway and major arterial road routes:

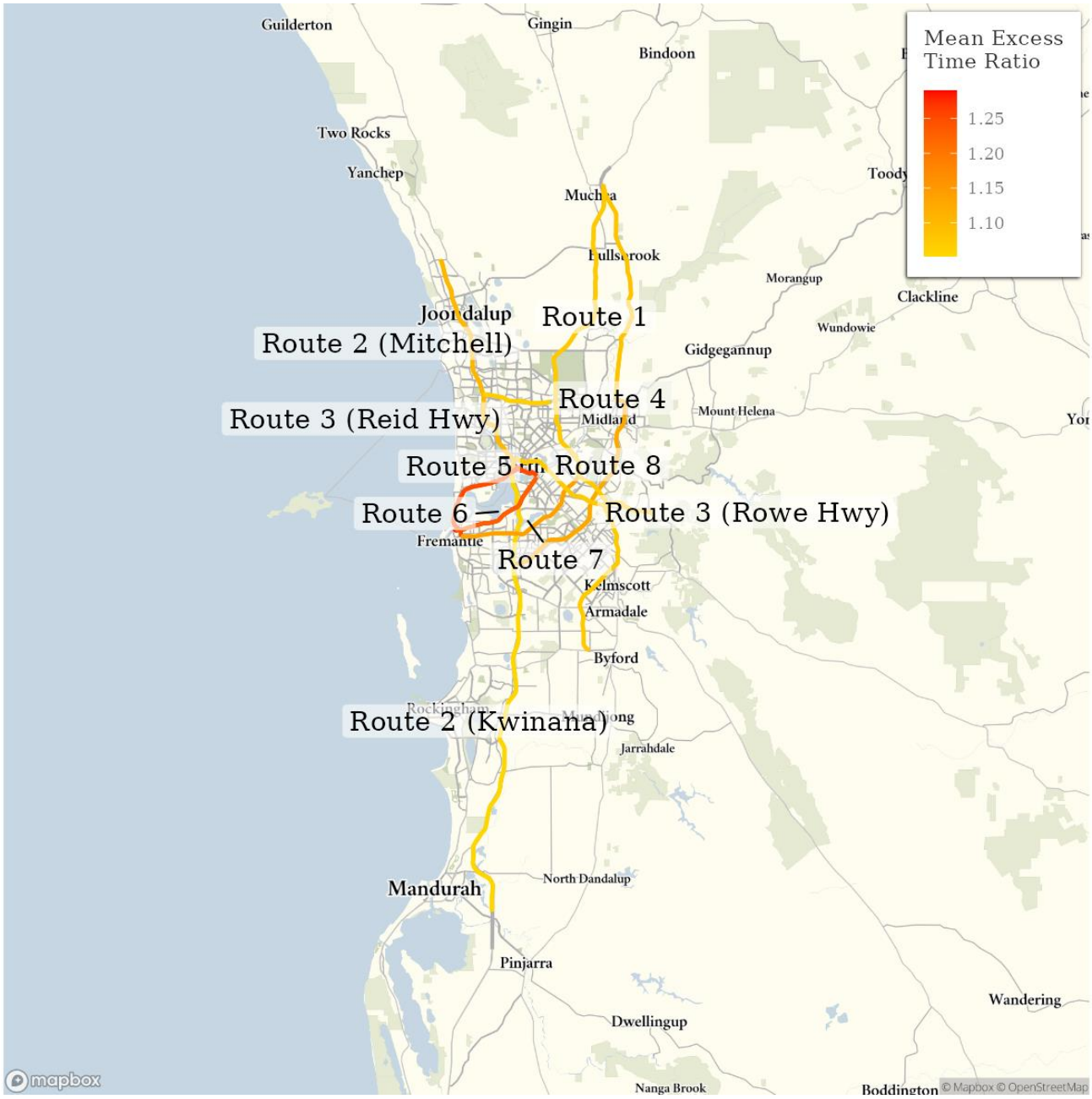
- Route 1 – Roe Highway to Tonkin Highway / Tonkin Highway to Roe Highway
- Route 2 (Mitchell) – Hester Avenue to Swan River / Swan River to Hester Avenue
- Route 2 (Kwinana) – Forrest Highway to Mitchell Highway / Mitchell Freeway to Forrest Highway
- Route 3 (Roe) – Great Northern Highway to Kwinana Freeway / Kwinana Freeway to Great Northern Highway
- Route 3 (Reid) – Mitchell Freeway to Tonkin Freeway / Tonkin Freeway to Mitchell Freeway
- Route 4 – Great Northern Highway to Thomas Road / Thomas Road to Great Northern Highway
- Route 5 – Great Eastern Highway to Stirling Highway, High Street / Stirling Highway, High Street to Great Eastern Highway
- Route 6 – Fremantle to Great Eastern Highway / Great Eastern Highway to Fremantle
- Route 7 – Stirling Highway to Tonkin Freeway / Tonkin Freeway to Stirling Highway
- Route 8 – Canning Road to Mitchell Freeway / Mitchell Freeway to Canning Road.

Figure 11 shows all 10 selected freight vehicle routes in Perth and an index of the METR across each route.

Figure 12 shows changes in the METRs and MEURs between 2020 and 2021 across each of the 10 selected Perth freight vehicle routes. Mean excess travel time congestion in Perth generally increased although this was inconsistent between and within routes.

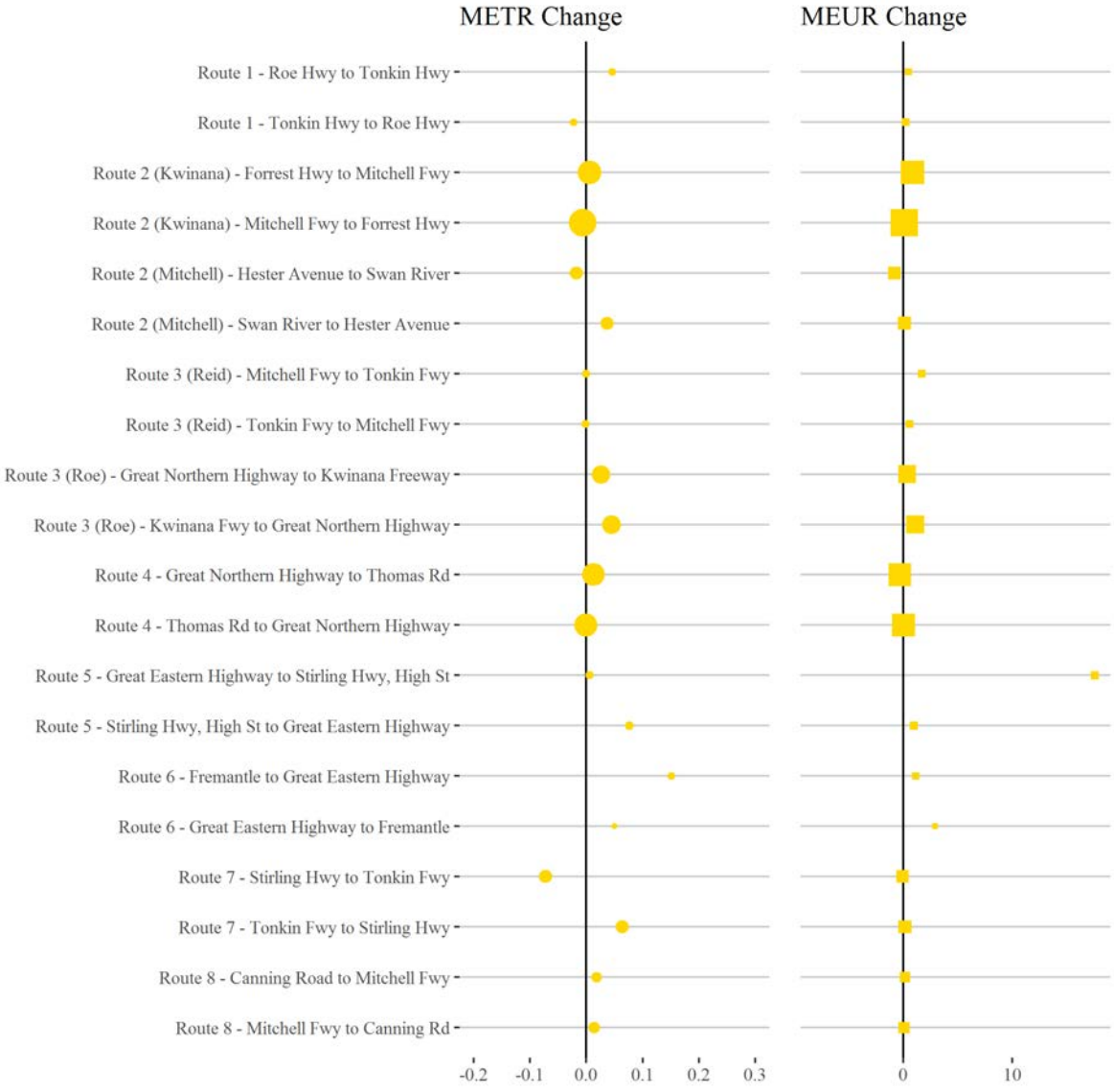
Likewise uncertainty congestion generally increased but was inconsistent across routes, although increases on the relatively higher-weighted Routes 2 and 3 (Roe) were enough to drive an increase in the city wide measure. The low-weighted Route 5 showed an anomalously large increase in congestion likely due to artefacts of the data processing.

Figure 11 Perth route congestion and median travel time index[a], 2021



Note: Ratio of median travel time to best (shortest) travel time for each route.
Source: BITRE estimates.

Figure 12 Perth route METR and MEUR changes between 2020 and 2021



Size represents 2021 weights in citywide measure. New routes are shown as zero and marked with asterix (*).

Source: BITRE estimates.

Appendix A – Individual route freight vehicle congestion measures

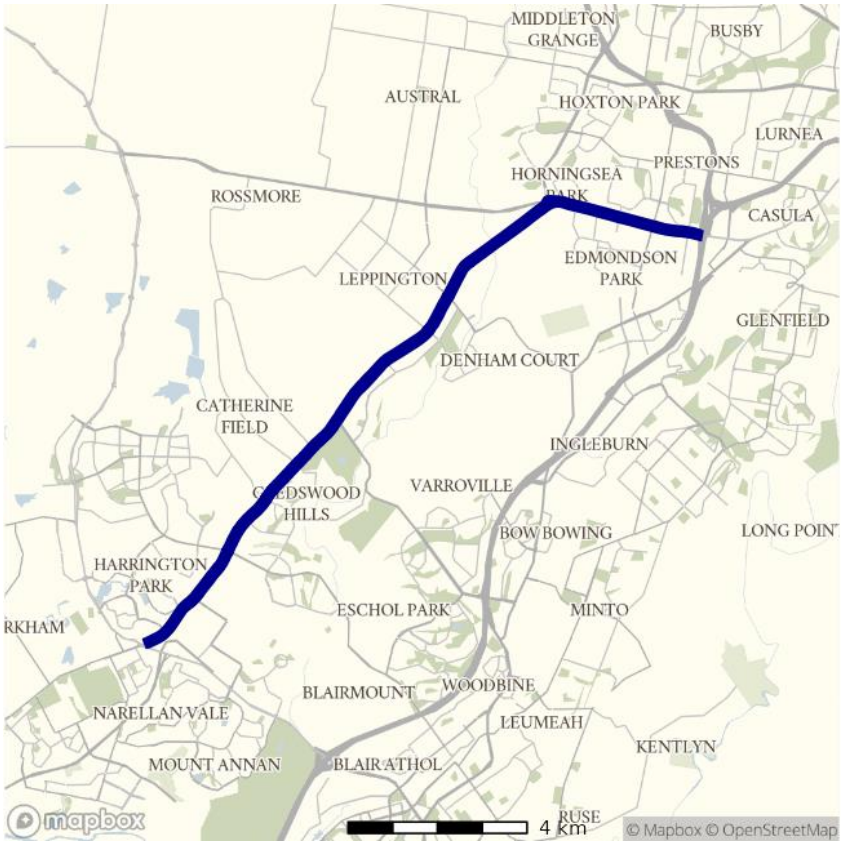
This appendix provides detailed route-specific freight vehicle travel times and congestion measures, including median and interquartile range travel times, for each route in each capital city. The routes are grouped by city and for each route the results comprise a route map, table of median and variation in travel times, and graphs showing the hourly distribution of median and interquartile range of travel time. Unless stated otherwise a “decrease” or “increase” refers to the peak or minimum compared to 2020, not the particular hour.

Sydney routes

12 – A9 to M7/M7 to A9

This route follows surface routes in South Western Sydney from the A9 at Narellan to Casula where the Hume Motorway branches into the M5 and M7. It serves areas adjacent to the Western Sydney Airport currently under construction and some light industrial areas. It runs predominantly along Camden Valley Way.

Figure A.1 A22 route map



Source: BITRE estimates.

Table A.1 12 route travel times and congestion measures, 2021

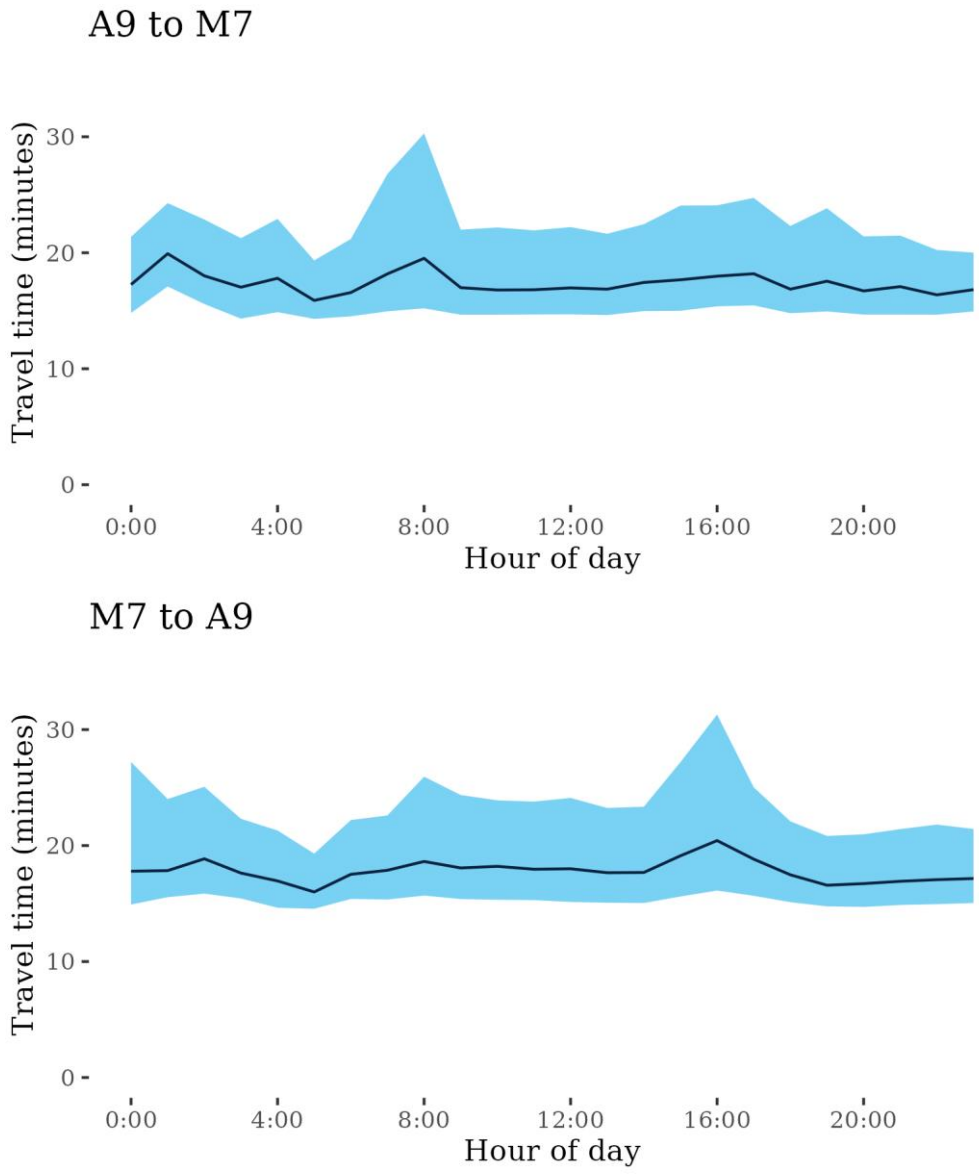
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
A9 to M7	0:15:54	0:19:55	1.094	0:05:02	0:15:05	1.541	17.12
M7 to A9	0:16:00	0:20:26	1.112	0:04:46	0:15:11	1.743	17.1

Source: BITRE estimates.

The best median travel times for journeys from the A9 to the M7 were 16 minutes at 5am and the lowest uncertainty was at 5am with an interquartile range of 5 minutes. The longest median travel times were 20 minutes at 1am and the greatest uncertainty were at 8am with an interquartile range of 15 minutes, where there was also a morning peak in travel times. Delays were concentrated in the Norther part of the route near the M7.

The best median travel times and lowest uncertainty for journeys from the M7 to the A9 were at 5am with a median travel time of 16 minutes and an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 20 minutes and an interquartile range of 15 minutes. Delays in this peak were concentrated near the far South of the route.

Figure A.2 12 route median and interquartile range travel times

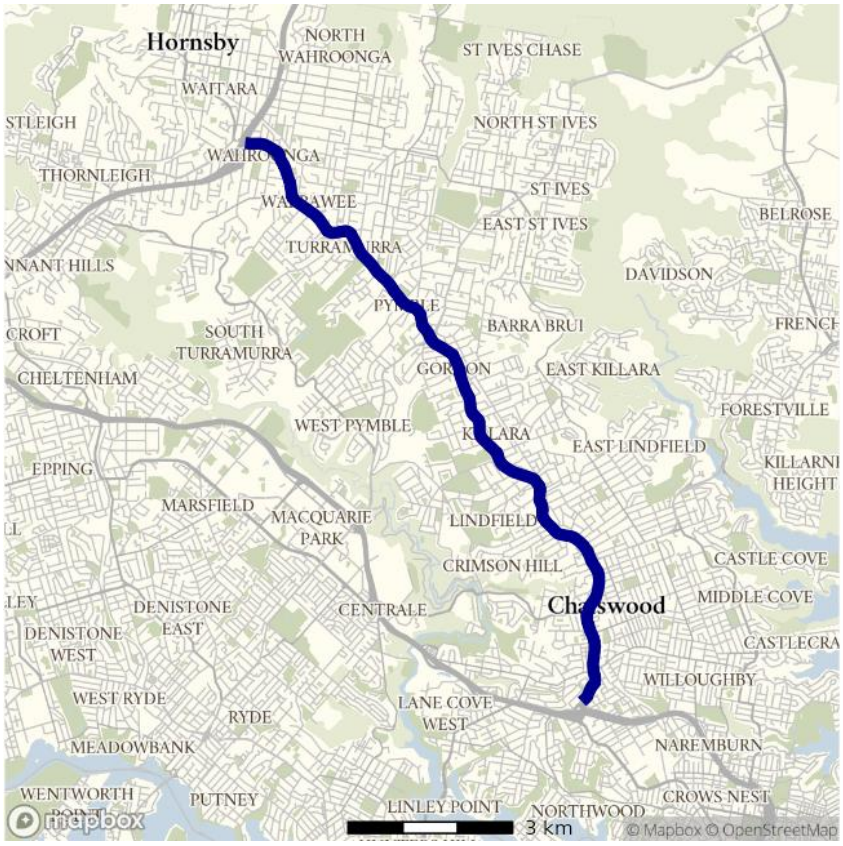


Source: BITRE estimates.

A1 – Artarmon to Wahroonga/Wahroonga to Artarmon

This route follows the Pacific Highway from the Gore Hill Expressway at Artarmon and the M1 Motorway at Wahroonga. It, along with NorthConnex, is one of two routes connecting the orbital road network to the Pacific Motorway (M1) and the north of the state and Queensland. It also services most of the Upper North Shore of Sydney.

Figure A.3 A22 route map



Source: BITRE estimates.

Table A.2 A1 route travel times and congestion measures, 2021

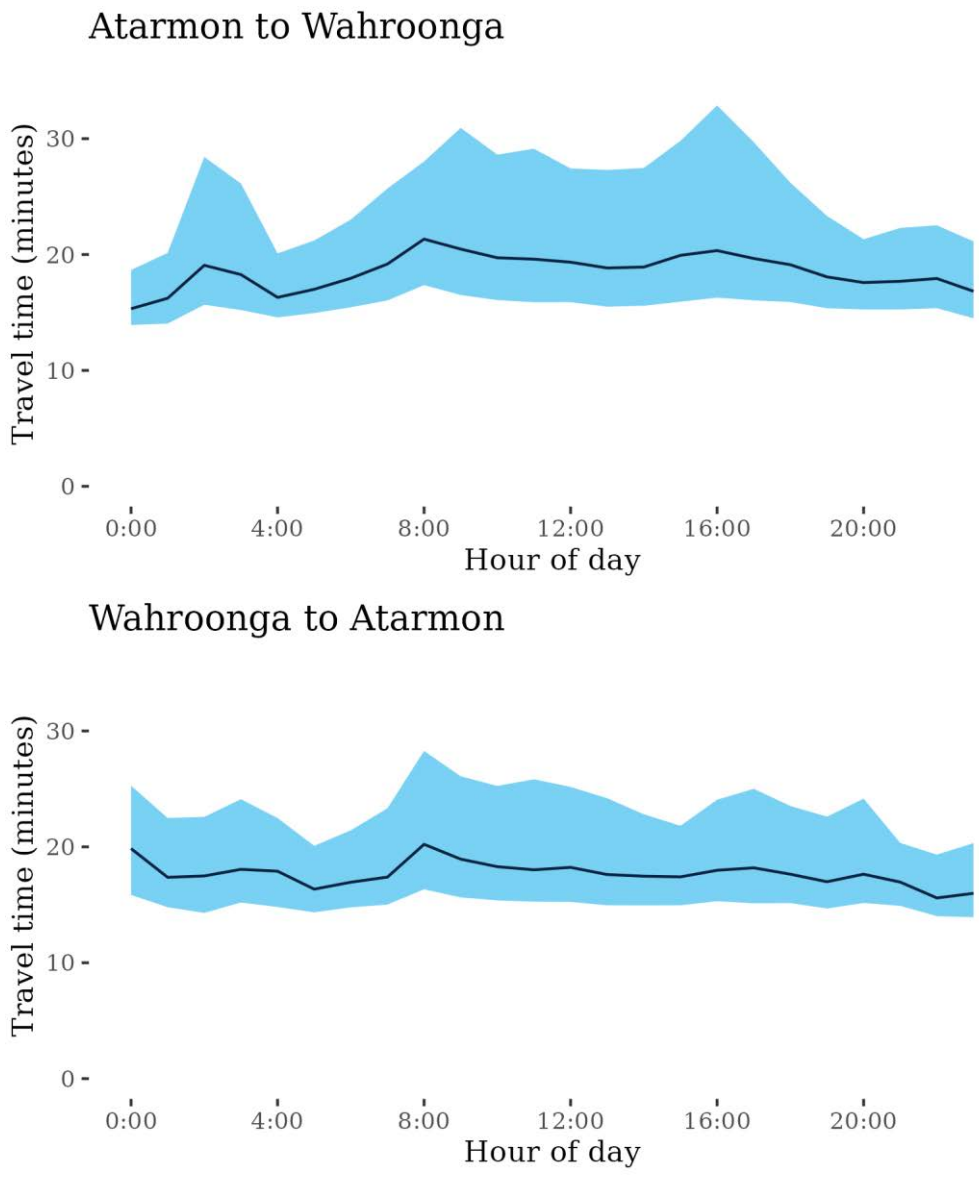
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Artarmon to Wahroonga	0:15:19	0:21:20	1.21	0:04:44	0:16:35	2.104	13.5
Wahroonga to Artarmon	0:15:35	0:20:13	1.135	0:05:18	0:11:56	1.574	13.48

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Artarmon to Wahroonga were at midnight with a median travel time of 15 minutes and an interquartile range of 5 minutes. The longest median travel times were 21 minutes at 8am and the greatest uncertainty were at 4pm with an interquartile range of 21 minutes. There was also a "third peak" at 2am. Delays were spread throughout the route.

The best median travel times and least uncertainty for journeys from Wahroonga to Artarmon were at 10pm with a median travel time of 16 minutes and an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 20 minutes and an interquartile range of 20 minutes. Unlike the other direction there was no afternoon peak.

Figure A.4 A1 route median and interquartile range travel times

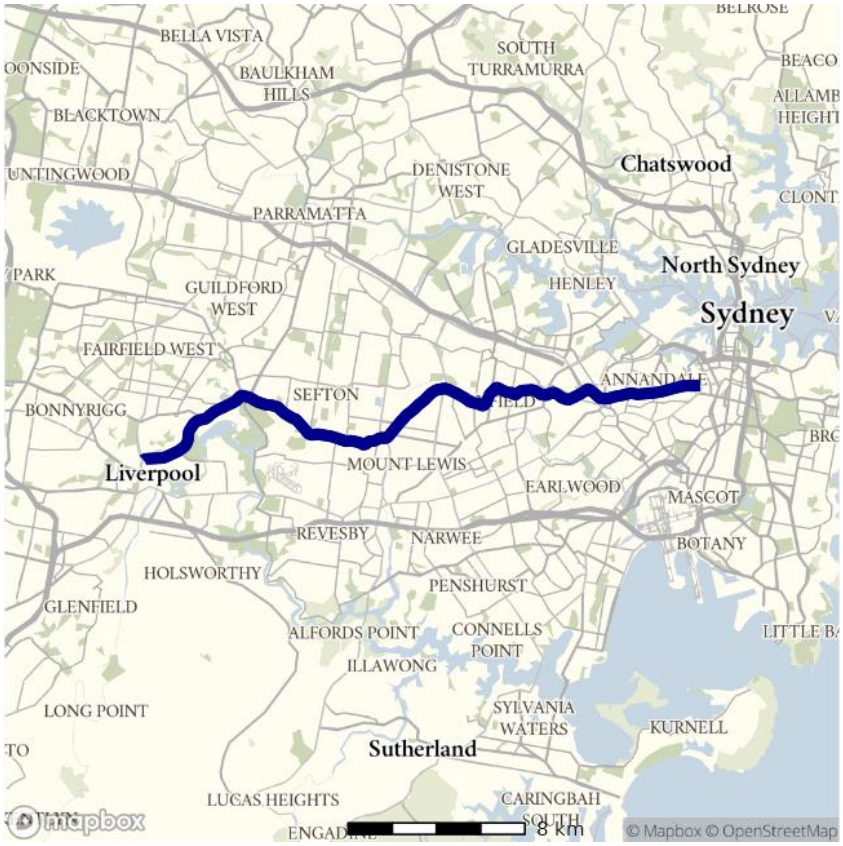


Source: BITRE estimates.

A22 – Glebe to Liverpool/Liverpool to Glebe

This route follows surface roads between the inner city and the south west of Sydney via Ashfield and important logistics sites around Chullora. It is known by various names along its extent, including Parramatta Road, Liverpool Road and also as the Hume Highway for most of its length.

Figure A.5 A22 route map



Source: BITRE estimates.

Table A.3 A22 route travel times and congestion measures, 2021

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Glebe to Liverpool	0:38:39	0:47:18	1.088	0:22:36	0:38:52	1.266	29.24
Liverpool to Glebe	0:38:06	0:45:45	1.103	0:21:36	0:37:28	1.308	29.27

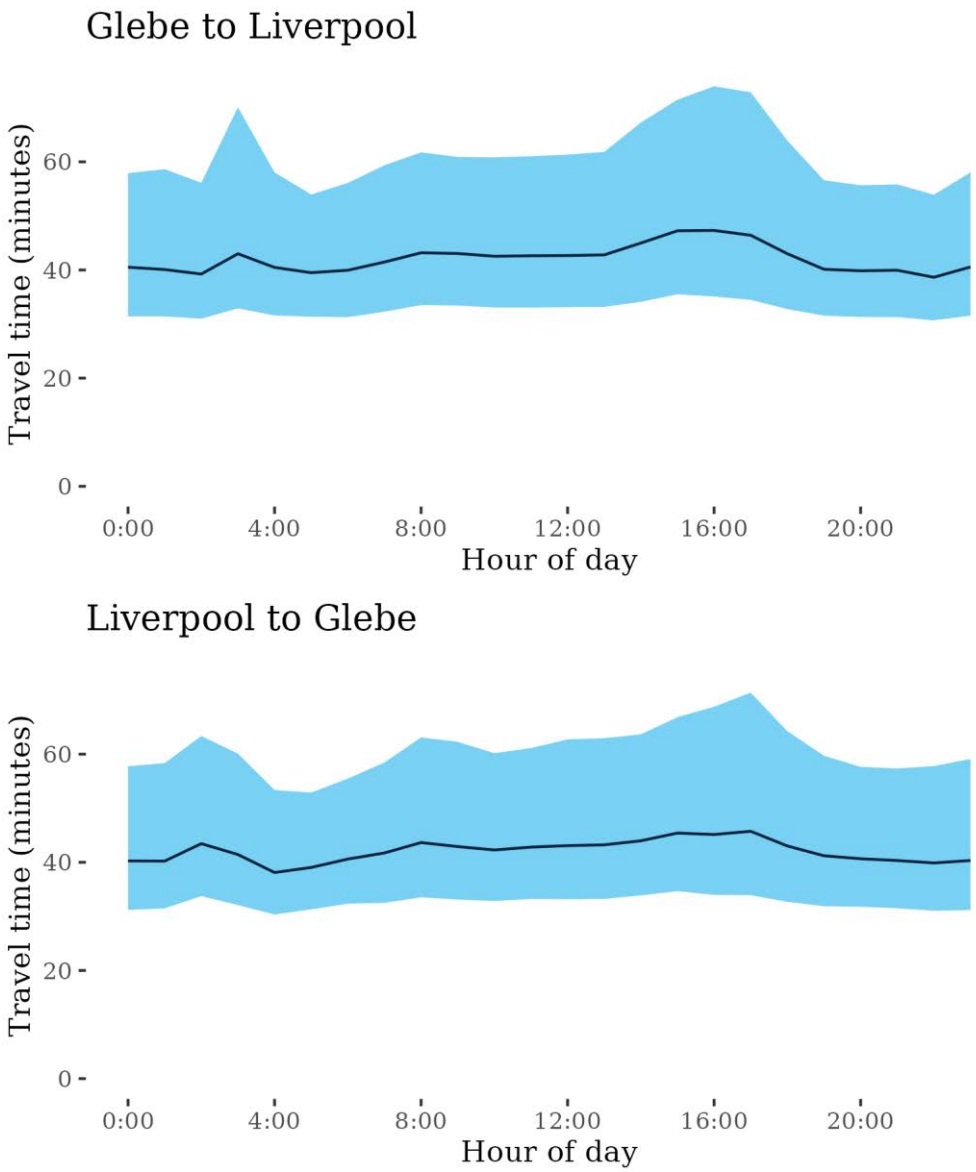
Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Glebe to Liverpool were at 10pm with a median travel time of 39 minutes and an interquartile range of 23 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 47 minutes and an interquartile range of 38 minutes.

The best travel times and lowest uncertainty travelling from Liverpool to Glebe were at 4am and 5am with a median travel time of 38 minutes and an interquartile range of 22 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 46 minutes and an interquartile range of 38 minutes.

As in 2020 delays were notable around Parramatta Road, Ashfield and Canley Vale. Congestion was noticeable lower during the third quarter.

Figure A.6 A22 route median and interquartile range travel times



Source: BITRE estimates.

A28 – Casula to M2 Motorway / M2 Motorway to Casula

This surface route traverses much of Western Sydney, from the intersection of the M2 and Pennant Hills Road to the intersection of the Hume Motorway and Camden Valley Way. It passes Wentworthville, Fairfield West, Liverpool and Casula and crosses the A44, M4 and M5 routes.

Figure A.7 A28 route map

Source: BITRE estimates.

Table A.4 A28 route travel times and congestion measures, 2021

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Casula to M2 Motorway	0:38:16	0:46:47	1.107	0:17:06	0:36:49	1.533	32.77
M2 Motorway to Casula	0:38:10	0:47:00	1.073	0:16:33	0:41:12	1.468	32.93

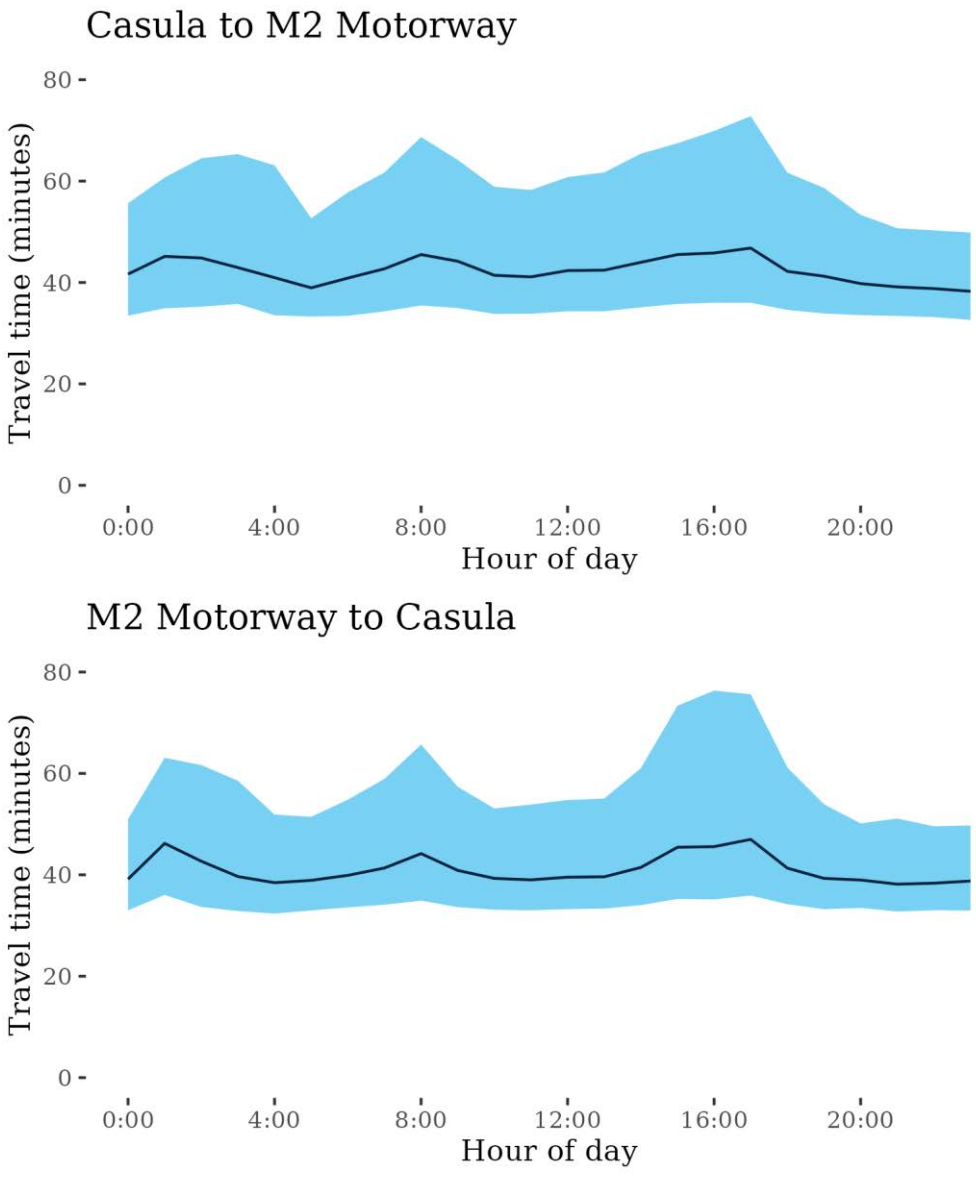
Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from Casula to the M2 Motorway were at 11pm and 10pm with a median travel time of 38 minutes and an interquartile range of 17 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 47 minutes and an interquartile range of 37 minutes.

The best travel times and lowest uncertainty travelling from the M2 Motorway to Casula were at 9pm and 10pm with a median travel time of 38 minutes and an interquartile range of 17 minutes. The longest median travel times were 47 minutes at 5pm and the greatest uncertainty were at 4pm with an interquartile range of 41 minutes.

Over all this was very similar to 2020 with delays prominent at Granville although congestion was lower in the third quarter.

Figure A.8 A28 route median and interquartile range travel times

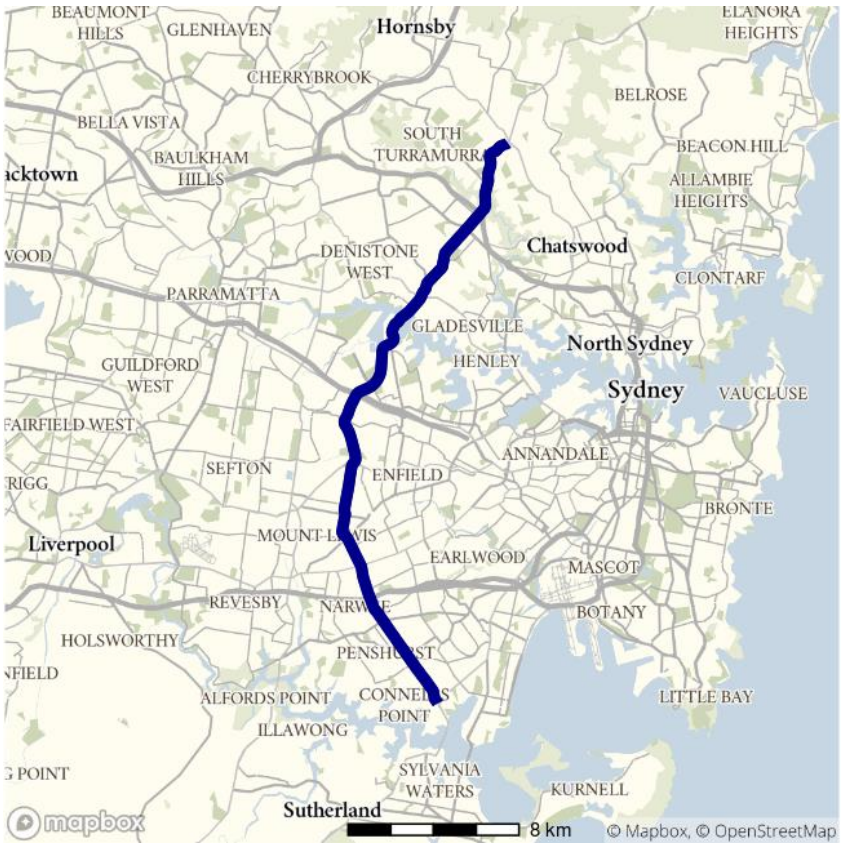


Source: BITRE estimates.

A3 – Blakehurst to Pymble / Pymble to Blakehurst

This route traverses Sydney from the intersection of Ryde Road and the Pacific Highway at Pymble to the Princes Highway at Blakehurst. It passes through Ryde, Strathfield, Roselands and Hurstville along its extent. It intersects with a number of other routes in this report including the M2, M4 and M5 motorways and the A34, A22 and A40.

Figure A.9 A3 route map



Source: BITRE estimates.

Table A.5 A3 route travel times and congestion measures, 2021

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Blakehurst to Pymble	0:36:24	0:45:33	1.094	0:15:35	0:34:12	1.44	30.5
Pymble to Blakehurst	0:36:17	0:52:40	1.123	0:16:50	0:41:11	1.418	30.79

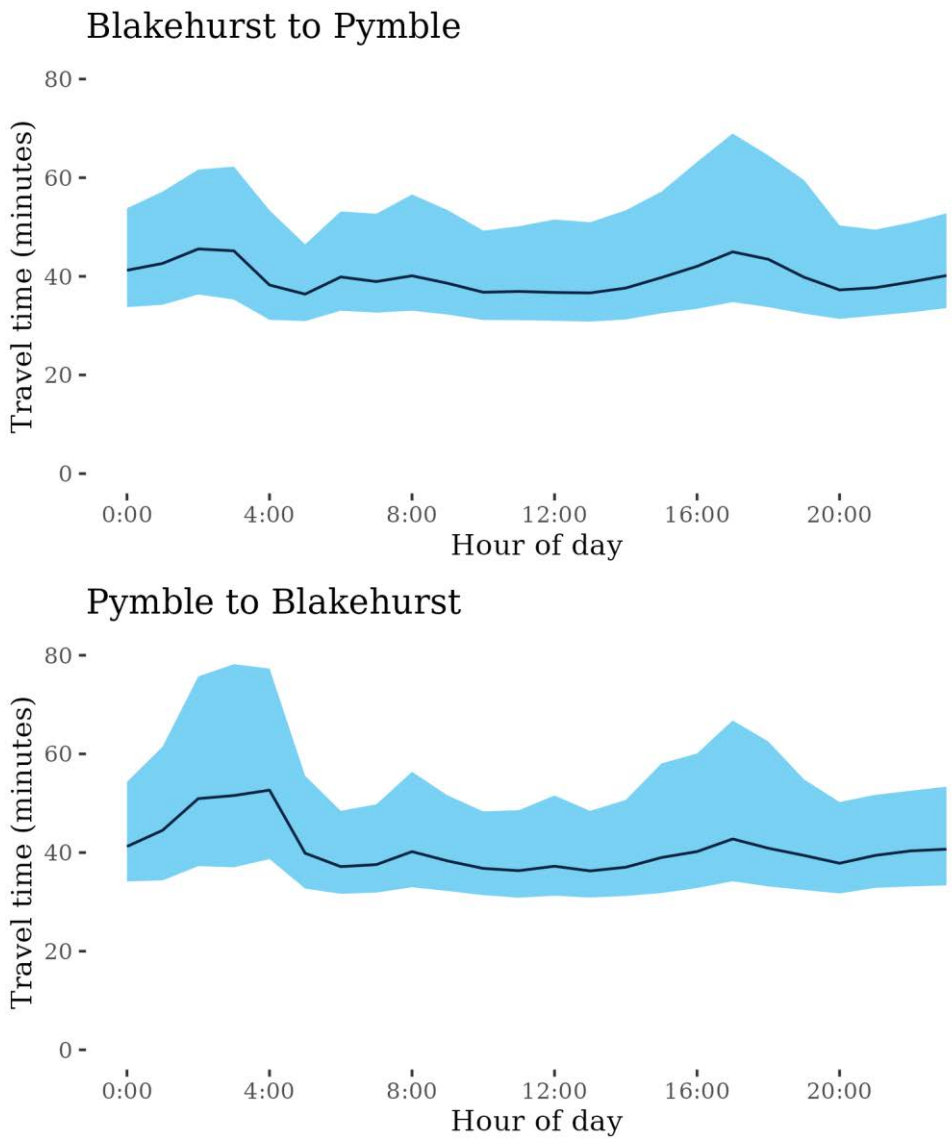
Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Blakehurst to Pymble were at 5am with a median travel time of 36 minutes and an interquartile range of 16 minutes. The longest median travel times were 46 minutes at 2am and the greatest uncertainty were at 5pm with an interquartile range of 34 minutes.

The best travel times and lowest uncertainty travelling from Pymble to Blakehurst were at 1pm and 6am with a median travel time of 36 minutes and an interquartile range of 17 minutes. The longest median travel times were at 4am with a median of 53 minutes and the greatest uncertainty at 3am with an interquartile range of 41 minutes.

The third peaks in both directions were not apparent in 2020 however the morning and afternoon peaks, whilst similar, were more subdued.

Figure A.10 A3 route median and interquartile range travel times



Source: BITRE estimates.

A34 – Liverpool to Newtown / Newtown to Liverpool

This route follows a path almost parallel but more southerly to the A22, passing Marrickville, Punchbowl and Milperra. It is known by various names, including Canterbury Road and Milperra Road along its length.

Figure A.11 A34 route map

Source: BITRE estimates.

Table A.6 A34 route travel times and congestion measures, 2021

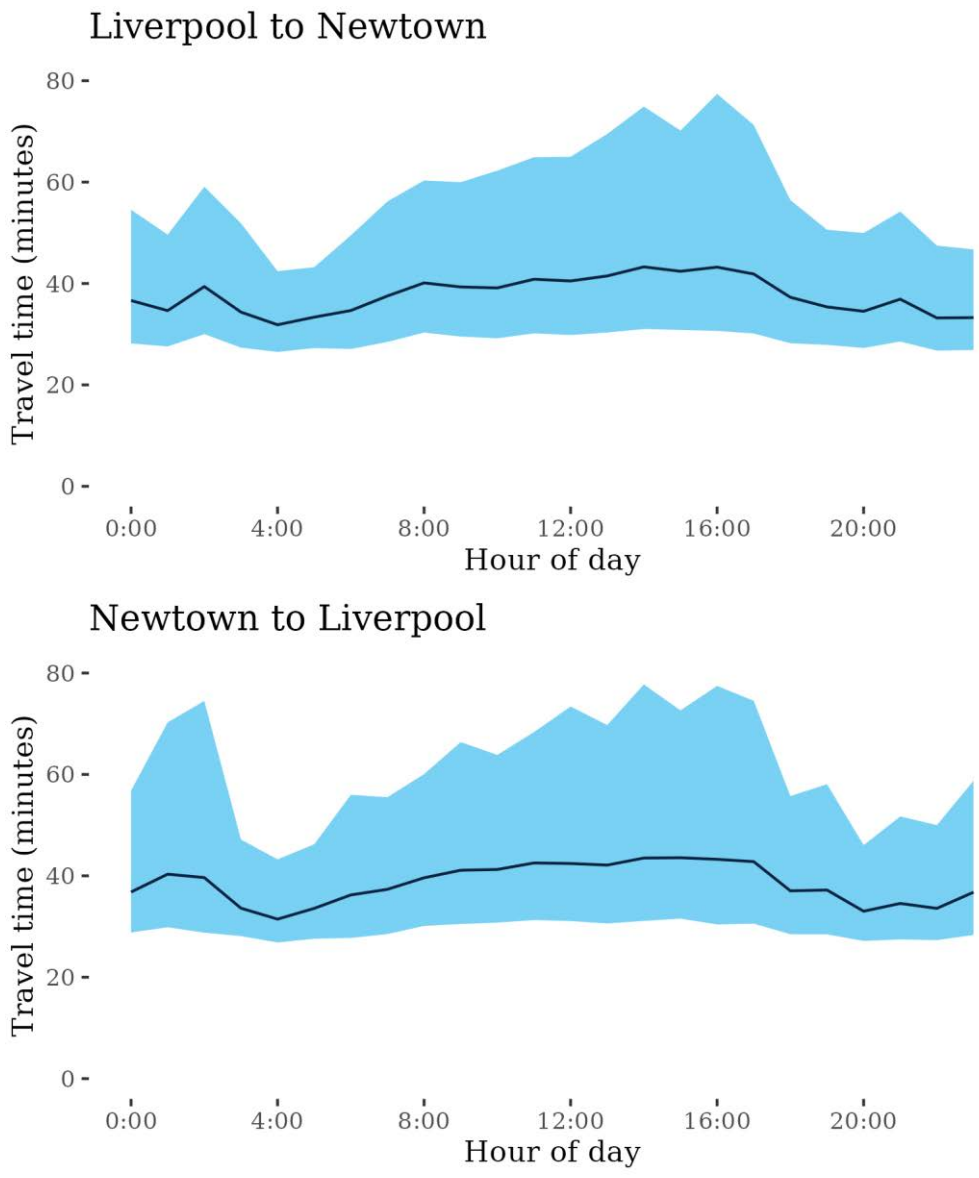
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Liverpool to Newtown	0:31:52	0:43:17	1.184	0:15:56	0:46:45	1.825	26.08
Newtown to Liverpool	0:31:28	0:43:34	1.223	0:16:24	0:47:03	1.964	26.74

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Liverpool to Newtown were at 4am with a median travel time of 32 minutes and an interquartile range of 16 minutes. The longest median travel times were 43 minutes at 2pm and the greatest uncertainty were at 4pm with an interquartile range of 47 minutes.

The best median travel times for journeys from Newtown to Liverpool were 31 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 16 minutes. The longest median travel times were at 3pm with a median of 44 minutes and the greatest uncertainty at 4pm with an interquartile range of 47 minutes.

Figure A.12 A34 route median and interquartile range travel times



Source: BITRE estimates.

A36 – Broadway to Georges River / Georges River to Broadway

This route travels south from the inner city at Broadway (Glebe), skirting industrial areas at Alexandria and passing through the St George region before meeting the A3 at Blakehurst. For most of its length it is known as the Princes Highway.

Figure A.13 A36 route map

Source: BITRE estimates.

Table A.7 A36 route travel times and congestion measures, 2021

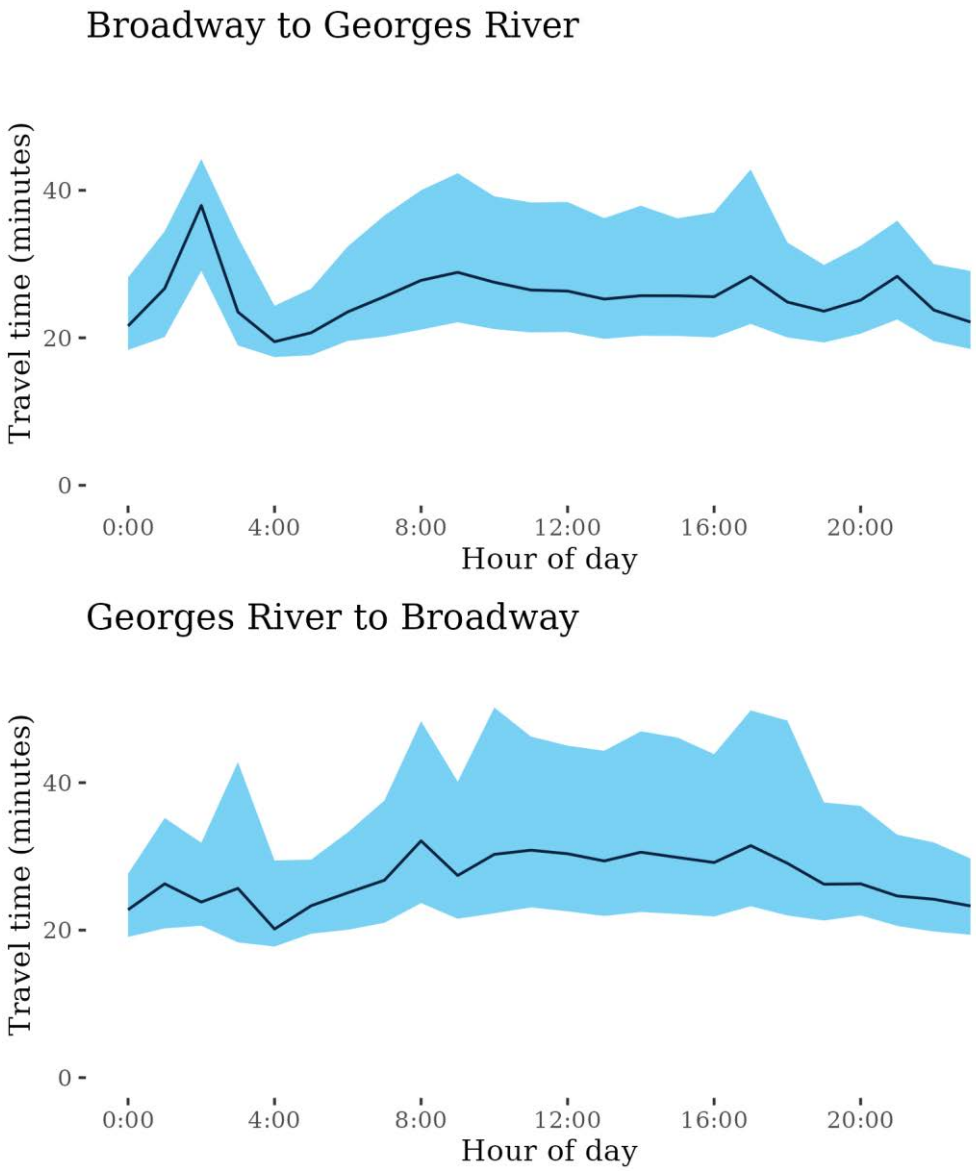
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Broadway to Georges River	0:19:28	0:37:57	1.315	0:06:58	0:20:57	2.089	16.48
Georges River to Broadway	0:20:09	0:32:07	1.342	0:08:34	0:27:54	2.136	16.51

Source: BITRE estimates.

The best median travel times for journeys from Broadway to Georges River were 19 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 7 minutes. The longest median travel times were 38 minutes at 2am and the greatest uncertainty were at 5pm with an interquartile range of 20 minutes

The best median travel times and least uncertainty for journeys from Georges River to Broadway were at 4am with a median travel time of 20 minutes and an interquartile range of 8.5 minutes. The longest median travel times were at 8am with a median of 32 minutes and the greatest uncertainty at 10am with an interquartile range of 28 minutes.

Figure A.14 A36 route median and interquartile range travel times

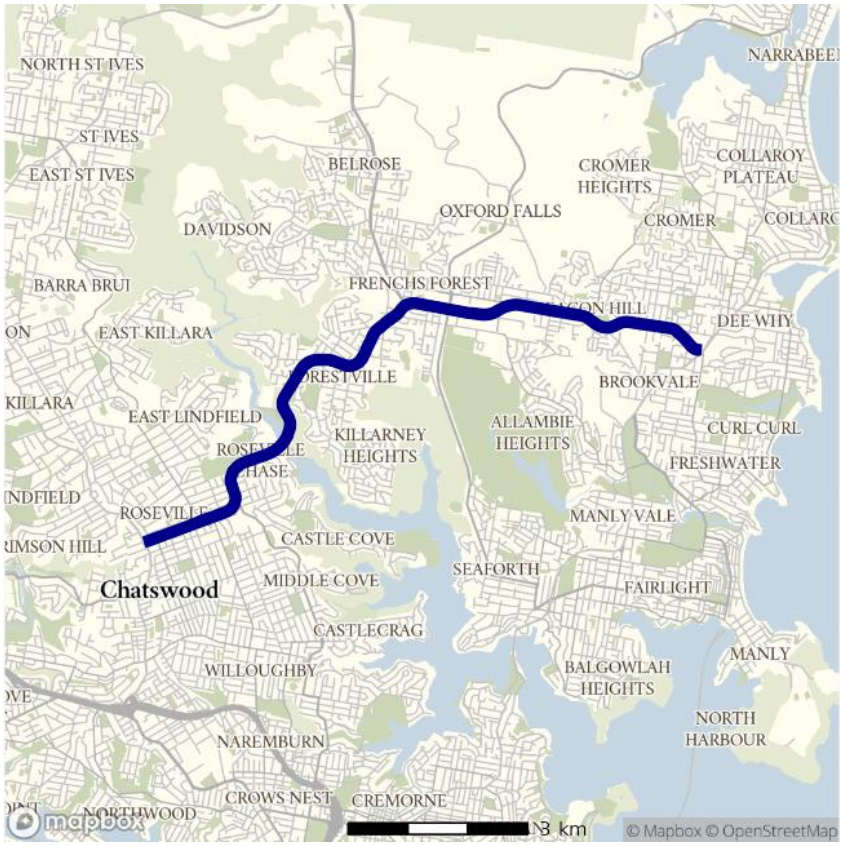


Source: BITRE estimates.

A38 – Dee Why to Roseville/Roseville to Dee Why

This route connects the Upper North Shore and Northern Beaches regions of Sydney, from the Pacific Highway (A1) at Roseville to Pittwater Rd (A8) at Dee Why.

Figure A.15 A38 route map



Source: BITRE estimates.

Table A.8 A38 route travel times and congestion measures, 2021

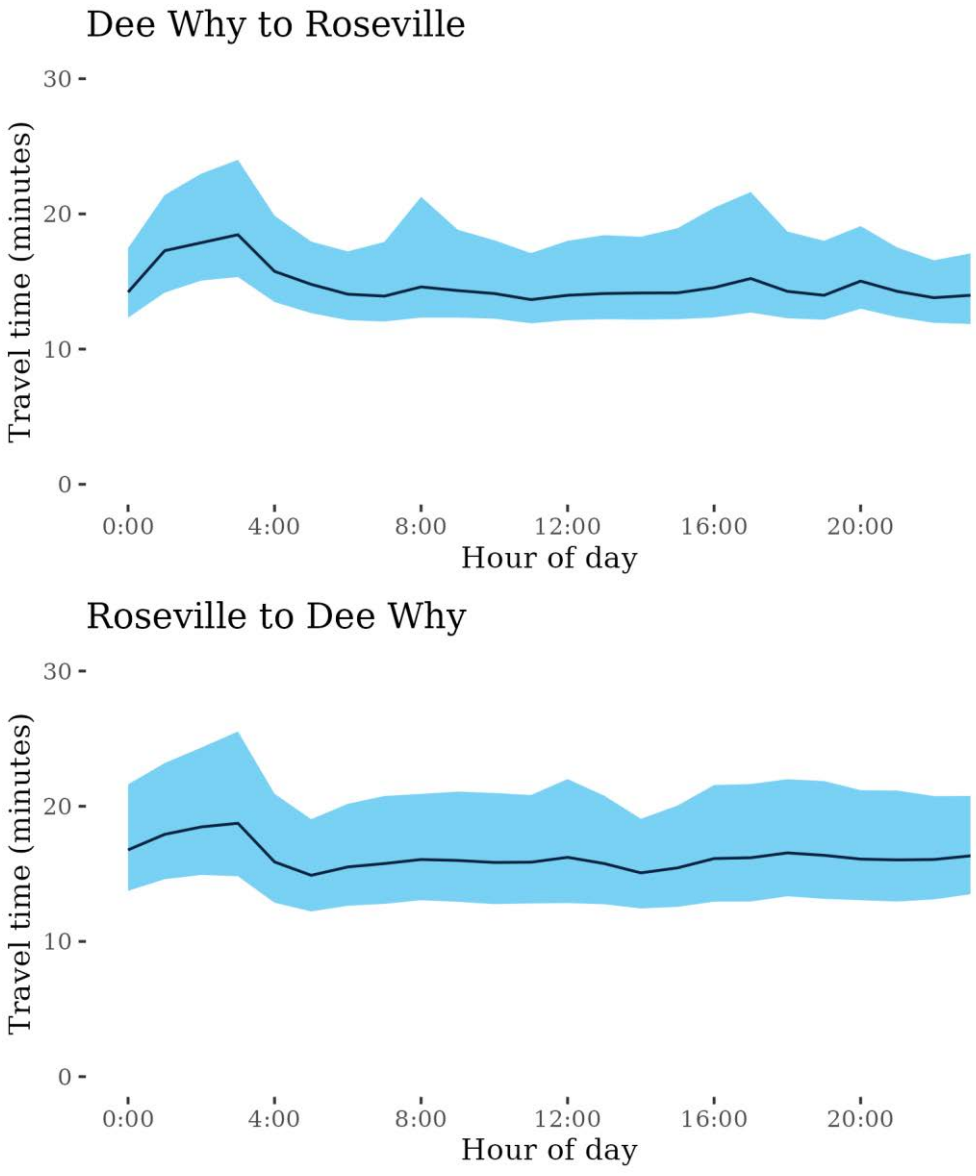
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Dee Why to Roseville	0:13:40	0:18:28	1.081	0:04:38	0:08:57	1.378	12.10
Roseville to Dee Why	0:14:54	0:18:45	1.091	0:06:38	0:10:42	1.235	12.12

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Dee Why to Roseville were at 11am with a median travel time of 14 minutes and an interquartile range of 5 minutes. The longest median travel times were at 3am with a median of 18 minutes and the greatest uncertainty at 8am with an interquartile range of 9 minutes.

The best median travel times and lowest uncertainty for journeys from Roseville to Dee Why were at 5am with a median travel time of 15 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at 3am with a median of 19 minutes and an interquartile range of 11 minutes.

Figure A.16 A38 route median and interquartile range travel times



Source: BITRE estimates.

A40 – Baulkham Hills to Rozelle / Rozelle to Baulkham Hills

This route connects the inner city (Rozelle) and the north-west of Sydney passing through Gladesville, Rydalmere and Toongabbie along its path. It is known at different points as Victoria Road, James Ruse Drive and Old Windsor Road.

Figure A.17 A40 route map

Source: BITRE estimates.

Table A.9 A40 route travel times and congestion measures, 2021

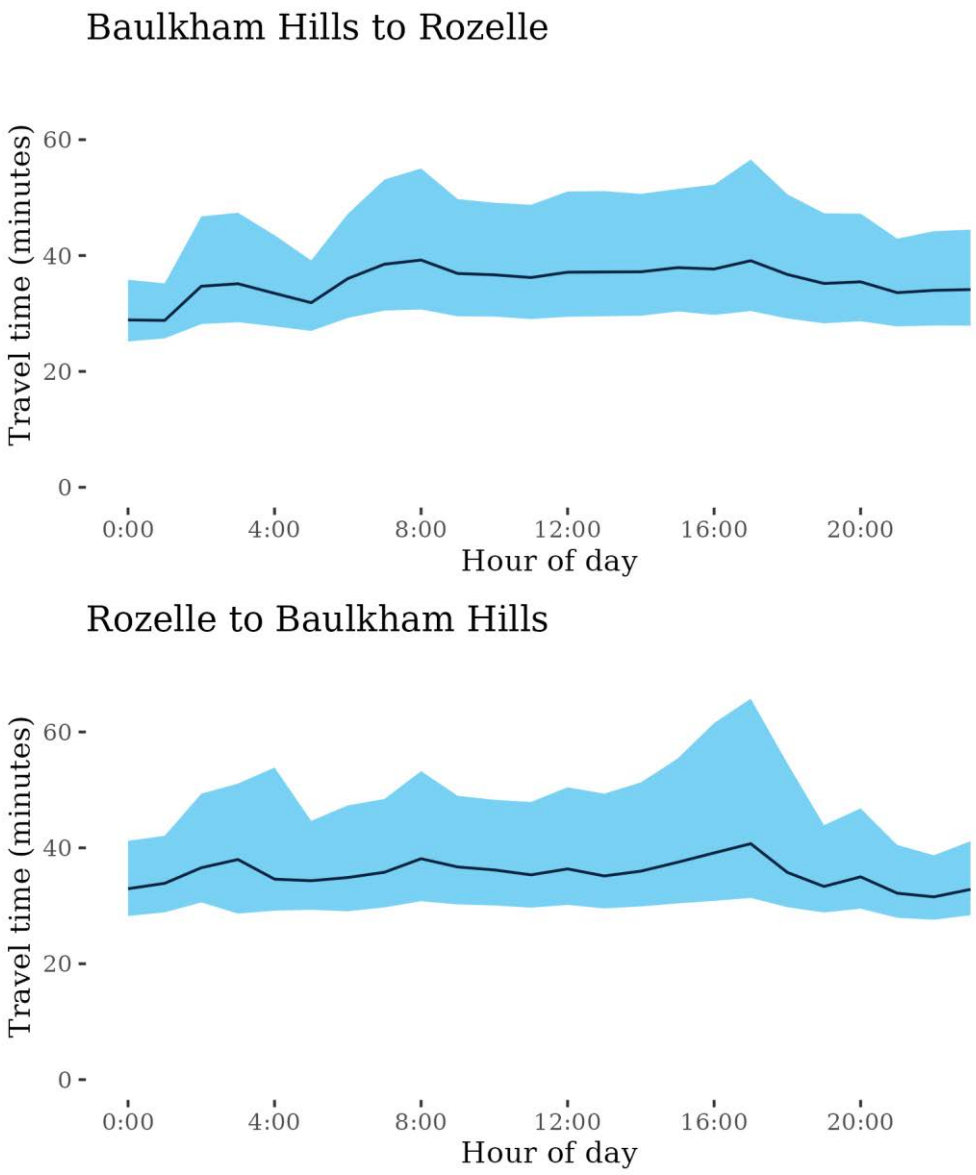
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Baulkham Hills to Rozelle	0:28:48	0:39:13	1.232	0:09:29	0:26:08	1.98	27.82
Rozelle to Baulkham Hills	0:31:33	0:40:43	1.127	0:11:07	0:34:23	1.751	28.12

Source: BITRE estimates.

The best median travel times for journeys from Baulkham Hills to Rozelle were 29 minutes at 1am and the lowest uncertainty was at 1am with an interquartile range of 9.5 minutes. The longest median travel times were 39 minutes at 8am and the greatest uncertainty were at 5pm with an interquartile range of 26 minutes.

The best median travel times for journeys from Rozelle to Baulkham Hills were 32 minutes at 10pm and the lowest uncertainty was at 10pm with an interquartile range of 11 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 41 minutes and an interquartile range of 34 minutes.

Figure A.18 A40 route median and interquartile range travel times

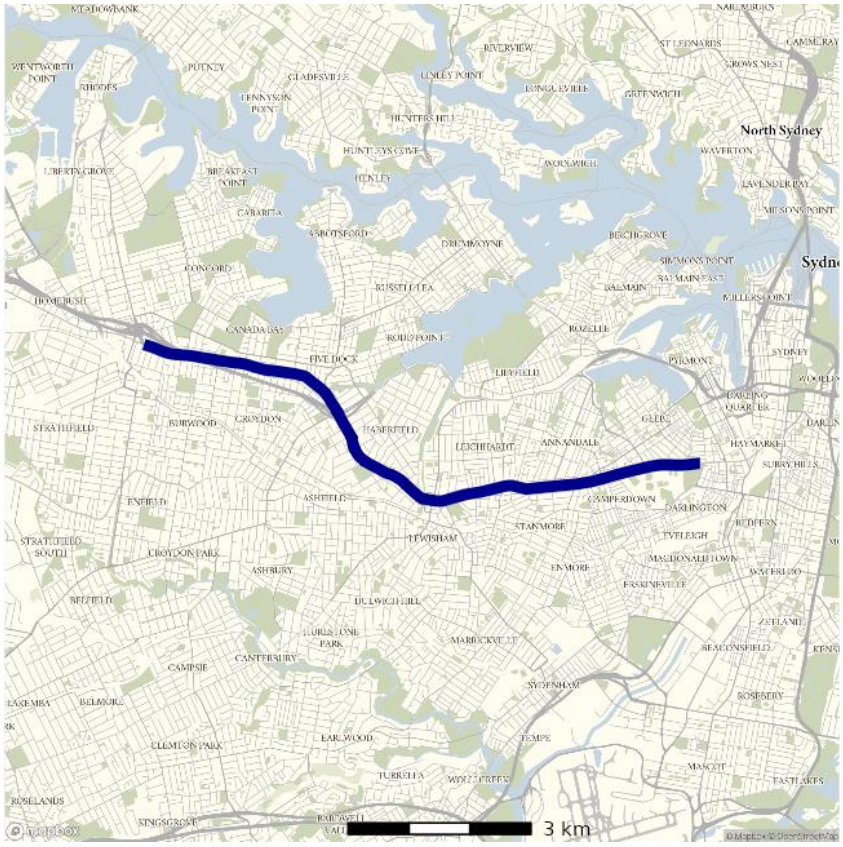


Source: BITRE estimates.

A44 – Camperdown to Strathfield / Strathfield to Camperdown

This route runs from the former end of the M4 Motorway at Strathfield to Camperdown in the inner city and services the Inner West Region of Sydney.

Figure A.19 A44 route map



Source: BITRE estimates.

Table A.10 A44 route travel times and congestion measures, 2021

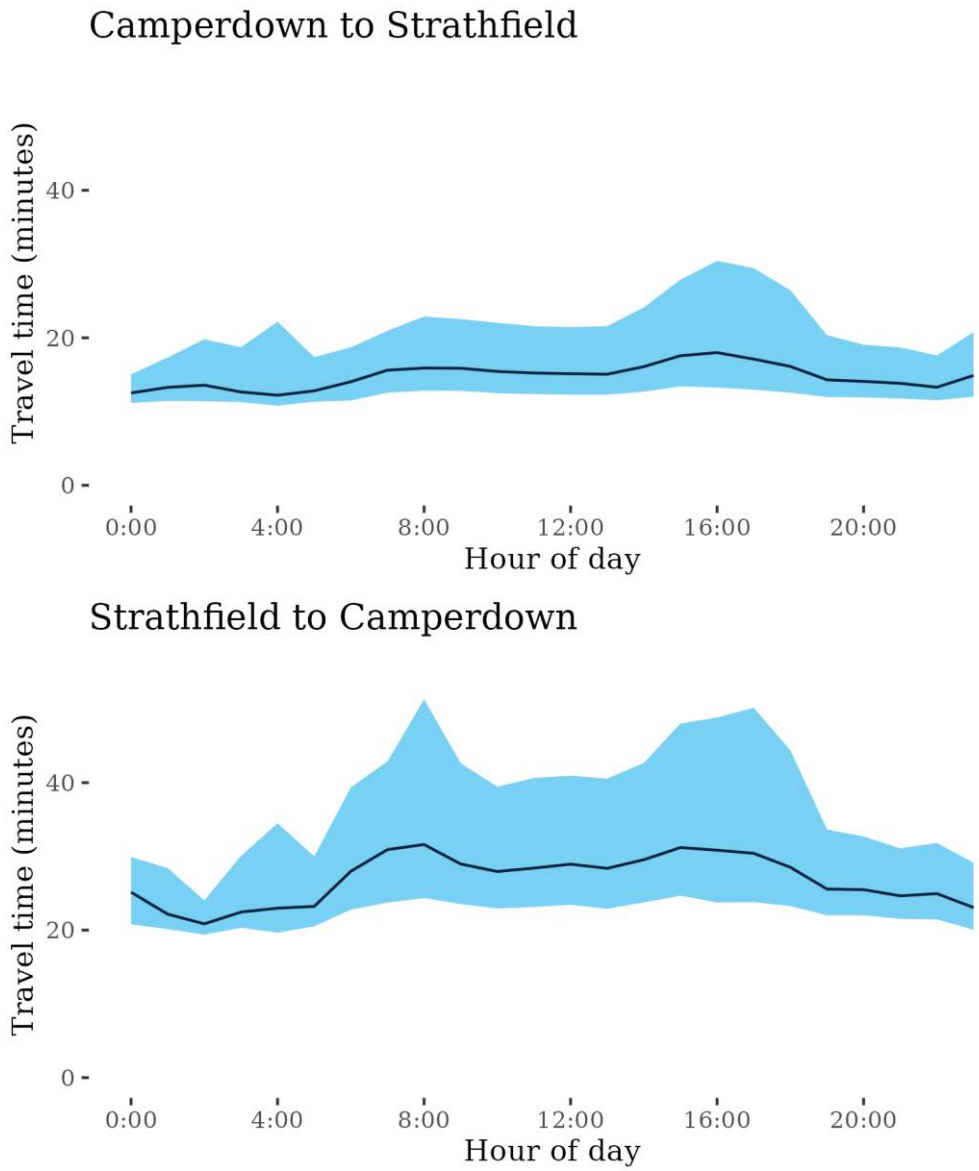
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Camperdown to Strathfield	0:12:13	0:18:00	1.21	0:03:52	0:17:11	2.441	10.21
Strathfield to Camperdown	0:20:51	0:31:37	1.287	0:04:41	0:26:58	3.322	19.10

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Camperdown to Strathfield were at 4am with a median travel time of 12 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 18 minutes and an interquartile range of 17 minutes.

The best median travel times for journeys from Strathfield to Camperdown were 21 minutes at 2am and the lowest uncertainty was at 2am with an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 32 minutes and an interquartile range of 27 minutes.

Figure A.20 A44 route median and interquartile range travel times

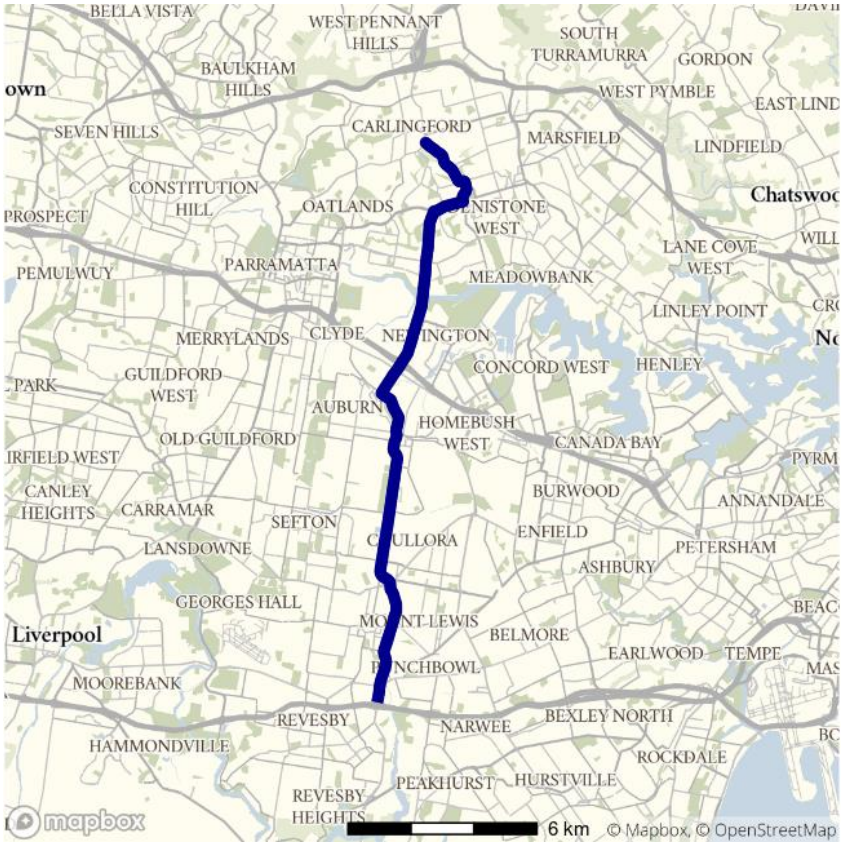


Source: BITRE estimates.

A6 – Carlingford to Padstow / Padstow to Carlingford

This route traverses Sydney linking Carlingford and Padstow, and roughly parallels the A3 route to the west. It passes through Rydalmere, Lidcombe, Bankstown and the Chullora precinct. This route intersects with the M2, M4 and M7 motorways.

Figure A.21 A6 route map



Source: BITRE estimates.

Table A.11 A6 route travel times and congestion measures, 2021

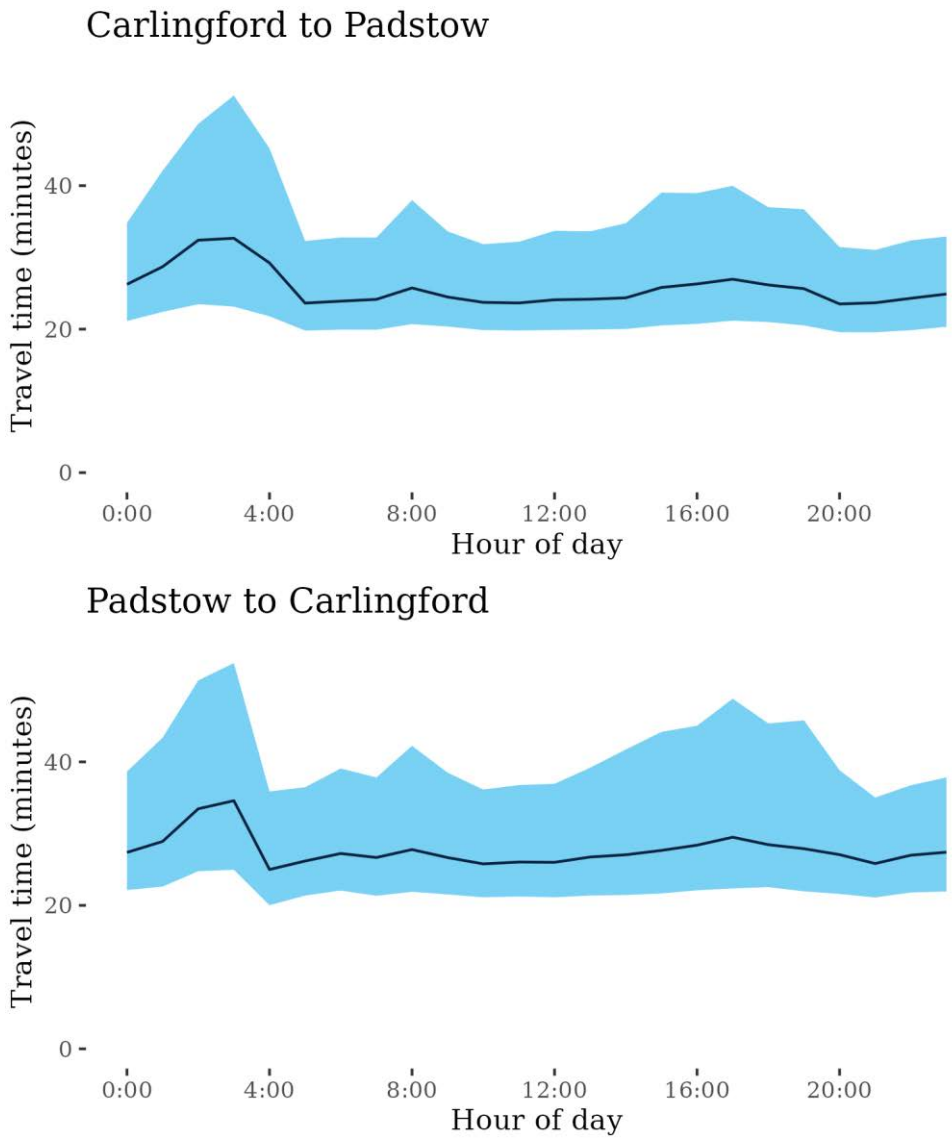
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Carlingford to Padstow	0:23:30	0:32:40	1.096	0:11:29	0:29:25	1.39	19.95
Padstow to Carlingford	0:25:00	0:34:35	1.108	0:13:56	0:28:49	1.375	20.13

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from Carlingford to Padstow were at 8pm and 9pm with a median travel time of 23.5 minutes and an interquartile range of 11.5 minutes. The longest median travel times and greatest uncertainty were at 3am with a median of 33 minutes and an interquartile range of 29.5 minutes.

The best median travel times and lowest uncertainty for journeys from Padstow to Carlingford were at 4am with a median travel time of 25 minutes and an interquartile range of 14 minutes. The longest median travel times and greatest uncertainty were at 3am with a median of 35 minutes and an interquartile range of 29 minutes.

Figure A.22 A6 route median and interquartile range travel times

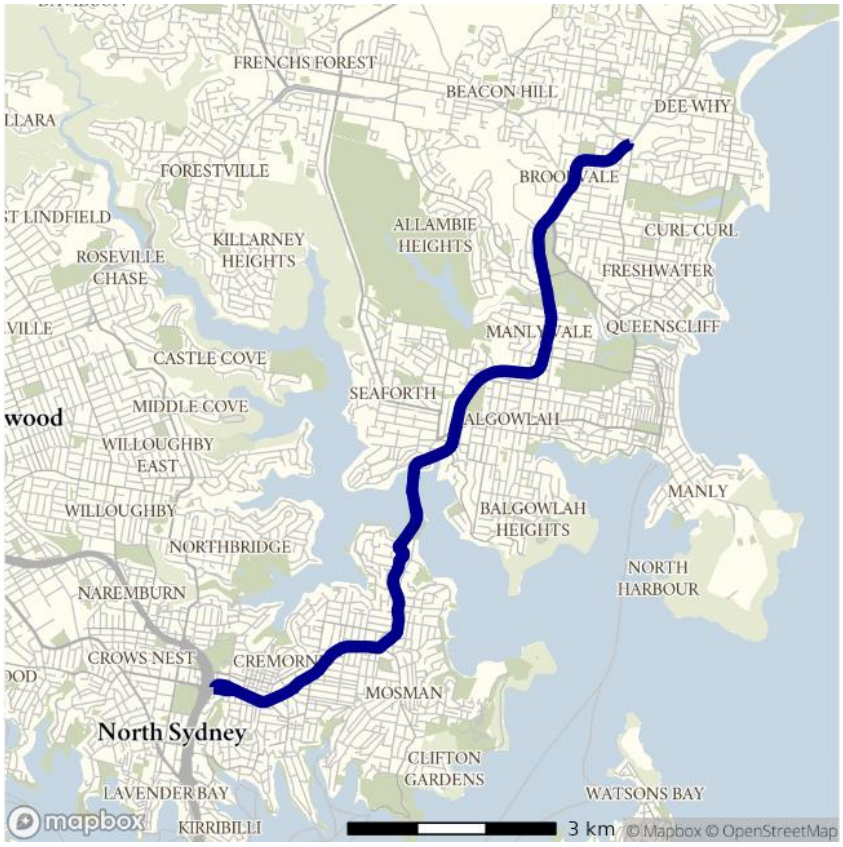


Source: BITRE estimates.

A8 – Dee Why to M1 / M1 to Dee Why

This route connects the Northern Beaches to the Gore Hill Expressway (and the orbital network) until it meets Warringah Road (A8) at Dee Why. It services suburbs including Neutral Bay, Balgowlah and Manly and is known by names including Military Road, Spit Road, Burnt Bridge Deviation and Condamine Street.

Figure A.23 A8 route map



Source: BITRE estimates.

Table A.12 A8 route travel times and congestion measures, 2021

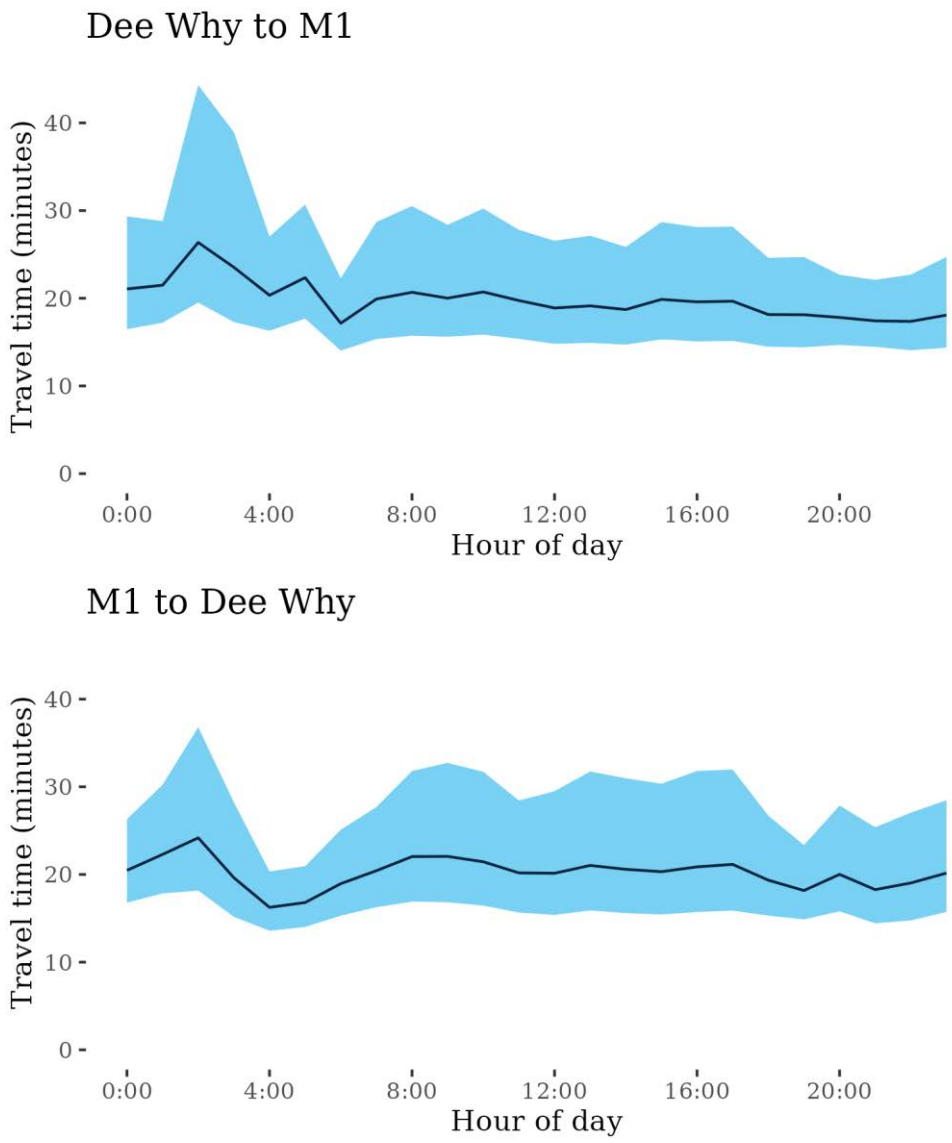
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Dee Why to M1	0:17:09	0:26:21	1.157	0:07:38	0:24:49	1.638	12.26
M1 to Dee Why	0:16:15	0:24:11	1.24	0:06:46	0:18:38	1.896	12.23

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from Dee Why to the M1 were at 6am and 9pm with a median travel time of 17 minutes and an interquartile range of 8 minutes. The longest median travel times and greatest uncertainty were at 2am with a median of 26 minutes and an interquartile range of 25 minutes.

The best median travel times and least uncertainty for journeys from the M1 to Dee Why were at 4am with a median travel time of 16 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at 2am with a median of 24 minutes and an interquartile range of 19 minutes.

Figure A.24 A8 route median and interquartile range travel times



Source: BITRE estimates.

A9 – Hume Freeway to M4 / M4 to Hume Freeway

This route skirts Western Sydney from the Hume Motorway at Mount Annan to the Great Western Highway (M4) at Glenmore Park. It services areas adjacent to the new Western Sydney Airport and is also known as the Northern Road.

Figure A.25 A9 route map

Source: BITRE estimates.

Table A.13 A9 route travel times and congestion measures, 2021

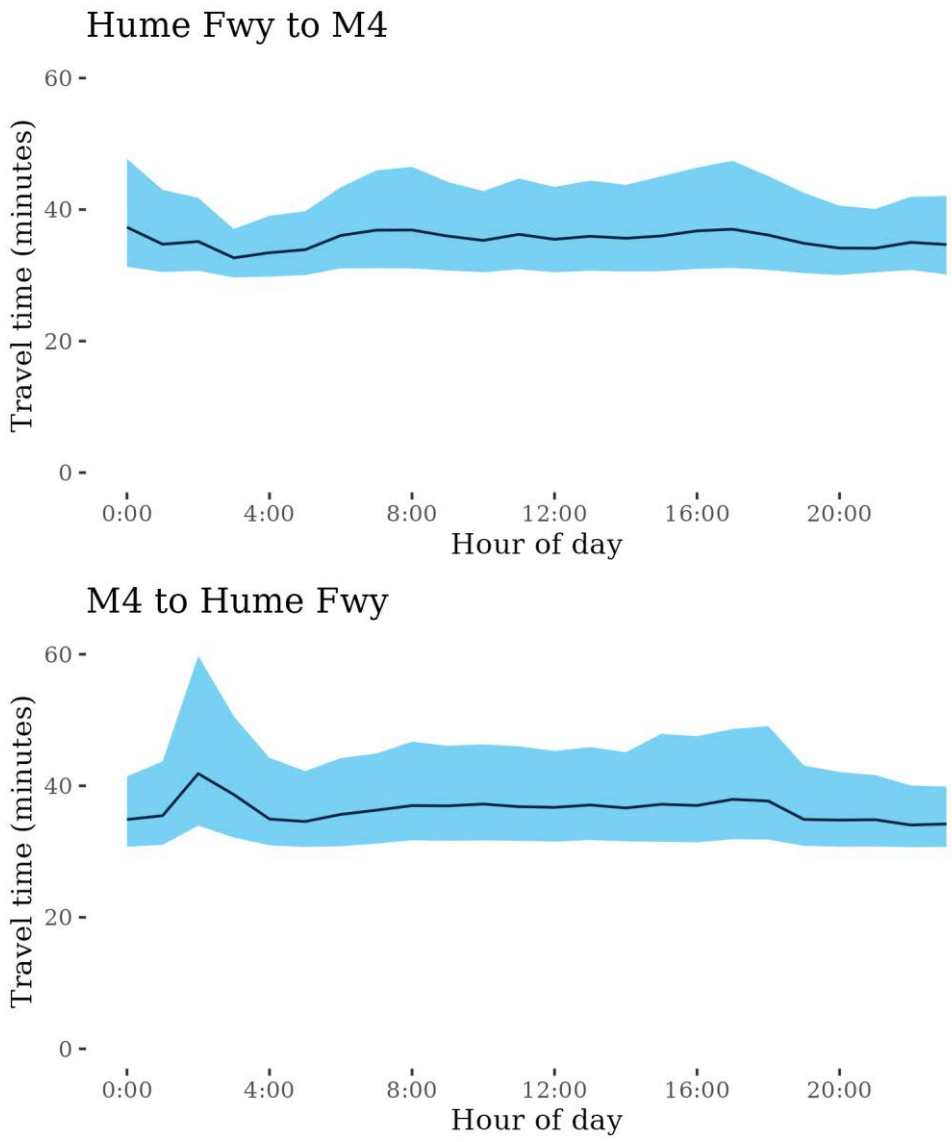
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hume Freeway to M4	0:32:40	0:37:18	1.085	0:07:22	0:16:26	1.722	37.36
M4 to Hume Freeway	0:34:02	0:41:51	1.069	0:09:11	0:25:50	1.54	37.40

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Hume Freeway to the M4 were at 3am with a median travel time of 33 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at midnight with a median of 37 minutes and an interquartile range of 16 minutes.

The best travel times and lowest uncertainty travelling from the M4 to Hume Freeway were at 10pm and 11pm with a median travel time of 34 minutes and an interquartile range of 9 minutes. The longest median travel times and greatest uncertainty were at 2am with a median of 42 minutes and an interquartile range of 26 minutes.

Figure A.26 A9 route median and interquartile range travel times



Source: BITRE estimates.

M1 (North) – Cahill Expressway to M2 / M2 to Cahill Expressway

This route links the Sydney CBD to the Lane Cove Tunnel at the beginning of the M2 via the Sydney Harbour Tunnel, the Warringah Freeway and the Gore Hill Freeway. It is a major commuter route but somewhat less important for freight.

Figure A.27 M1 (North) route map

Source: BITRE estimates.

Table A.14 M1 (North) route travel times and congestion measures, 2021

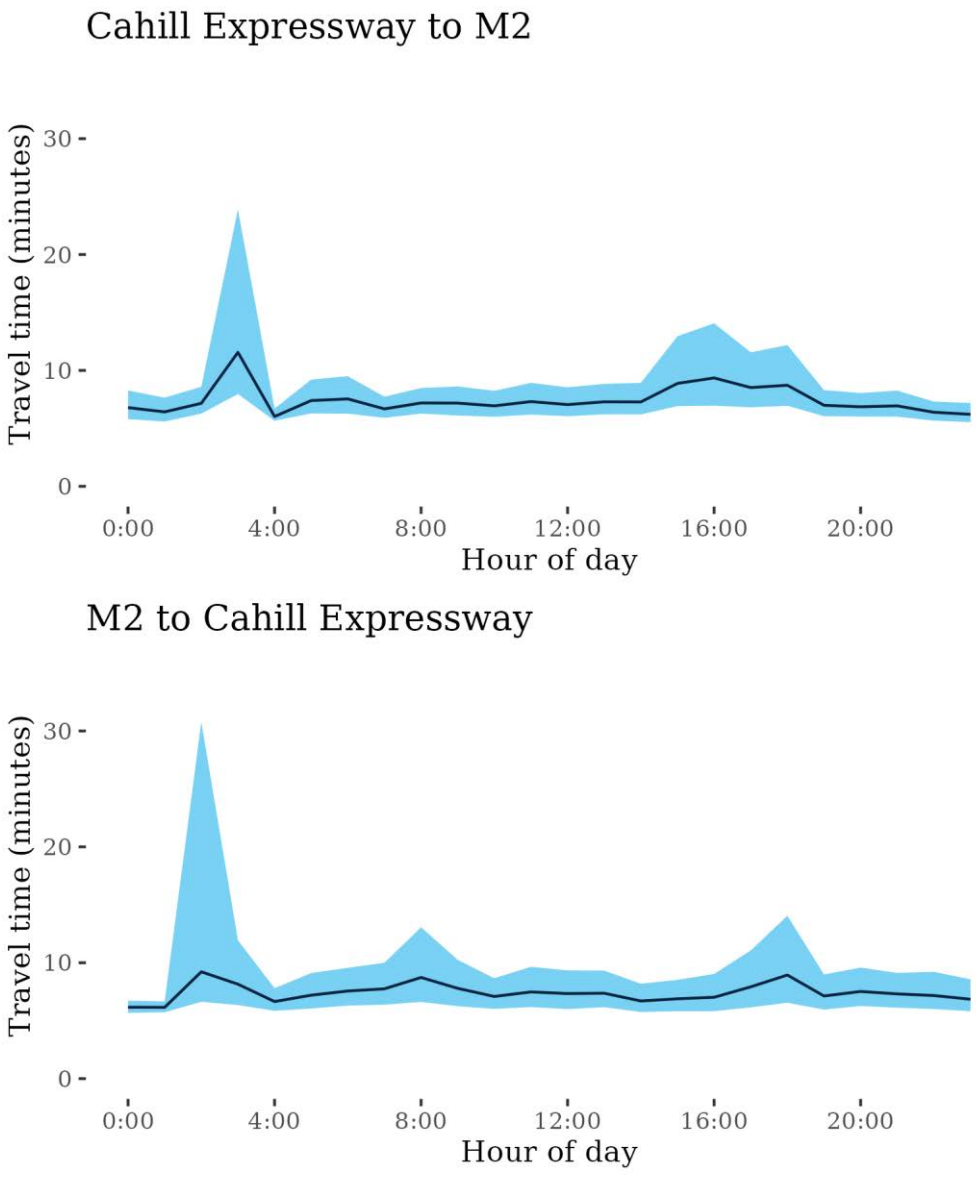
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Cahill Expressway to M2	0:06:01	0:11:34	1.236	0:01:03	0:15:56	3.266	7.28
M2 to Cahill Expressway	0:06:09	0:09:13	1.207	0:00:56	0:24:09	4.601	7.28

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Cahill Expressway to the M2 were at 4am with a median travel time of 6 minutes and an interquartile range of just over 1 minute. The longest median travel times and greatest uncertainty were at 3am with a median of 12 minutes and an interquartile range of 16 minutes.

The best median travel times for journeys from the M2 to Cahill Expressway were 6 minutes at 1am and the lowest uncertainty was at 1am with an interquartile range of just under 1 minute. The longest median travel times and greatest uncertainty were at 2am with a median of 9 minutes and an interquartile range of 24 minutes.

Figure A.28 M1 (North) route median and interquartile range travel times

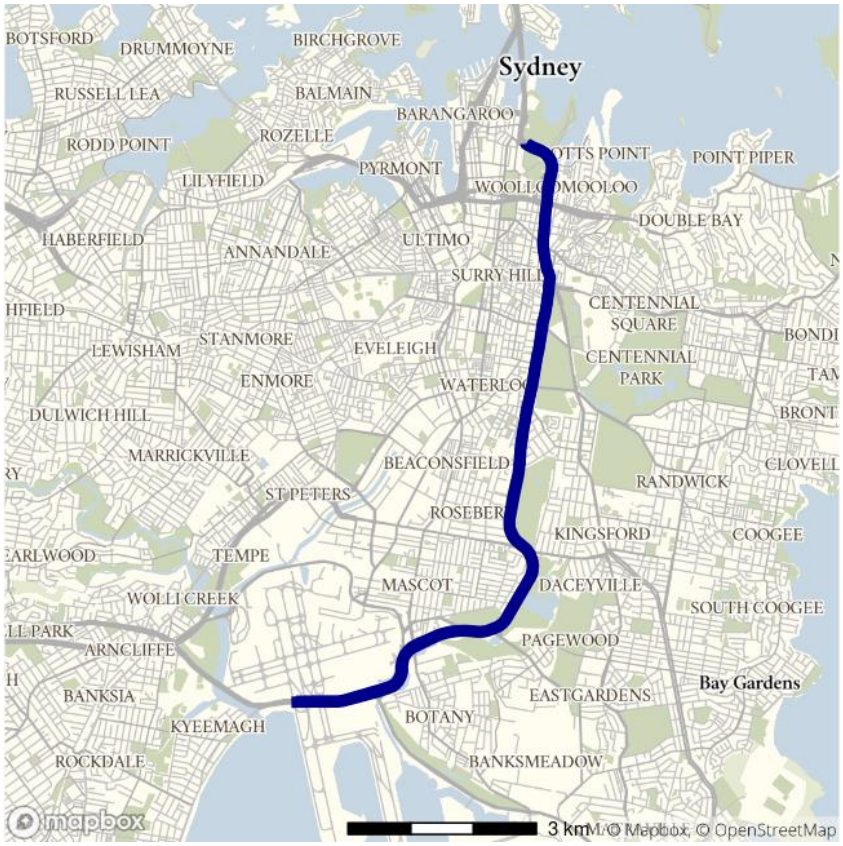


Source: BITRE estimates.

M1 (South) – Cahill Expressway to M5 / M5 to Cahill Expressway

This route travels between the east of the Sydney CBD and M5 near Sydney Airport via the Eastern Distributor, South Dowling Street and General Holmes Drive.

Figure A.29 M1 (South) route map



Source: BITRE estimates.

Table A.15 M1 (South) route travel times and congestion measures, 2021

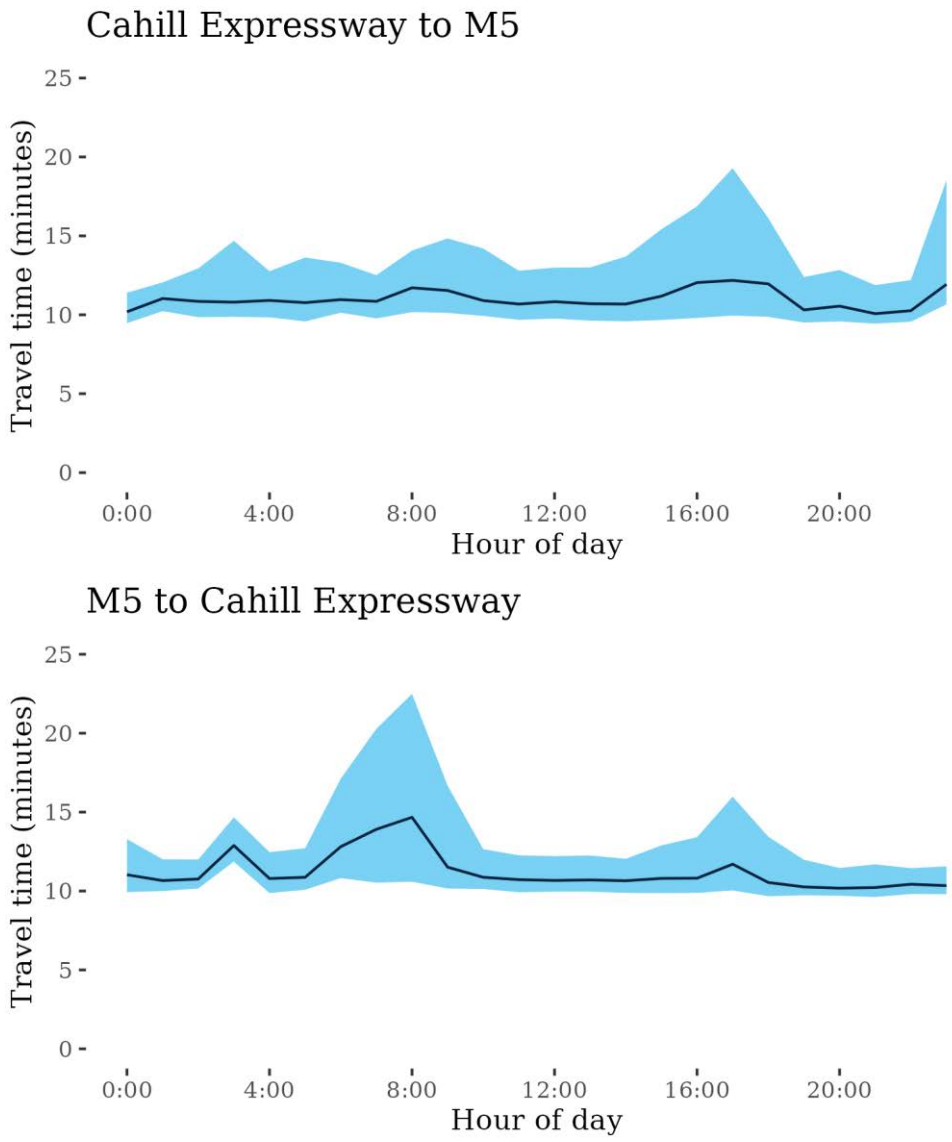
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Cahill Expressway to M5	0:10:04	0:12:11	1.091	0:01:49	0:09:20	2.262	12.11
M5 to Cahill Expressway	0:10:11	0:14:40	1.101	0:01:39	0:11:54	2.199	12.00

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Cahill Expressway to the M5 were at 9pm with a median travel time of 10 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 12 minutes and an interquartile range of 9 minutes.

The best median travel times and least uncertainty for journeys from the M5 to Cahill Expressway were at 8pm with a median travel time of 10 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 15 minutes and an interquartile range of 12 minutes.

Figure A.30 M1 (South) route median and interquartile range travel times

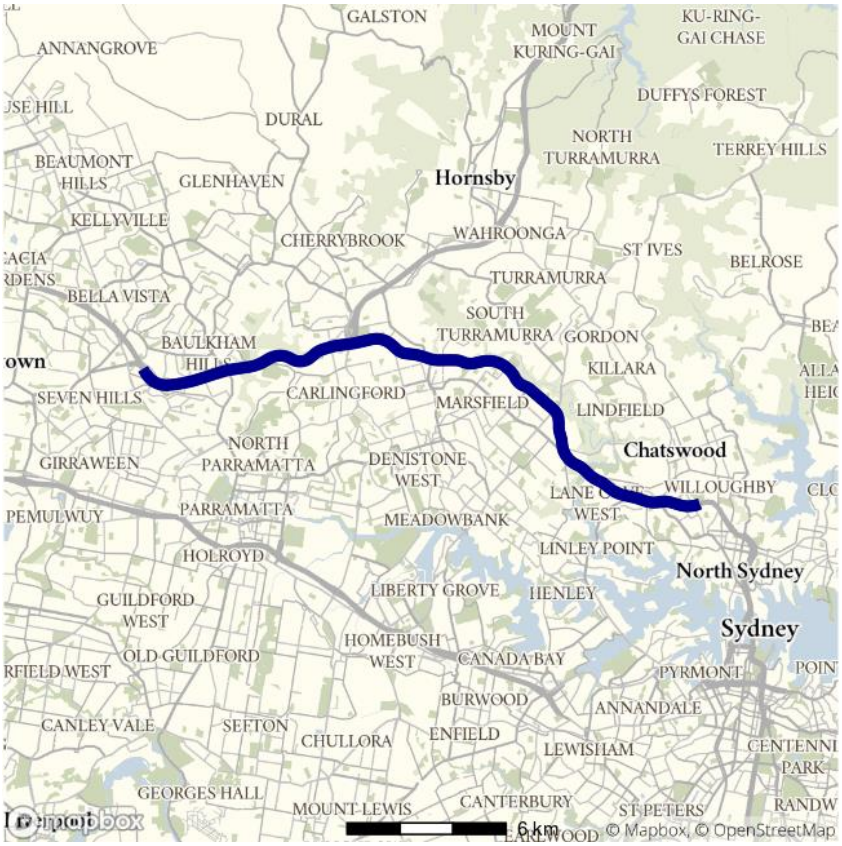


Source: BITRE estimates.

M2 – M1 to M7 / M7 to M1

This route runs between the Hills District and Lane Cove connecting the M7 and M1 via the M2 motorway and the Lane Cove Tunnel. It is an important route for both commuter and freight traffic.

Figure A.31 M2 route map



Source: BITRE estimates.

Table A.16 M2 route travel times and congestion measures, 2021

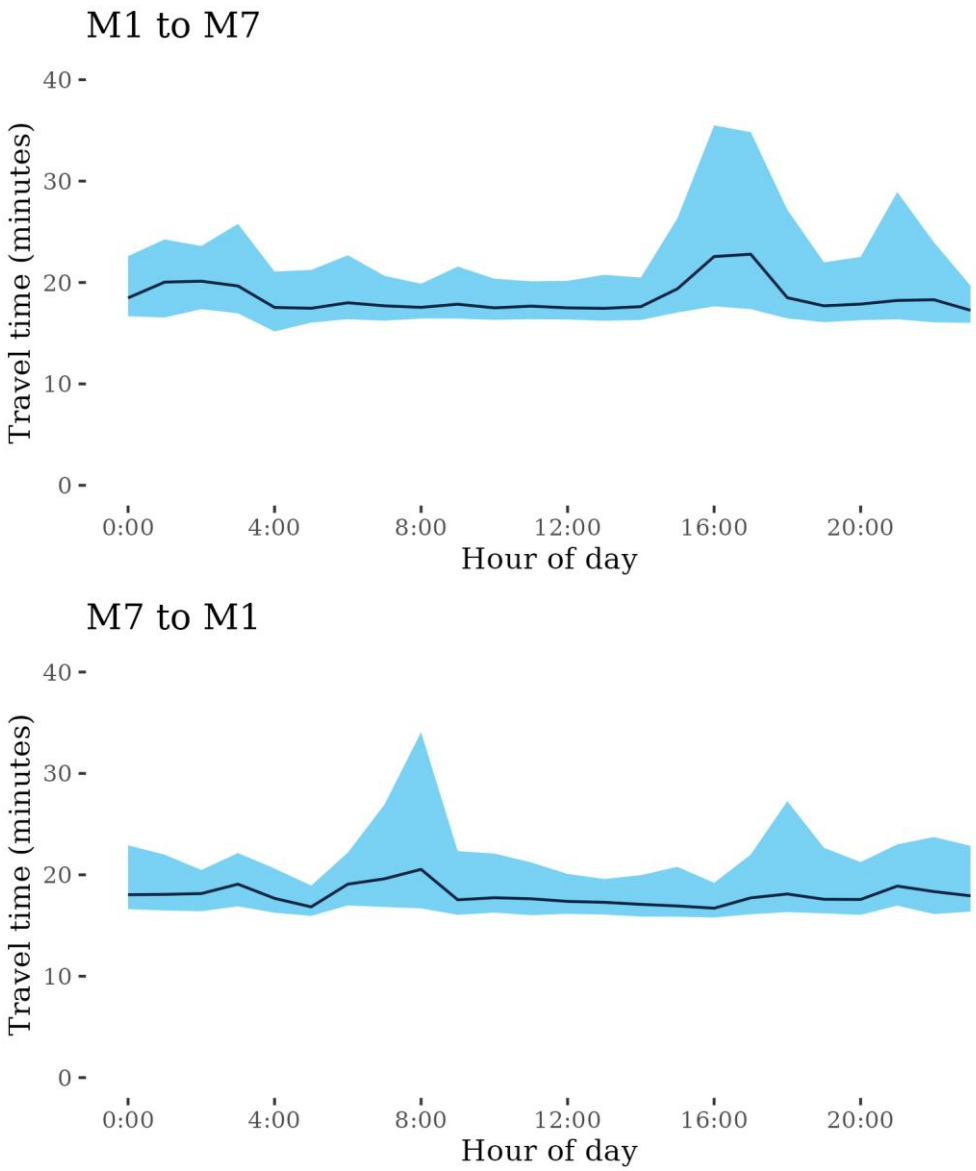
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
M1 to M7	0:17:16	0:22:47	1.073	0:03:26	0:17:51	2.075	24.50
M7 to M1	0:16:43	0:20:32	1.076	0:02:59	0:17:23	2.048	24.30

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the M1 to M7 were at 11pm with a median travel time of 17 minutes and an interquartile range of 3.5 minutes. The longest median travel times were at 5pm with a median of 23 minutes and the greatest uncertainty at 4pm with an interquartile range of 18 minutes.

The best median travel times and least uncertainty for journeys from the M7 to M1 were at 4pm with a median travel time of 17 minutes and an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 21 minutes and an interquartile range of 17 minutes.

Figure A.32 M2 route median and interquartile range travel times



Source: BITRE estimates.

M4 – Glenbrook to Strathfield / Strathfield to Glenbrook

This route connects the A32 at Glenbrook with the former terminus of the M4 at Strathfield. It intersects with several north–south routes presented in this report, including the M7, A28 and A6. It does not incorporate Parramatta Road or the City West Link, nor the M4 East tunnel that opened in July 2020.

Figure A.33 M4 route map

Source: BITRE estimates.

Table A.17 M4 route travel times and congestion measures, 2021

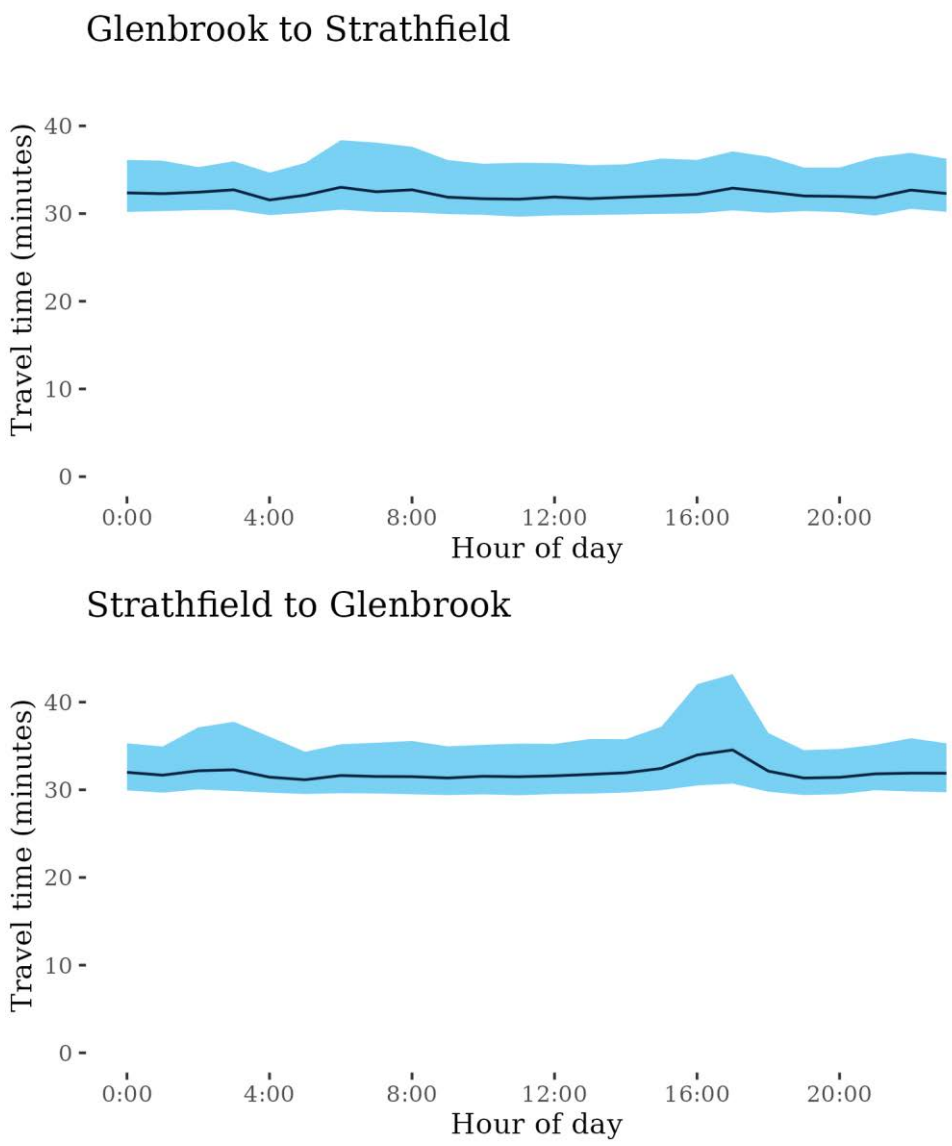
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Glenbrook to Strathfield	0:31:33	0:33:00	1.02	0:04:51	0:07:56	1.256	45.82
Strathfield to Glenbrook	0:31:09	0:34:32	1.025	0:04:50	0:12:29	1.334	45.78

Source: BITRE estimates.

The best median travel times for journeys from Glenbrook to Strathfield were 32 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were at 6am with a median of 33 minutes and an interquartile range of 8 minutes.

The best median travel times and lowest uncertainty for journeys from Strathfield to Glenbrook were at 5am with a median travel time of 31 minutes and an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 35 minutes and an interquartile range of 12.5 minutes.

Figure A.34 M4 route median and interquartile range travel times

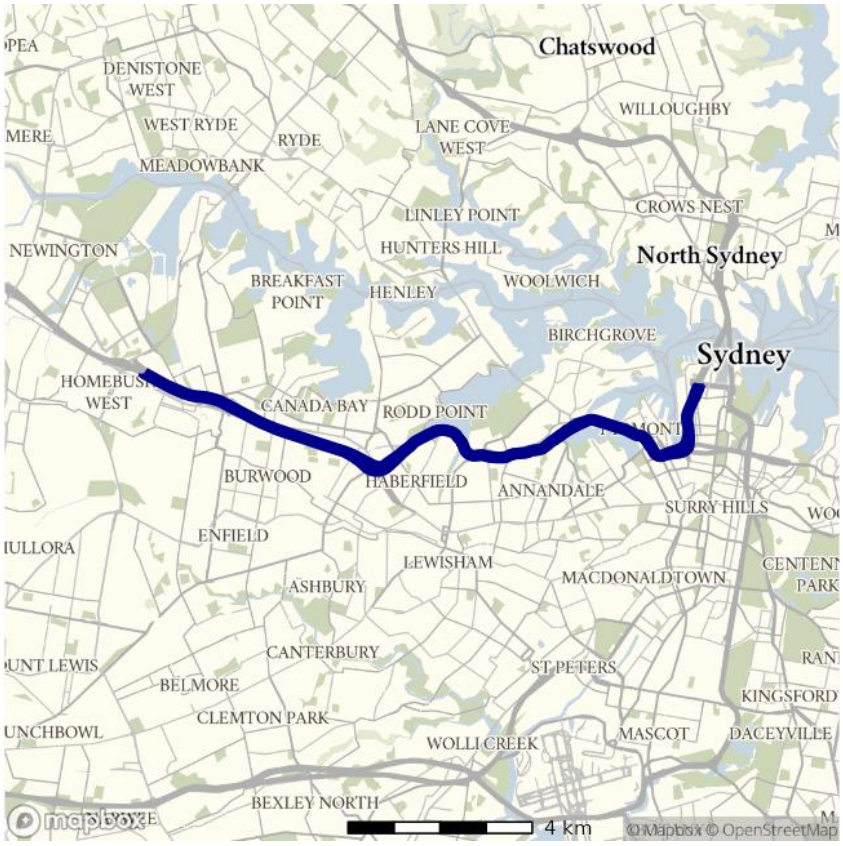


Source: BITRE estimates.

M4 (East)-A4 – Cahill Expressway to Strathfield/Strathfield to Cahill Expressway

This route follows the M4 tunnel from the former terminus of the M4 Motorway at Strathfield to Ashfield and then the A4 (also known as the City West Link) to the Cahill Expressway near the Sydney CBD. It extends the M4 route with roads that were not built in 2019 and has been included as a separate route so data remains consistent.

Figure A.35 M4 (East) route map



Source: BITRE estimates.

Table A.18 M4 (East) route travel times and congestion measures, 2021

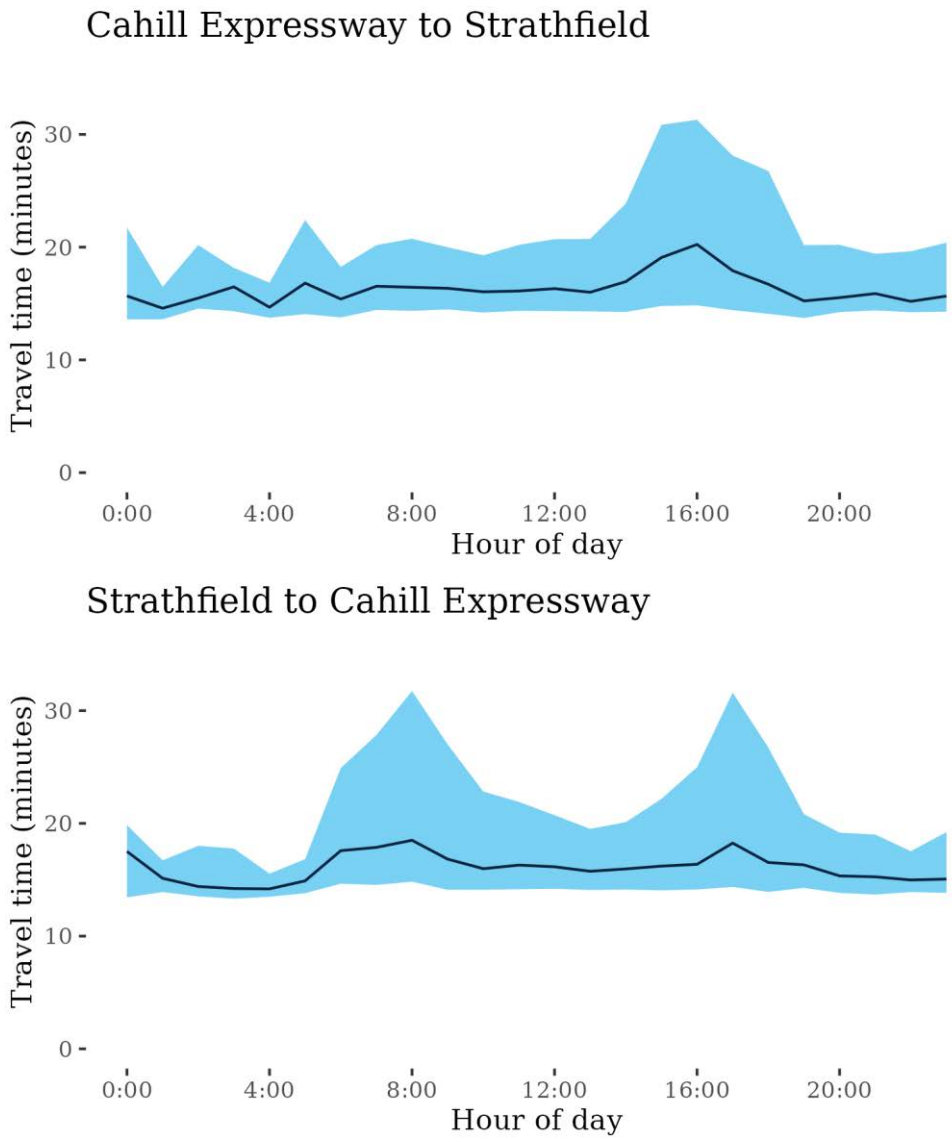
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Cahill Expressway to Strathfield	0:14:35	0:20:15	1.118	0:02:53	0:16:27	2.532	14.84
Strathfield to Cahill Expressway	0:14:12	0:18:30	1.132	0:02:03	0:17:15	3.779	14.63

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the Cahill Expressway to Strathfield were at 1am with a median travel time of 15 minutes and an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 20 minutes and an interquartile range of 16.5 minutes.

The best median travel times for journeys from Strathfield to the Cahill Expressway were 14 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 2 minutes. The longest median travel times were at 8am with a median of 18.5 minutes and the greatest uncertainty at 5pm with an interquartile range of 17 minutes.

Figure A.36 M4 (East) route median and interquartile range travel times



Source: BITRE estimates.

M5 – Hume Motorway to M1 / M1 to Hume Motorway

This route follows the M5 Motorway between the Hume Motorway at Casula and the M1 at General Holmes Drive. It is a major commuter route and also services freight traffic in areas around the Airport and Port Botany.

Figure A.37 M5 route map

Source: BITRE estimates.

Table A.19 M5 route travel times and congestion measures, 2021

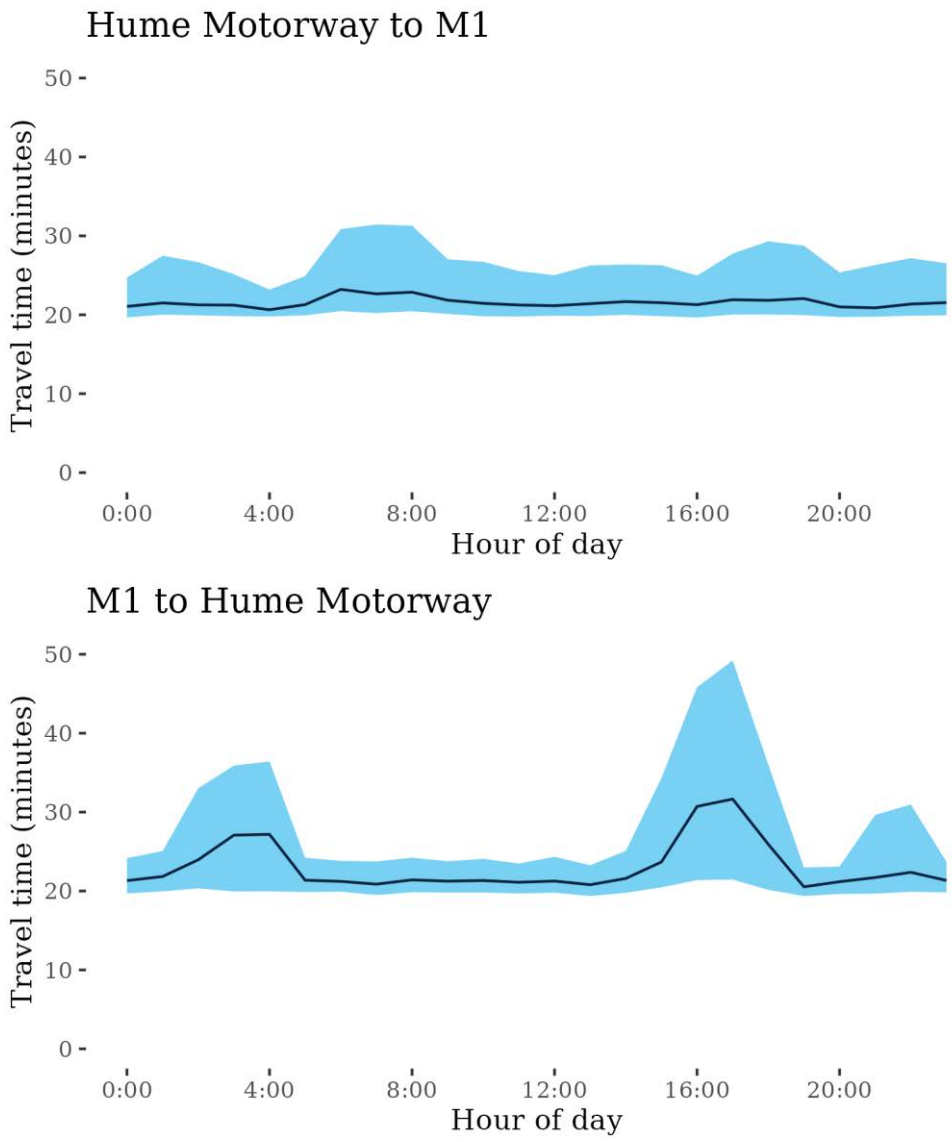
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hume Motorway to M1	0:20:38	0:23:13	1.045	0:03:25	0:11:13	2.032	29.35
M1 to Hume Motorway	0:20:32	0:31:39	1.122	0:03:28	0:27:46	2.536	29.25

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Hume Motorway to the M1 were at 4am with a median travel time of 21 minutes and an interquartile range of 3.5 minutes. The longest median travel times were 23 minutes at 6am and the greatest uncertainty were at 7am with an interquartile range of 11 minutes

The best median travel times and lowest uncertainty for journeys from the M1 to Hume Motorway were at 7pm with a median travel time of 21 minutes and an interquartile range of 3.5 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 32 minutes and an interquartile range of 28 minutes.

Figure A.38 M5 route median and interquartile range travel times



Source: BITRE estimates.

M7 – M2 to M5 / M5 to M2

This route follows the M7 Motorway between its confluence with the M2 in the Hills District and Hume Motorway at Casula, skirting much of Western Sydney and crossing the M4 Motorway. It is a major route for intercity freight including trips that do not start or end in Sydney.

Figure A.39 M7 route map

Source: BITRE estimates.

Table A.20 M7 route travel times and congestion measures, 2021

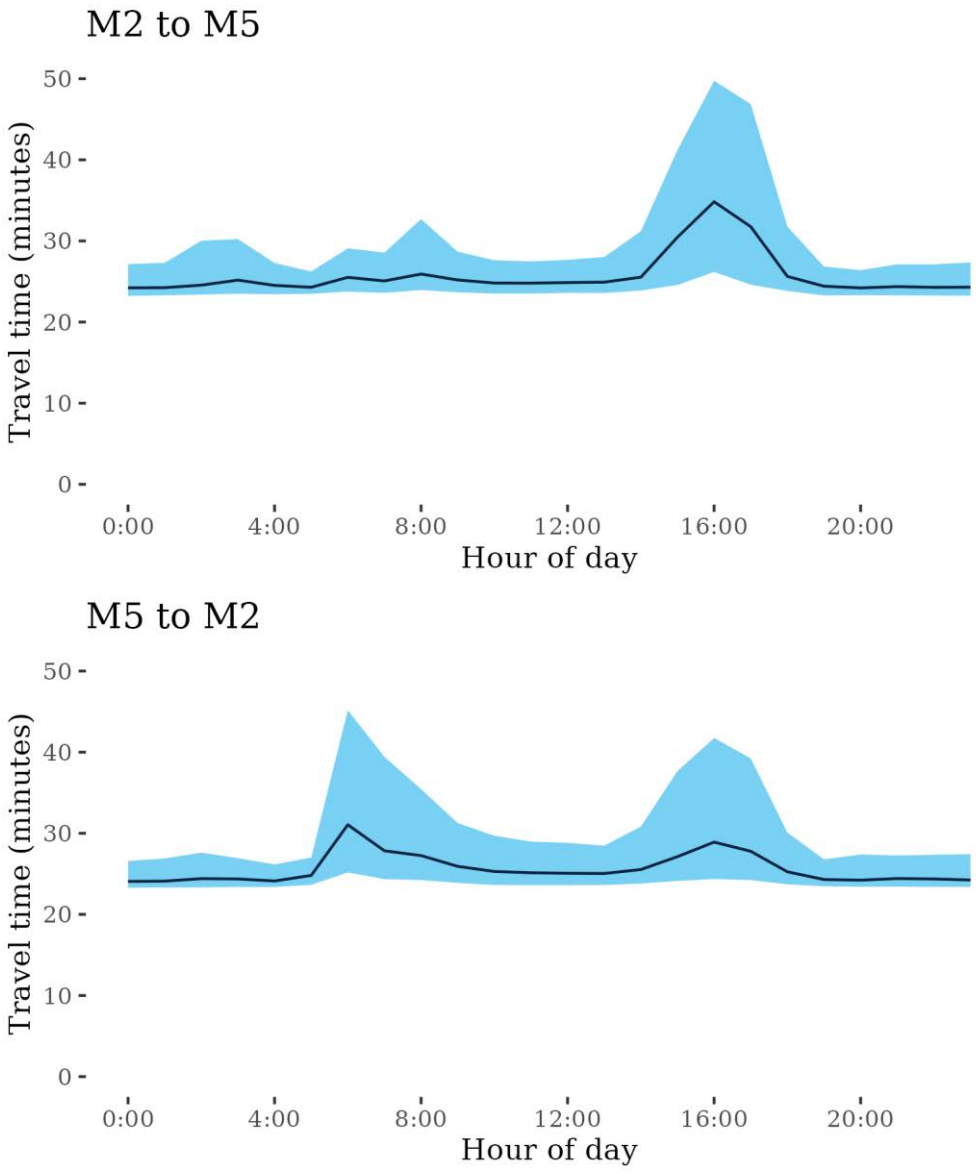
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
M2 to M5	0:24:12	0:34:50	1.063	0:02:46	0:23:34	2.483	38.38
M5 to M2	0:24:03	0:31:03	1.065	0:02:47	0:19:59	2.614	38.52

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from the M2 to the M5 were at 8pm and 5am with a median travel time of 24 minutes and an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 35 minutes and an interquartile range of 23.5 minutes.

The best median travel times and least uncertainty for journeys from the M5 to the M2 were at midnight with a median travel time of 24 minutes and an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 6am with a median of 31 minutes and an interquartile range of 20 minutes.

Figure A.40 M7 route median and interquartile range travel times

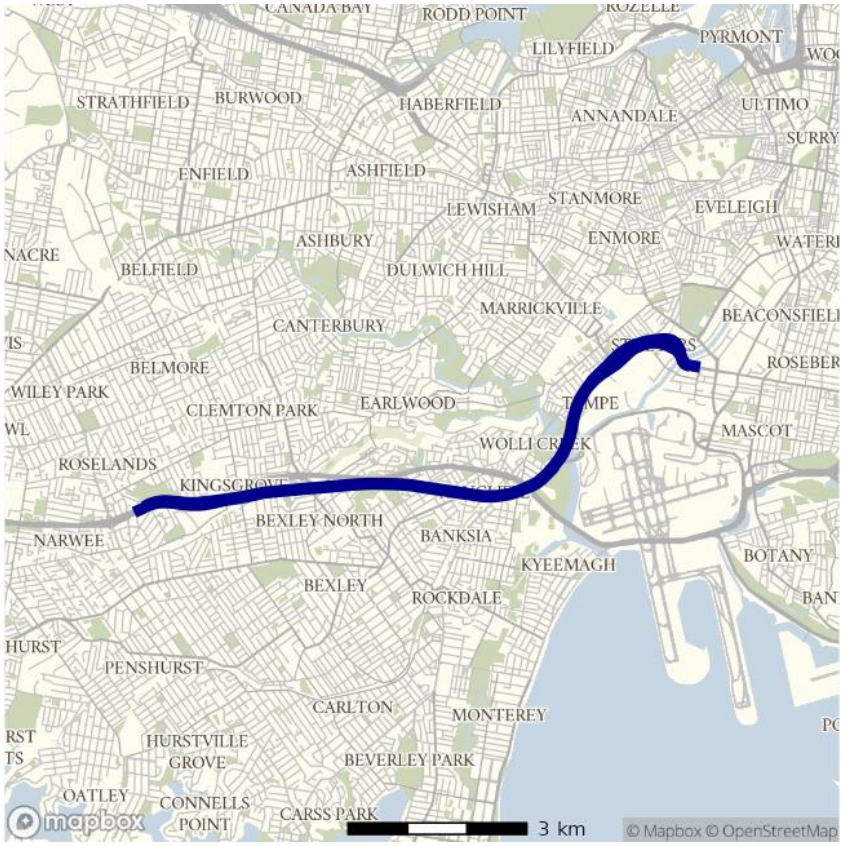


Source: BITRE estimates.

M8 – M5 to Mascot/Mascot to M5

This route follows the recently built M8 tunnel connecting the M5 with Inner Southern Sydney. It services light industrial areas in the vicinity of the port and airport.

Figure A.41 M8 route map



Source: BITRE estimates.

Table A.21 M8 route travel times and congestion measures, 2021

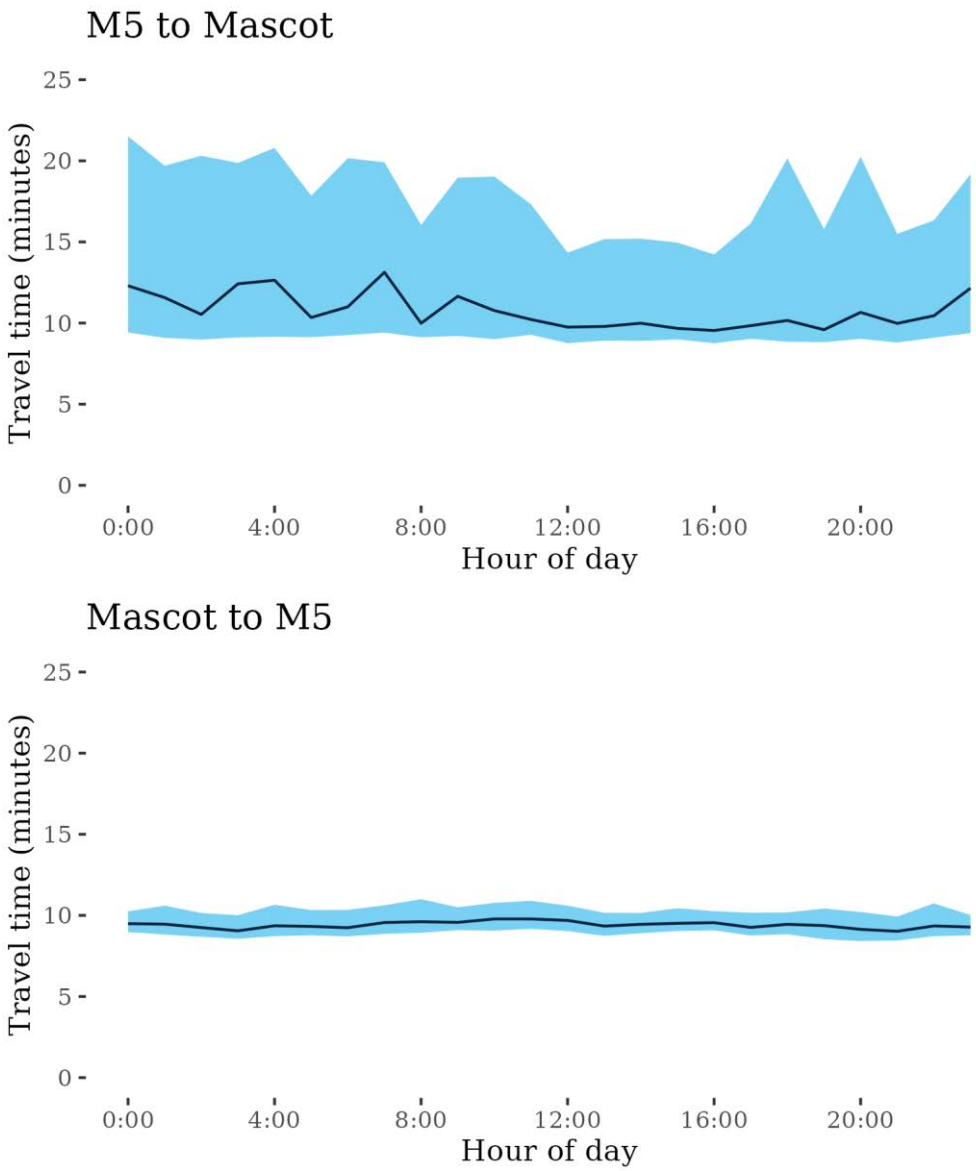
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
M5 to Mascot	0:09:32	0:13:08	1.128	0:05:28	0:12:05	1.608	10.99
Mascot to M5	0:09:01	0:09:47	1.044	0:01:11	0:02:04	1.335	10.88

Source: BITRE estimates.

The best median travel times for journeys from the M5 to Mascot were 9.5 minutes at 4pm and the lowest uncertainty was at 4pm with an interquartile range of 5.5 minutes. The longest median travel times were 13 minutes at 7am and the greatest uncertainty were at midnight with an interquartile range of 12 minutes

The best travel times and lowest uncertainty travelling from Mascot to the M5 were at 9pm and 4pm with a median travel time of 9 minutes and an interquartile range of 71 seconds. The longest median travel times were at 11am with a median of 10 minutes and the greatest uncertainty at 8am with an interquartile range of 2 minutes.

Figure A.42 M8 route median and interquartile range travel times



Source: BITRE estimates.

NorthConnex-M1 – Brooklyn to M2 / M2 to Brooklyn

This route connects the Sydney orbital network to the Pacific Motorway (M1), and connects Sydney to northern NSW and Queensland. It starts at the M2 Motorway at Carlingford and uses the recently built NorthConnex tunnel to the start of the M1 Motorway (commonly referred to as the F3) at Wahroonga and continues until the Hawkesbury River at Brooklyn.

Figure A.43 NorthConnex-M1 route map

Source: BITRE estimates.

Table A.22 NorthConnex-M1 route travel times and congestion measures, 2021

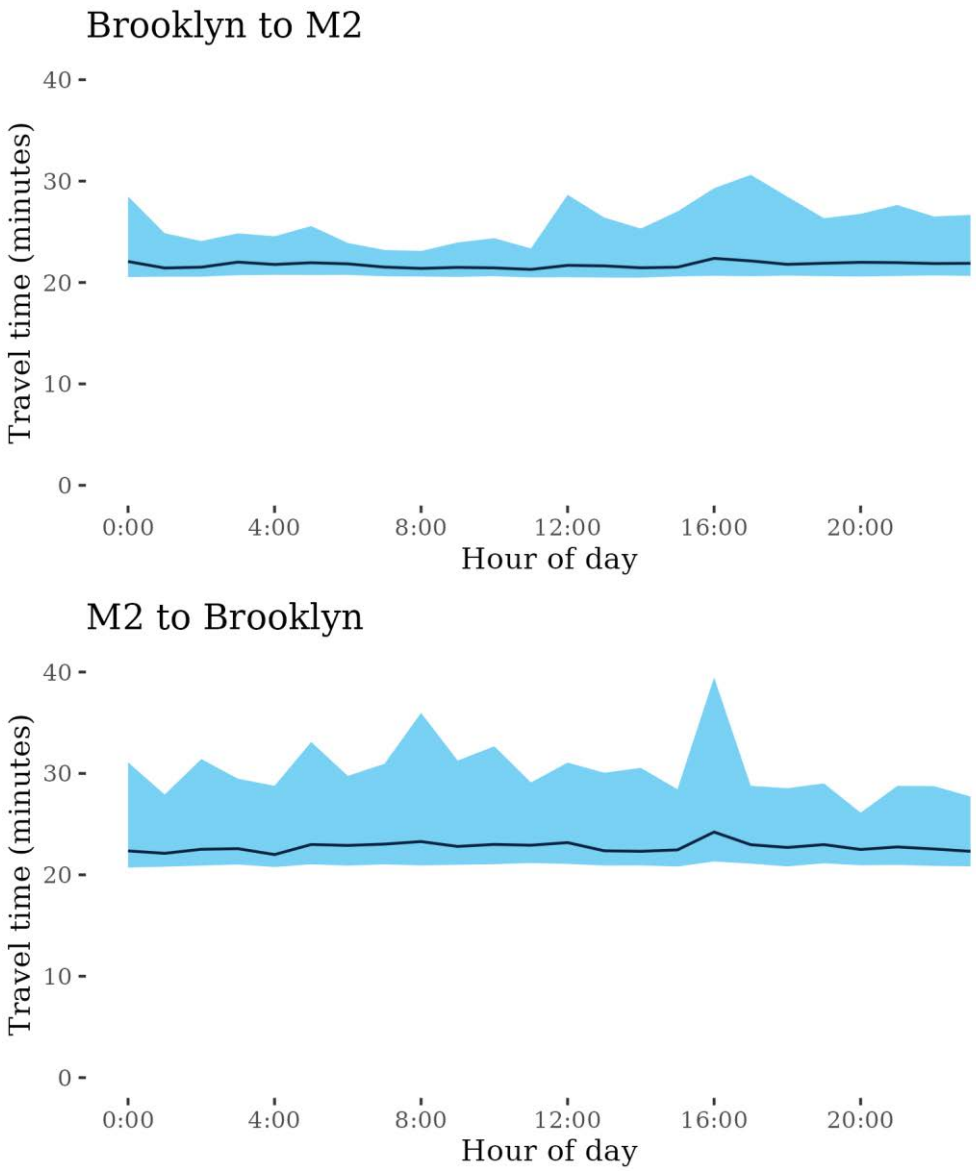
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
NorthConnex-M1 - Brooklyn to M2	0:21:17	0:22:23	1.022	0:02:31	0:10:00	2.143	31.37
NorthConnex-M1 - M2 to Brooklyn	0:22:00	0:24:13	1.034	0:05:11	0:18:10	1.812	31.67

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from Brooklyn to the M2 were at 11am and 8am with a median travel time of 21 minutes and an interquartile range of 2.5 minutes. The longest median travel times were at 4pm with a median of 22 minutes and the greatest uncertainty at 5pm with an interquartile range of 10 minutes.

The best median travel times and lowest uncertainty for journeys from the M2 to Brooklyn were at 4am with a median travel time of 22 minutes and an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 24 minutes and an interquartile range of 18 minutes.

Figure A.44 NorthConnex-M1 route median and interquartile range travel times



Source: BITRE estimates.

Melbourne routes

Route 13-49 – Monash Freeway to South Gippsland Highway / South Gippsland Highway to Monash Freeway

This route arcs through Melbourne's outer south eastern suburbs to from the Monash Freeway at Glen Waverley to the South Gippsland Highway, just south of Dandenong. The route traverses the suburbs of Clayton, Springvale and Keysborough, and crosses the M3. It is known by names including the Dandenong Bypass, Westall Road and Clayton Road and includes a small portion of the Princes Highway.

Figure A.45 Route 13-49 route map

Source: BITRE estimates.

Table A.23 Route 13-49 route travel times and congestion measures, 2021

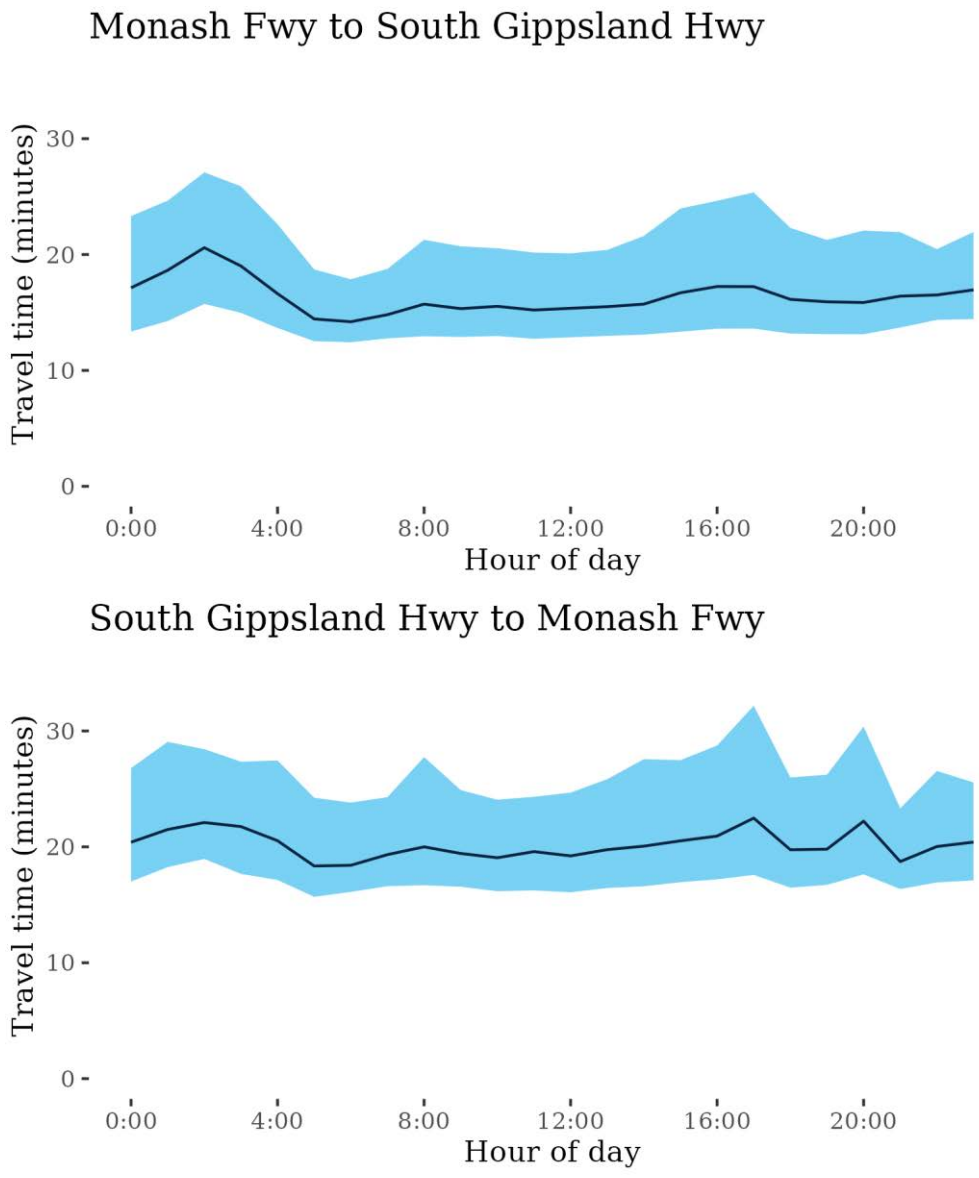
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Monash Freeway to South Gippsland Highway	0:14:12	0:20:35	1.153	0:05:26	0:11:45	1.57	14.82
South Gippsland Highway to Monash Freeway	0:18:21	0:22:29	1.1	0:06:58	0:14:36	1.386	18.19

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the Monash Freeway to South Gippsland Highway were at 6am with a median travel time of 14 minutes and an interquartile range of 5.5 minutes. The longest median travel times were at 2am with a median of 21 minutes and the greatest uncertainty at 5pm with an interquartile range of 12 minutes.

The best median travel times and lowest uncertainty for journeys from South Gippsland Highway to the Monash Freeway were at 5am with a median travel time of 18 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 22.5 minutes and an interquartile range of 14.5 minutes.

Figure A.46 Route 13-49 route median and interquartile range travel times



Source: BITRE estimates.

Route 15 – Beach Road to Surrey Hills / Surrey Hills to Beach Road

This surface route extends from Canterbury Road in Surrey Hills to Beach Road in Parkdale. The route traverses Moorabbin, Oakleigh, the major retail precinct at Chadstone and Burwood in Melbourne's south east, crossing the M1 (East) along the way. It is also known as Warrigal Road.

Figure A.47 Route 15 route map

Source: BITRE estimates.

Table A.24 Route 15 route travel times and congestion measures, 2021

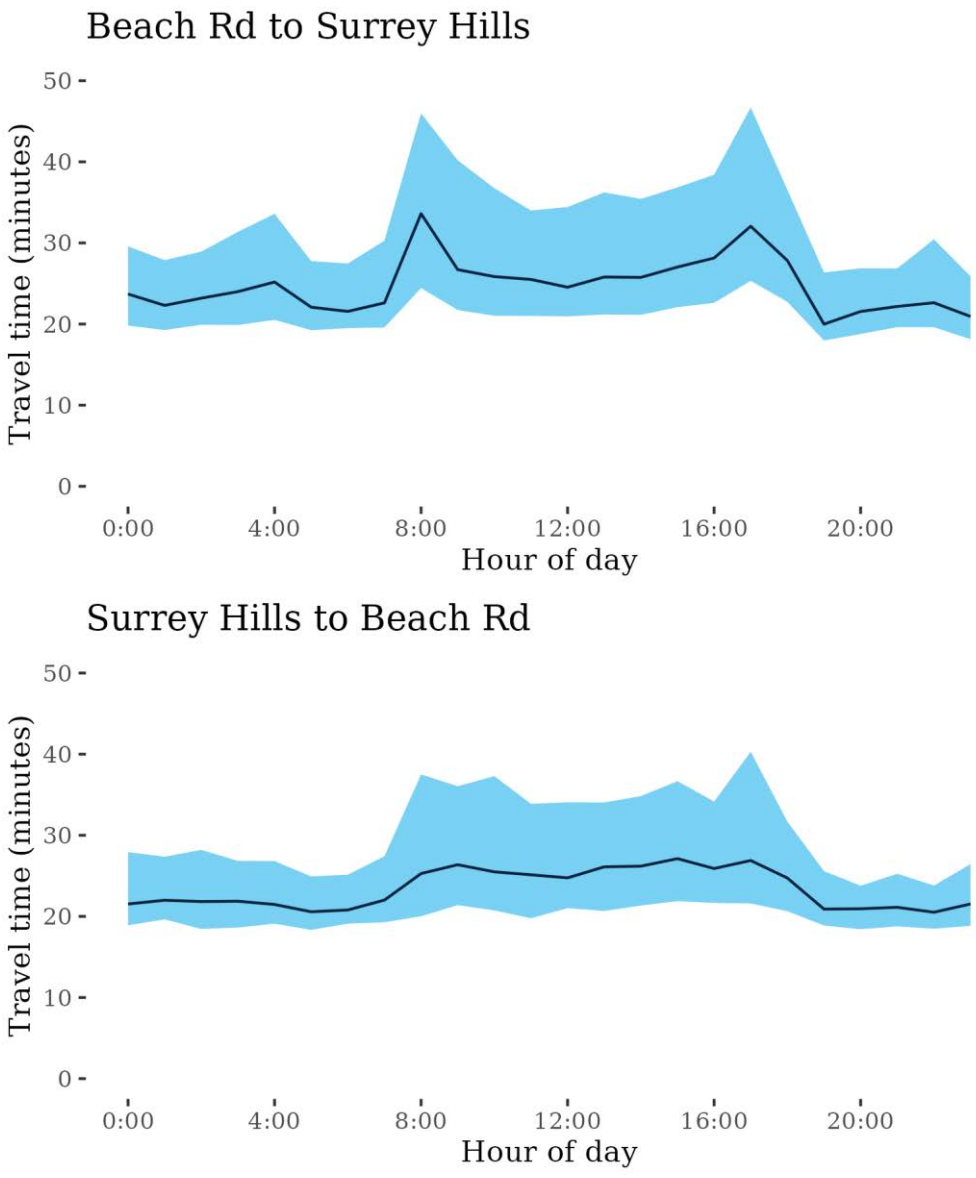
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Beach Road to Surrey Hills	0:19:59	0:33:37	1.24	0:07:15	0:21:33	1.718	18.87
Surrey Hills to Beach Road	0:20:31	0:27:07	1.14	0:05:19	0:18:43	1.993	18.87

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Beach Road to Surrey Hills were at 7pm with a median travel time of 20 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 34 minutes and an interquartile range of 21.5 minutes.

The best median travel times for journeys from Surrey Hills to Beach Road were 20.5 minutes at 10pm and the lowest uncertainty was at 10pm with an interquartile range of 5 minutes. The longest median travel times were 27 minutes at 3pm and the greatest uncertainty were at 5pm with an interquartile range of 19 minutes/

Figure A.48 Route 15 route median and interquartile range travel times



Source: BITRE estimates.

Route 22 – Ferntree Gully to M1 / M1 to Ferntree Gully

This surface route in Melbourne's East starts at the M1 (east) at Notting Hill and extends east through Wheelers Hill and Knoxfield to Ferntree Gully. It services light industrial areas in the vicinity of the M3. It is also known as Ferntree Gully Road.

Figure A.49 Route 22 route map

Source: BITRE estimates.

Table A.25 Route 22 route travel times and congestion measures, 2021

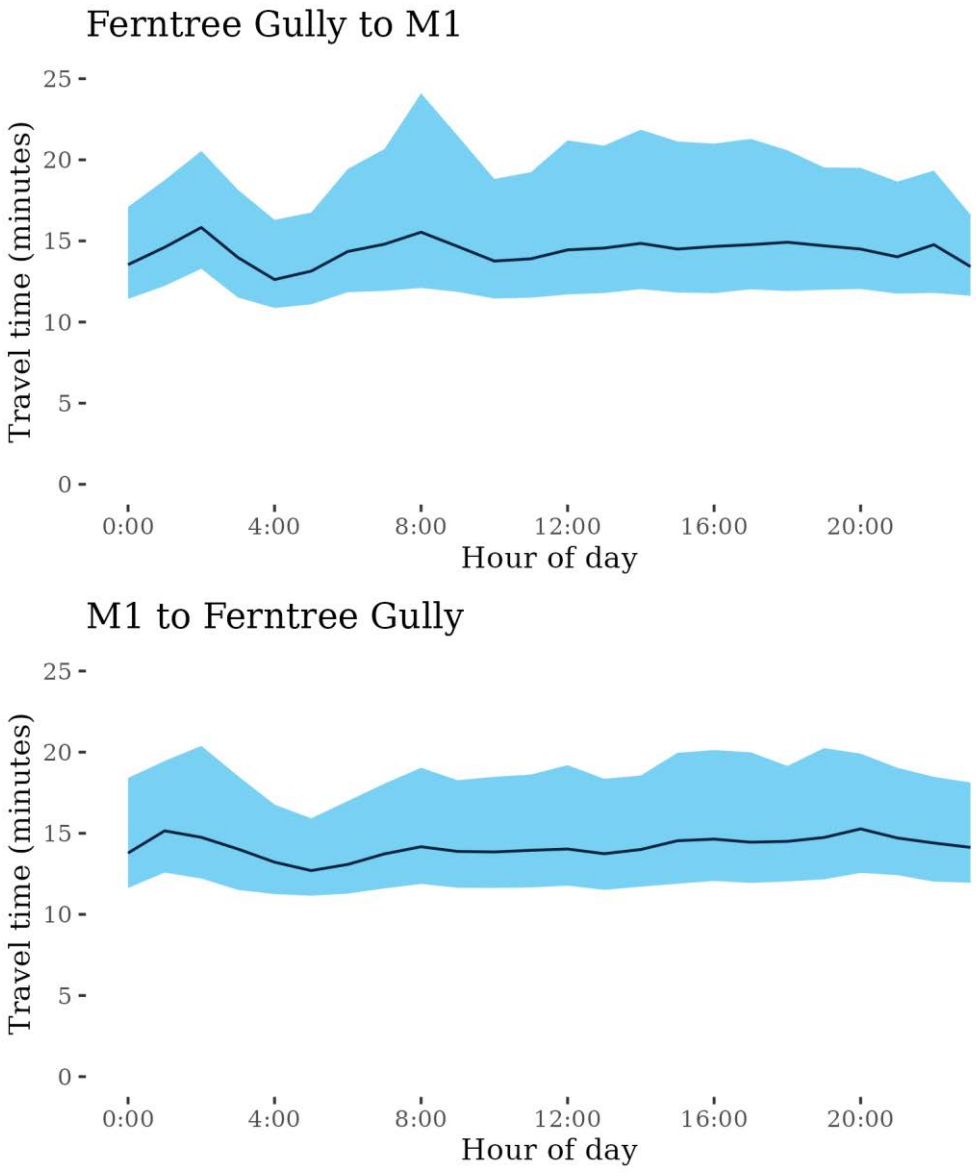
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Ferntree Gully to M1	0:12:37	0:15:50	1.138	0:05:00	0:12:00	1.582	12.56
M1 to Ferntree Gully	0:12:42	0:15:16	1.114	0:04:46	0:08:11	1.453	12.61

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from Ferntree Gully to the M1 were at 4am and 11pm with a median travel time of 13 minutes and an interquartile range of 5 minutes. The longest median travel times were at 2am with a median of 16 minutes and the greatest uncertainty at 8am with an interquartile range of 12 minutes.

The best median travel times and lowest uncertainty for journeys from the M1 to Ferntree Gully were at 5am with a median travel time of 13 minutes and an interquartile range of 5 minutes. The longest median travel times were at 8pm with a median of 15 minutes and the greatest uncertainty at 2am with an interquartile range of 8 minutes.

Figure A.50 Route 22 route median and interquartile range travel times



Source: BITRE estimates.

Route 3 – Albert Park to Cheltenham / Cheltenham to Albert Park

This surface route travels south east from Albert Park, south-east of the Melbourne CBD, through St Kilda, Brighton and Moorabbin to meet Route 15 (Warrigal Road) at Cheltenham/Mentone. It is also known as the Nepean Highway.

Figure A.51 Route 3 route map

Source: BITRE estimates.

Table A.26 Route 3 route travel times and congestion measures, 2021

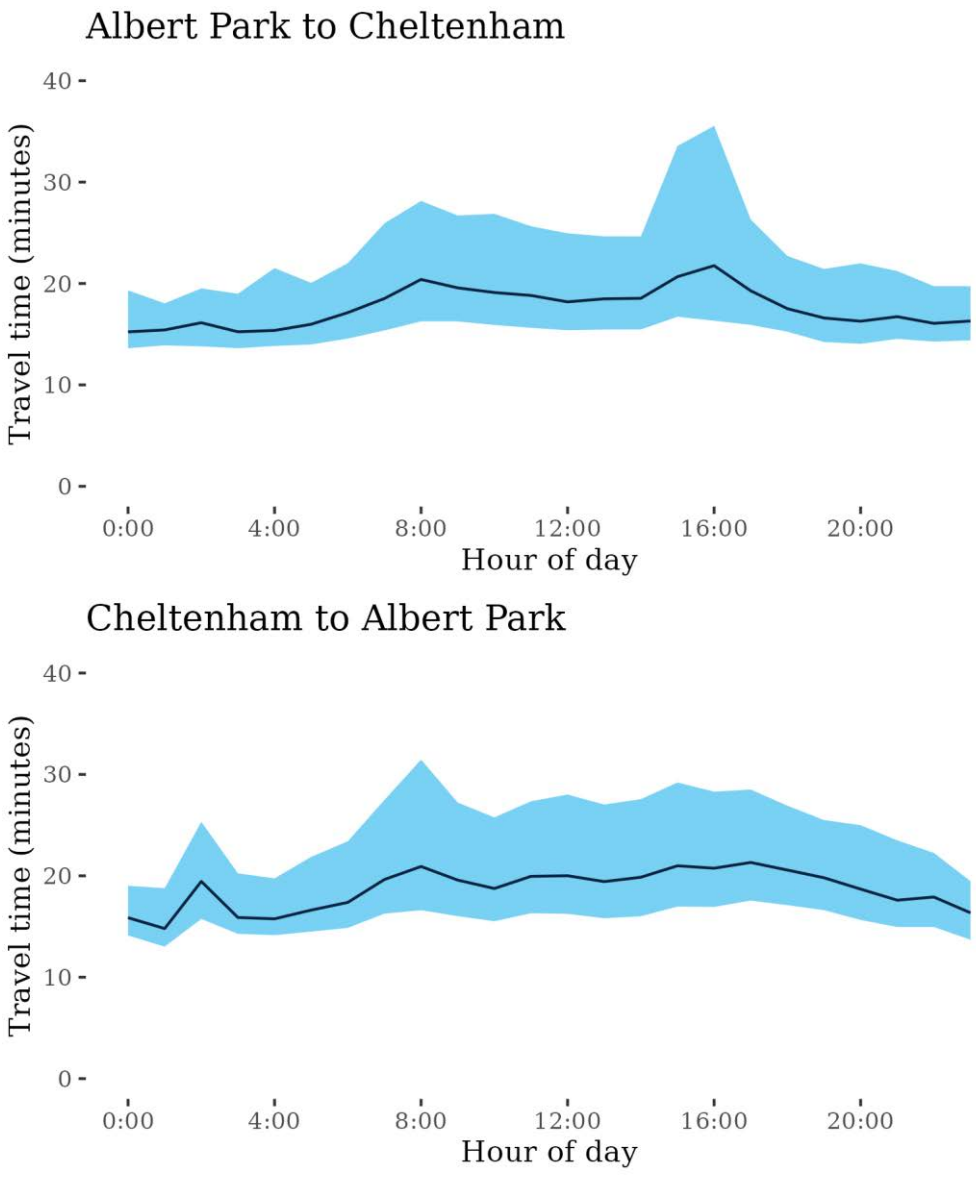
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Albert Park to Cheltenham	0:15:14	0:21:46	1.158	0:04:09	0:19:13	2.116	16.07
Cheltenham to Albert Park	0:14:48	0:21:19	1.261	0:04:54	0:14:51	1.913	16.02

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Albert Park to Cheltenham were at midnight with a median travel time of 15 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 22 minutes and an interquartile range of 19 minutes.

The best median travel times and least uncertainty for journeys from Cheltenham to Albert Park were at 1am with a median travel time of 15 minutes and an interquartile range of 5 minutes. The longest median travel times were at 5pm with a median of 21 minutes and the greatest uncertainty at 8am with an interquartile range of 15 minutes.

Figure A.52 Route 3 route median and interquartile range travel times



Source: BITRE estimates.

Route 32 – Derrimut to Montrose / Montrose to Derrimut

This 53-kilometre surface route extends from Derrimut, west of the CBD, to Montrose on the eastern urban fringe. It crosses under the M80, passes Somerville Road, Footscray Road, Port of Melbourne and Victoria Street/Parade at Carlton, Burke Road in Camberwell, Canterbury Road, and intersects with the M3 at Ringwood.

Figure A.53 Route 32 route map

Source: BITRE estimates.

Table A.27 Route 32 route travel times and congestion measures, 2021

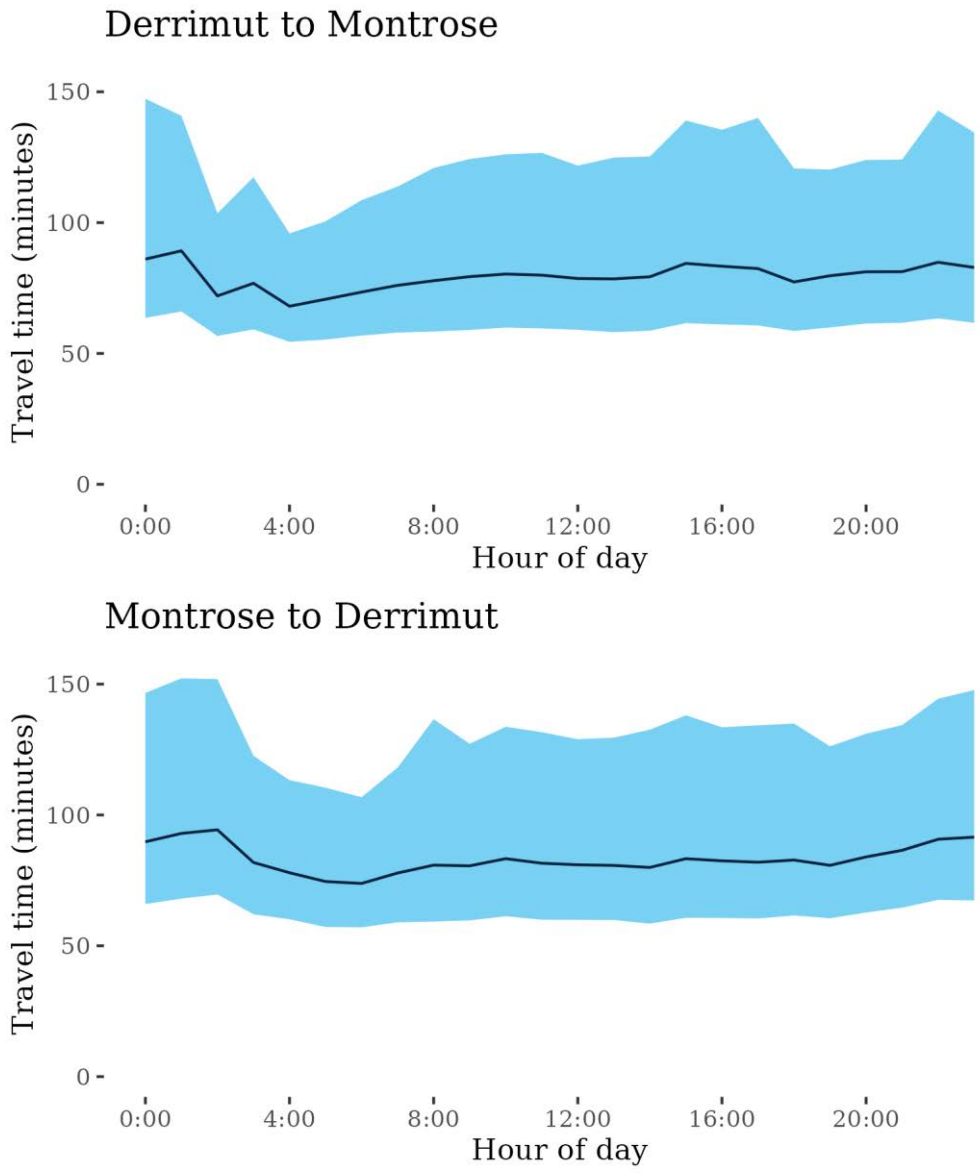
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Derrimut to Montrose	1:08:04	1:29:13	1.165	0:41:26	1:23:44	1.554	52.85
Montrose to Derrimut	1:13:50	1:34:19	1.126	0:49:44	1:24:10	1.41	53.10

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Derrimut to Montrose were at 4am with a median travel time of 1 hour 8 minutes and an interquartile range of 41 minutes. The longest median travel times were at 1am with a median of 1 hour 29 minutes and the greatest uncertainty at midnight with an interquartile range of 1 hour 24 minutes.

The best median travel times and lowest uncertainty for journeys from Montrose to Derrimut were at 6am with a median travel time of 1 hour 14 minutes and an interquartile range of 50 minutes. The longest median travel times were 1 hour 34 minutes at 2am and the greatest uncertainty were at 1am with an interquartile range of 1 hour 24 minutes

Figure A.54 Route 32 route median and interquartile range travel times

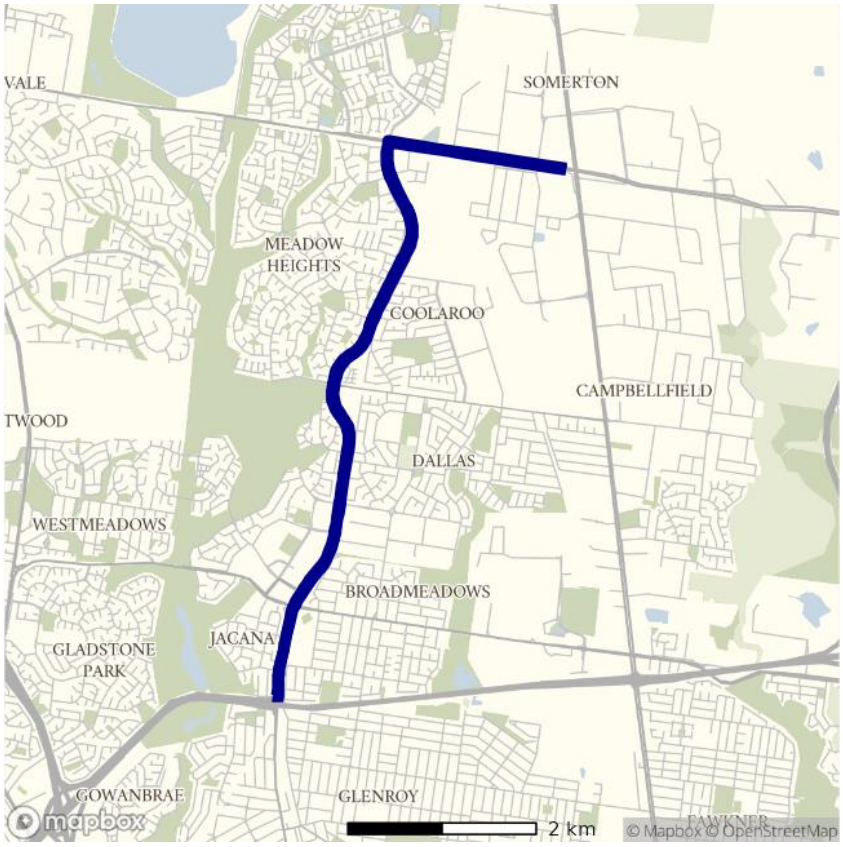


Source: BITRE estimates.

Route 35 – Hume Highway to M80 / M80 to Hume Highway

This surface route extends north from the Metropolitan Ring Road (M80) past Broadmeadows to Roxburgh Park and then east through Somerton to the intersection with Sydney Road (old Hume Highway). It serves light industrial areas around Somerton and uses Pascoe Vale and Somerton Roads.

Figure A.55 Route 35 route map



Source: BITRE estimates.

Table A.28 Route 35 route travel times and congestion measures, 2021

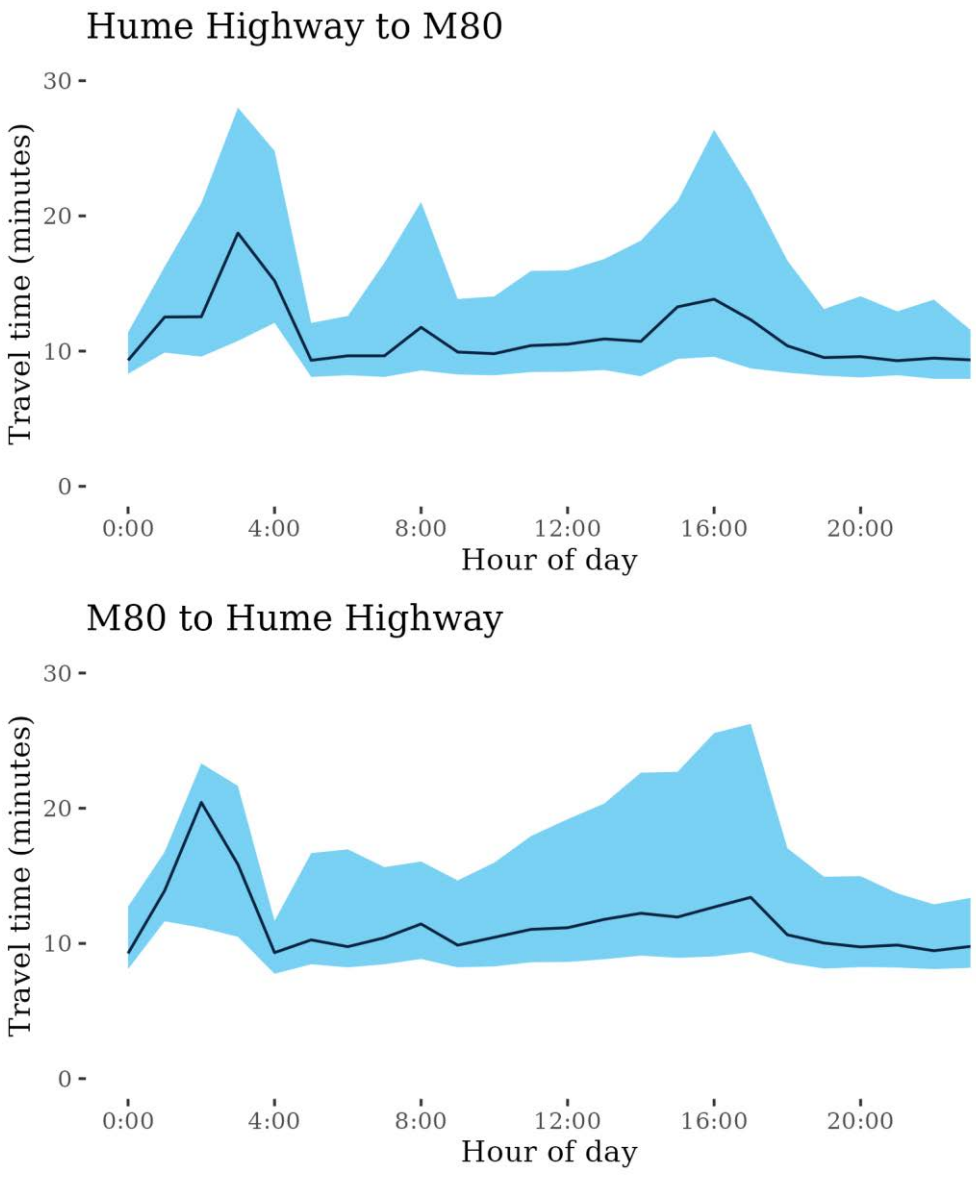
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hume Highway to M80	0:09:18	0:18:44	1.202	0:03:04	0:17:15	2.712	8.32
M80 to Hume Highway	0:09:15	0:20:26	1.237	0:03:55	0:16:53	2.257	8.29

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Hume Highway to the M80 were at 9pm with a median travel time of 9 minutes and an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 3am with a median of 19 minutes and an interquartile range of 17 minutes.

The best median travel times and lowest uncertainty for journeys from the M80 to Hume Highway were at midnight with a median travel time of 9 minutes and an interquartile range of 4 minutes. The longest median travel times were 20.5 minutes at 2am and the greatest uncertainty were at 5pm with an interquartile range of 17 minutes

Figure A.56 Route 56 route median and interquartile range travel times



Source: BITRE estimates.

Route 40 – Doncaster to M2 / M2 to Doncaster

This surface route extends from Doncaster in the east to the M2 at Strathmore, north of the CBD. The route traverses suburbs including Heidelberg, Preston and Coburg, incorporating Manningham Road, Banksia Street and Bell Street along its length.

Figure A.57 Route 40 route map

Source: BITRE estimates.

Table A.29 Route 40 route travel times and congestion measures, 2021

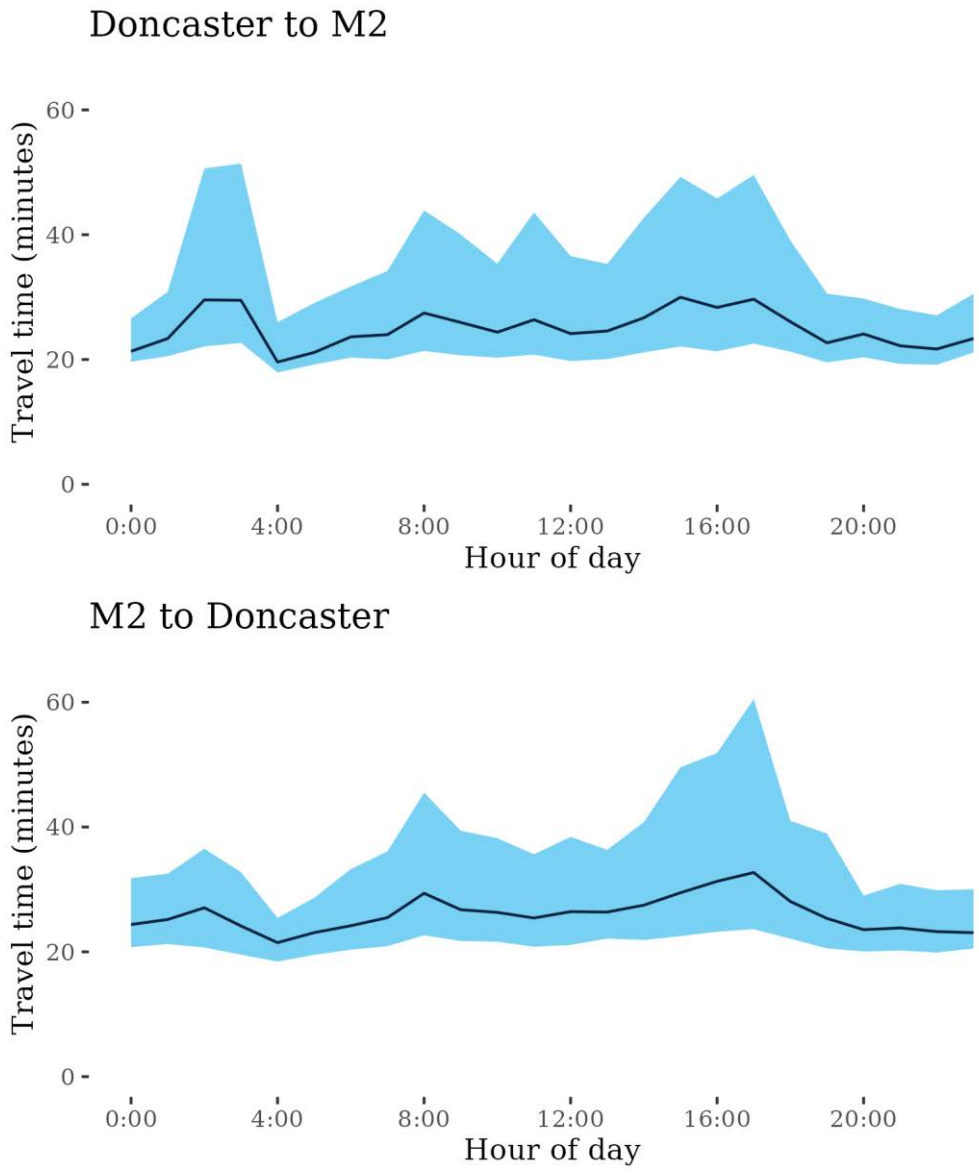
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Doncaster to M2	0:19:35	0:29:59	1.275	0:06:57	0:28:44	2.365	18.61
M2 to Doncaster	0:21:28	0:32:43	1.21	0:07:01	0:36:53	2.301	18.63

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Doncaster to the M2 were at 4am with a median travel time of 19.5 minutes and an interquartile range of 7 minutes. The longest median travel times were at 3pm with a median of 30 minutes and the greatest uncertainty at 3am with an interquartile range of 29 minutes.

The best median travel times and lowest uncertainty for journeys from the M2 to Doncaster were at 4am with a median travel time of 21.5 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 33 minutes and an interquartile range of 37 minutes.

Figure A.58 Route 40 route median and interquartile range travel times

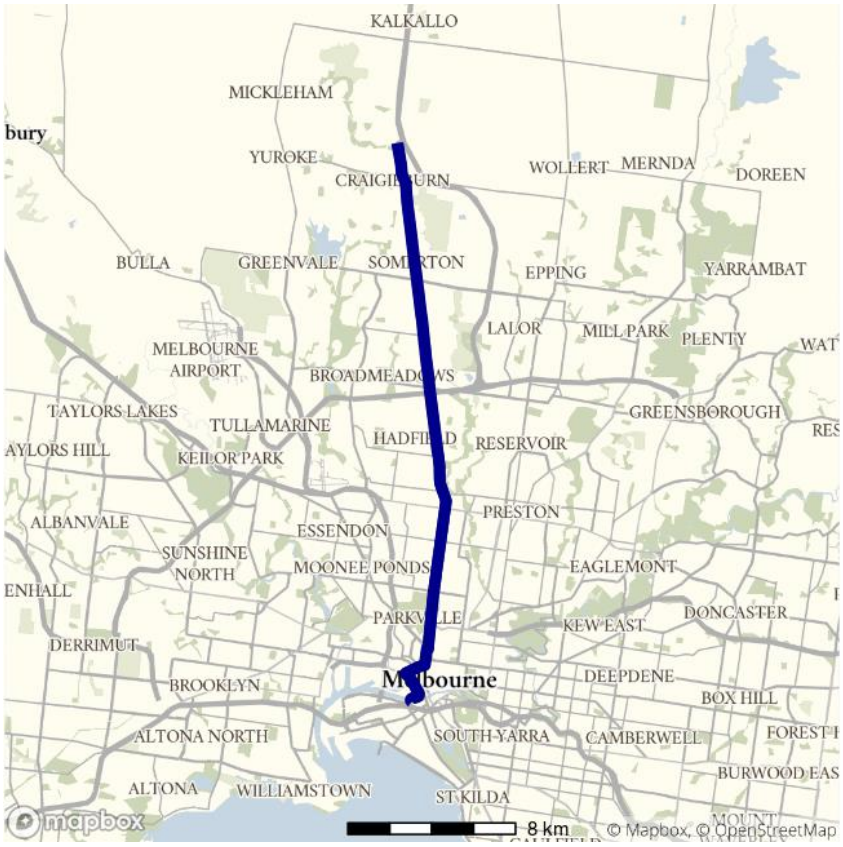


Source: BITRE estimates.

Route 55 – Hume Freeway to Montague St / Montague St to Hume Freeway

This surface route connects the Hume Freeway at Craigieburn and Montague Street in south Melbourne via Sydney Road through Somerton, Coburg and North Melbourne, skirting the CBD along Dudley Street and Wurundjeri Way.

Figure A.59 Route 55 route map



Source: BITRE estimates.

Table A.30 Route 55 route travel times and congestion measures, 2021

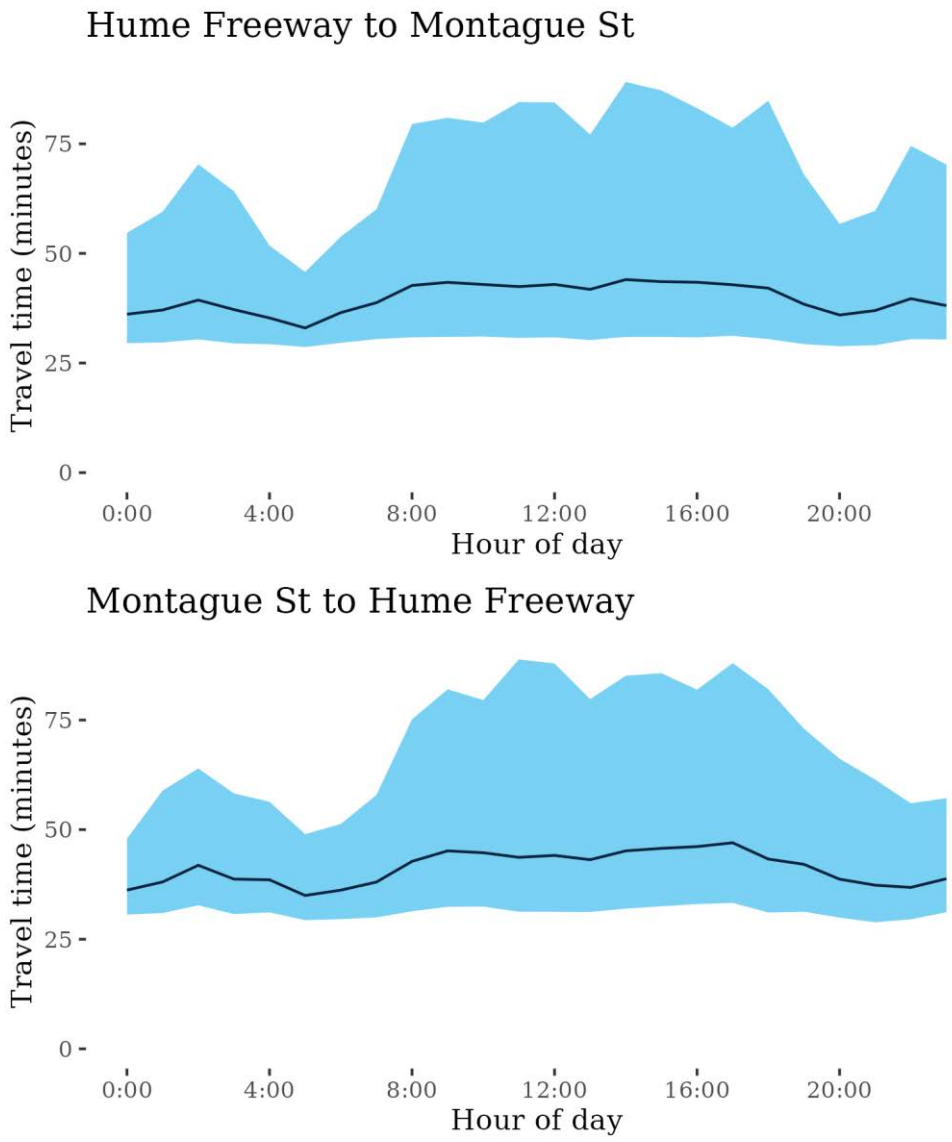
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hume Freeway to Montague St	0:33:00	0:44:02	1.205	0:17:07	0:58:09	2.372	28.02
Montague St to Hume Freeway	0:34:59	0:47:01	1.176	0:17:19	0:57:33	2.227	27.98

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Hume Freeway to Montague Street were at 5am with a median travel time of 33 minutes and an interquartile range of 17 minutes. The longest median travel times and greatest uncertainty were at 2pm with a median of 44 minutes and an interquartile range of nearly an hour (58 minutes).

The best median travel times and least uncertainty for journeys from Montague Street to the Hume Freeway were at 5am with a median travel time of 35 minutes and an interquartile range of 17 minutes. The longest median travel times were 47 minutes at 5pm and the greatest uncertainty were at 11am with an interquartile range of 57 minutes

Figure A.60 Route 55 route median and interquartile range travel times



Source: BITRE estimates.

Route 56 – Laverton to Spotswood / Spotswood to Laverton

This surface route travels a short distance (9 kilometres) between Laverton and Spotswood in Melbourne's west using Dohertys Road, Grieve Parade and Blackshaws Road and passes a number of light industrial areas.

Figure A.61 Route 56 route map

Source: BITRE estimates.

Table A.31 Route 56 route travel times and congestion measures, 2021

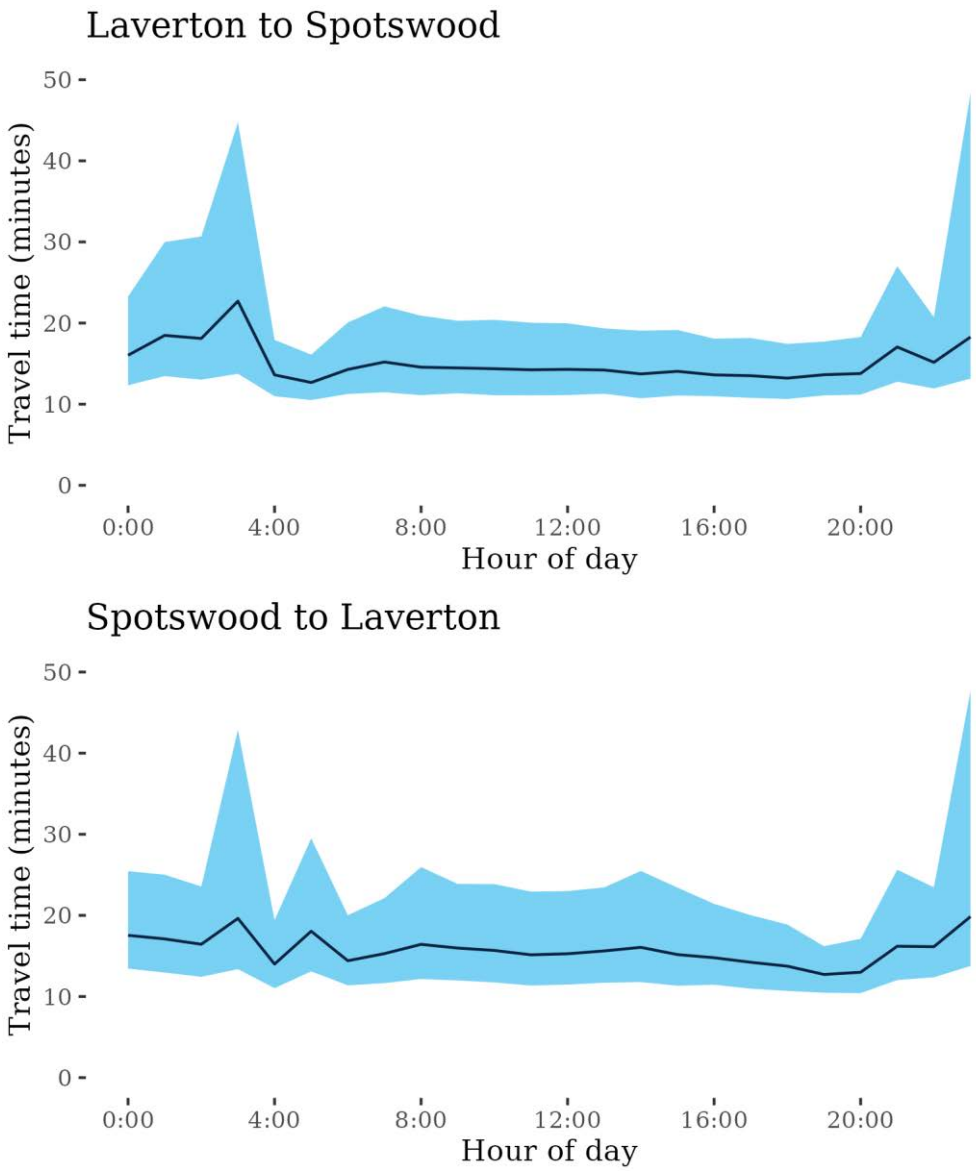
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Laverton to Spotswood	0:12:40	0:22:42	1.194	0:05:36	0:35:09	2.019	9.14
Spotswood to Laverton	0:12:43	0:19:51	1.24	0:05:44	0:33:54	2.222	9.14

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Laverton to Spotswood were at 5am with a median travel time of 13 minutes and an interquartile range of 6 minutes. The longest median travel times were at 3am with a median of 23 minutes and the greatest uncertainty at 11pm with an interquartile range of 35 minutes.

The best median travel times for journeys from Spotswood to Laverton were 13 minutes at 7pm and the lowest uncertainty was at 7pm with an interquartile range of 6 minutes. The longest median travel times and greatest uncertainty were at 11pm with a median of 20 minutes and an interquartile range of 34 minutes.

Figure A.62 Route 56 route median and interquartile range travel times



Source: BITRE estimates.

Route 58 – Greenvale to Yan Yean Road / Yan Yean Road to Greenvale

This surface route extends across Melbourne's northern fringe connecting Mickleham Road in the west and the intersection of Gorge Road and Yan Yean Road near Plenty in northeast Melbourne. It uses Somerton Road, Cooper Street, High Street and McDonalds Road.

Figure A.63 Route 58 route map

Source: BITRE estimates.

Table A.32 Route 58 route travel times and congestion measures, 2021

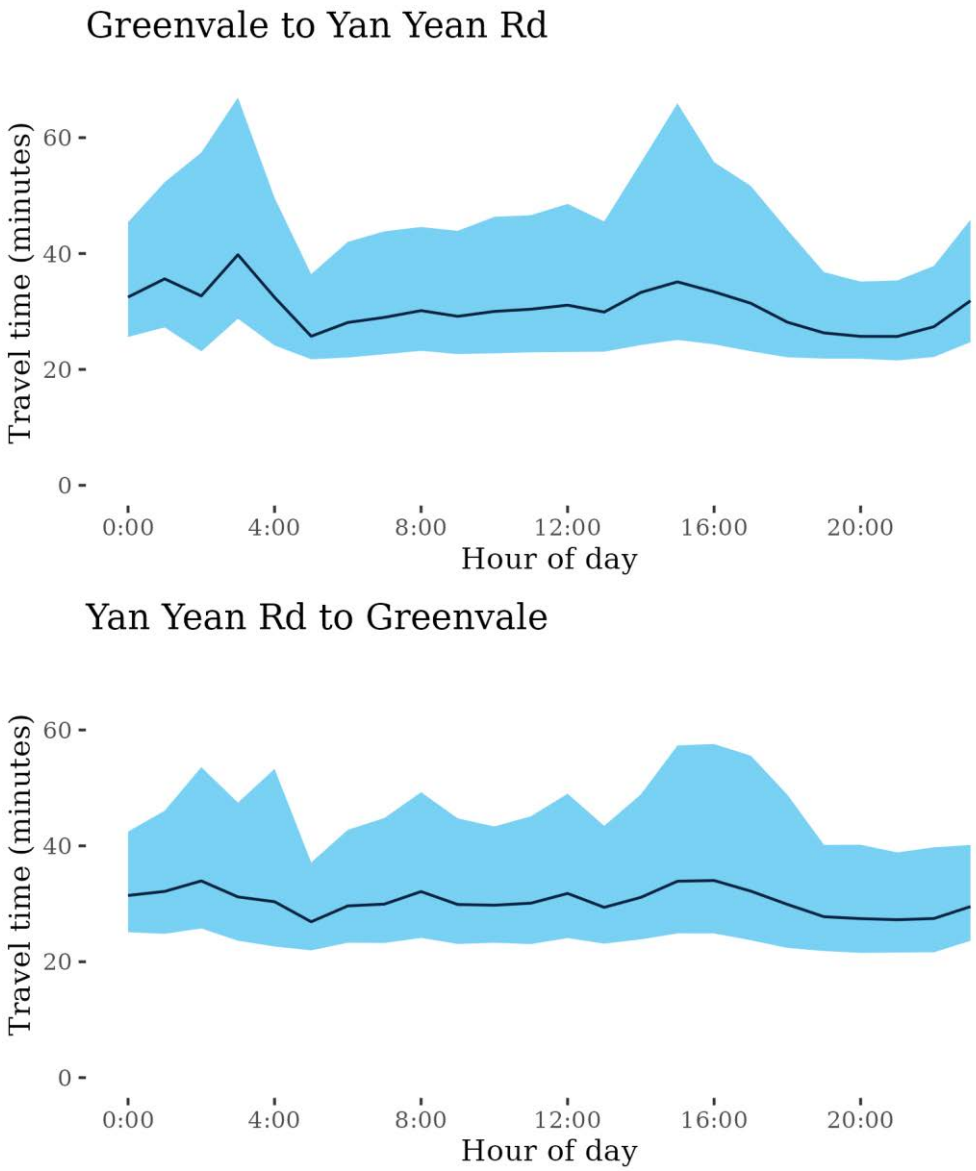
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Greenvale to Yan Yean Road	0:25:42	0:39:47	1.192	0:13:19	0:40:50	1.784	22.32
Yan Yean Road to Greenvale	0:26:54	0:34:01	1.129	0:15:11	0:32:42	1.506	22.45

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from Greenvale to Yan Yean Road were at 9pm and 8pm with a median travel time of 26 minutes and an interquartile range of 13 minutes. The longest median travel times were at 3am with a median of 40 minutes and the greatest uncertainty at 3pm with an interquartile range of 41 minutes.

The best median travel times for journeys from Yan Yean Road to Greenvale were 27 minutes at 5am and the lowest uncertainty was at 5am with an interquartile range of 15 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 34 minutes and an interquartile range of 33 minutes.

Figure A.64 Route 58 route median and interquartile range travel times



Source: BITRE estimates.

Route 60 – M3 to Southbank / Southbank to M3

This surface route travels southeast from the Melbourne CBD roughly parallel to, but south of, the M1 (East). From Southbank it passes through suburbs including Prahran, Oakleigh and Springvale before meeting the M3 at Noble Park. It is also known as the Princes Highway.

Figure A.65 Route 60 route map

Source: BITRE estimates.

Table A.33 Route 60 route travel times and congestion measures, 2021

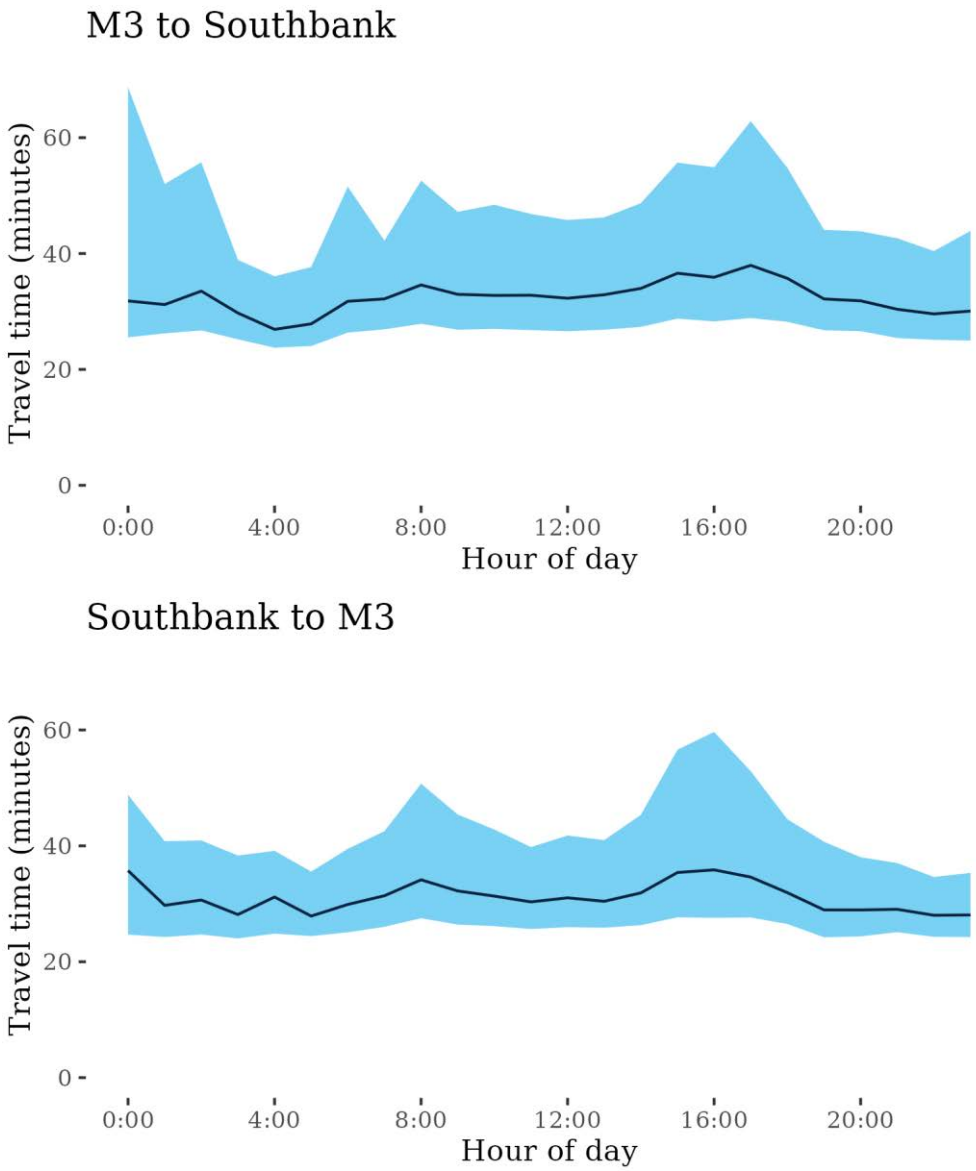
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
M3 to Southbank	0:26:55	0:37:57	1.204	0:12:19	0:43:09	1.775	26.92
Southbank to M3	0:27:53	0:35:52	1.116	0:10:20	0:32:05	1.687	26.82

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the M3 to Southbank were at 4am with a median travel time of 27 minutes and an interquartile range of 12 minutes. The longest median travel times were at 5pm with a median of 38 minutes and the greatest uncertainty at midnight with an interquartile range of 43 minutes.

The best median travel times and least uncertainty for journeys from Southbank to the M3 were at 5am with a median travel time of 28 minutes and an interquartile range of 10 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 36 minutes and an interquartile range of 32 minutes.

Figure A.66 Route 60 route median and interquartile range travel times

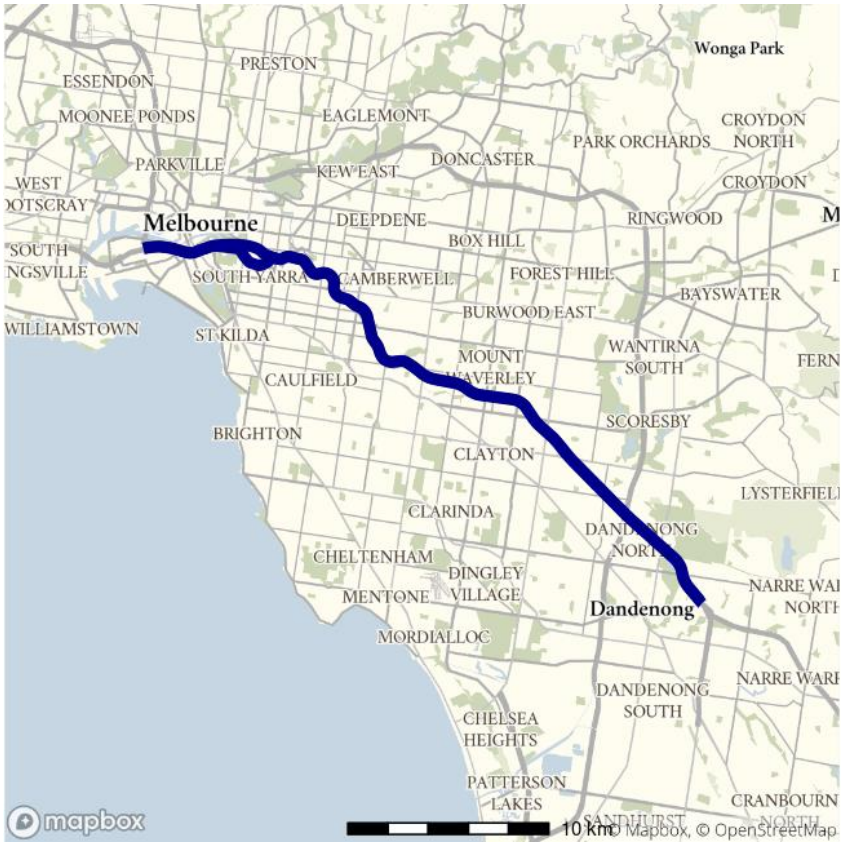


Source: BITRE estimates.

M1 (East) – City to M420 / M420 to City

This route follows the M1 connecting Port Melbourne and the South Gippsland Freeway (M420) on Melbourne's southeast fringe. It serves light industrial areas around Dandenong and interregional freight from Gippsland. For most of its length it is known as the Monash Freeway.

Figure A.67 M1 (East) route map



Source: BITRE estimates.

Table A.34 M1 (East) route travel times and congestion measures, 2021

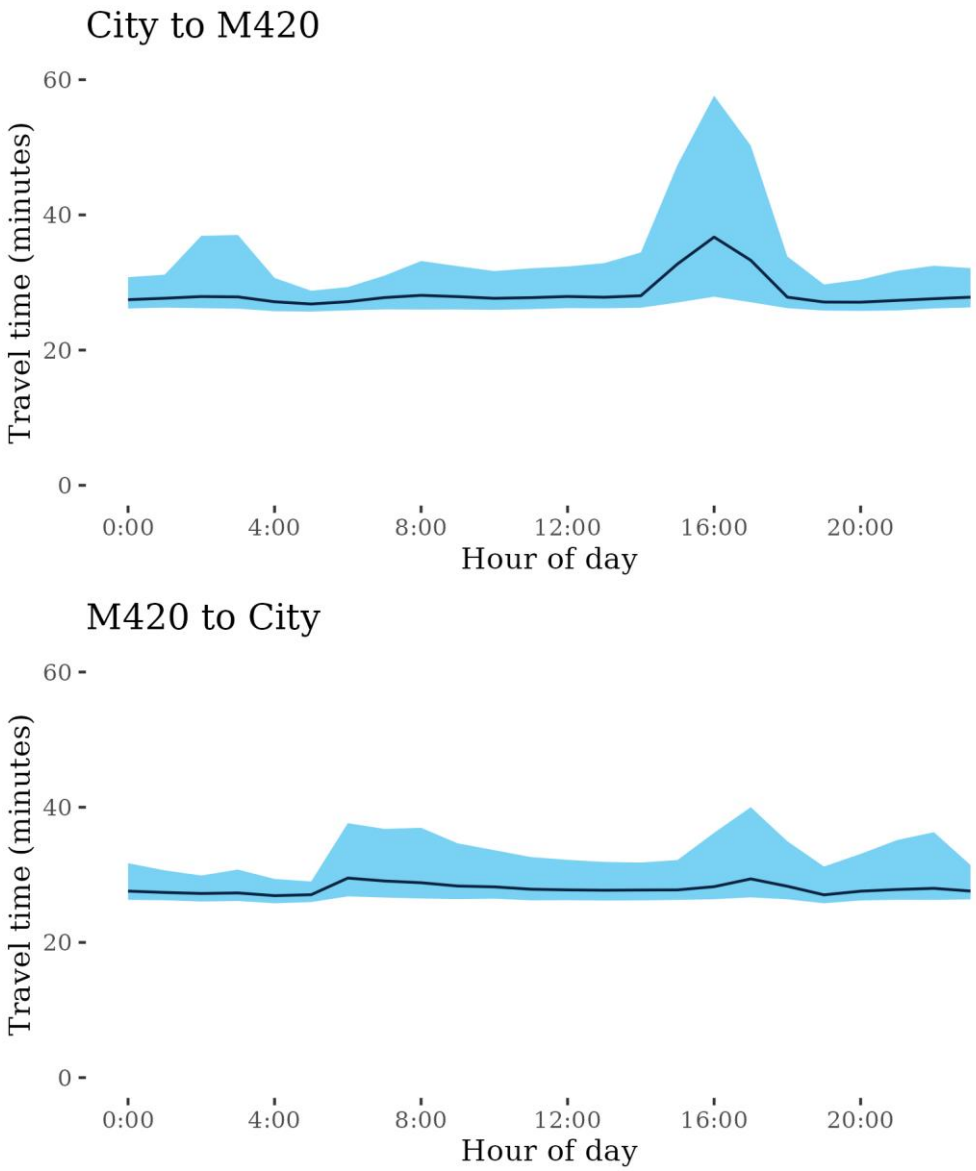
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
City to M420	0:26:49	0:36:43	1.061	0:03:05	0:29:44	2.727	36.04
M420 to City	0:26:55	0:29:31	1.038	0:03:03	0:13:21	2.311	36.47

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from City to M420 were at 5am with a median travel time of 27 minutes and an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 37 minutes and an interquartile range of 30 minutes.

The best median travel times and least uncertainty for journeys from the M420 to City were at 4am with a median travel time of 27 minutes and an interquartile range of 3 minutes. The longest median travel times were at 6am with a median of 30 minutes and the greatest uncertainty at 5pm with an interquartile range of 13 minutes.

Figure A.68 M1 (East) route median and interquartile range travel times



Source: BITRE estimates.

M1 (West) – City to M80 / M80 to City

This route follows the West Gate Freeway (M1) connecting at its confluence with the Western Ring Road (M80) at Altona and the M2 at Port Melbourne. It serves extensive freight areas around the Port precinct and in Melbourne's west.

Figure A.69 M1 (West) route map

Source: BITRE estimates.

Table A.35 M1 (West) route travel times and congestion measures, 2021

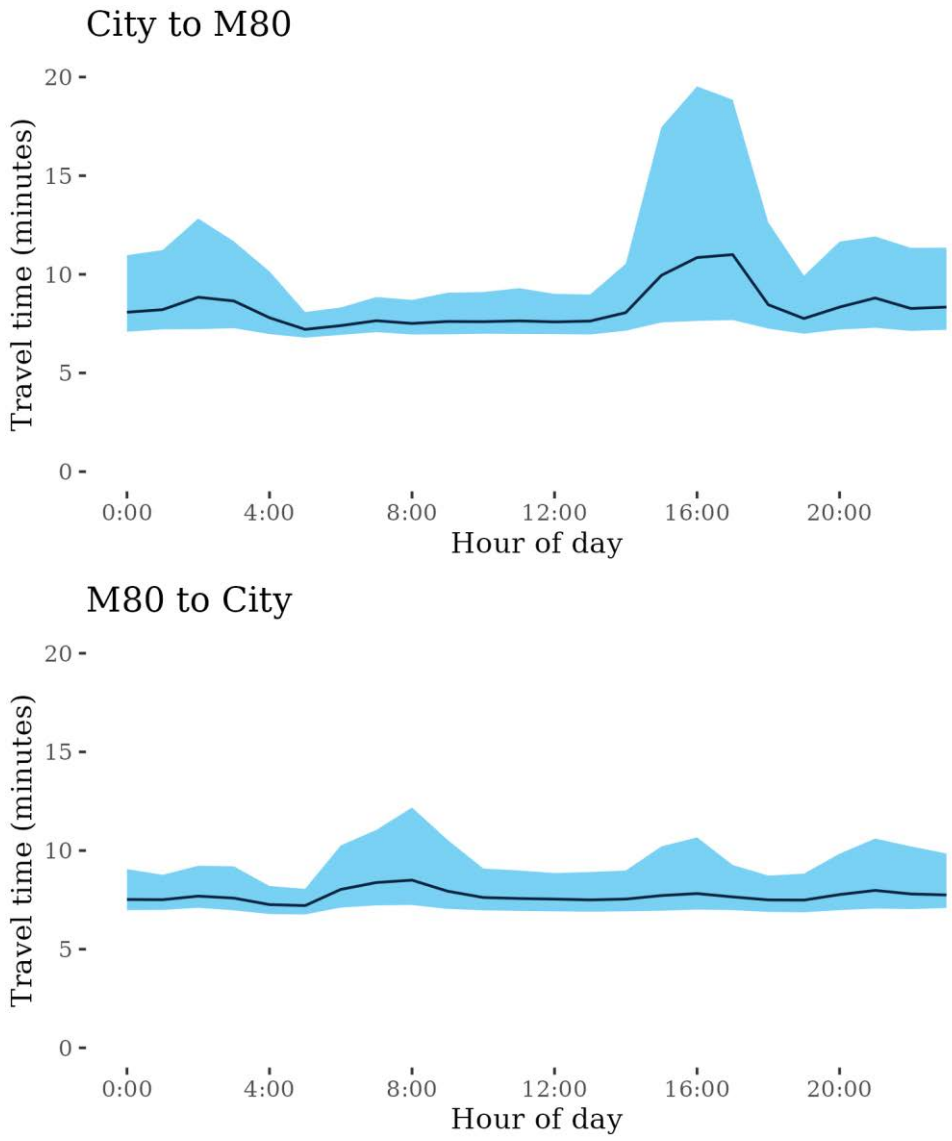
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
City to M80	0:07:13	0:11:00	1.151	0:01:18	0:11:54	3.202	9.04
M80 to City	0:07:13	0:08:30	1.068	0:01:18	0:04:57	1.984	9.00

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from the City to the M80 were at 5am with a median travel time of 7 minutes and an interquartile range of 78 seconds. The longest median travel times were at 5pm with a median of 11 minutes and the greatest uncertainty at 4pm with an interquartile range of 12 minutes.

The best median travel times and lowest uncertainty for journeys from the M80 to the City were at 5am with a median travel time of 7 minutes and an interquartile range of 78 seconds. The longest median travel times and greatest uncertainty were at 8am with a median of 8.5 minutes and an interquartile range of 5 minutes.

Figure A.70 M1 (West) route median and interquartile range travel times

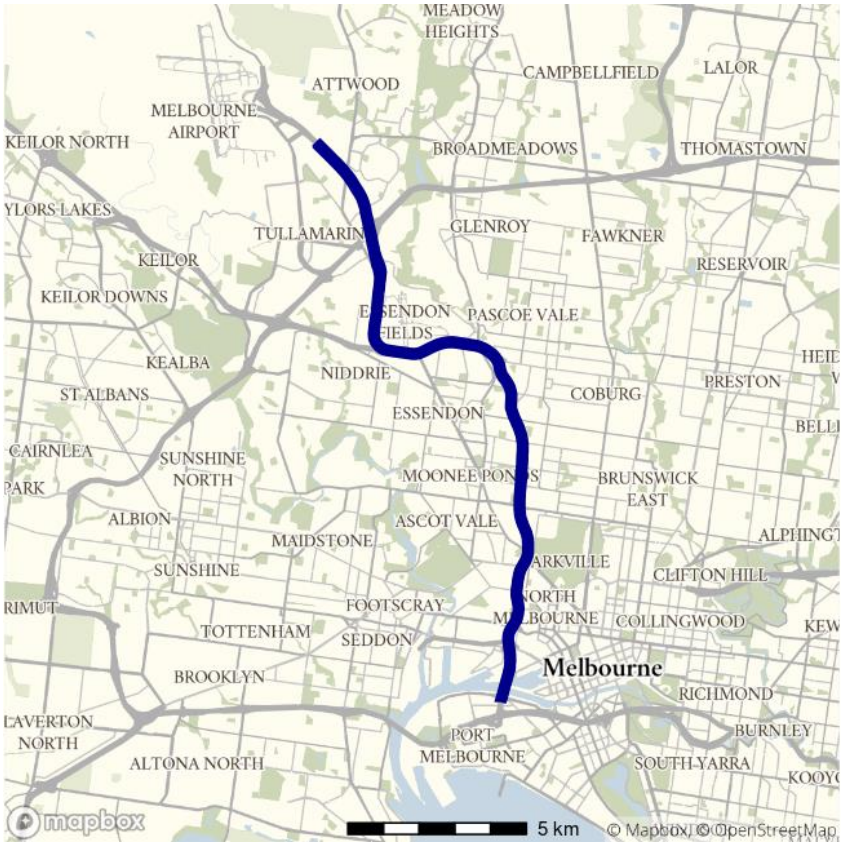


Source: BITRE estimates.

M2 – CityLink then Tullamarine / Tullamarine then CityLink

This route connects Melbourne Airport and the M1 at Port Melbourne via the CityLink toll road and Tullamarine Freeway.

Figure A.71 M2 route map



Source: BITRE estimates.

Table A.36 M2 route travel times and congestion measures, 2021

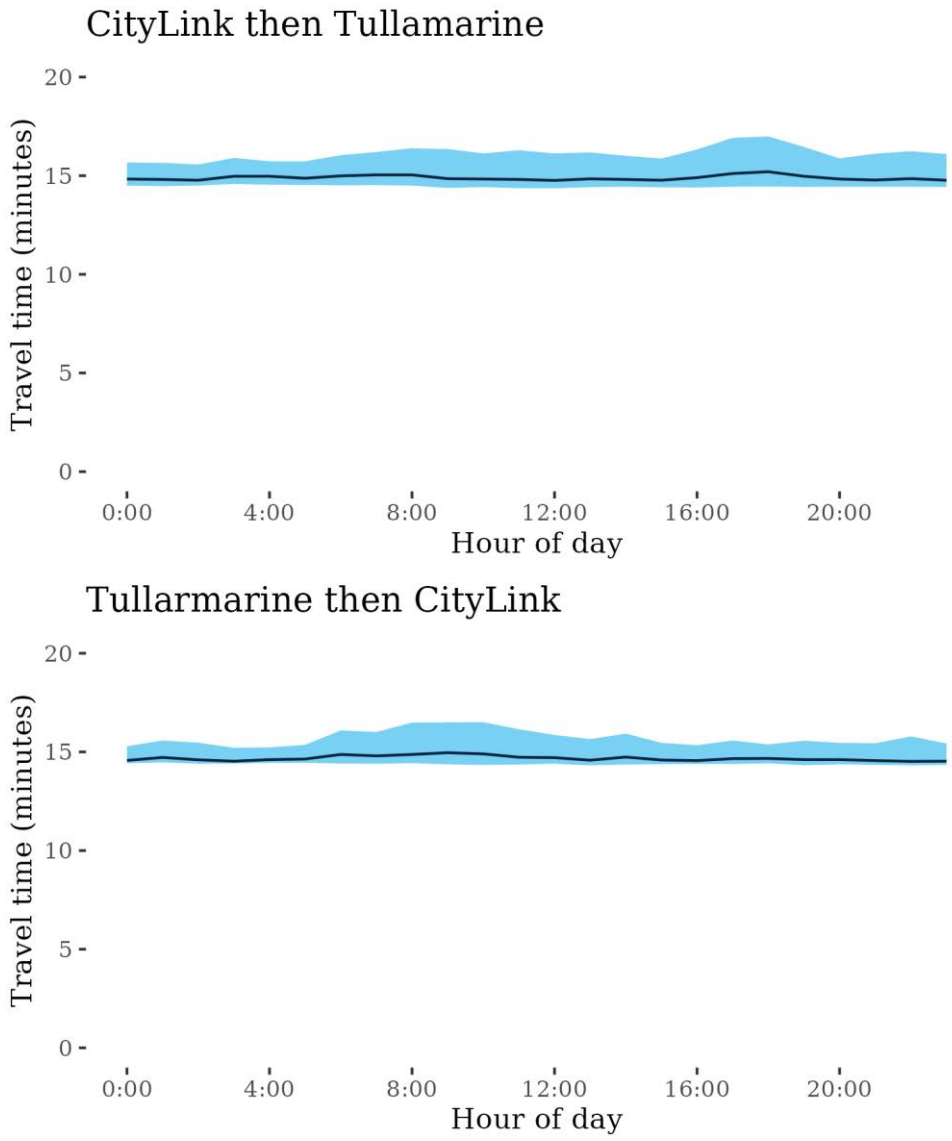
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
CityLink then Tullamarine	0:14:45	0:15:12	1.009	0:01:05	0:02:32	1.549	19.76
Tullamarine then CityLink	0:14:31	0:14:58	1.011	0:00:48	0:02:10	1.658	19.78

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from CityLink were at 12am and 2am with a median travel time of 15 minutes and an interquartile range of 65 seconds. The longest median travel times and greatest uncertainty were at 6pm with a median of 15 minutes and an interquartile range of 2.5 minutes.

The best median travel times and lowest uncertainty for journeys from Tullamarine were at 10pm with a median travel time of 15 minutes and an interquartile range of 48 seconds. The longest median travel times were at 9am with a median of 15 minutes and the greatest uncertainty at 10am with an interquartile range of 2 minutes.

Figure A.72 M2 route median and interquartile range travel times

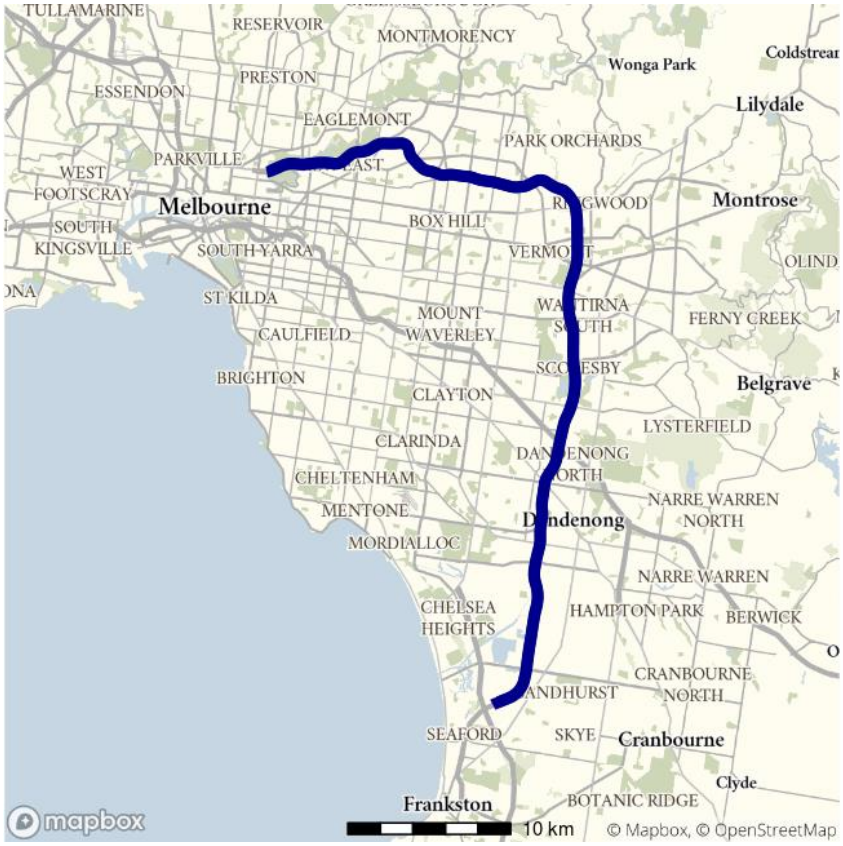


Source: BITRE estimates.

M3 – Frankston to Hoddle Street / Hoddle Street to Frankston

This route runs between Abbotsford, northeast of the CBD, and Frankston in Melbourne's far south east. It uses the Eastern Freeway, Eastlink and the Frankston Freeway.

Figure A.73 M3 route map



Source: BITRE estimates.

Table A.37 M3 route travel times and congestion measures, 2021

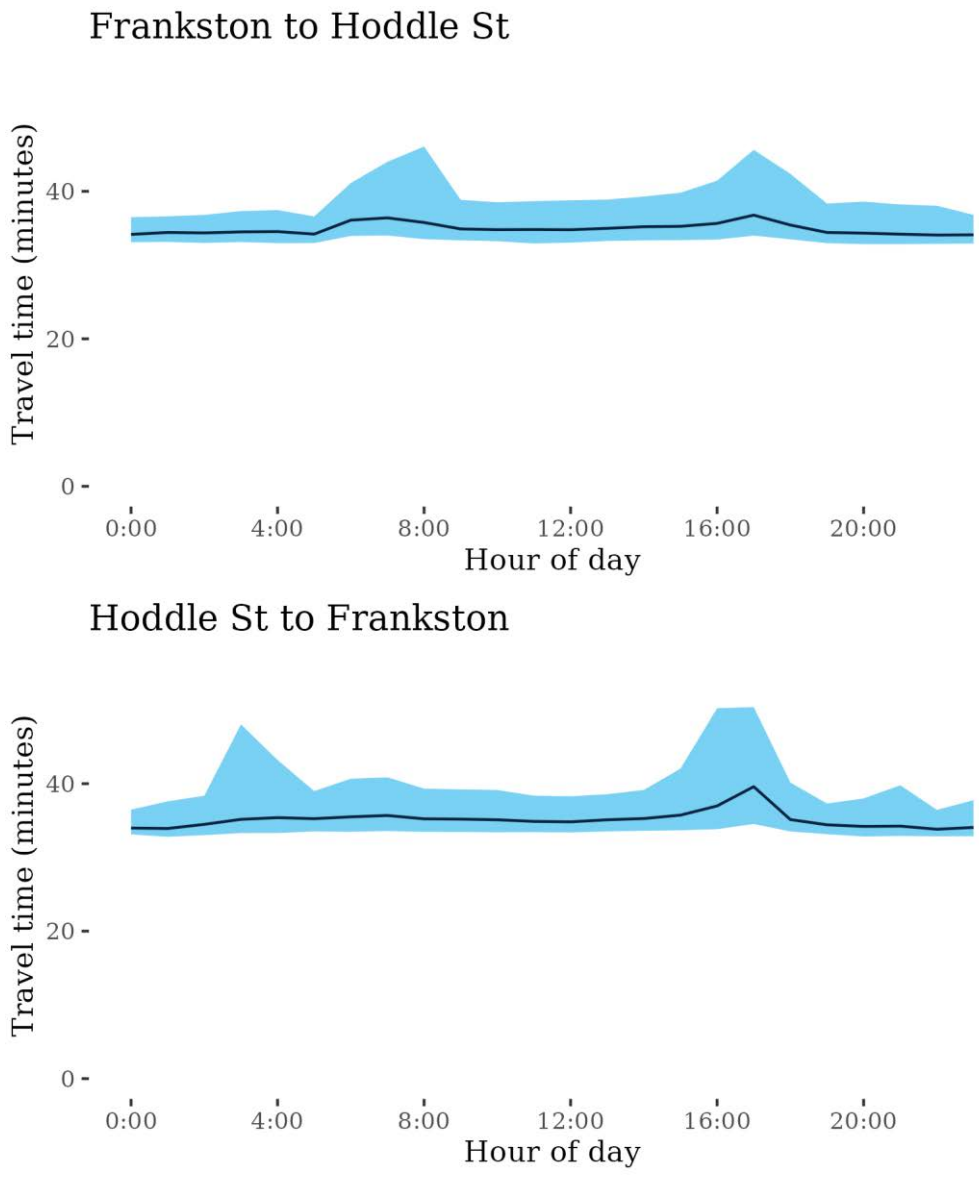
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Frankston to Hoddle St	0:34:04	0:36:46	1.025	0:03:24	0:12:33	1.803	53.03
Hoddle St to Frankston	0:33:49	0:39:35	1.039	0:03:21	0:16:24	2.089	53.33

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Frankston to Hoddle Street were at 10pm with a median travel time of 34 minutes and an interquartile range of 3.5 minutes. The longest median travel times were 37 minutes at 5pm and the greatest uncertainty were at 8am with an interquartile range of 12.5 minutes

The best travel times and lowest uncertainty travelling from Hoddle Street to Frankston were at 10pm and midnight with a median travel time of 34 minutes and an interquartile range of 3 minutes. The longest median travel times were 40 minutes at 5pm and the greatest uncertainty were at 4pm with an interquartile range of 16.5 minutes

Figure A.74 M3 route median and interquartile range travel times



Source: BITRE estimates.

M420 – Monash Freeway to South Gippsland Highway / South Gippsland Highway to Monash Freeway

This short (4.5 kilometre) route connects the M1 (East) to the South Gippsland Highway at Lyndhurst, servicing industrial areas in Melbourne's south east, via the South Gippsland Freeway.

Figure A.75 M420 route map

Source: BITRE estimates.

Table A.38 M420 route travel times and congestion measures, 2021

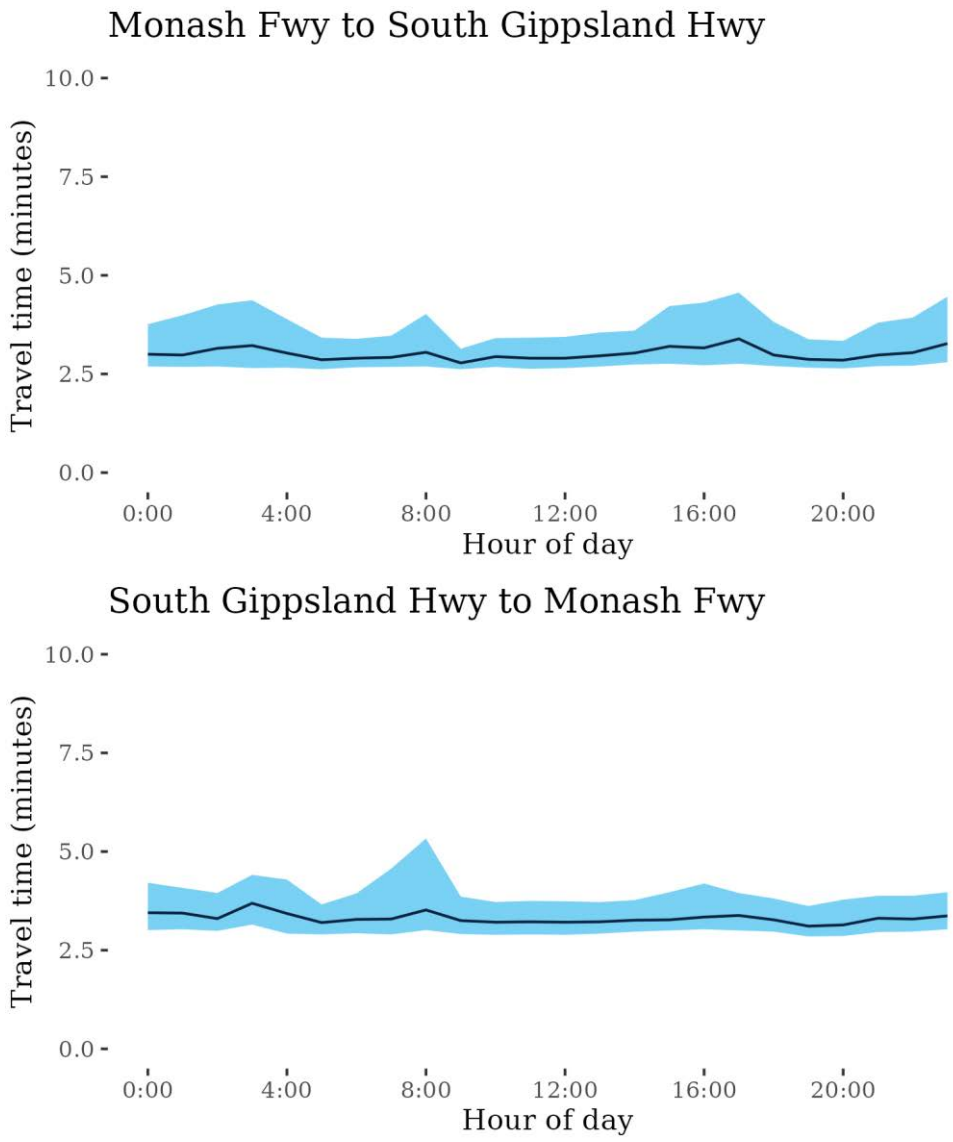
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
City to M80	0:02:47	0:03:23	1.084	0:00:31	0:01:48	2.101	4.20
M80 to City	0:03:07	0:03:41	1.063	0:00:46	0:02:19	1.358	4.57

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the Monash Freeway to South Gippsland Highway were at 9am with a median travel time of 3 minutes and an interquartile range of 31 seconds. The longest median travel times and greatest uncertainty were at 5pm with a median of 3 minutes and an interquartile range of 2 minutes.

The best travel times and lowest uncertainty travelling from South Gippsland Highway to the Monash Freeway were at 7pm and 5am with a median travel time of 3 minutes and an interquartile range of 46 seconds. The longest median travel times were at 3am with a median of 4 minutes and the greatest uncertainty at 8am with an interquartile range of 2 minutes.

Figure A.76 M420 route median and interquartile range travel times



Source: BITRE estimates.

M79 – Essendon to Gap Road / Gap Road to Essendon

This lengthy motorway route follows the A79/M79 from Gap Road, west of Sunbury, to Essendon where it joins the CityLink toll road. For most of its length it is known as the Calder Freeway.

Figure A.77 M79 route map

Source: BITRE estimates.

Table A.39 M79 route travel times and congestion measures, 2021

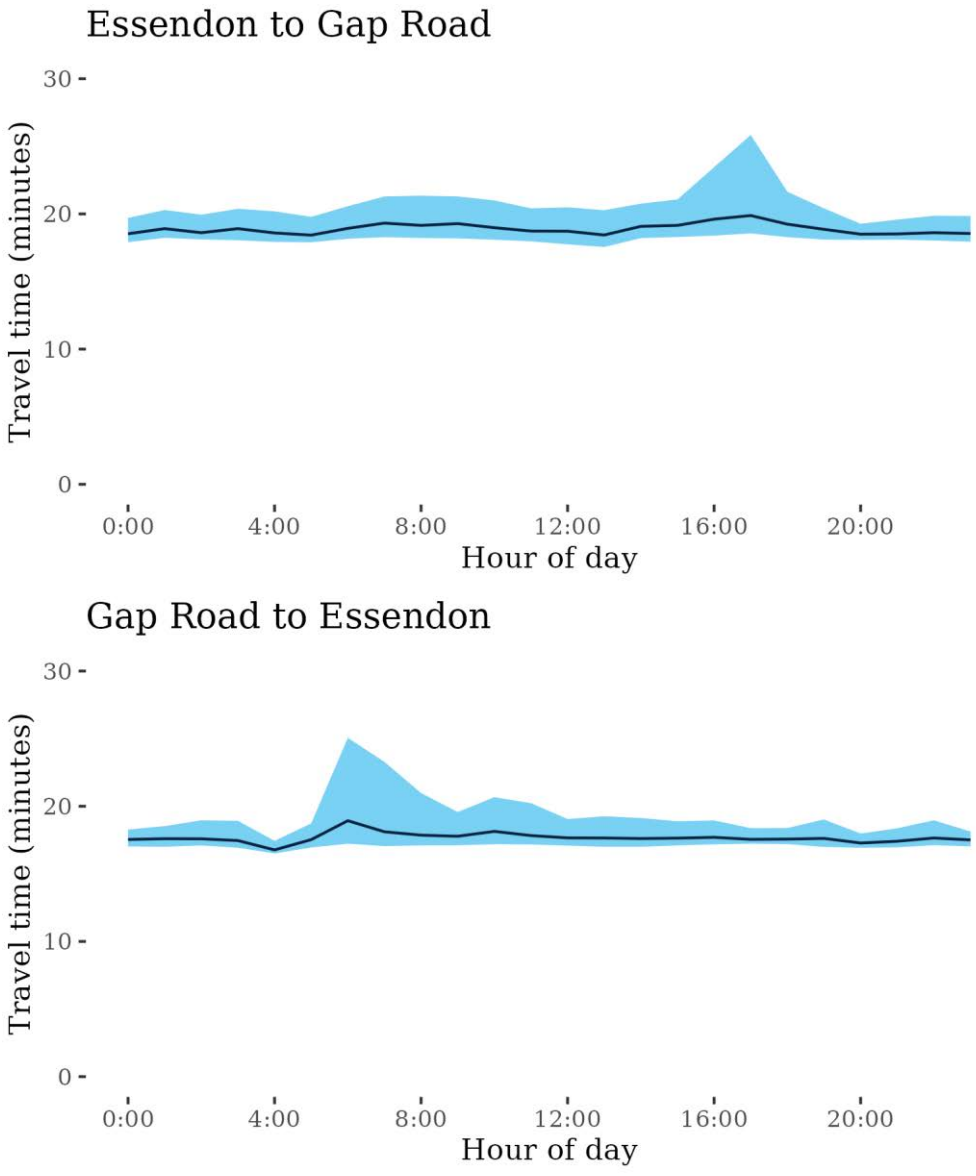
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Essendon to Gap Road	0:18:26	0:19:53	1.025	0:01:11	0:07:16	2.262	27.27
Gap Road to Essendon	0:16:46	0:18:56	1.054	0:00:56	0:07:49	2.494	27.21

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from Essendon to Gap Road were at 5am and 8pm with a median travel time of 18.5 minutes and an interquartile range of 71 seconds. The longest median travel times and greatest uncertainty were at 5pm with a median of 20 minutes and an interquartile range of 7 minutes.

The best median travel times and lowest uncertainty for journeys from Gap Road to Essendon were at 4am with a median travel time of 17 minutes and an interquartile range of just under 1 minute. The longest median travel times and greatest uncertainty were at 6am with a median of 19 minutes and an interquartile range of 8 minutes.

Figure A.78 M79 route median and interquartile range travel times



Source: BITRE estimates.

M80 – Altona to Greensborough / Greensborough to Altona

This 38 kilometre route follows the M80 (Western Ring Road) in the west and north of Melbourne. It passes through the western outskirts of the Melbourne metropolitan area as the Western Ring Road, meets the M1 and proceeds to the Greensborough Bypass in north-east Melbourne as the Metropolitan Ring Road.

Figure A.79 M80 route map

Source: BITRE estimates.

Table A.40 M80 route travel times and congestion measures, 2021

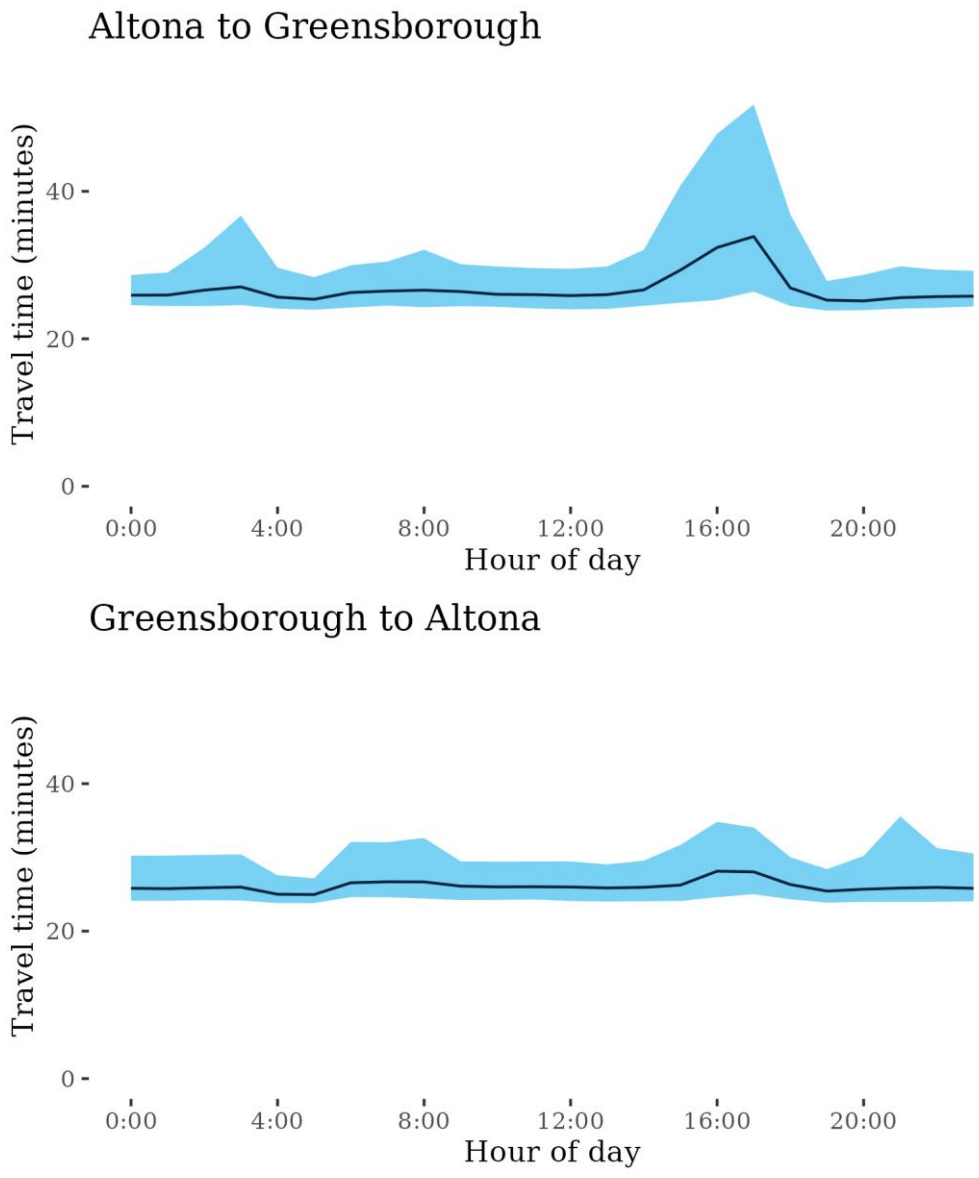
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Altona to Greensborough	0:25:08	0:33:52	1.065	0:04:01	0:25:22	2.02	37.52
Greensborough to Altona	0:24:58	0:28:08	1.046	0:03:22	0:11:36	1.916	37.42

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Altona to Greensborough were at 8pm with a median travel time of 25 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 34 minutes and an interquartile range of 25 minutes.

The best median travel times and least uncertainty for journeys from Greensborough to Altona were at 5am with a median travel time of 25 minutes and an interquartile range of 3 minutes. The longest median travel times were 28 minutes at 4pm and the greatest uncertainty were at 9pm with an interquartile range of 12 minutes.

Figure A.80 M80 route median and interquartile range travel times,



Source: BITRE estimates.

Princes Freeway – Geelong Ring Road to M80/M80 to Geelong Ring Road

This route connects Geelong to the Melbourne orbital road network. It also serves Melbourne's expanding Western Suburbs.

Figure A.81 Princes Freeway route map

Source: BITRE estimates.

Table A.41 Princes Freeway route travel times and congestion measures, 2021

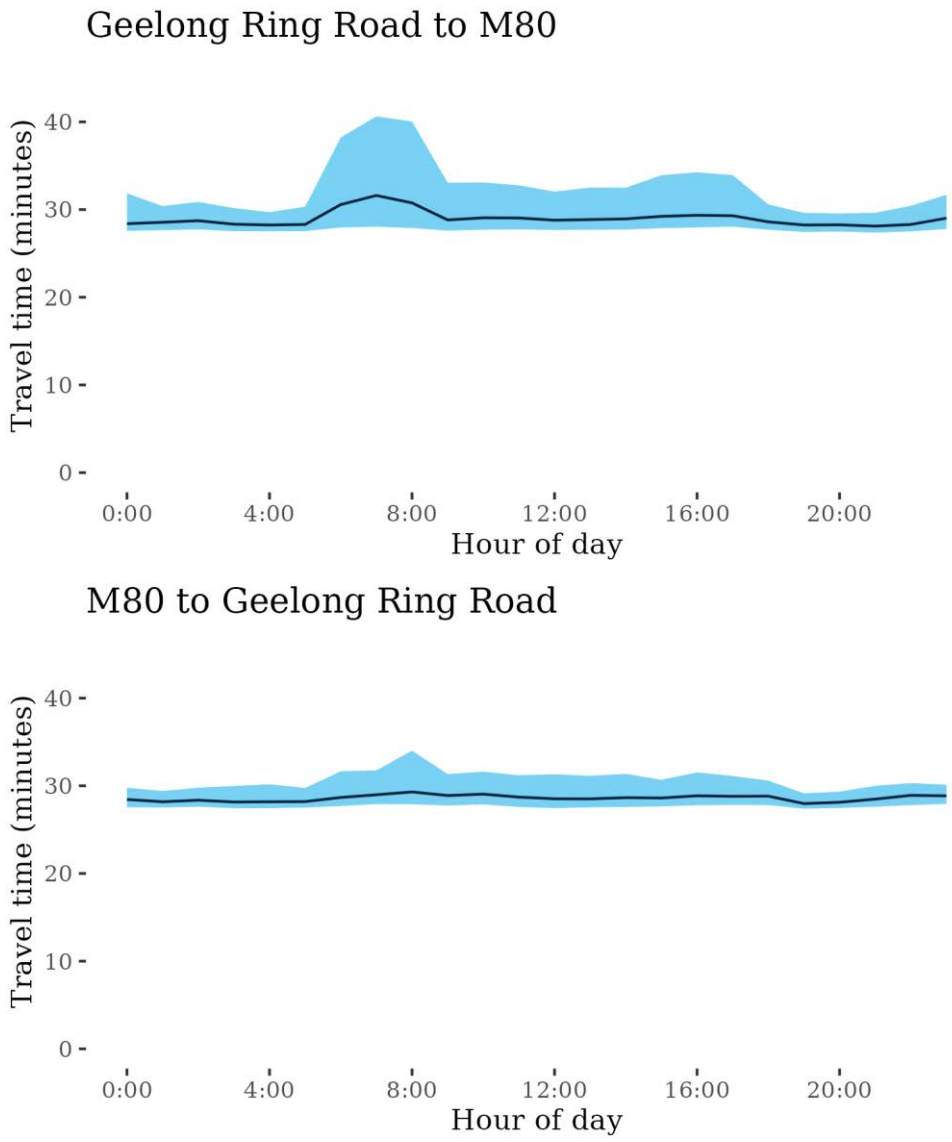
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Geelong Ring Road to M80	0:28:07	0:31:37	1.031	0:02:05	0:12:36	2.351	45.38
M80 to Geelong Ring Road	0:27:58	0:29:18	1.022	0:01:45	0:06:07	1.75	45.11

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from the Geelong Ring Road to the M80 were at 9pm with a median travel time of 28 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 7am with a median of 32 minutes and an interquartile range of 12.5 minutes.

The best median travel times and lowest uncertainty for journeys from the M80 to the Geelong Ring Road were at 7pm with a median travel time of 28 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 29 minutes and an interquartile range of 6 minutes.

Figure A.82 Princes Freeway route median and interquartile range travel times



Source: BITRE estimates.

Western Freeway – Bacchus Marsh to Derrimut / Derrimut to Bacchus Marsh

This route follows the Western Freeway (M8) linking Bacchus Marsh west of Melbourne and Derrimut where it meets the M80 (Western Ring Road).

Figure A.83 Western Freeway route map

Source: BITRE estimates.

Table A.42 Western Freeway route travel times and congestion measures, 2021

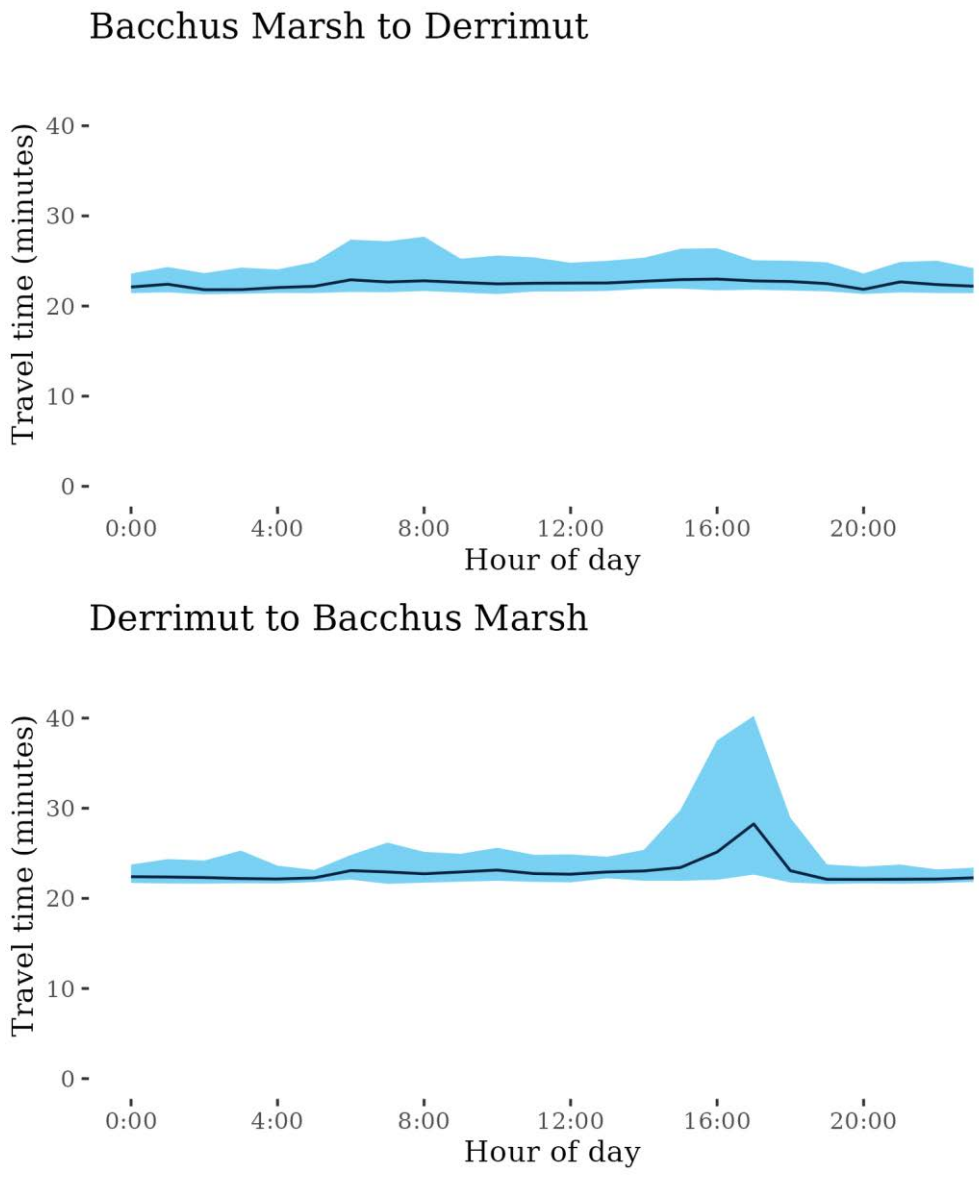
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Bacchus Marsh to Derrimut	0:21:49	0:22:59	1.03	0:02:10	0:06:01	1.66	35.67
Derrimut to Bacchus Marsh	0:22:06	0:28:15	1.038	0:01:20	0:17:37	3.15	35.62

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Bacchus Marsh to Derrimut were at 2am with a median travel time of 22 minutes and an interquartile range of 2 minutes. The longest median travel times were 23 minutes at 4pm and the greatest uncertainty were at 8am with an interquartile range of 6 minutes

The best median travel times and lowest uncertainty for journeys from Derrimut to Bacchus Marsh were at 8pm with a median travel time of 22 minutes and an interquartile range of 80 seconds. The longest median travel times and greatest uncertainty were at 5pm with a median of 28 minutes and an interquartile range of 18 minutes.

Figure A.84 Western Freeway route median and interquartile range travel times



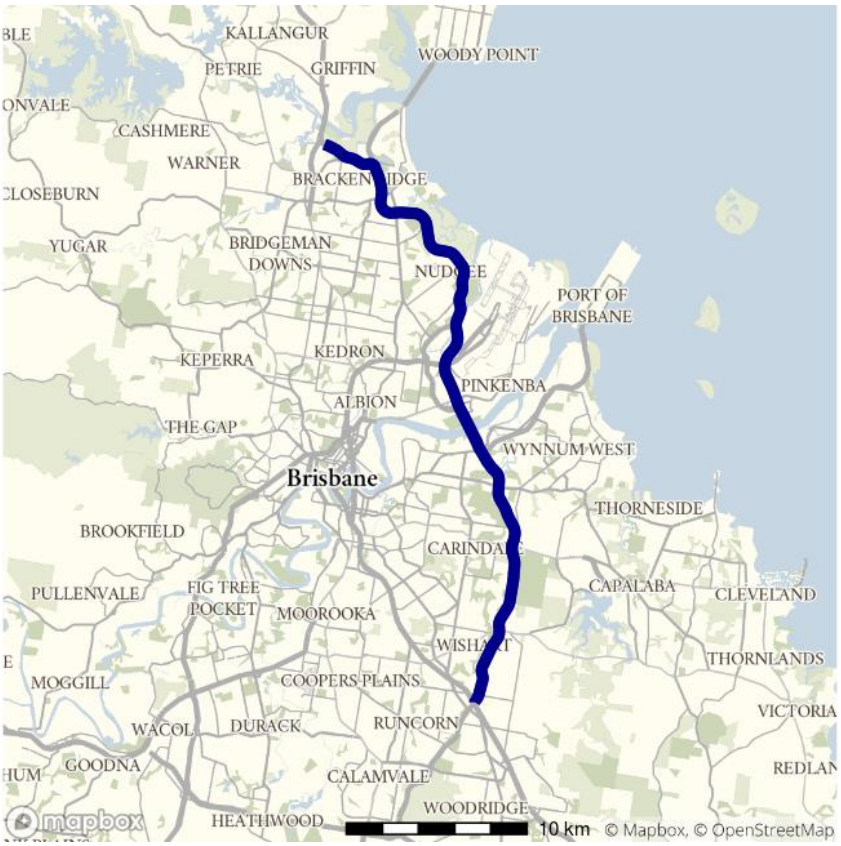
Source: BITRE estimates.

Brisbane routes

M1 – Bruce Hwy to Pacific Motorway / Pacific Motorway to Bruce Hwy

This route extends from the Gympie Arterial Road (M3) at Bald Hills in the north of Brisbane to Eight Mile Plains in the south of Brisbane, crossing the Brisbane River near Eagle Farm. It encompasses most of the Gateway Motorway. It is a major intercity and interregional route through its connections with the Pacific Motorway and Bruce Highway. This route also connects to the M2, M3, M4, M6 and M7 (via Southern Cross Way) motorways also covered in this report.

Figure A.85 M1 route map



Source: BITRE estimates.

Table A.43 M1 route travel times and congestion measures, 2021

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Bruce Hwy to Pacific Motorway	0:23:51	0:28:50	1.039	0:01:51	0:11:49	1.792	37.74
Pacific Motorway to Bruce Hwy	0:23:34	0:39:51	1.108	0:01:18	0:28:11	4.63	37.52

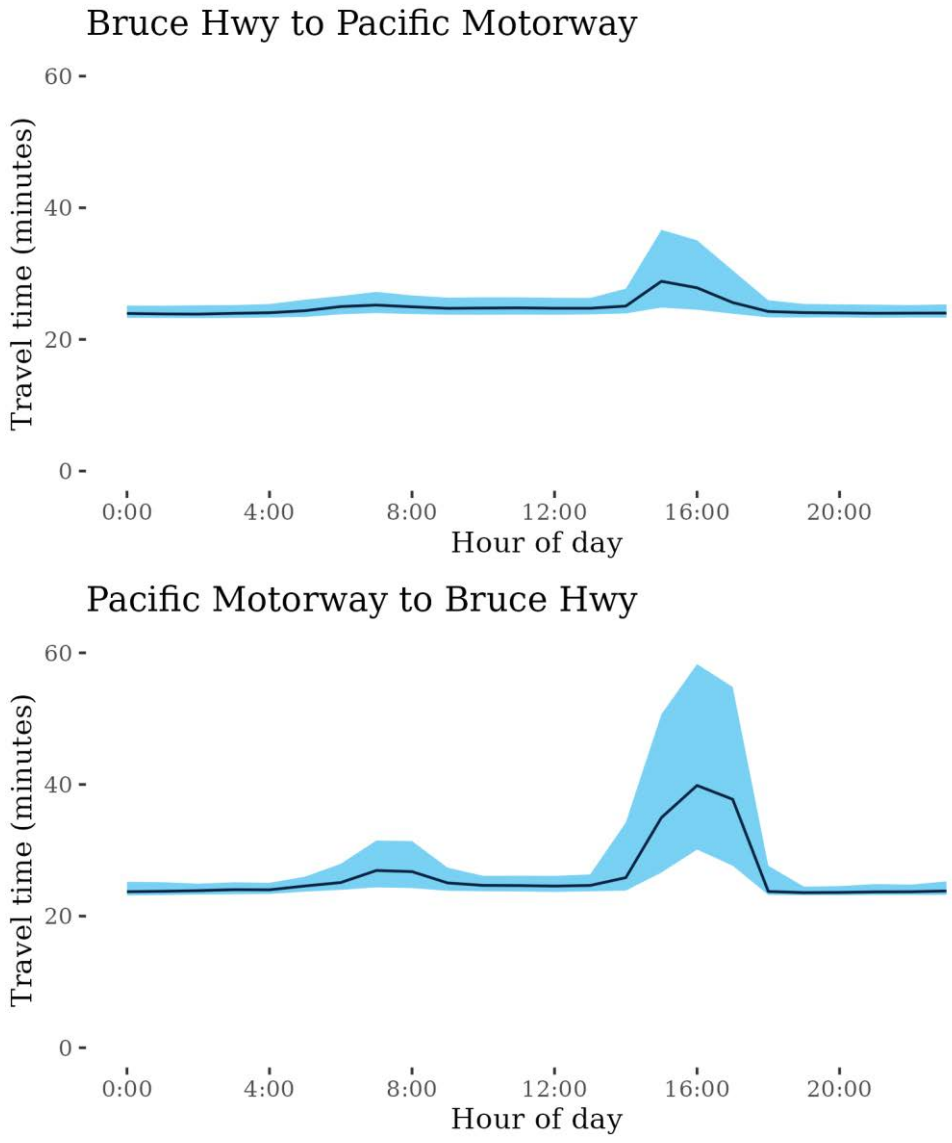
Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from the Bruce Highway to the Pacific Motorway were at 2am and 1am with a median travel time of 24 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 3pm with a median of 29 minutes and an interquartile range of 12 minutes.

The best median travel times for journeys from the Pacific Motorway to the Bruce Highway were 24 minutes at 7pm and the lowest uncertainty was at 7pm with an interquartile range of 78 seconds The longest median travel times and greatest uncertainty were at 4pm with a median of 40 minutes and an interquartile range of 28 minutes.

The afternoon peaks in both directions can be attributed to commuter traffic leaving the inner areas of Brisbane.

Figure A.86 M1 route median and interquartile range travel times



Source: BITRE estimates.

M2 (North) – Logan Motorway to Pacific Motorway / Pacific Motorway to Logan Motorway

This short (8 kilometre) route consists of the Gateway Motorway section of the M2 linking the M1 and the Logan Motorway at Drewvale in Southern Brisbane.

Figure A.87 M2 (North) route map

Source: BITRE estimates.

Table A.44 M2 (North) route travel times and congestion measures, 2021

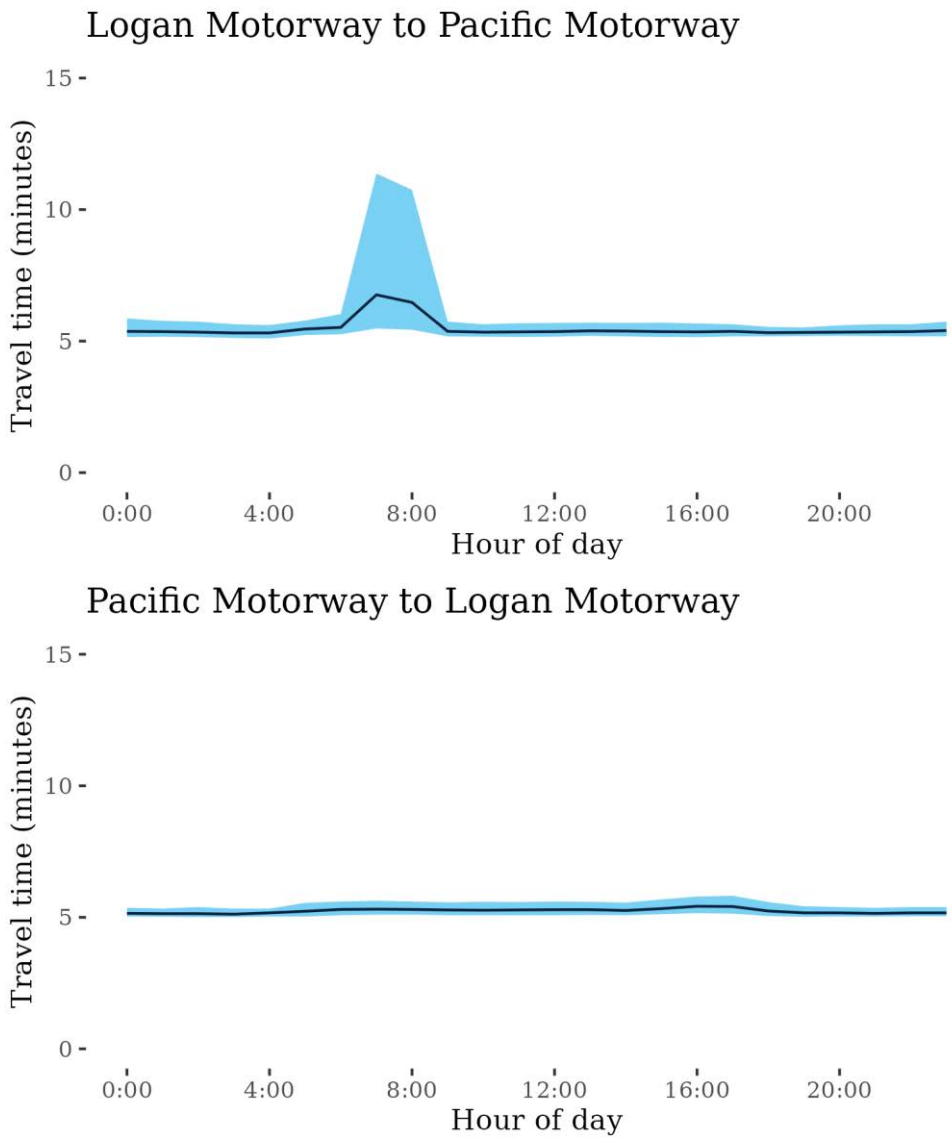
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Logan Motorway to Pacific Motorway	0:05:18	0:06:46	1.031	0:00:20	0:05:53	2.849	8.40
Pacific Motorway to Logan Motorway	0:05:07	0:05:25	1.023	0:00:18	0:00:41	1.497	8.30

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the Logan Motorway to the Pacific Motorway were at 4am with a median travel time of 5 minutes and an interquartile range of 20 seconds. The longest median travel times and greatest uncertainty were at 7am with a median of 7 minutes and an interquartile range of 6 minutes.

The best travel times and lowest uncertainty travelling from the Pacific Motorway to the Logan Motorway were at 3am and 4am with a median travel time of 5 minutes and an interquartile range of 18 seconds. The longest median travel times were 5 minutes at 4pm and the greatest uncertainty were at 5pm with an interquartile range of 40 seconds.

Figure A.88 M2 (North) route median and interquartile range travel times



Source: BITRE estimates.

M2 (West) – Gateway Motorway to Ipswich Motorway / Ipswich Motorway to Gateway

This route uses the Logan Motorway section of the M2 between its confluence with the Gateway Motorway (M2 North) and junction with the M7 (Ipswich Motorway) at Gailes. It crosses the M5 (Centenary Highway) at Carole Park.

Figure A.89 M2 (West) route map

Source: BITRE estimates.

Table A.45 M2 (West) route travel times and congestion measures, 2021

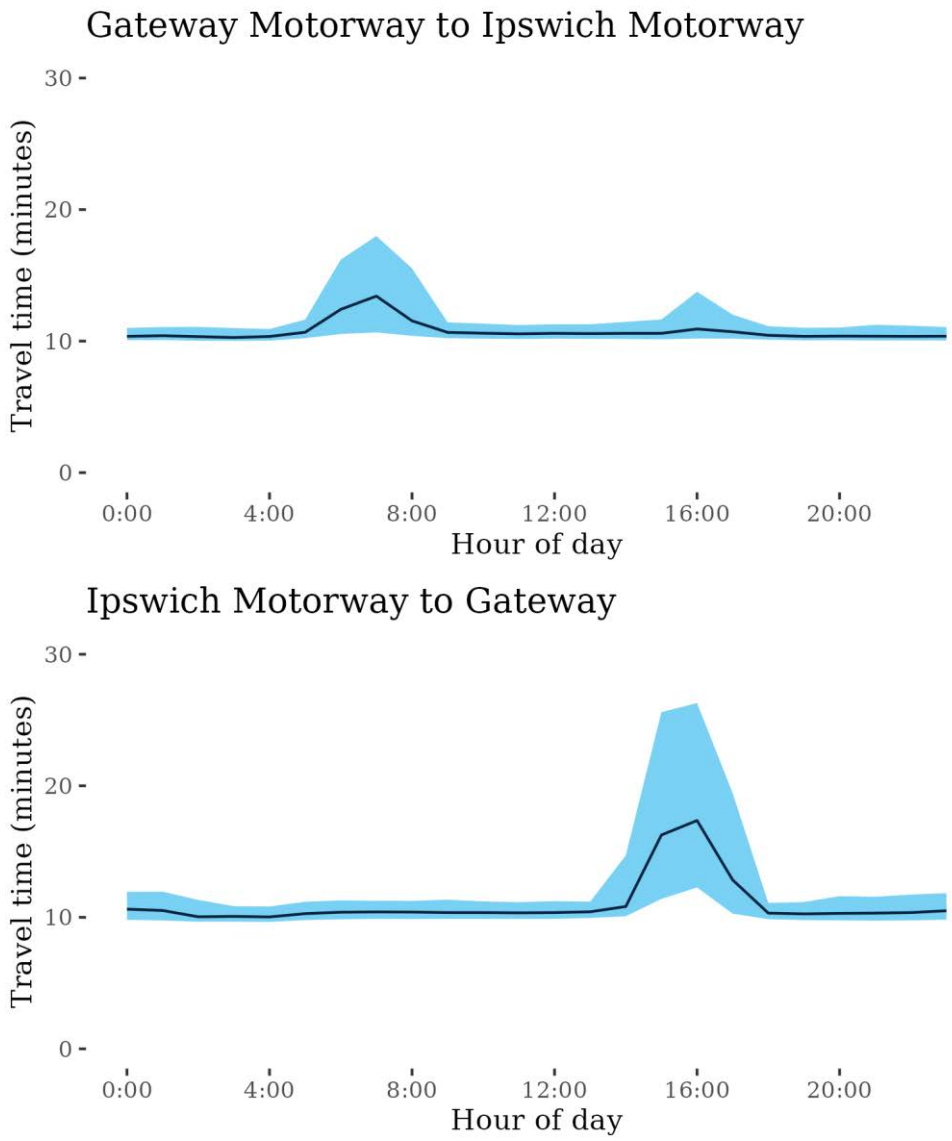
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Gateway Motorway to Ipswich Motorway	0:10:16	0:13:25	1.046	0:00:52	0:07:20	2.12	16.11
Ipswich Motorway to Gateway Motorway	0:10:02	0:17:21	1.096	0:01:10	0:14:12	2.585	15.84

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the Gateway Motorway to the Ipswich Motorway were at 3am with a median travel time of 10 minutes and an interquartile range of 52 seconds. The longest median travel times and greatest uncertainty were at 7am with a median of 13.5 minutes and an interquartile range of 7 minutes.

The best median travel times for journeys from the Ipswich Motorway to the Gateway were 10 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 70 seconds. The longest median travel times were at 4pm with a median of 17 minutes and the greatest uncertainty at 3pm with an interquartile range of 14 minutes.

Figure A.90 M2 (West) route median and interquartile range travel times



Source: BITRE estimates.

M3-A3 – Airport Link to M1 / M1 to Airport Link

This route follows the M3 and the surface road A3 with one end merging with the M1 at Bald Hills and the other meeting Airport Link (M7) next to Gordon Park. It is known as Gympie Road when labelled as the A3 and the Gympie Arterial Road when labelled as the M3.

Figure A.91 M3-A3 route map

Source: BITRE estimates.

Table A.46 M3-A3 route travel times and congestion measures, 2021

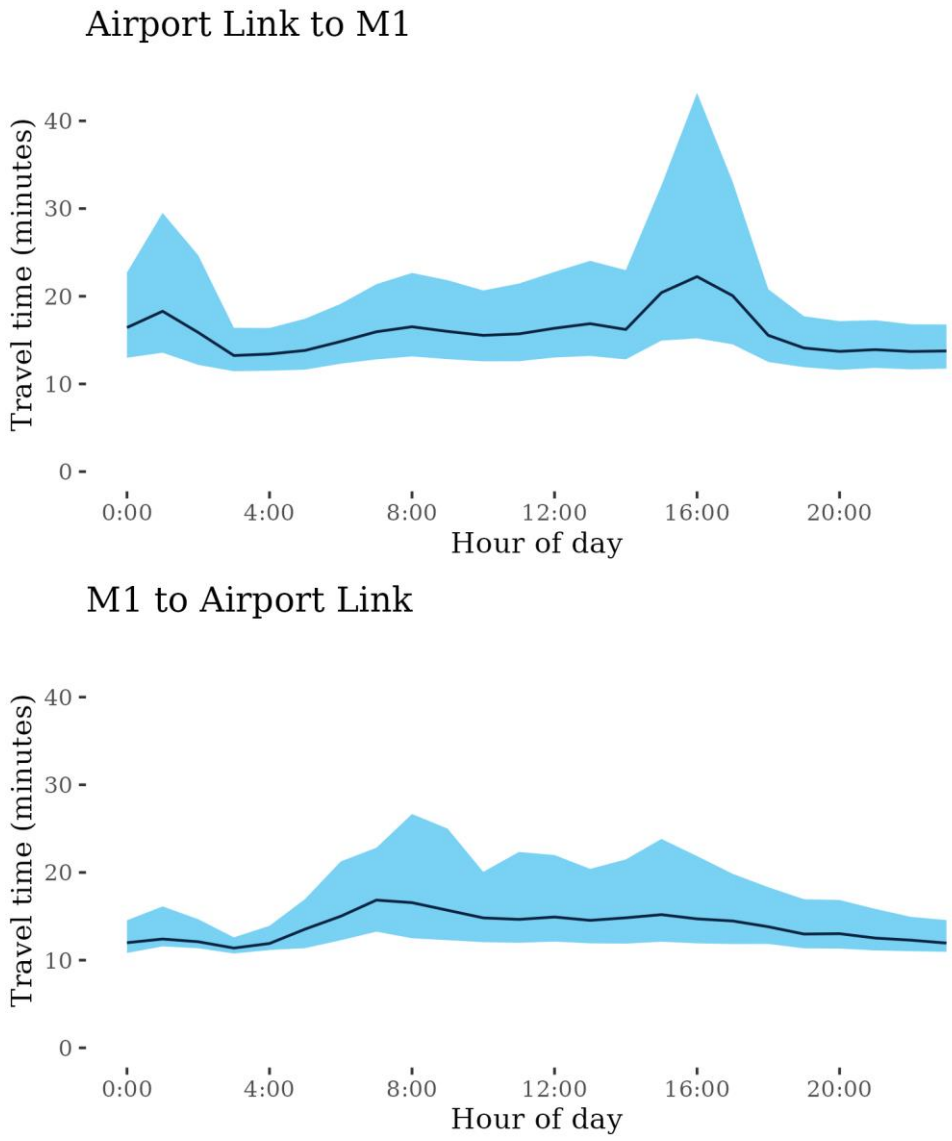
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Airport Link to M1	0:13:14	0:22:14	1.204	0:04:52	0:28:00	2.009	12.98
M1 to Airport Link	0:11:23	0:16:51	1.216	0:01:50	0:14:10	3.926	12.97

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the Airport Link to the M1 were at 3am with a median travel time of 13 minutes and an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 22 minutes and an interquartile range of 28 minutes.

The best median travel times for journeys from the M1 to the Airport Link were 11 minutes at 3am and the lowest uncertainty was at 3am with an interquartile range of 2 minutes. The longest median travel times were 17 minutes at 7am and the greatest uncertainty were at 8am with an interquartile range of 14 minutes

Figure A.92 M3-A3 route median and interquartile range travel times

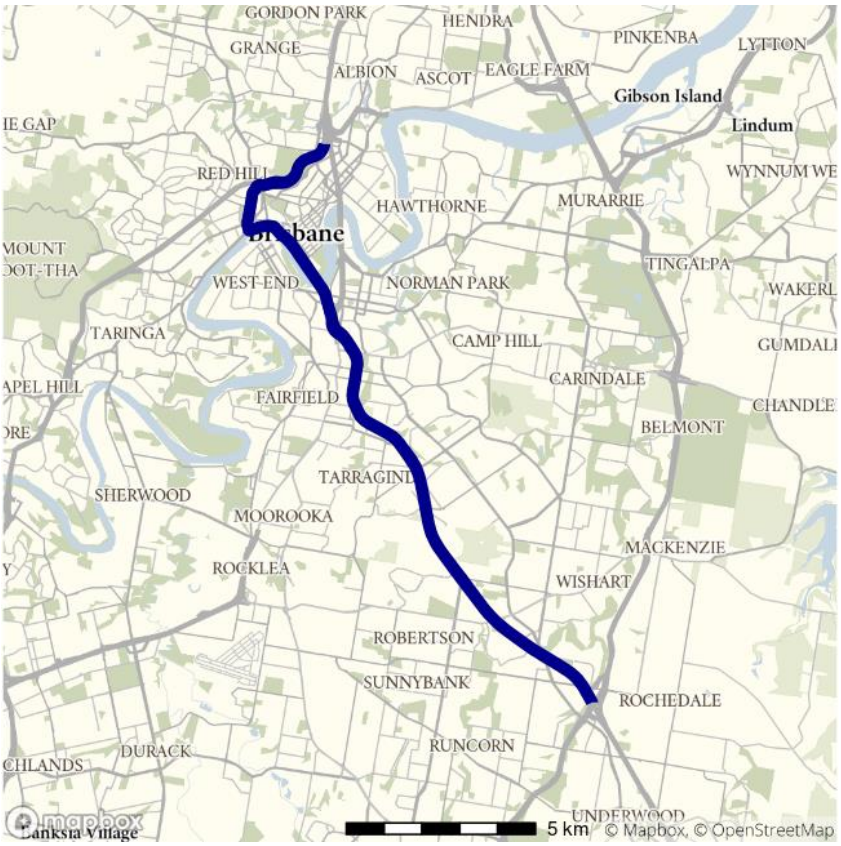


Source: BITRE estimates.

M3 (South) – Inner City Bypass to Pacific Motorway / Pacific Motorway to Inner City Bypass

This route follows the M3 connecting the Inner City Bypass at Bowen Hills and the M1 (Pacific Motorway) at Springwood in Brisbane's southeast. It passes around the western edge of the CBD and crosses the Brisbane River at Woolloongabba and follows the Pacific Motorway.

Figure A.93 M3 (South) route map



Source: BITRE estimates.

Table A.47 M3 (South) route travel times and congestion measures, 2021

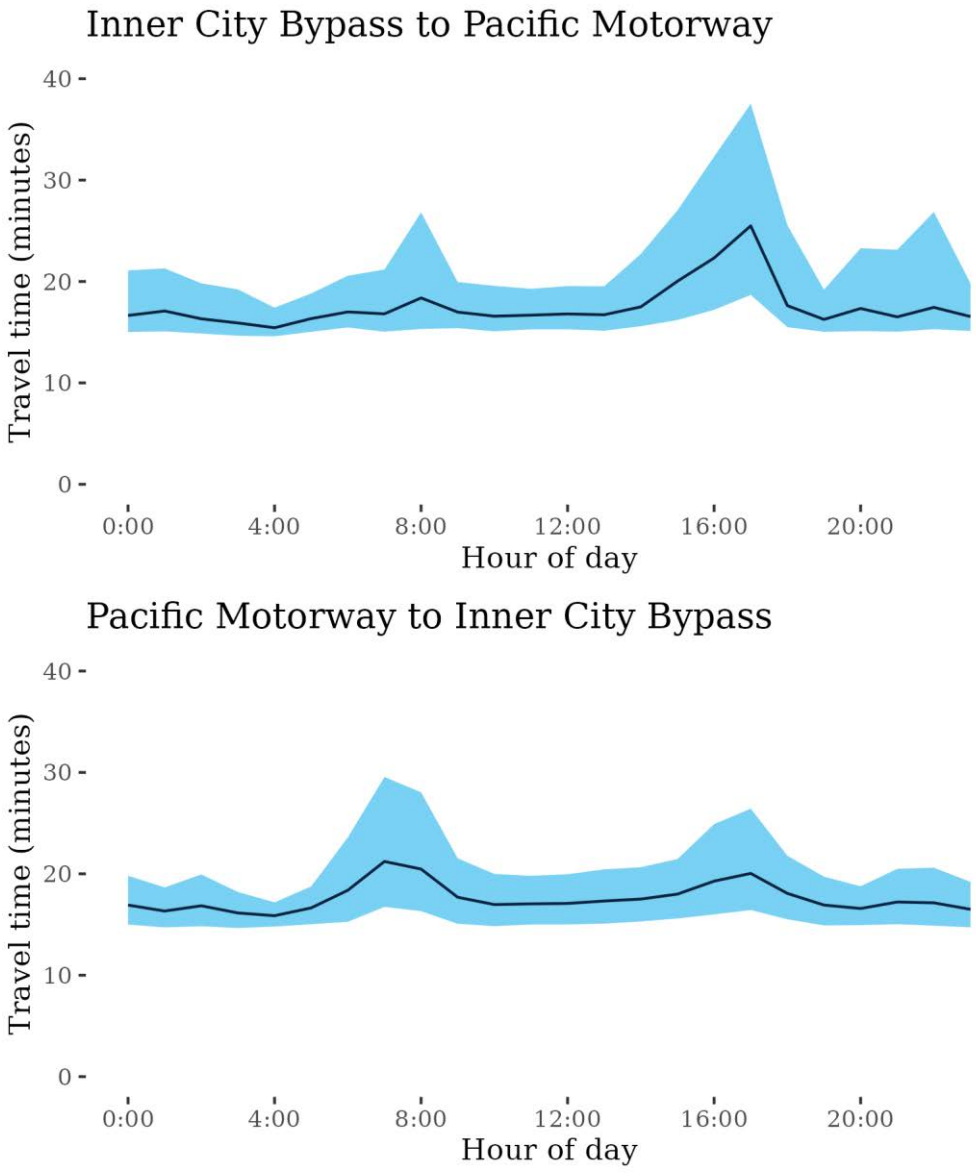
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Inner City Bypass to Pacific Motorway	0:15:26	0:25:29	1.135	0:02:50	0:18:51	2.526	20.07
Pacific Motorway to Inner City Bypass	0:15:52	0:21:13	1.109	0:02:23	0:12:49	2.506	20.11

Source: BITRE estimates.

The best median travel times for journeys from the Inner City Bypass to the Pacific Motorway were 15 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 25 minutes and an interquartile range of 19 minutes.

The best median travel times and least uncertainty for journeys from the Pacific Motorway to the Inner City Bypass were at 4am with a median travel time of 16 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 7am with a median of 21 minutes and an interquartile range of 13 minutes.

Figure A.94 M3 (South) route median and interquartile range travel times



Source: BITRE estimates.

M4 – Gateway Motorway to Port of Brisbane / Port of Brisbane to Gateway Motorway

This route links the Gateway Motorway (M1) at Murarrie and the Port of Brisbane via Port Drive and Port of Brisbane Motorway. It is an important route for freight to and from the Port but is not a major commuter route.

Figure A.95 M4 route map

Source: BITRE estimates.

Table A.48 M4 route travel times and congestion measures, 2021

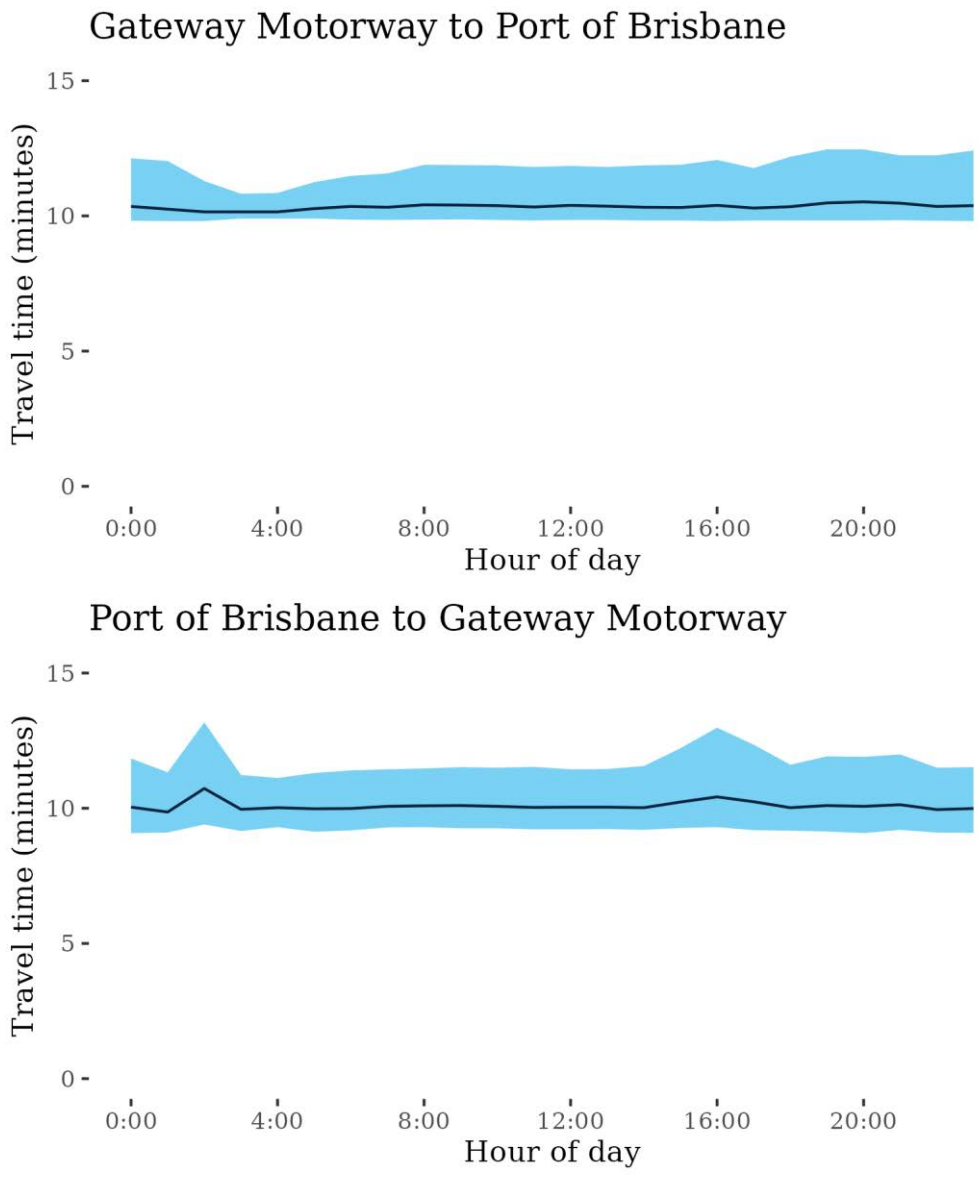
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Gateway Motorway to Port of Brisbane	0:10:09	0:10:31	1.019	0:00:55	0:02:38	2.167	11.68
Port of Brisbane to Gateway Motorway	0:09:52	0:10:44	1.023	0:01:49	0:03:47	1.384	11.70

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from the Gateway Motorway to Port of Brisbane were at 4am and 3am with a median travel time of 10 minutes and an interquartile range of just under 1 minute. The longest median travel times were 11 minutes at 8pm and the greatest uncertainty were at 7pm with an interquartile range of just under 3 minutes

The best travel times and lowest uncertainty travelling from Port of Brisbane to the Gateway Motorway were at 1am and 4am with a median travel time of 10 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 2am with a median of 11 minutes and an interquartile range of 4 minutes.

Figure A.96 M4 route median and interquartile range travel times

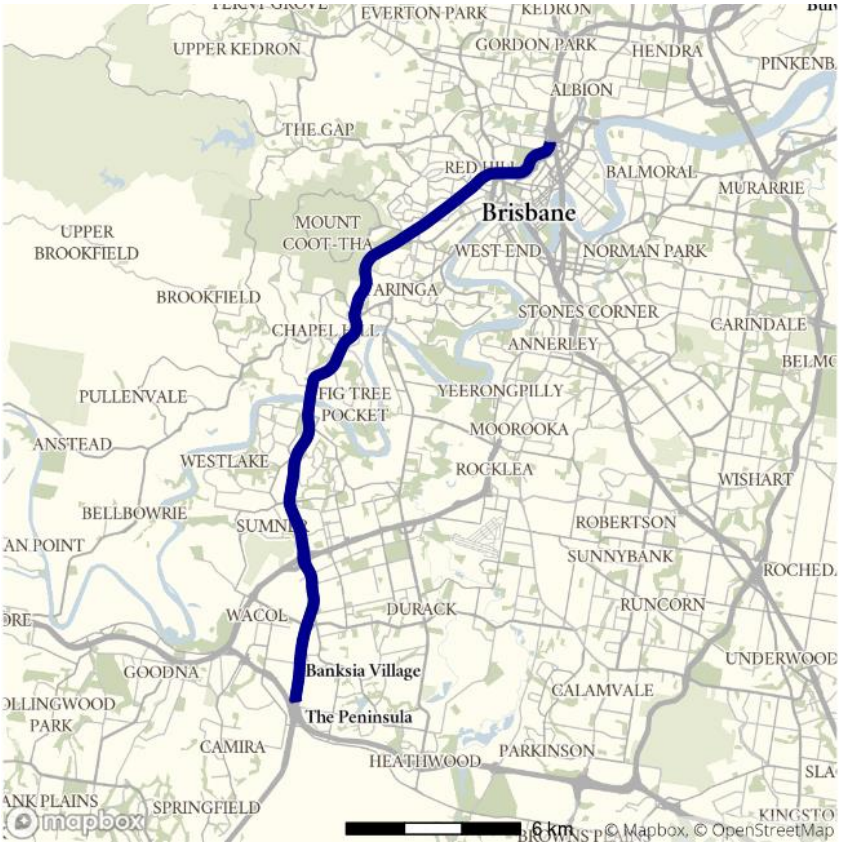


Source: BITRE estimates.

M5 – Bowen Hills to Logan Motorway / Logan Motorway to Bowen Hills

This route follows the M5 from the M3 and M7 motorways at Bowen Hills and meets the Logan Motorway (M2) at Forest Lake. It traverses the southwest fringe of Brisbane and utilises the Inner City Bypass, Legacy Tunnel, Western Freeway and Centenary Highway.

Figure A.97 M5 route map



Source: BITRE estimates.

Table A.49 M5 route travel times and congestion measures, 2021

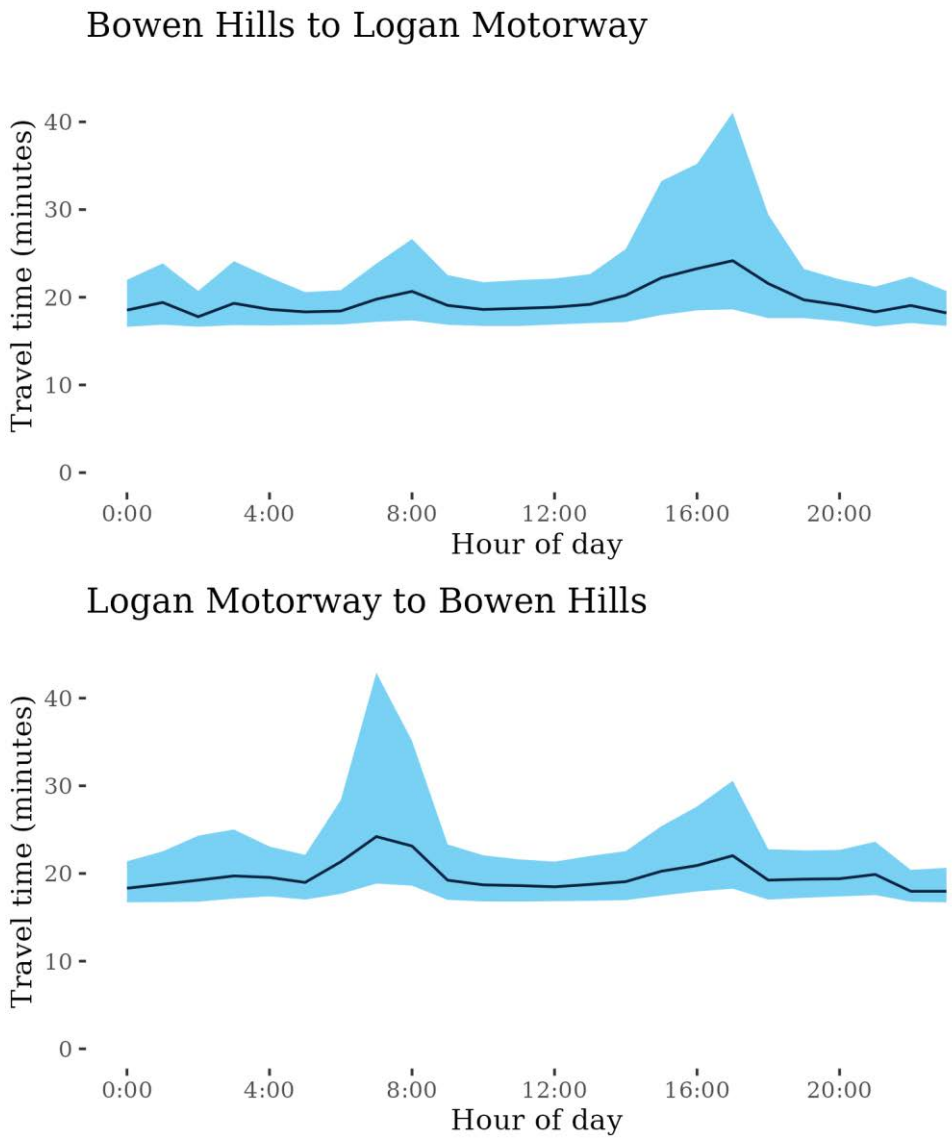
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Bowen Hills to Logan Motorway	0:17:47	0:24:10	1.104	0:03:44	0:22:26	1.988	24.09
Logan Motorway to Bowen Hills	0:17:58	0:24:12	1.097	0:03:38	0:24:03	2.063	24.17

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Bowen Hills to the Logan Motorway were at 2am with a median travel time of 18 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 24 minutes and an interquartile range of 22.5 minutes.

The best median travel times and least uncertainty for journeys from the Logan Motorway to Bowen Hills were at 10pm with a median travel time of 18 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 7am with a median of 24 minutes and an interquartile range also of 24 minutes.

Figure A.98 M5 route median and interquartile range travel times



Source: BITRE estimates.

M6 – Gateway Motorway to Pacific Motorway / Pacific Motorway to Gateway Motorway

The M6 route merges with the M2 at Drewvale and meets the Pacific Motorway (M1) at Loganholme using the Logan Motorway

Figure A.99 M6 route map

Source: BITRE estimates.

Table A.50 M6 route travel times and congestion measures, 2021

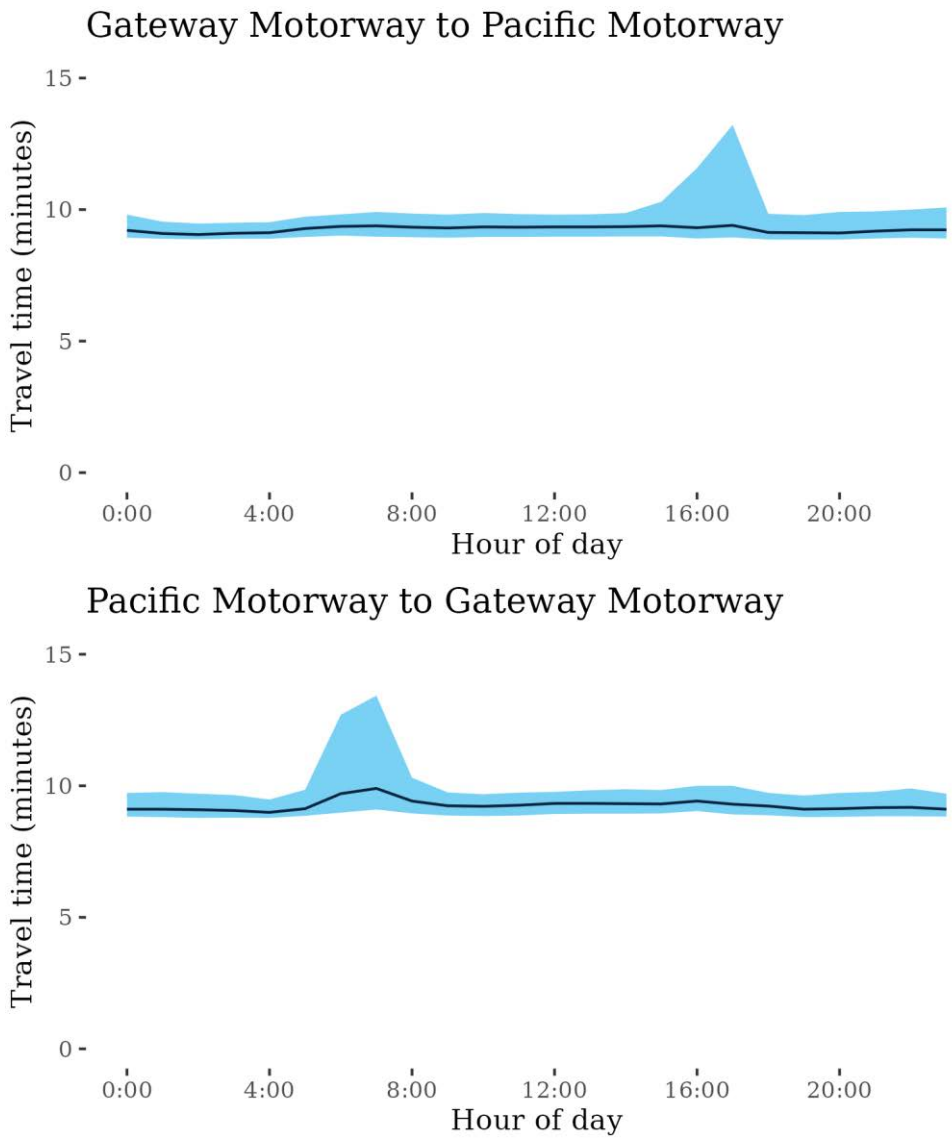
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Gateway Motorway to Pacific Motorway	0:09:03	0:09:24	1.022	0:00:36	0:04:17	1.834	14.60
Pacific Motorway to Gateway Motorway	0:08:59	0:09:54	1.03	0:00:42	0:04:20	1.686	14.54

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from the Gateway Motorway to the Pacific Motorway were at 2am and 3am with a median travel time of 9 minutes and an interquartile range of 36 seconds. The longest median travel times and greatest uncertainty were at 5pm with a median of 9 minutes and an interquartile range of 4 minutes.

The best median travel times for journeys from the Pacific Motorway to the Gateway Motorway were 9 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 42 seconds The longest median travel times and greatest uncertainty were at 7am with a median of 10 minutes and an interquartile range of 4 minutes.

Figure A.100 M6 route median and interquartile range travel times



Source: BITRE estimates.

M7-A7 – Logan Motorway to Southern Cross Way / Southern Cross Way to Logan Motorway

This route follows the A7 and M7 through central Brisbane and links the Logan Motorway (M2) at Gailes in the south and the Southern Cross Way branch of the Gateway Motorway near Brisbane Airport. It uses Ipswich Motorway (M7), Ipswich Road (A7) and Airport Link M7 past the CBD and under the Brisbane River as the Clem Jones Tunnel along its way.

Figure A.101 M7-A7 route map

Source: BITRE estimates.

Table A.51 M7-A7 route travel times and congestion measures, 2021

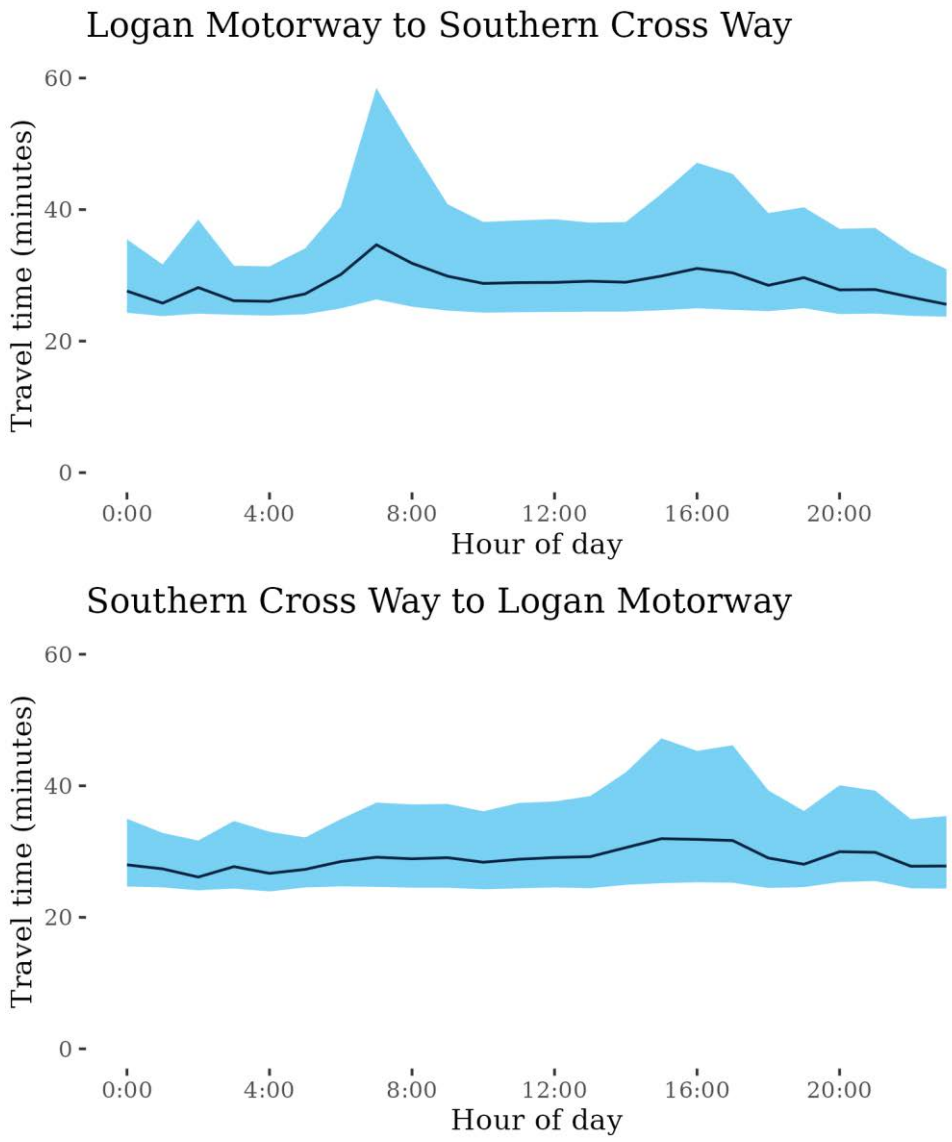
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Logan Motorway to Southern Cross Way	0:25:35	0:34:39	1.122	0:07:14	0:32:11	2.012	30.33
Southern Cross Way to Logan Motorway	0:26:07	0:31:58	1.105	0:07:34	0:22:02	1.707	30.46

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from the Logan Motorway to Southern Cross Way were at 11pm with a median travel time of 26 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at 7am with a median of 35 minutes and an interquartile range of 32 minutes.

The best median travel times and least uncertainty for journeys from Southern Cross Way to the Logan Motorway were at 2am with a median travel time of 26 minutes and an interquartile range of 7.5 minutes. The longest median travel times and greatest uncertainty were at 3pm with a median of 32 minutes and an interquartile range of 22 minutes.

Figure A.102 M7-A7 route median and interquartile range travel times



Source: BITRE estimates.

Route 2 – A7 to Gateway / Gateway to A7

This short (11 kilometre) surface route links the M7/A7 at Rocklea with the Gateway Motorway (M1) at Mackenzie. It passes Robertson and under the Pacific Motorway (M3) along the way.

Figure A.103 Route 2 route map

Source: BITRE estimates.

Table A.52 Route 2 route travel times and congestion measures, 2021

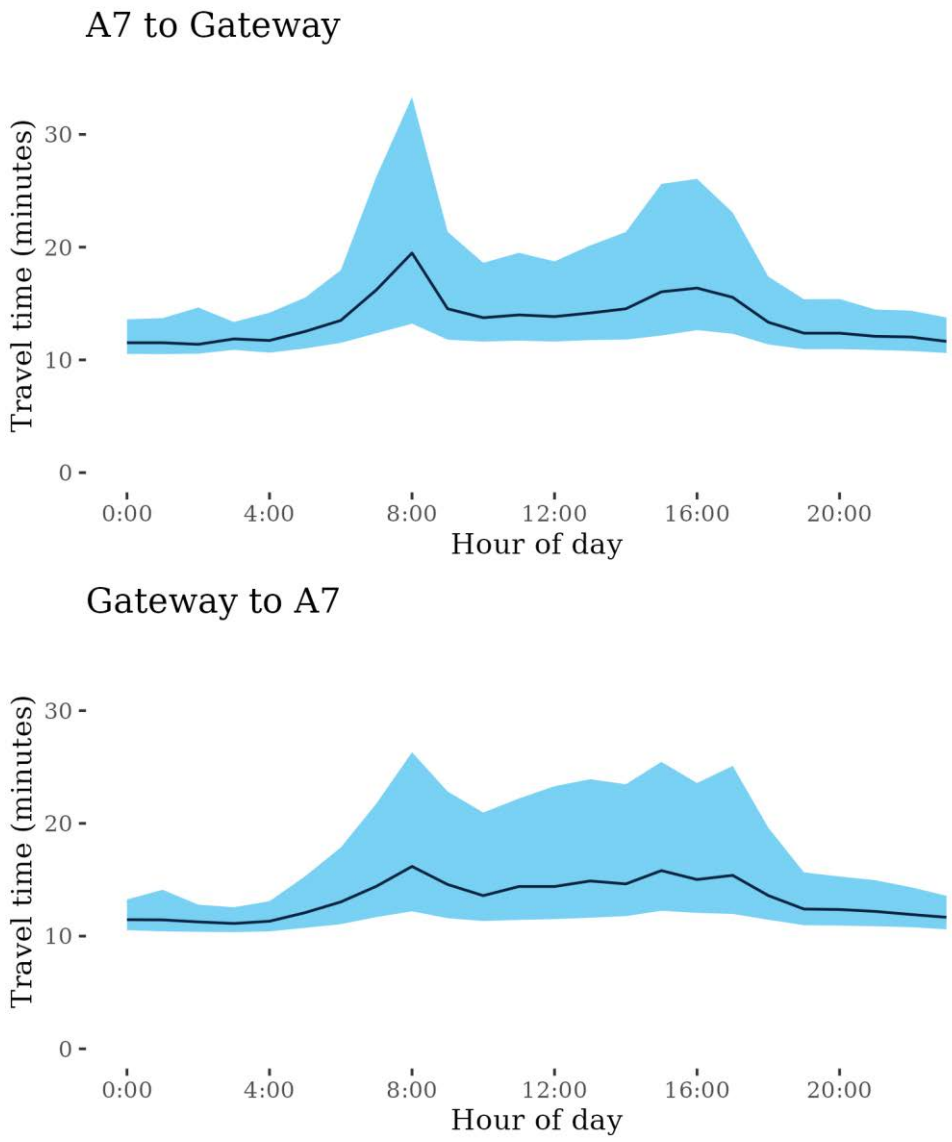
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
A7 to Gateway	0:11:23	0:19:29	1.195	0:02:29	0:20:06	2.922	11.06
Gateway to A7	0:11:07	0:16:11	1.196	0:02:12	0:14:07	3.442	11.06

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from A7 to the Gateway Motorway were at 2am with a median travel time of 11 minutes and an interquartile range of 2.5 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 19.5 minutes and an interquartile range of 20 minutes.

The best median travel times and least uncertainty for journeys from the Gateway Motorway to A7 were at 3am with a median travel time of 11 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 16 minutes and an interquartile range of 14 minutes.

Figure A.104 Route 2 route median and interquartile range travel times



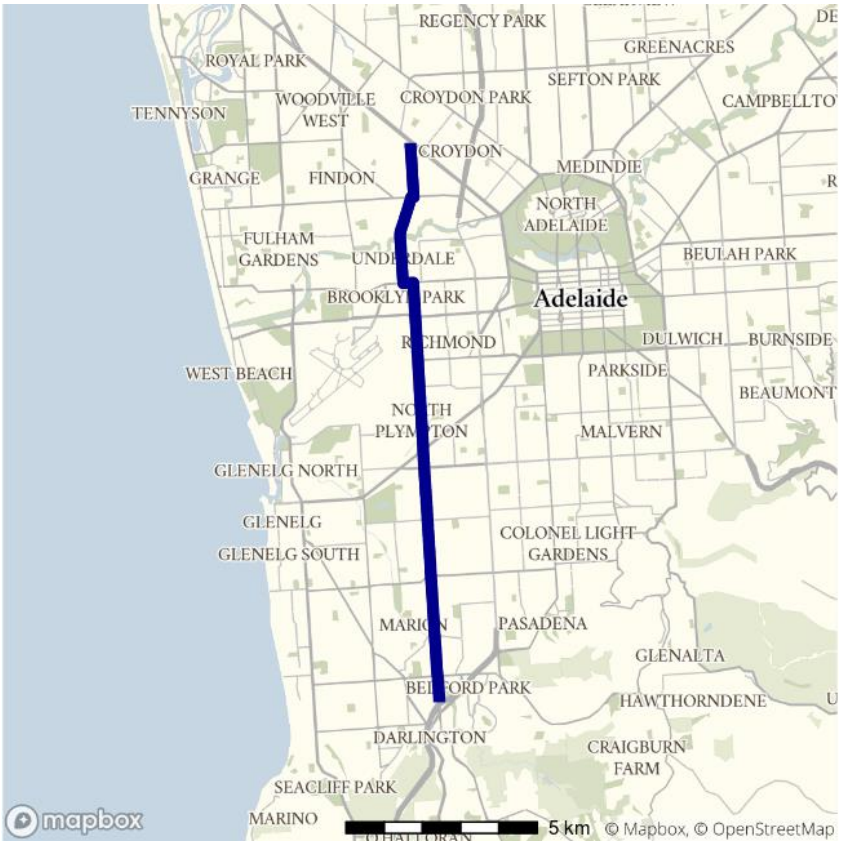
Source: BITRE estimates.

Adelaide routes

A14 – Port Road to Southern Expressway / Southern Expressway to Port Road

This surface route traverses Adelaide's eastern suburbs and links Port Road (A7) at West Croydon in the north with the A13 at Darlington in the south. It passes Richmond near the Adelaide Airport and Plympton along the way. The route comprises several different roads including Holbrooks Road, Marion Road and Henley Beach Road.

Figure A.105 A14 route map



Source: BITRE estimates.

Table A.53 A14 route travel times and congestion measures, 2021

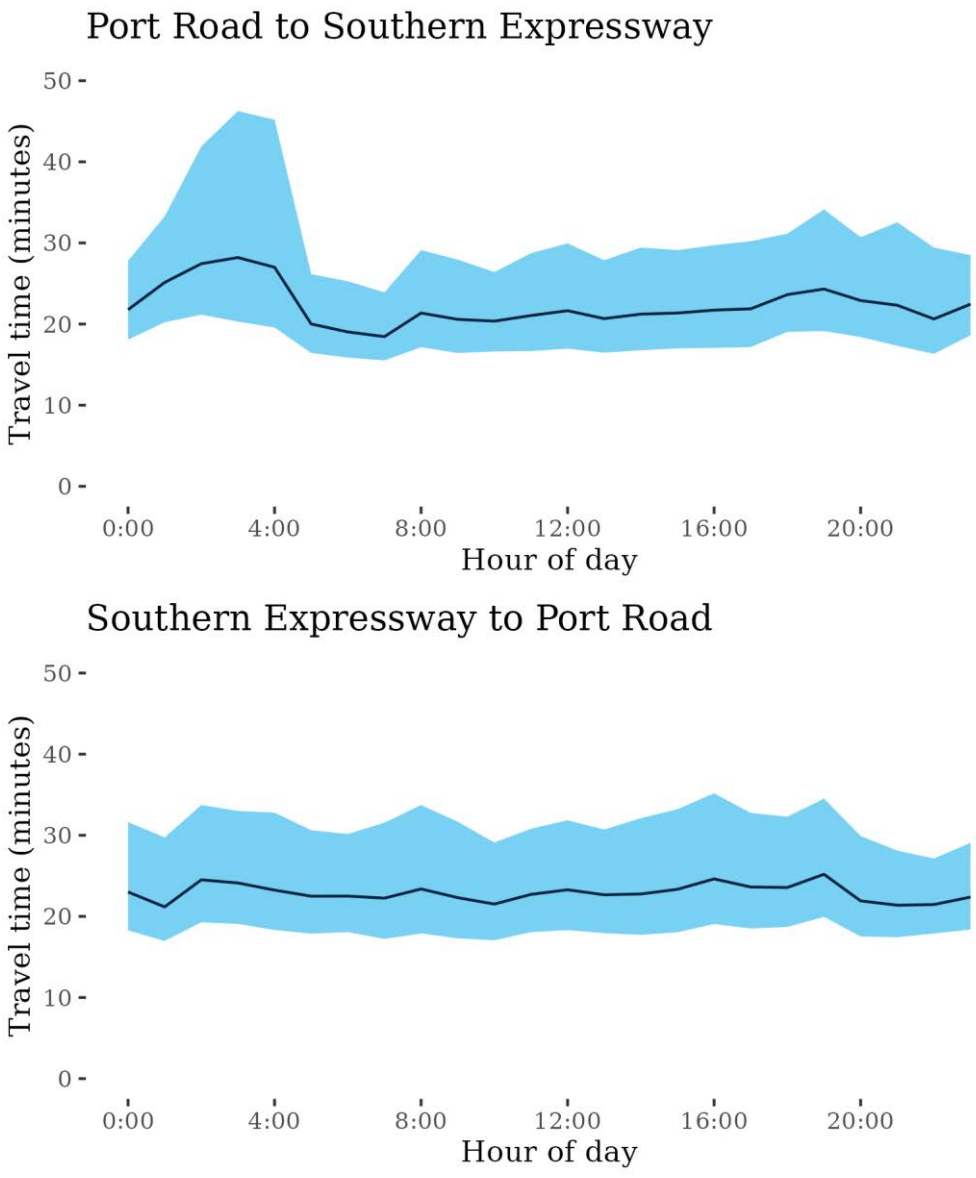
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Port Road to Southern Expressway	0:18:27	0:28:12	1.209	0:08:23	0:25:57	1.592	15.00
Southern Expressway to Port Road	0:21:10	0:25:12	1.081	0:09:15	0:16:07	1.444	15.04

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Port Road to Southern Expressway were at 7am with a median travel time of 18 minutes and an interquartile range of 8 minutes. The longest median travel times and greatest uncertainty were at 3am with a median of 28 minutes and an interquartile range of 26 minutes.

The best median travel times and least uncertainty for journeys from Southern Expressway to Port Road were at 1am with a median travel time of 21 minutes and an interquartile range of 9 minutes. The longest median travel times were at 7pm with a median of 25 minutes and the greatest uncertainty at 4pm with an interquartile range of 16 minutes.

Figure A.106 A14 route median and interquartile range travel times

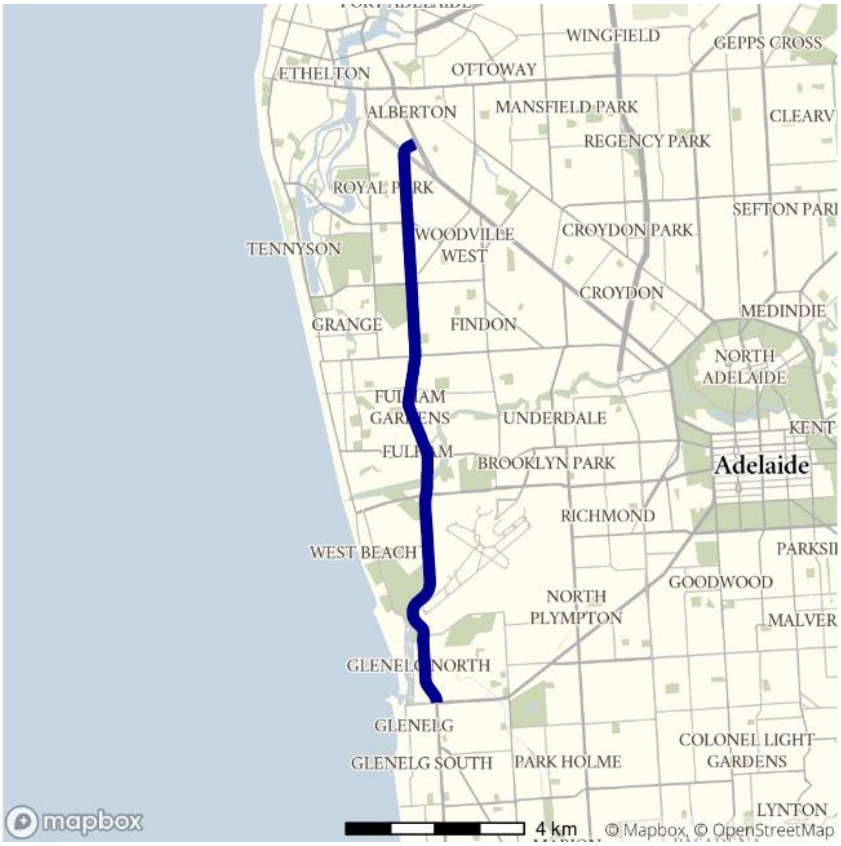


Source: BITRE estimates.

A15 – ANZAC Hwy to Port Road / Port Road to ANZAC Hwy

This route traverses the western suburbs of Adelaide between Glenelg and Queenstown-Alberton. Its northern sections run parallel to the A14 route (presented above), but passes west of Adelaide Airport. This route is also known as Tapleys Hill Road.

Figure A.107 A15 route map



Source: BITRE estimates.

Table A.54 A15 route travel times and congestion measures, 2021

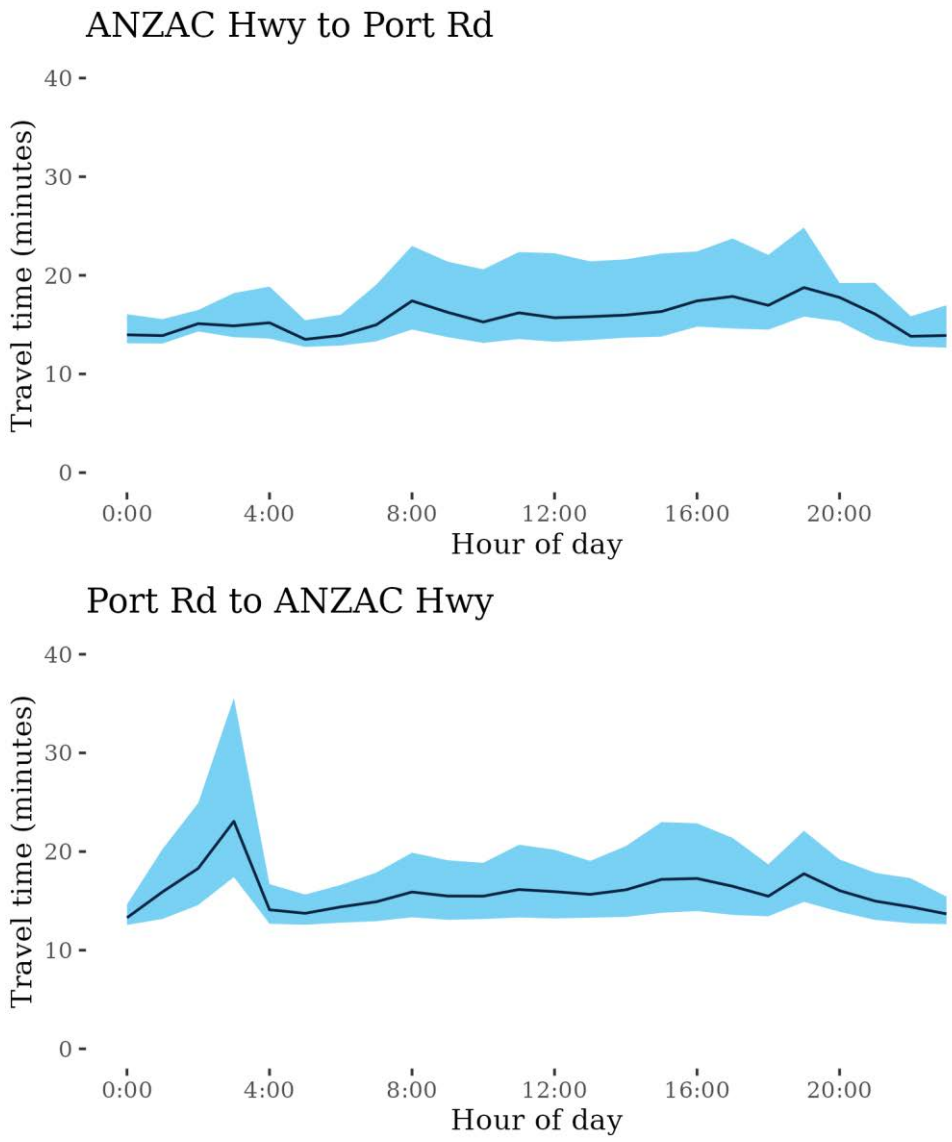
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
ANZAC Hwy to Port Road	0:13:30	0:18:46	1.163	0:02:11	0:09:08	2.771	13.06
Port Road to ANZAC Hwy	0:13:18	0:23:04	1.196	0:02:05	0:18:10	3.107	13.03

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from ANZAC Highway to Port Road were at 5am and 2am with a median travel time of 13.5 minutes and an interquartile range of 2 minutes. The longest median travel times were 19 minutes at 7pm and the greatest uncertainty were at 5pm with an interquartile range of 9 minutes

The best median travel times for journeys from Port Road to ANZAC Highway were 13 minutes at midnight and the lowest uncertainty was at midnight with an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 3am with a median of 23 minutes and an interquartile range of 18 minutes.

Figure A.108 A15 route median and interquartile range travel times



Source: BITRE estimates.

A16 – Hampstead Road to Outer Harbor / Outer Harbor to Hampstead Road

This route connects Port of Adelaide, at Outer Harbor, to north Adelaide at Hampstead Road (A17). It uses Grand Junction Road, Causeway Road and Semaphore Road and Victoria Road through the suburbs of Ethelton and Birkenhead.

Figure A.109 A16 route map

Source: BITRE estimates.

Table A.55 A16 route travel times and congestion measures, 2021

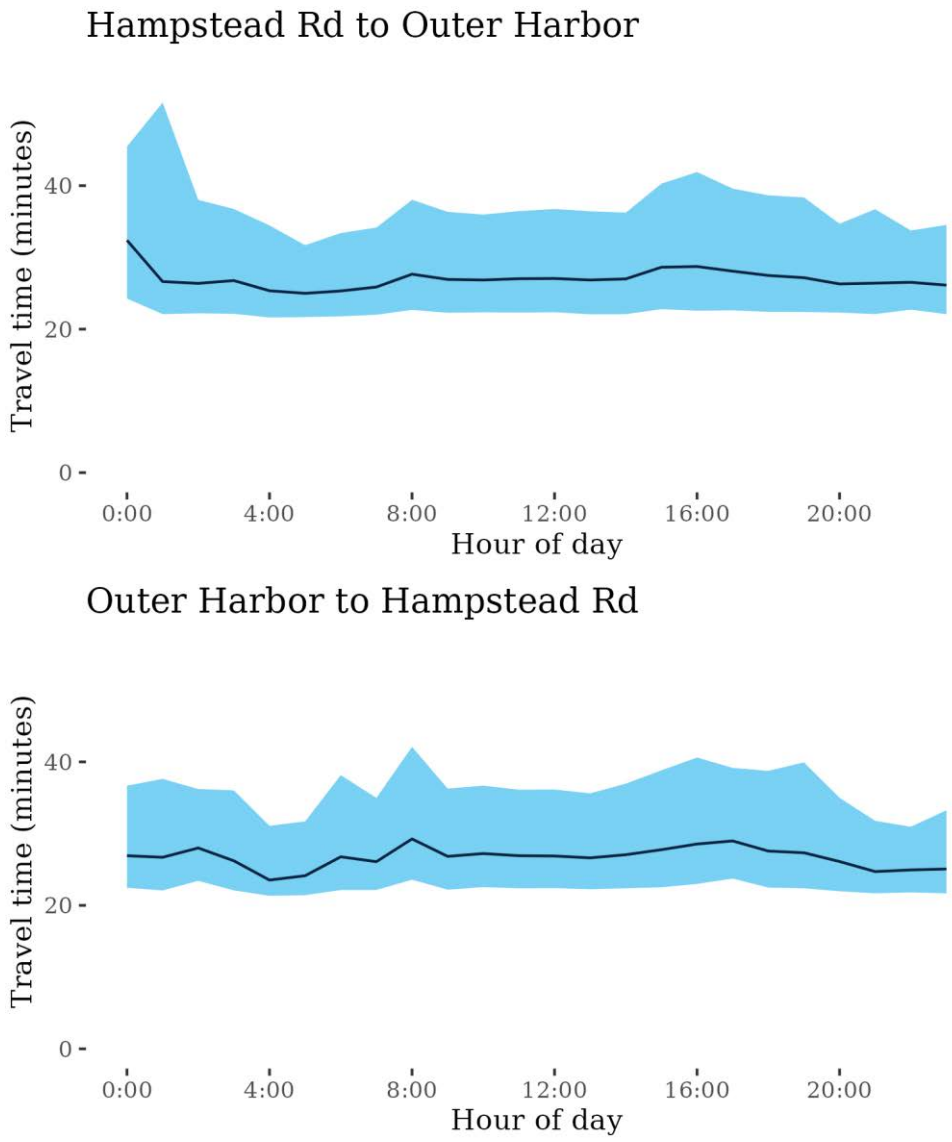
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hampstead Road to Outer Harbor	0:24:59	0:32:23	1.081	0:10:01	0:29:30	1.515	20.74
Outer Harbor to Hampstead Road	0:23:32	0:29:15	1.134	0:09:09	0:18:31	1.523	20.80

Source: BITRE estimates.

The best median travel times for journeys from Hampstead Road to Outer Harbor were 25 minutes at 5am and the lowest uncertainty was at 5am with an interquartile range of 10 minutes. The longest median travel times were at midnight with a median of 32 minutes and the greatest uncertainty at 1am with an interquartile range of 29.5 minutes.

The best travel times and lowest uncertainty travelling from Outer Harbor to Hampstead Road were at 4am and 10pm with a median travel time of 23.5 minutes and an interquartile range of 9 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 29 minutes and an interquartile range of 18.5 minutes.

Figure A.110 A16 route median and interquartile range travel times



Source: BITRE estimates.

A17 – Grand Junction Road to South Eastern Freeway / South Eastern Freeway to Grand Junction Road

This route extends from the A16 (Grand Junction Road) south through Adelaide's eastern suburbs to the junction of the South Eastern Freeway and Cross Road at Glen Osmond. The route traverses Hampstead Road, Ascot Avenue and Portrush Road along its length.

Figure A.111 A17 route map

Source: BITRE estimates.

Table A.56 A17 route travel times and congestion measures, 2021

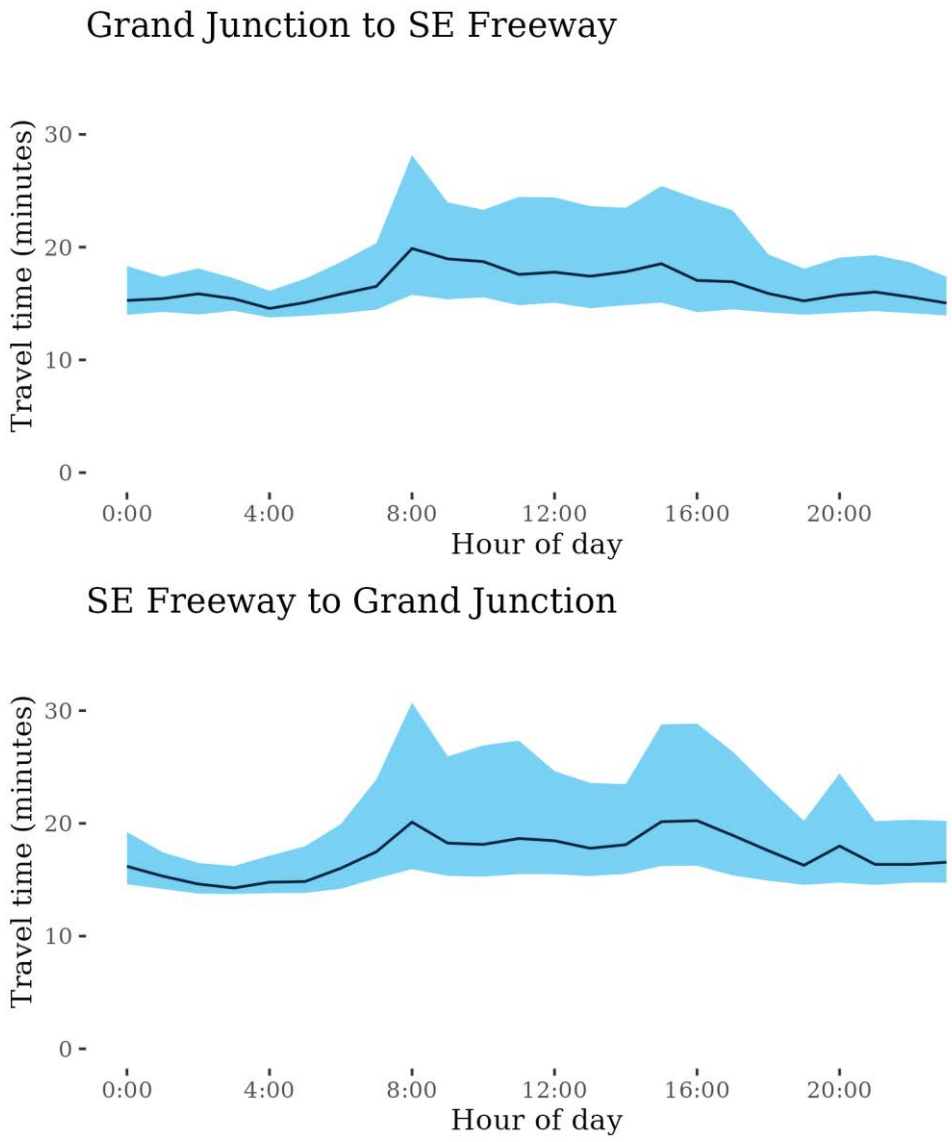
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Grand Junction to SE Freeway	0:14:34	0:19:53	1.139	0:02:23	0:12:24	2.669	13.62
SE Freeway to Grand Junction	0:14:16	0:20:15	1.207	0:02:29	0:14:47	3.11	13.61

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Grand Junction to the SE Freeway were at 4am with a median travel time of 14.5 minutes and an interquartile range of 2.5 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 20 minutes and an interquartile range of 12.5 minutes.

The best median travel times and least uncertainty for journeys from the SE Freeway to Grand Junction were at 3am with a median travel time of 14 minutes and an interquartile range of 2.5 minutes. The longest median travel times were at 4pm with a median of 20 minutes and the greatest uncertainty at 8am with an interquartile range of 15 minutes.

Figure A.112 A17 route median and interquartile range travel times



Source: BITRE estimates.

A20 – Grand Junction Road to Sturt Highway / Sturt Highway to Grand Junction Road

This route follows the A20 (comprising Main North Road and the Gawler Bypass) from Grand Junction Road at Gepps Cross north to the Stuart Highway near Gawler, and passes through Evanston Park, Blakeview, Elizabeth, Salisbury Park and Mawson Lakes.

Figure A.113 A20 route map

Source: BITRE estimates.

Table A.57 A20 route travel times and congestion measures, 2021

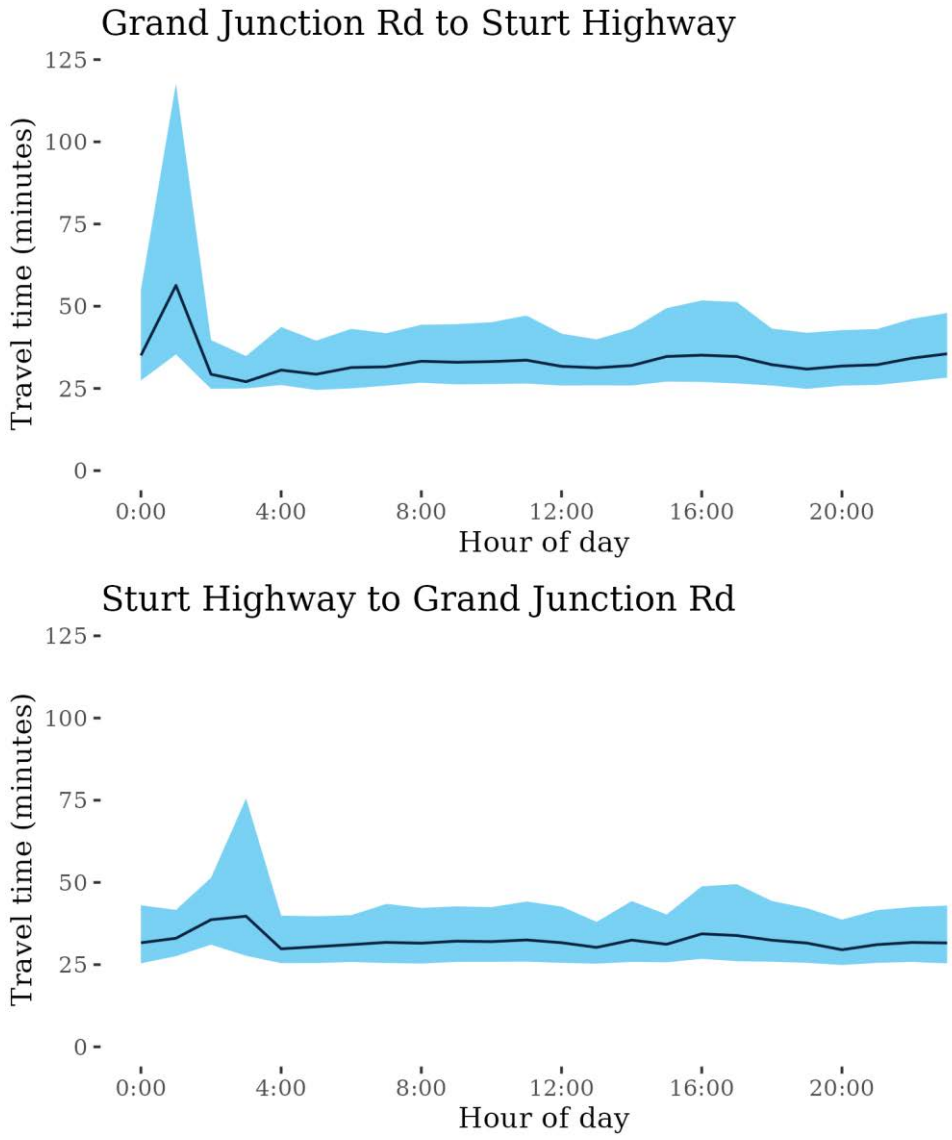
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Grand Junction Road to Sturt Highway	0:27:03	0:56:20	1.232	0:09:52	1:22:24	2.124	32.44
Sturt Highway to Grand Junction Road	0:29:32	0:39:44	1.095	0:12:42	0:47:51	1.434	32.62

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Grand Junction Road to Sturt Highway were at 3am with a median travel time of 27 minutes and an interquartile range of 10 minutes. The longest median travel times and greatest uncertainty were at 1am with a median of 56 minutes and an interquartile range of 82 minutes.

The best median travel times and least uncertainty for journeys from Sturt Highway to Grand Junction Road were at 8pm with a median travel time of 29.5 minutes and an interquartile range of 13 minutes. The longest median travel times and greatest uncertainty were at 3am with a median of 40 minutes and an interquartile range of 48 minutes.

Figure A.114 A20 route median and interquartile range travel times,

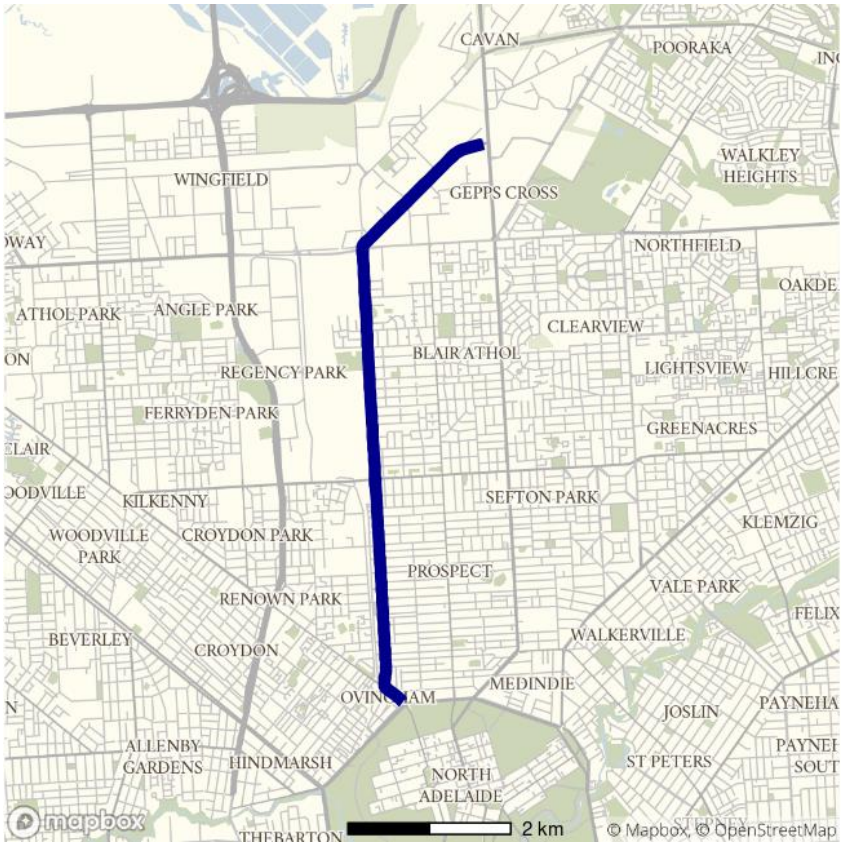


Source: BITRE estimates.

A22 – Park Terrace to Port Wakefield Road / Port Wakefield Road to Park Terrace

This route extends from Park Terrace at north Adelaide north to the Princes Highway (A1, Port Wakefield Road) at Gepps Cross. It uses Churchill Road and Cavan Road, crossing Grand Junction Road (A16) along its length.

Figure A.115 A22 route map



Source: BITRE estimates.

Table A.58 A22 route travel times and congestion measures, 2021

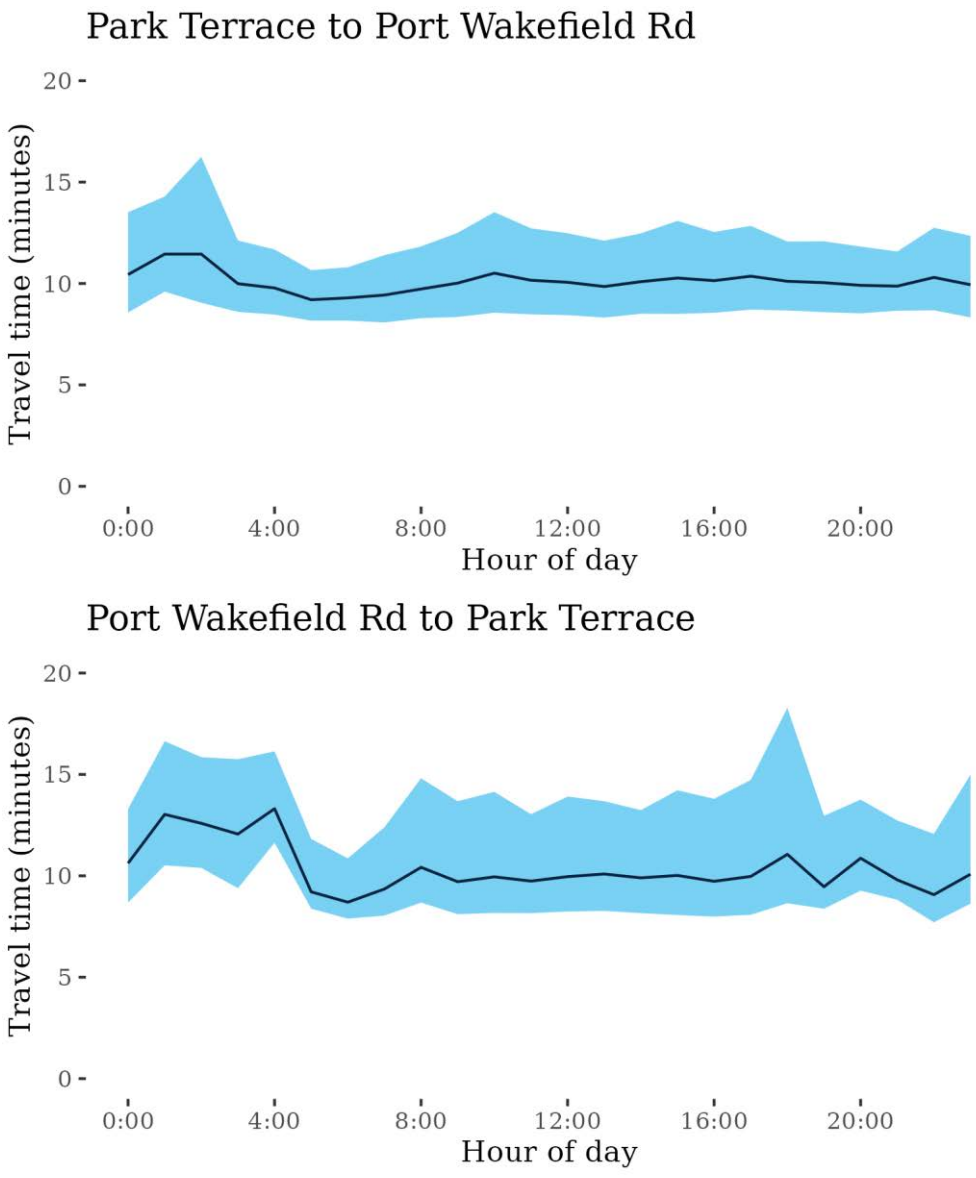
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Park Terrace to Port Wakefield Road	0:09:12	0:11:27	1.098	0:02:29	0:07:12	1.585	7.70
Port Wakefield Road to Park Terrace	0:08:42	0:13:19	1.191	0:02:59	0:09:38	1.799	7.64

Source: BITRE estimates.

The best median travel times for journeys from Park Terrace to Port Wakefield Road were 9 minutes at 5am and the lowest uncertainty was at 5am with an interquartile range of 2.5 minutes. The longest median travel times and greatest uncertainty were at 2am with a median of 11.5 minutes and an interquartile range of 7 minutes.

The best median travel times and lowest uncertainty for journeys from Port Wakefield Road to Park Terrace were at 6am with a median travel time of 9 minutes and an interquartile range of 3 minutes. The longest median travel times were at 4am with a median of 13 minutes and the greatest uncertainty at 6pm with an interquartile range of 10 minutes.

Figure A.116 A22 route median and interquartile range travel times



Source: BITRE estimates.

A3 – ANZAC Highway to SE Freeway / SE Freeway to ANZAC Highway

This route follows Cross Road (A3) between the ANZAC Highway (A5) and the South Eastern Freeway at Glen Osmond. It traverses Adelaide's Southern Suburbs.

Figure A.117 A3 route map

Source: BITRE estimates.

Table A.59 A3 route travel times and congestion measures, 2021

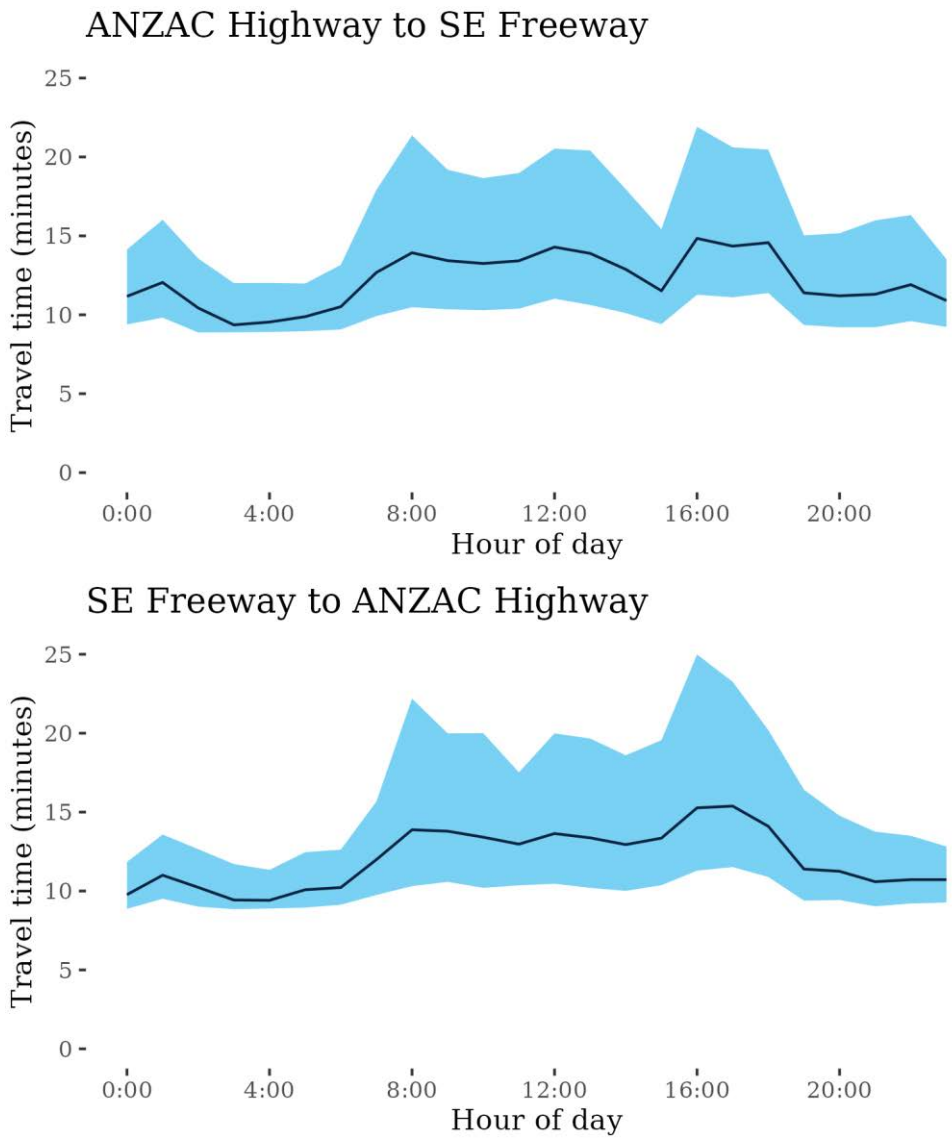
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
ANZAC Highway to SE Freeway	0:09:22	0:14:51	1.302	0:03:01	0:10:53	2.289	8.70
SE Freeway to ANZAC Highway	0:09:25	0:15:23	1.279	0:02:27	0:13:42	2.782	8.69

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from ANZAC Highway to the SE Freeway were at 3am and 5am with a median travel time of 9 minutes and an interquartile range of 3 minutes. The longest median travel times were at 4pm with a median of 15 minutes and the greatest uncertainty at 8am with an interquartile range of 11 minutes.

The best median travel times and least uncertainty for journeys from the SE Freeway to ANZAC Highway were at 4am with a median travel time of 9 minutes and an interquartile range of 2.5 minutes. The longest median travel times were at 5pm with a median of 15 minutes and the greatest uncertainty at 4pm with an interquartile range of 14 minutes.

Figure A.118 A3 route median and interquartile range travel times

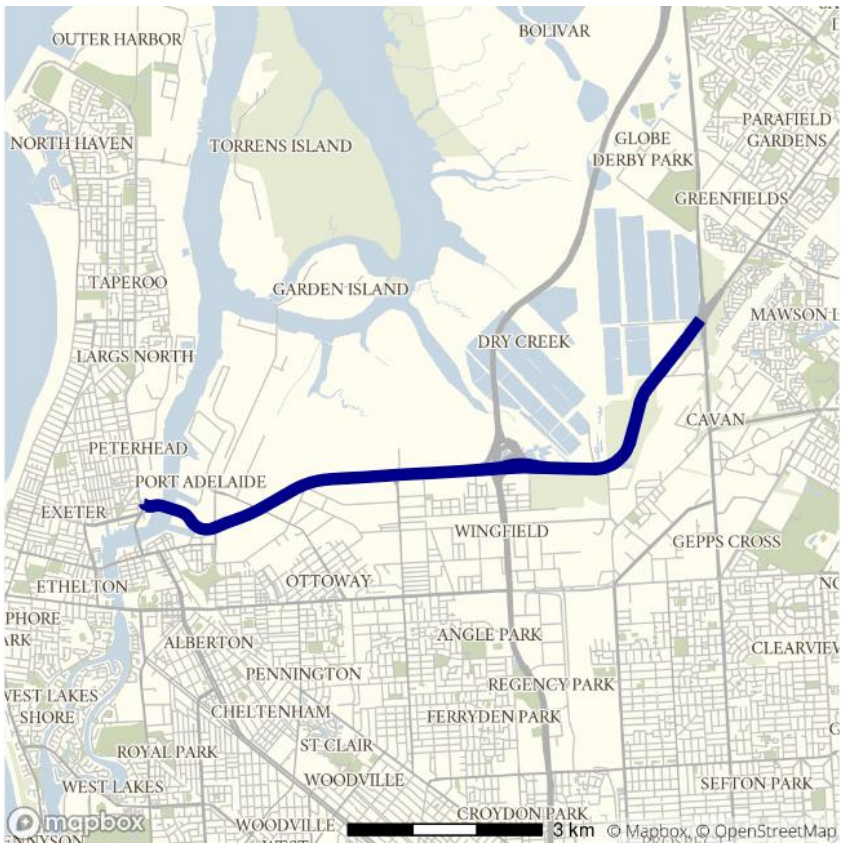


Source: BITRE estimates.

A9 – Nelson St to Port Wakefield Road / Port Wakefield Road to Nelson St

This route traverses the light industrial areas on Adelaide's northern fringe. It links Victoria Road and Nelson Street at Birkenhead and the Princes Highway (Port Wakefield Road, A1) at Mawson Lakes, and is an important link for freight from northern Adelaide to the port. It is known at different points on its route as the Port River Expressway and the Salisbury Highway.

Figure A.119 A9 route map



Source: BITRE estimates.

Table A.60 A9 route travel times and congestion measures, 2021

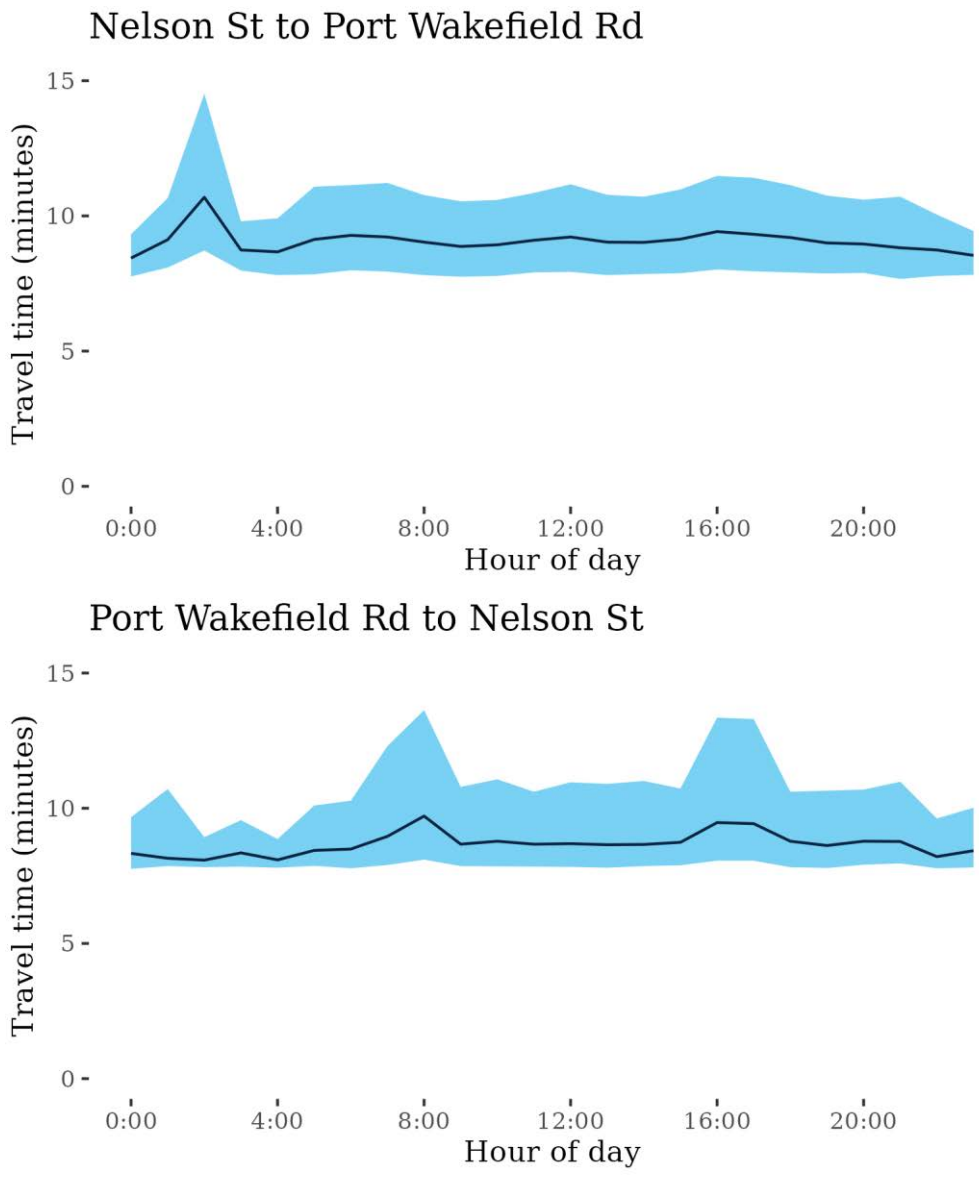
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Nelson St to Port Wakefield Road	0:08:26	0:10:41	1.075	0:01:33	0:05:48	1.87	10.23
Port Wakefield Road to Nelson St	0:08:05	0:09:43	1.073	0:01:03	0:05:32	2.777	10.20

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Nelson Street to Port Wakefield Road were at midnight with a median travel time of 8.5 minutes and an interquartile range of 1.5 minute. The longest median travel times and greatest uncertainty were at 2am with a median of 11 minutes and an interquartile range of 6 minutes.

The best travel times and lowest uncertainty travelling from Port Wakefield Road to Nelson Street were at 2am and 4am with a median travel time of 8 minutes and an interquartile range of just over 1 minute. The longest median travel times and greatest uncertainty were at 8am with a median of 10 minutes and an interquartile range of 5.5 minutes.

Figure A.120 A9 route median and interquartile range travel times

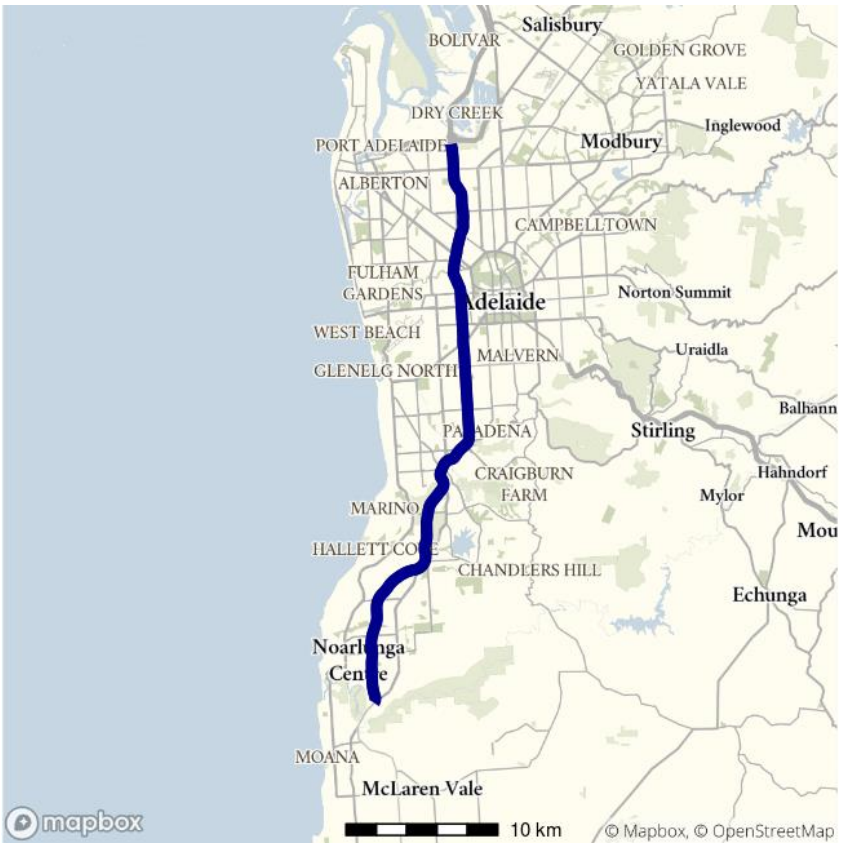


Source: BITRE estimates.

A2-M2 – Main South Road to Port River Expressway / Port River Expressway to Main South Road

This route, the only Adelaide route in this report with motorway sections, traverses Adelaide north to south. It follows the A2 and the M2, from the Port River Expressway (A9) at Angle Park to the Main South Road at Noarlunga Downs. This route uses the Southern Expressway (M2), South Road (A2) and the North-South Motorway (M2). It does not include the Northern Connector opened in March 2020.

Figure A.121 A2-M2 route map



Source: BITRE estimates.

Table A.61 A2-M2 route travel times and congestion measures, 2021

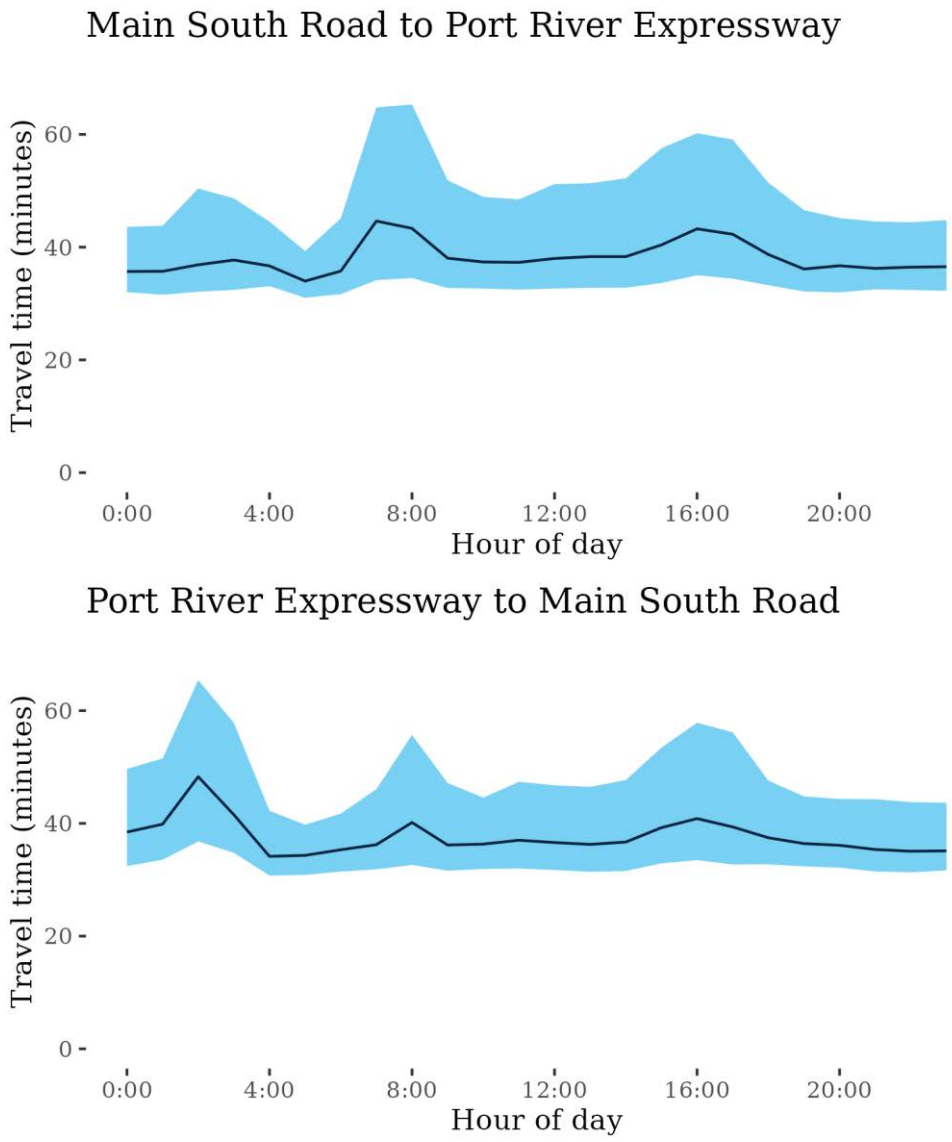
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Main South Road to Port River Expressway	0:33:59	0:44:38	1.121	0:08:18	0:30:48	2.094	40.07
Port River Expressway to Main South Road	0:34:09	0:48:17	1.101	0:08:53	0:28:37	1.828	39.84

Source: BITRE estimates.

The best median travel times for journeys from Main South Road to Port River Expressway were 34 minutes at 5am and the lowest uncertainty was at 5am with an interquartile range of 8 minutes. The longest median travel times were at 7am with a median of 45 minutes and the greatest uncertainty at 8am with an interquartile range of 31 minutes.

The best travel times and lowest uncertainty travelling from Port River Expressway to Main South Road were at 4am and 5am with a median travel time of 34 minutes and an interquartile range of 9 minutes. The longest median travel times and greatest uncertainty were at 2am with a median of 48 minutes and an interquartile range of 28.5 minutes.

Figure A.122 A2-M2 route median and interquartile range travel times



Source: BITRE estimates.

Perth routes

Route 1 – Roe Highway to Tonkin Highway / Tonkin Highway to Roe Highway

This route follows the Great Northern Highway north-south between the Tonkin Highway at Muchea and the Roe Highway–Reid Highway junction at Middle Swan. It passes Herne Hill, Upper Swan and Bullsbrook along its length. The BITRE telematics data shows it is a major route for freight heading north out of Perth.

Figure A.123 Route 1 route map

Source: BITRE estimates.

Table A.62 Route 1 route travel times and congestion measures, 2021

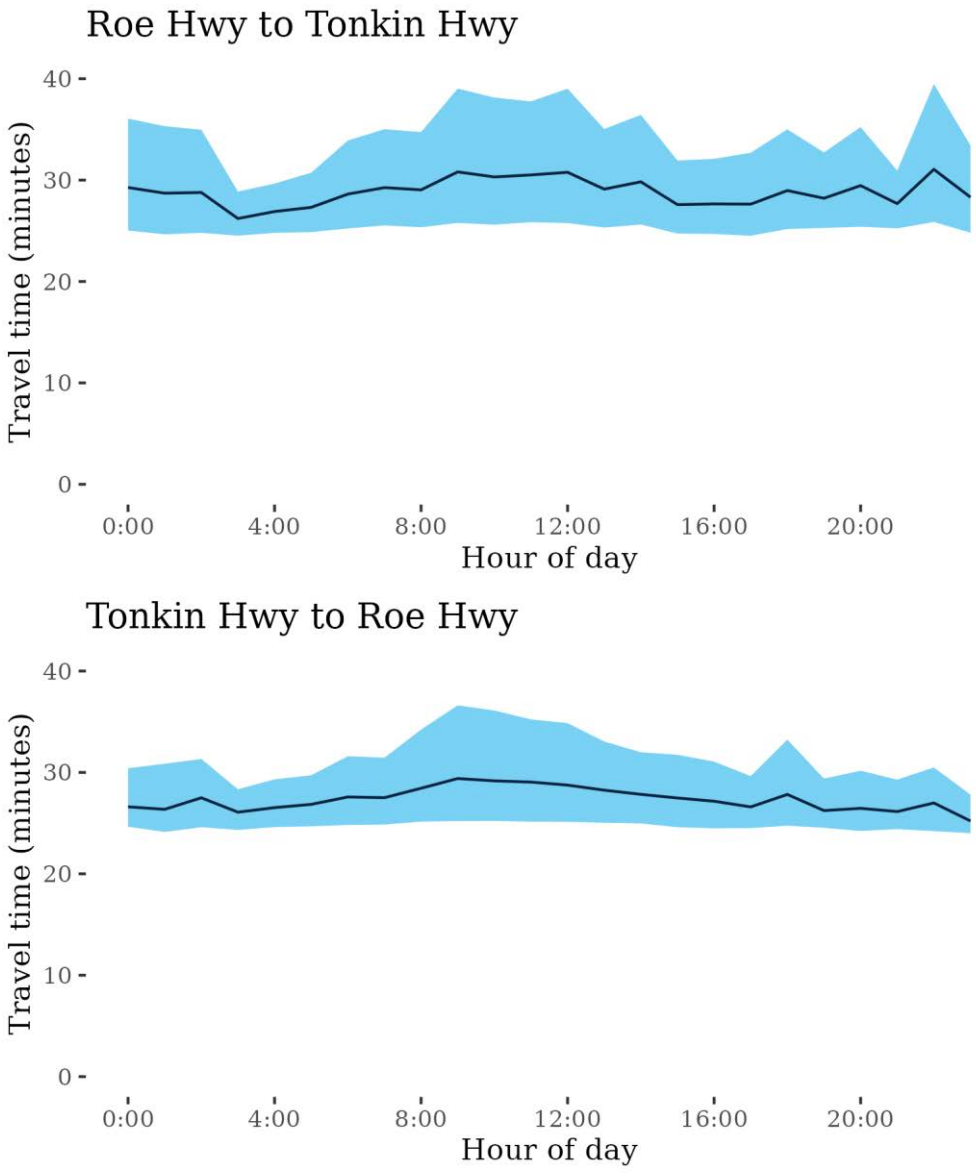
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Roe Hwy to Tonkin Hwy	0:26:12	0:31:04	1.1	0:04:21	0:13:37	2.146	34.55
Tonkin Hwy to Roe Hwy	0:25:13	0:29:24	1.084	0:03:48	0:11:25	1.815	34.54

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Roe Highway to Tonkin Highway were at 3am with a median travel time of 26 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 10pm with a median of 31 minutes and an interquartile range of 14 minutes.

The best median travel times for journeys from Tonkin Highway to Roe Highway were 25 minutes at 11pm and the lowest uncertainty was at 11pm with an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 9am with a median of 29.5 minutes and an interquartile range of 11.5 minutes.

Figure A.124 Route 1 route median and interquartile range travel times

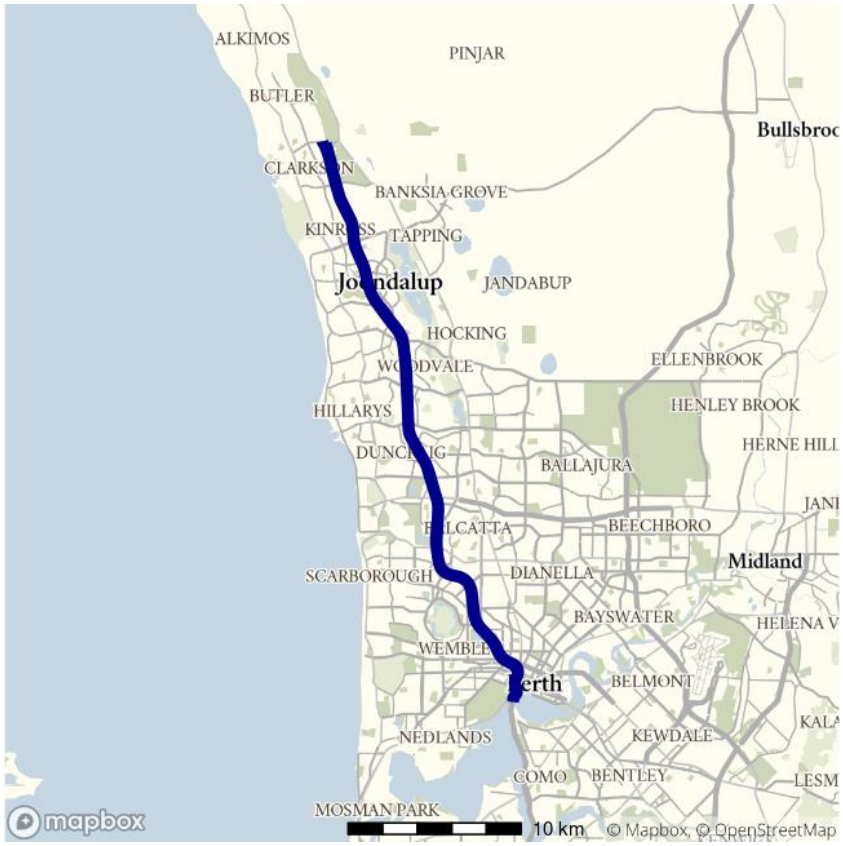


Source: BITRE estimates.

Route 2 (Mitchell) – Hester Avenue to Swan River / Swan River to Hester Avenue

This route follows the Mitchell Highway (Route 2) between Hester Avenue near Ridgewood in Perth's northern suburbs, and the Swan River near the Perth CBD, and is one of the main routes servicing Perth's northern suburbs. It also carries traffic to and from the north coast of Western Australia.

Figure A.125 Route 2 (Mitchell) route map



Source: BITRE estimates.

Table A.63 Route 2 (Mitchell) route travel times and congestion measures, 2021

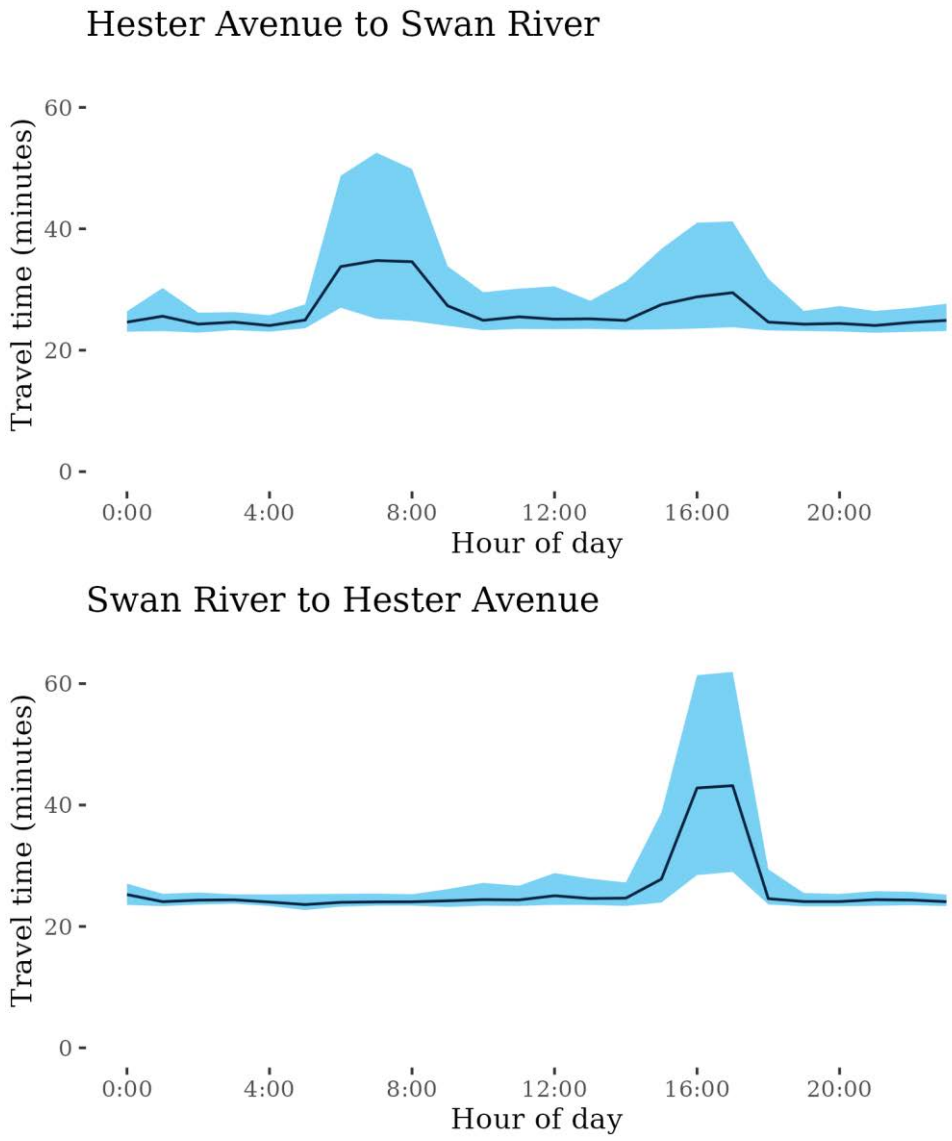
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hester Avenue to Swan River	0:24:04	0:34:46	1.103	0:02:43	0:27:22	3.313	35.86
Swan River to Hester Avenue	0:23:36	0:43:11	1.102	0:01:33	0:32:57	3.782	35.91

Source: BITRE estimates.

The best median travel times for journeys from Hester Avenue to Swan River were 24 minutes at 4am and the lowest uncertainty was at 4am with an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 7am with a median of 35 minutes and an interquartile range of 27 minutes.

The best travel times and lowest uncertainty travelling from Swan River to Hester Avenue were at 5am and 3am with a median travel time of 24 minutes and an interquartile range of 1.5 minutes. The longest median travel times and greatest uncertainty were at 5pm with a median of 43 minutes and an interquartile range of 33 minutes.

Figure A.126 Route 2 (Mitchell) route median and interquartile range travel times

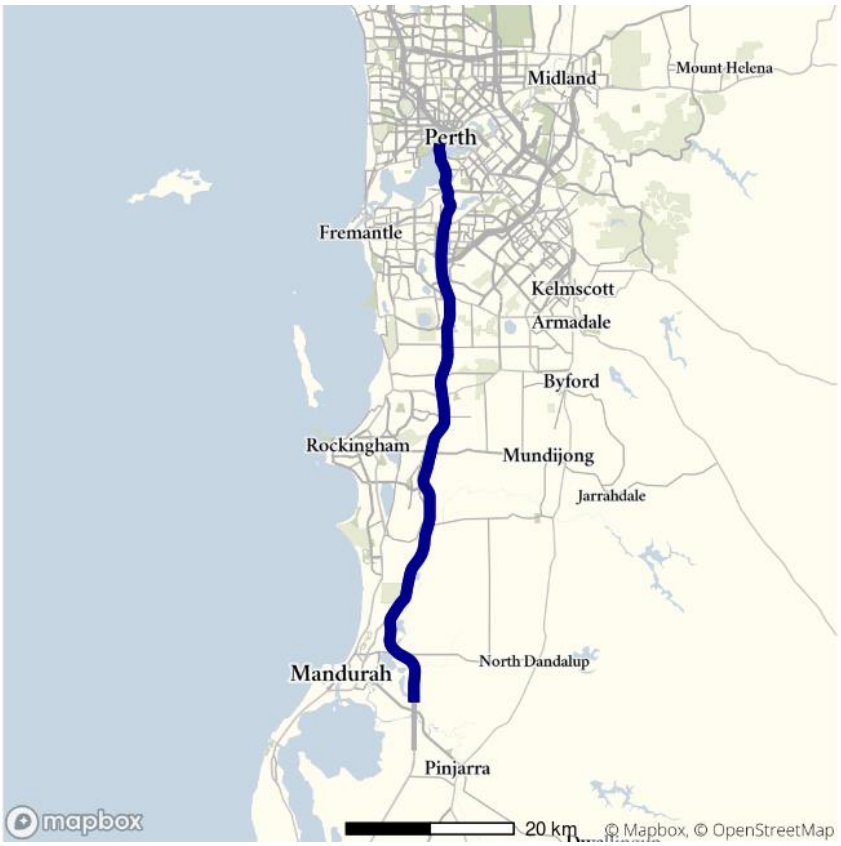


Source: BITRE estimates.

Route 2 (Kwinana) – Forrest Highway to Mitchell Freeway / Mitchell Freeway to Forrest Highway

This route follows the Kwinana Highway connecting the Forrest Highway south of Mandurah and the Mitchell Highway at the Swan River near the Perth CBD. It is one of the main routes servicing Perth's southern suburbs and Rockingham and Mandurah south of Perth.

Figure A.127 Route 2 (Kwinana) route map



Source: BITRE estimates.

Table A.64 Route 2 (Kwinana) route travel times and congestion measures, 2021

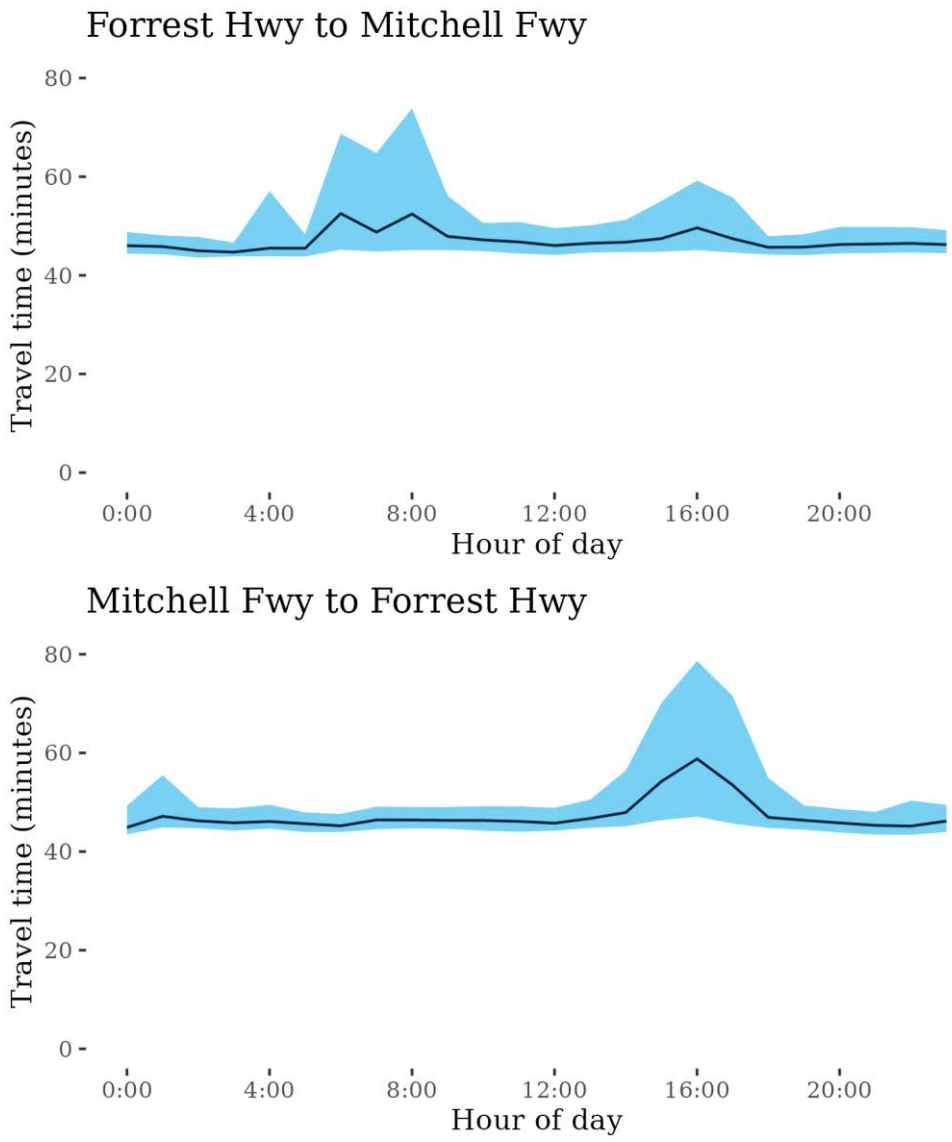
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Forrest Highway to Mitchell Freeway	0:44:42	0:52:32	1.052	0:02:49	0:28:42	3.096	70.67
Mitchell Freeway to Forrest Highway	0:44:53	0:58:48	1.054	0:03:39	0:31:35	2.294	70.72

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Forrest Highway to Mitchell Freeway were at 3am with a median travel time of 45 minutes and an interquartile range of 3 minutes. The longest median travel times were at 6am with a median of 52.5 minutes and the greatest uncertainty at 8am with an interquartile range of 29 minutes.

The best travel times and lowest uncertainty travelling from the Mitchell Freeway to Forrest Highway were at midnight and 6am with a median travel time of 45 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 1 hour and an interquartile range of 31.5 minutes.

Figure A.128 Route 2 (Kwinana) route median and interquartile range travel times

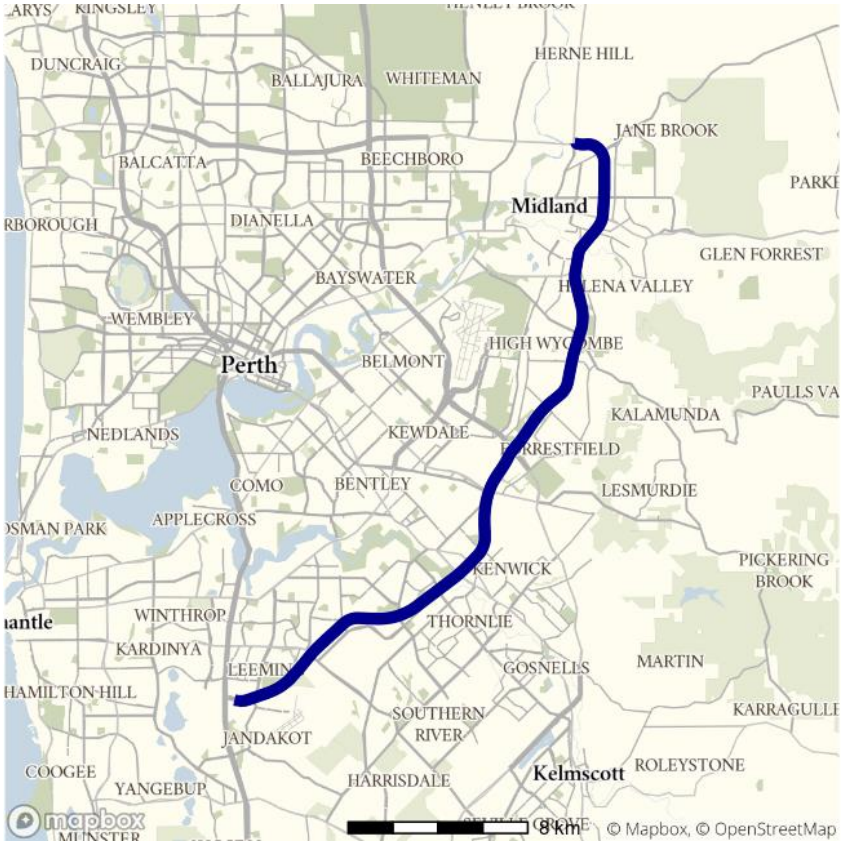


Source: BITRE estimates.

Route 3 (Roe Highway) – Great Northern Highway to Kwinana Freeway / Kwinana Freeway to Great Northern Highway

This route follows the Roe Highway between its junction the Great Northern Highway (Route 1) in the north and its connection with the Kwinana Freeway (Route 2) at Leeming in Perth's south.

Figure A.129 Route 3 (Roe Highway) route map



Source: BITRE estimates.

Table A.65 Route 3 (Roe Highway) route travel times and congestion measures, 2021

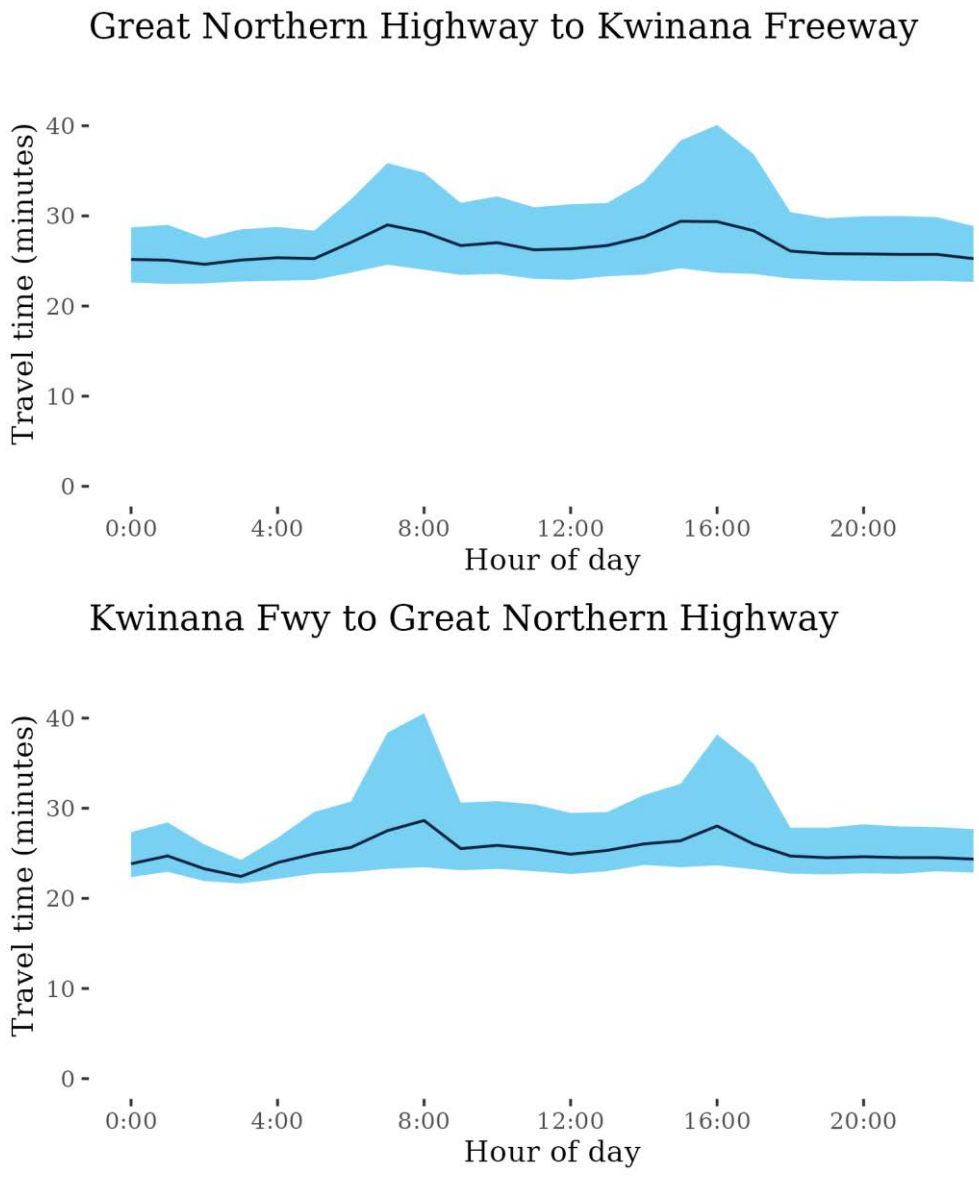
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Great Northern Highway to Kwinana Freeway	0:24:38	0:29:24	1.078	0:05:01	0:16:24	1.677	34.08
Kwinana Freeway to Great Northern Highway	0:22:26	0:28:38	1.126	0:02:37	0:17:06	2.846	34.18

Source: BITRE estimates.

The best median travel times for journeys from Great Northern Highway to Kwinana Freeway were 25 minutes at 2am and the lowest uncertainty was at 2am with an interquartile range of 5 minutes. The longest median travel times were at 3pm with a median of 29.5 minutes and the greatest uncertainty at 4pm with an interquartile range of 16.5 minutes.

The best median travel times and lowest uncertainty for journeys from Kwinana Freeway to Great Northern Highway were at 3am with a median travel time of 22.5 minutes and an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were at 8am with a median of 29 minutes and an interquartile range of 17 minutes.

Figure A.130 Route 3 (Roe Highway) route median and interquartile range travel times



Source: BITRE estimates.

Route 3 (Reid Highway) – Mitchell Freeway to Tonkin Freeway / Tonkin Freeway to Mitchell Freeway

This route follows the Reid Highway between its connection with the Mitchell Freeway (Route 2) north of Perth's CBD, and its interchange with the Tonkin Freeway (Route 4) at Malaga, in Perth's near northern suburbs. It passes the Perth suburbs of Westminster, Mirrabooka and Noranda.

Figure A.131 Route 3 (Reid Highway) route map

Source: BITRE estimates.

Table A.66 Route 3 (Reid Highway) route travel times and congestion measures, 2021

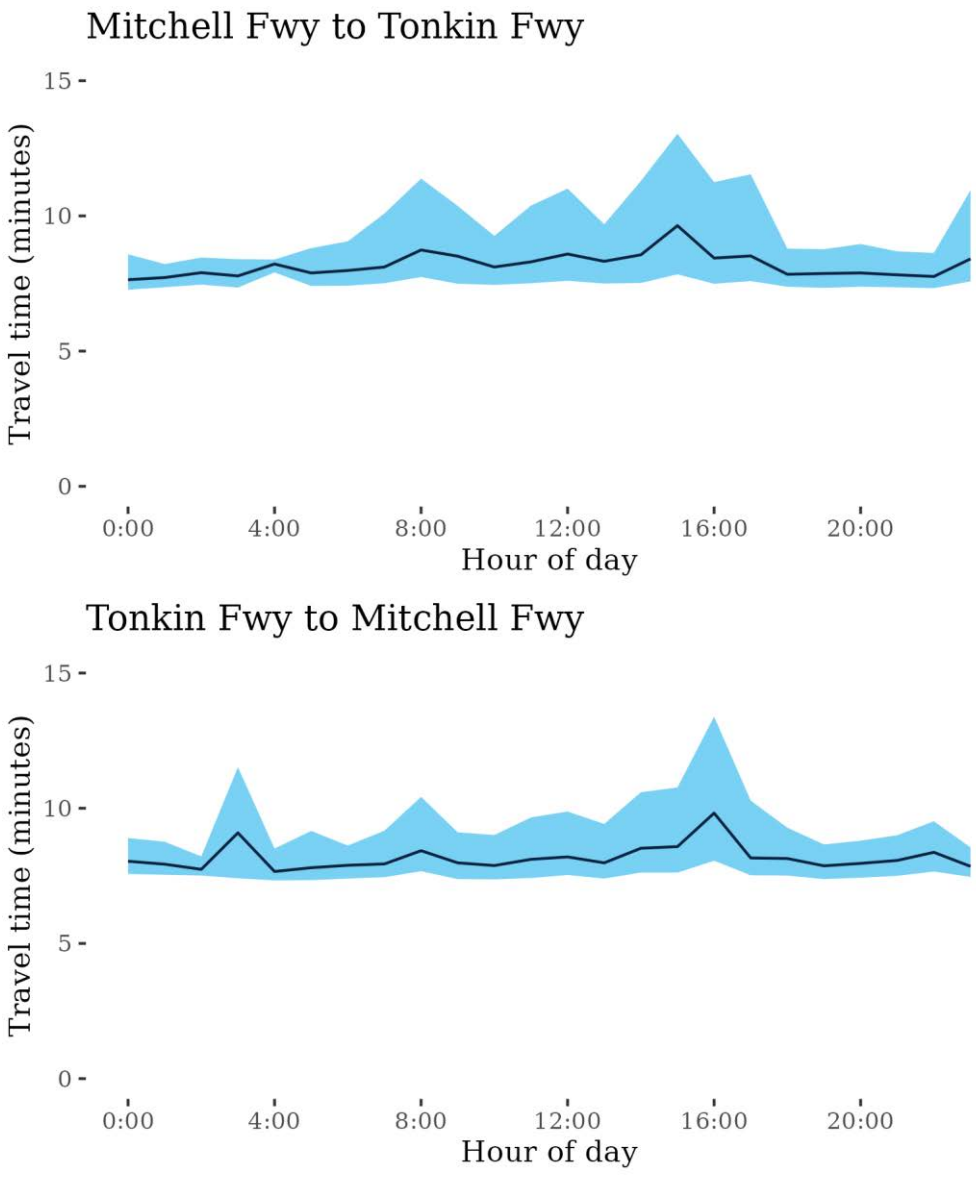
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Mitchell Freeway to Tonkin Freeway	0:07:39	0:09:38	1.071	0:00:29	0:05:12	4.746	10.35
Tonkin Freeway to Mitchell Freeway	0:07:40	0:09:49	1.066	0:00:43	0:05:20	2.878	10.50

Source: BITRE estimates.

The best travel times and lowest uncertainty travelling from the Mitchell Freeway to Tonkin Freeway were at midnight and 4am with a median travel time of 8 minutes and an interquartile range of 29 seconds. The longest median travel times and greatest uncertainty were at 3pm with a median of 10 minutes and an interquartile range of 5 minutes.

The best travel times and lowest uncertainty travelling from Tonkin Freeway to Mitchell Freeway were at 4am and 2am with a median travel time of 8 minutes and an interquartile range of 43 seconds. The longest median travel times and greatest uncertainty were at 4pm with a median of 10 minutes and an interquartile range of 5 minutes.

Figure A.132 Route 3 (Reid Highway) route median and interquartile range travel times



Source: BITRE estimates.

Route 4 – Great Northern Highway to Thomas Road / Thomas Road to Great Northern Highway

This route follows the Tonkin Highway (Route 4) between its junction with the Great Northern Highway, at Muchea north of Perth, and its terminus at Thomas Road on Perth's southern outskirts. It crosses the Reid Highway (Route 3) north of Morley and the Swan River near Redcliffe, and runs past Perth airport.

Figure A.133 Route 4 route map

Source: BITRE estimates.

Table A.67 Route 4 route travel times and congestion measures, 2021

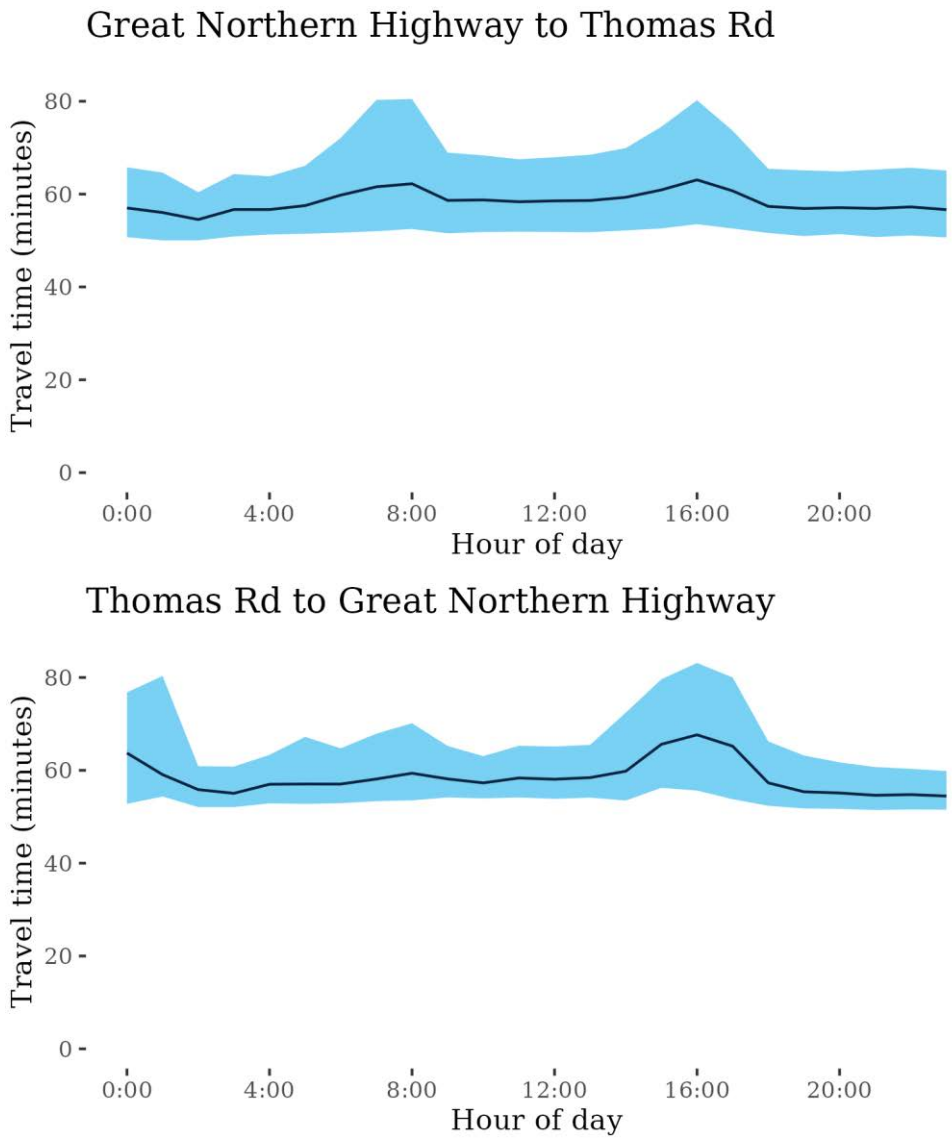
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Great Northern Highway to Thomas Road	0:54:31	1:03:04	1.071	0:10:22	0:28:17	1.656	79.91
Thomas Road to Great Northern Highway	0:54:28	1:07:39	1.073	0:08:18	0:27:30	1.741	79.91

Source: BITRE estimates.

The best median travel times for journeys from Great Northern Highway to Thomas Road were 54.5 minutes at 2am and the lowest uncertainty was at 2am with an interquartile range of 10 minutes. The longest median travel times were at 4pm with a median of 1 hour 3 minutes and the greatest uncertainty at 7am with an interquartile range of 28 minutes.

The best median travel times and lowest uncertainty for journeys from Thomas Road to Great Northern Highway were at 11pm with a median travel time of 54.5 minutes and an interquartile range of 8 minutes. The longest median travel times and greatest uncertainty were at 4pm with a median of 1 hour 8 minutes and an interquartile range of 27.5 minutes.

Figure A.134 Route 4 route median and interquartile range travel times

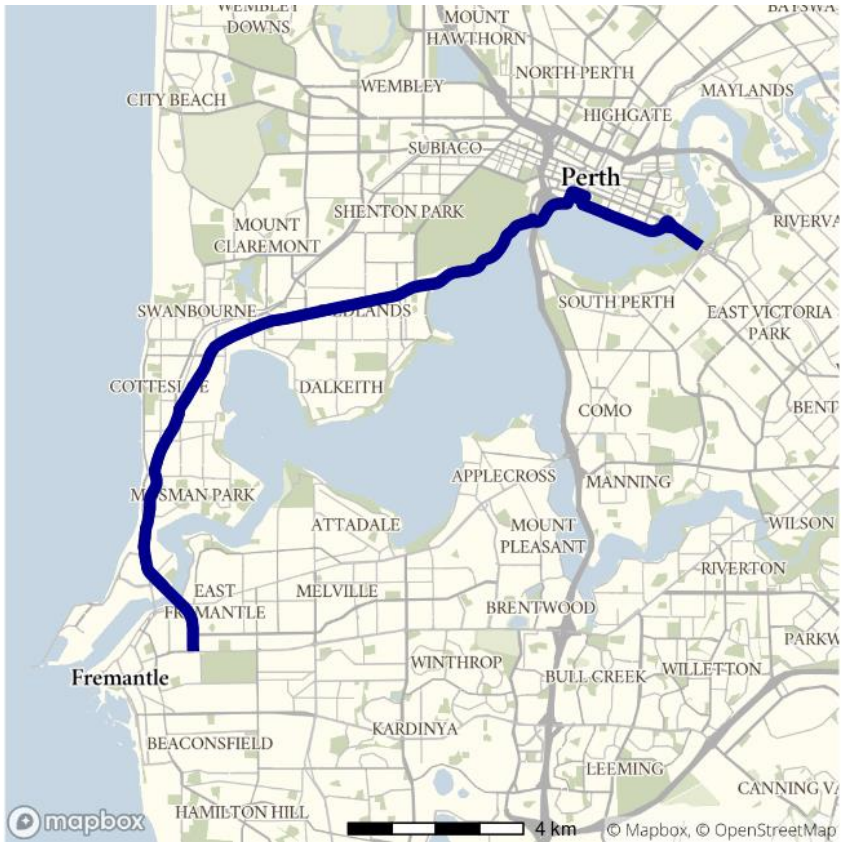


Source: BITRE estimates.

Route 5 – Great Eastern Highway to Stirling Hwy, High Street / Stirling Hwy, High Street to Great Eastern Highway

This route runs between High Street (Route 7) in Fremantle, via the northern side of the Swan River and to the junction of Albany Highway, Great Eastern Highway (GEH) and Canning Highway near Burswood, southwest of the CBD. It traverses Stirling Highway, Mounts Bay Road, Riverside Drive and the Causeway.

Figure A.135 Route 5 route map



Source: BITRE estimates.

Table A.68 Route 5 route travel times and congestion measures, 2021

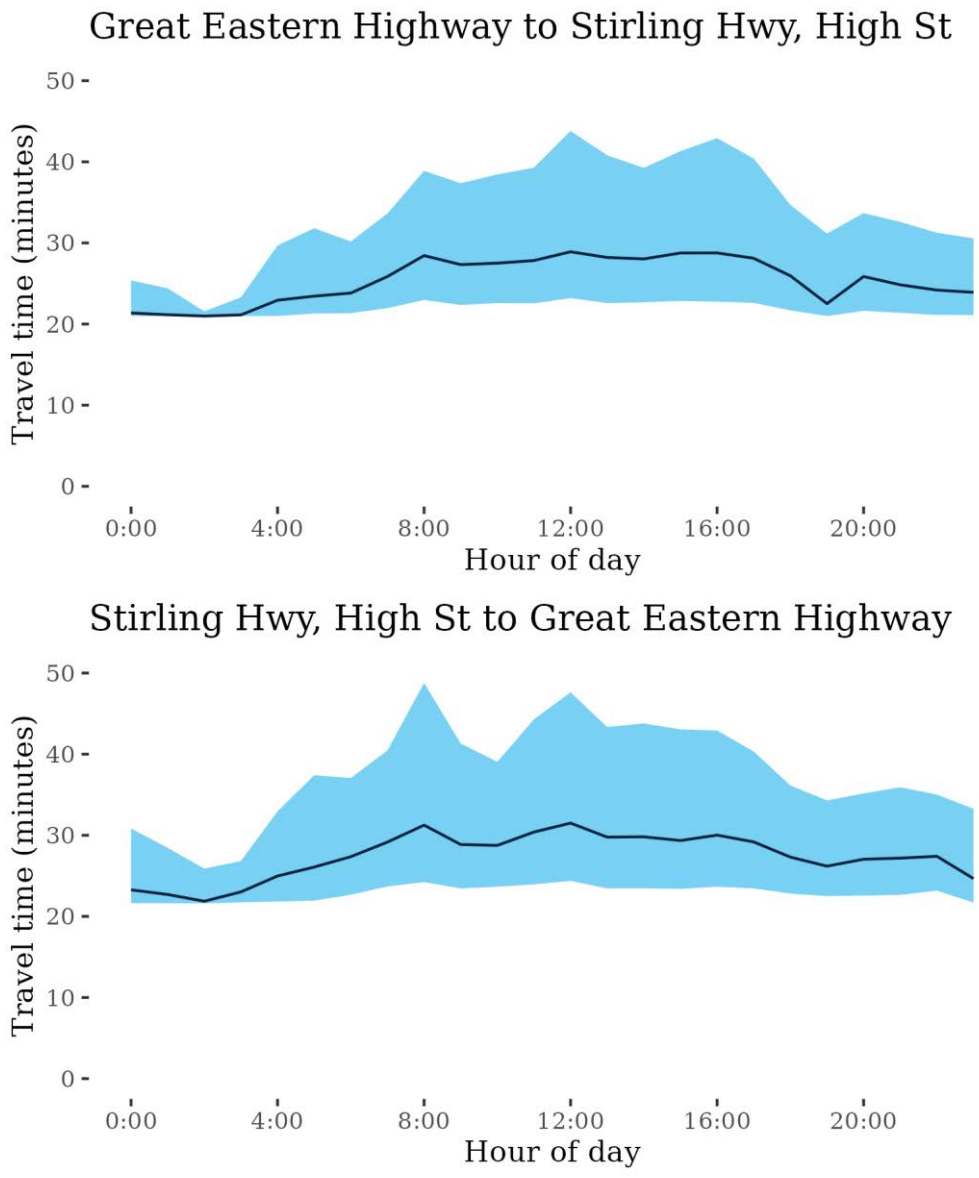
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Great Eastern Highway to Stirling Hwy, High Street	0:21:00	0:28:55	1.21	0:00:35	0:20:36	21.061	20.35
Stirling Hwy, High Street to Great Eastern Highway	0:21:52	0:31:30	1.252	0:04:17	0:24:34	3.452	20.73

Source: BITRE estimates.

The best median travel times for journeys from Great Eastern Highway to Stirling Highway, High Street were 21 minutes at 2am and the lowest uncertainty was at 2am with an interquartile range of 35 seconds. The longest median travel times and greatest uncertainty were at 12am with a median of 29 minutes and an interquartile range of 21 minutes.

The best median travel times and lowest uncertainty for journeys from Stirling Highway, High Street to Great Eastern Highway were at 2am with a median travel time of 22 minutes and an interquartile range of 4 minutes. The longest median travel times were 31.5 minutes at 12am and the greatest uncertainty were at 8am with an interquartile range of 24.5 minutes

Figure A.136 Route 5 route median and interquartile range travel times

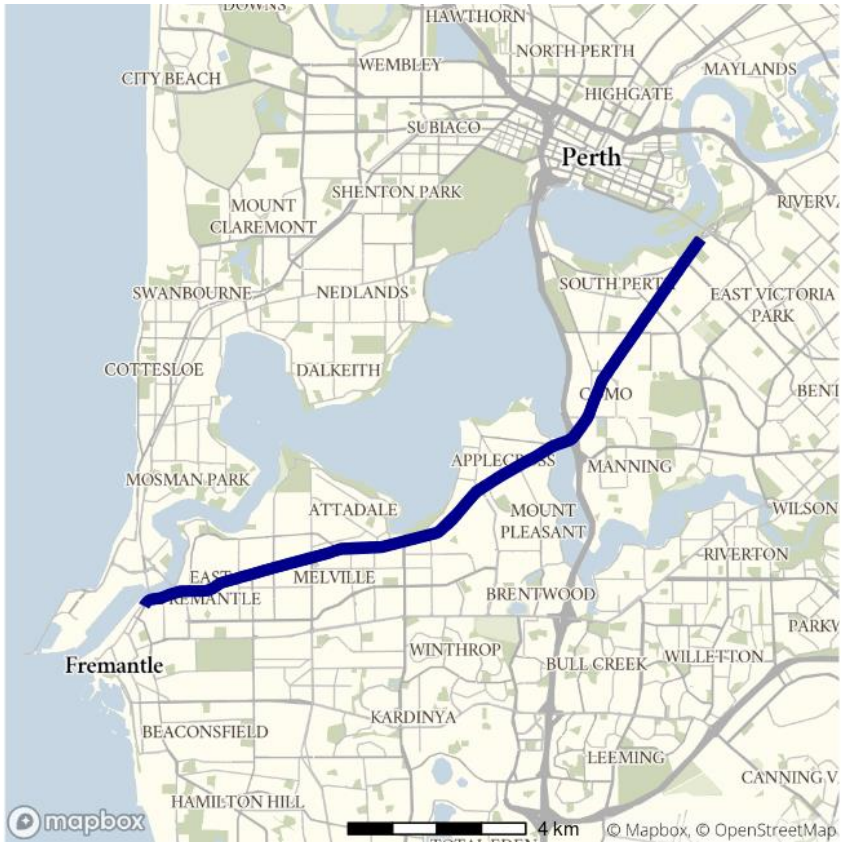


Source: BITRE estimates.

Route 6 – Fremantle to Great Eastern Highway / Great Eastern Highway to Fremantle

This surface route follows the Canning Highway between Fremantle and the Great Eastern Highway, to the east of the Perth CBD—like Route 5 but south of the Swan River.

Figure A.137 Route 6 route map



Source: BITRE estimates.

Table A.69 Route 6 route travel times and congestion measures, 2021

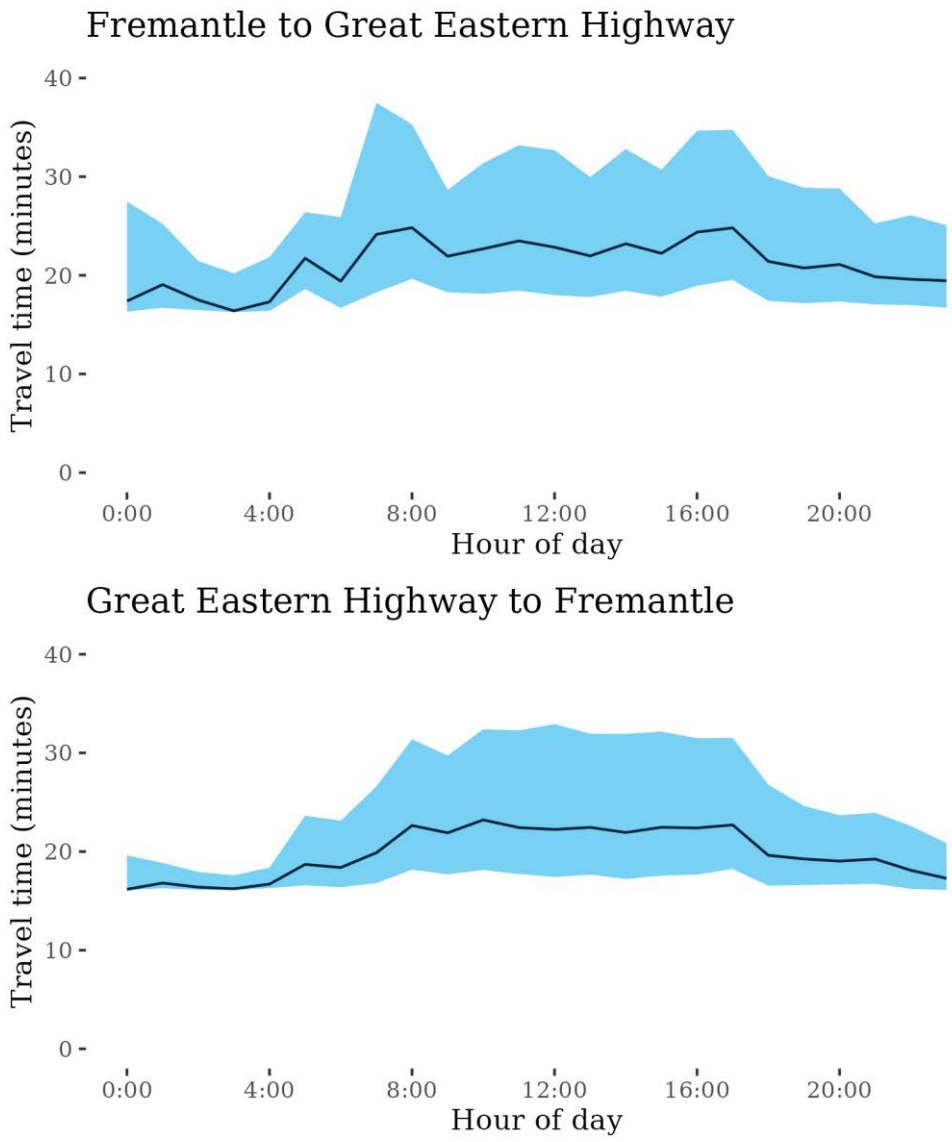
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Fremantle to Great Eastern Highway	0:16:24	0:24:50	1.29	0:03:56	0:19:14	2.872	15.99
Great Eastern Highway to Fremantle	0:16:10	0:23:12	1.227	0:01:30	0:15:30	6.115	15.83

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Fremantle to Great Eastern Highway were at 3am with a median travel time of 16 minutes and an interquartile range of 4 minutes. The longest median travel times were 25 minutes at 8am and the greatest uncertainty were at 7am with an interquartile range of 19 minutes

The best median travel times and least uncertainty for journeys from Great Eastern Highway to Fremantle were at midnight with a median travel time of 16 minutes and an interquartile range of 1.5 minutes. The longest median travel times were at 10am with a median of 23 minutes and the greatest uncertainty at 12am with an interquartile range of 15.5 minutes.

Figure A.138 Route 6 route median and interquartile range travel times



Source: BITRE estimates.

Route 7 – Stirling Hwy to Tonkin Freeway / Tonkin Freeway to Stirling Hwy

This route follows the Leach Highway (Route 7) between the Stirling Highway (Route 6), at Fremantle, to the interchange with the Tonkin Freeway (Route 4) near Perth Airport.

Figure A.139 Route 7 route map

Source: BITRE estimates.

Table A.70 Route 7 route travel times and congestion measures, 2021

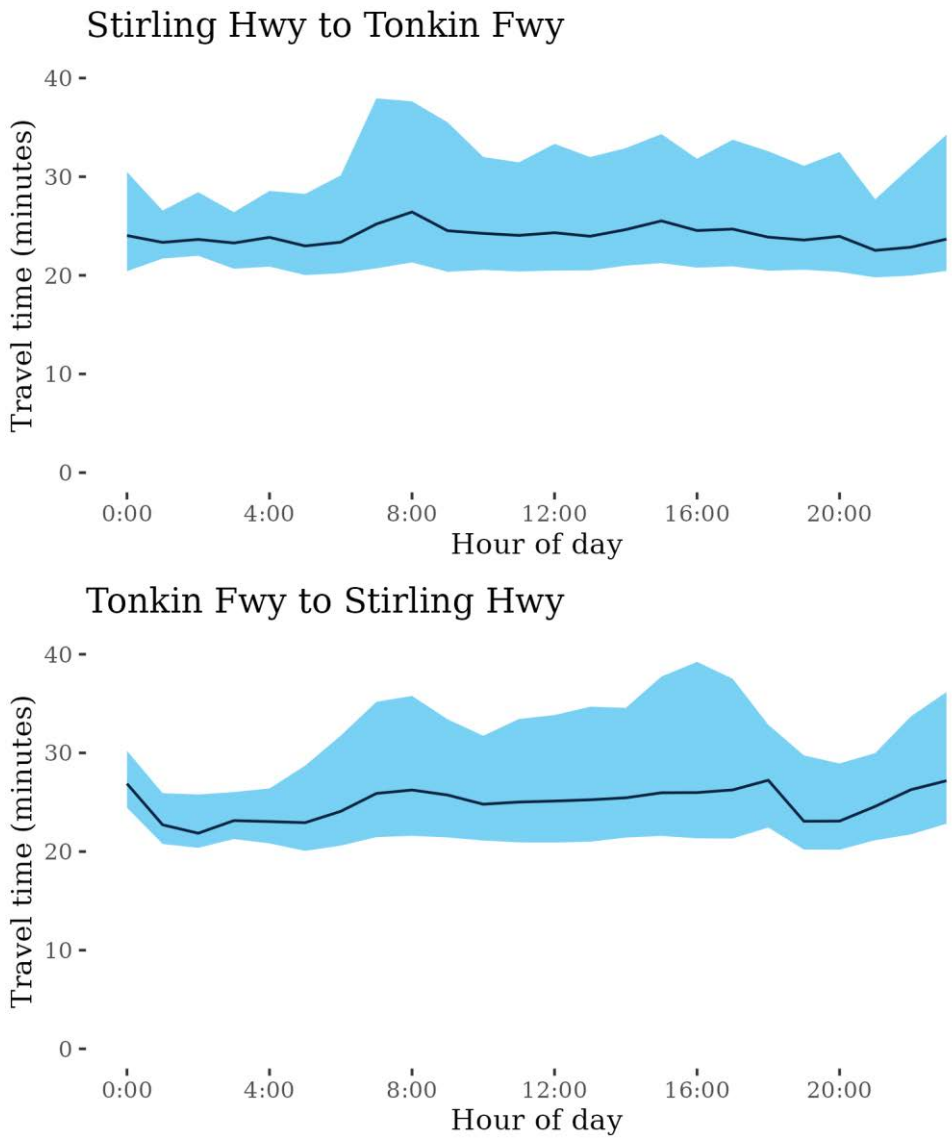
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Stirling Hwy to Tonkin Freeway	0:22:32	0:26:25	1.067	0:04:52	0:17:14	2.271	21.91
Tonkin Freeway to Stirling Hwy	0:21:51	0:27:14	1.139	0:04:46	0:17:53	2.295	22.14

Source: BITRE estimates.

The best median travel times and lowest uncertainty for journeys from Stirling Highway to Tonkin Freeway were at 9pm with a median travel time of 22.5 minutes and an interquartile range of 5 minutes. The longest median travel times were at 8am with a median of 26.5 minutes and the greatest uncertainty at 7am with an interquartile range of 17 minutes.

The best travel times and lowest uncertainty travelling from Tonkin Freeway to Stirling Highway were at 2am and 3am with a median travel time of 22 minutes and an interquartile range of 5 minutes. The longest median travel times were 27 minutes at 6pm and the greatest uncertainty were at 4pm with an interquartile range of 18 minutes

Figure A.140 Route 7 route median and interquartile range travel times



Source: BITRE estimates.

Route 8 – Canning Road to Mitchell Freeway / Mitchell Freeway to Canning Road

This route runs from Canning Road on Perth's eastern fringe, through Perth's eastern suburbs, to the Mitchell Freeway (Route 2) just west of the CBD. The route follows the Graham Farmer Freeway, Orrong Road and Welshpool Road.

Figure A.141 Route 8 route map

Source: BITRE estimates.

Table A.71 Route 8 route travel times and congestion measures, 2021

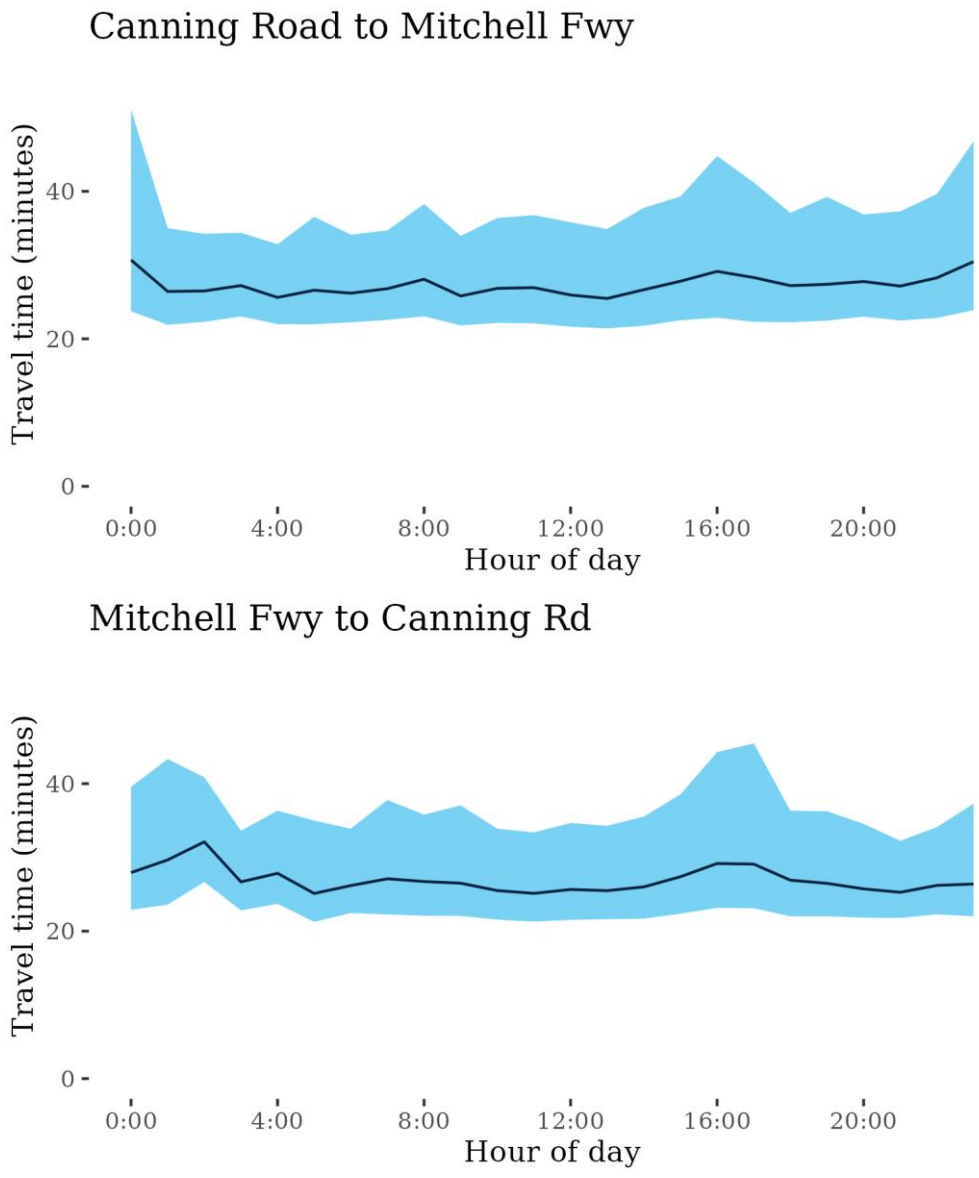
Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Canning Road to Mitchell Freeway	0:25:28	0:30:41	1.072	0:10:50	0:27:22	1.426	24.13
Mitchell Freeway to Canning Road	0:25:06	0:32:07	1.072	0:10:27	0:22:21	1.38	24.14

Source: BITRE estimates.

The best median travel times and least uncertainty for journeys from Canning Road to Mitchell Freeway were at 1pm with a median travel time of 25.5 minutes and an interquartile range of 11 minutes. The longest median travel times and greatest uncertainty were at midnight with a median of 31 minutes and an interquartile range of 27 minutes.

The best travel times and lowest uncertainty travelling from the Mitchell Freeway to Canning Road were at 5am and 9pm with a median travel time of 25 minutes and an interquartile range of 10.5 minutes. The longest median travel times were 32 minutes at 2am and the greatest uncertainty were at 5pm with an interquartile range of 22 minutes

Figure A.142 Route 8 route median and interquartile range travel times



Source: BITRE estimates.

Appendix B – Brief summary of methods and measures

For this paper, BITRE used freight telematics to collate speeds experienced by freight vehicles on individual road segments ranging in length from less than 10 to several hundred metres. BITRE defined routes and identified the segments that make up those routes. Median travel times were determined by calculating the time taken if a vehicle experienced the median travel speeds across all segments on the route, and the same method was applied for the interquartile range with speeds at the 1st and 3rd quartiles.

The Mean Excess Time Ratio (METR) is calculated as the mean hourly ratio of median travel times to the best observed median travel time. The Mean Excess Uncertainty Ratio (MEUR) is calculated as the mean hourly ratio of interquartile range to the smallest observed interquartile range.

The aggregate measures for each city are calculated as the mean of these two measures for all routes in each city, weighted by the distance and volumes of traffic observed on each route. This ensures congested, but relatively short and unimportant routes for freight, such as the M1 in Sydney, do not overly influence the city-wide results.

Some data sparse segments required Bayesian estimation. Bayesian estimation was implemented via the Stan modelling language for Bayesian analysis (Stan Development Team 2020), implemented through the 'rethinking' package for R (McElreath 2020).

The segments making up routes were identified with a lightly modified version of the OSRM routing engine (Luxen and Vetter 2011).

Summary data for all routes and segments on this report will be available on data.gov.au, and the analysis code is available at BITRE (2021b).

Appendix C – About the BITRE freight telematics program

This paper uses data from the BITRE telematics project. This project transforms GPS traces from freight vehicles of private road freight operators into data about Australia's road freight industry and road freight network, to help inform industry, government and other interested parties. This data can help inform planning and investment in the road network and rest areas, inform industry and government on economic activity and assist trip planning among other things. The project uses BITRE's independently developed Yulo framework (Green and Mitchell, 2018, BITRE 2021b). By tracking the entirety of vehicles' journeys it can generate data on more parts of the road network than is practical using conventional road data collection means such as fixed cameras or pneumatic tubes. This report is based on over 282 million observations from over 7 000 road segments whilst the database contains billions of observations on over 1 million road segments.

Previous publications using this data include an analysis of the effect of COVID 19 lockdowns on freight route performance in 2020 (BITRE 2020) and a display of the freight catchments served by Australian ports (BITRE 2021c).

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