

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



Freight vehicle congestion in Australia's five major cities - 2020

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Executive Summary

This is the second issue of a planned regular series that uses vehicle telematics data to provide measures of traffic congestion for freight vehicles on 53 selected routes across Australia's five mainland state capital cities—Sydney, Melbourne, Brisbane, Adelaide and Perth over 2020.

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.

Between midnight and 5am

A 'third' peak in freight travel times was observed again in 2020 on some routes.



The reason for this third peak is not certain, although freight specific activity or road works are potential reasons. Data sources Congestion lower in 2020

COVID-19 and **urban congestion** Freight congestion decreased overall in Australia in 2020 due to COVID lockdowns.



Peaks became less pronounced across all Australian capital cities in 2020, with the effect greater in Sydney and Melbourne.

Freight telematics 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 2020 with those of 2019 (BITRE 2021a), this report identifies several notable features across the selected urban routes:

- Freight vehicle congestion decreased across all five mainland Australian capital cities in 2020 due to lower commuter activity on roads, particularly in peak periods, as a result of COVID-19 lockdowns.
- Whilst peak period travel times were less pronounced in 2020 across all cities, this effect was more significant in Sydney and Melbourne, because those cities had larger pre-COVID-19 traffic peaks and experienced longer lockdowns (particularly in Melbourne) – in many cases traffic peaks in Melbourne disappeared entirely.
- Morning peaks reduced by a greater extent than afternoon peaks, particularly in Sydney. This may be because commuting trips related to school student movements (most afternoon peaks are between 3-5 pm) returned earlier and are less flexible than commuting to work.
- In Brisbane, peaks in uncertainty decreased more than peaks in travel times, but overall uncertainty mildly increased.
- Perth and Adelaide showed less change between 2019 and 2020 overall than the eastern state capitals. These cities also experienced fewer or no COVID-related lockdowns.
- Most routes exhibited a sharp decrease in congestion in April 2020 and a gradual, but incomplete return to pre-COVID-19 conditions by November 2020.
- The unexplained 'third peak' noted on many surface routes in 2019 is usually still present.

Introduction

This paper, the second 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 2020.

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 in each 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 the 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 2020, across each of the five capital cities.

	•			•
City	Excess Time	e Index	Excess Uncerta	ainty Index
	2019	2020	2019	2020
Sydney	1.000	0.973	1.000	0.895
Melbourne	1.000	0.932	1.000	0.694
Brisbane	1.000	0.978	1.000	1.061
Adelaide	1.000	1.006	1.000	1.093
Perth	1.000	0.986	1.000	0.069

Гable 1	Congestion measures of cities studied in this report
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Source: BITRE estimates.





Source: BITRE estimates.

Four of the five cities experienced reductions in the city-wide mean excess time index due to reductions in commuter traffic during COVID (Figure 1). In particular, the reduction or elimination of morning and, to a lesser extent, afternoon peaks during initial lockdowns between March and June 2020 accounted for most of the reduction. Perth, Brisbane and Sydney saw falls of between 1 and 3 per cent and Melbourne, which experienced its second lockdown through the winter of 2020, had a larger reduction of 7 per cent. However, most routes that experienced pronounced reductions in April 2020, when lockdowns were first introduced, had returned to comparable levels of congestion by September 2020.

Adelaide experienced a slight increase in freight vehicle congestion, as measured by the mean excess time index. COVID-related lockdowns likely did not produce a significant reduction in METR for Adelaide because the routes chosen, only one of which is a motorway, did not exhibit the same pronounced morning and afternoon peaks as in the other cities in 2020. This means that the absence of commuter traffic could not have the same effect.

The mean excess uncertainty index also declined between 2019 and 2020 in Sydney, Melbourne and Perth, with the most significant declines in Sydney and Melbourne (see Figure 2). Adelaide experienced an increase in the mean excess uncertainty, which is consistent with the direction of change in the mean excess time index in Adelaide. Finally, the mean excess uncertainty index increased in Brisbane between 2019 and 2020, whereas the mean excess time decreased over the same period, which implies that averaged across all Brisbane routes, mean travel time decreased, but travel time uncertainty increased between 2019 and 2020.



Figure 2 Mean Excess Uncertainty Ratio (MEUR), by capital city, 2019 and 2020

Source: BITRE estimates.

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

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, freight vehicles comprise a small minority of total urban traffic volumes. 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.



Sydney

Sydney metropolitan area freight vehicle routes cover the following 13 motorway, freeway and/or major arterial road routes:

- 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
- A40 Baulkham Hills to Rozelle / Rozelle to Baulkham Hills
- A6 Carlingford to Padstow / Padstow to Carlingford
- 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
- M5 Hume Motorway to M1 / M1 to Hume Motorway
- M7 M2 to M5 / M5 to M2

Figure 3 shows all 13 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 2019 and 2020 across each of the 13 selected Sydney freight vehicle routes. Reductions in travel time congestion were observed across almost all routes in Sydney but were most apparent on motorway routes, particularly those that in typical years have strong peaks related to commuter traffic. The city-bound directions on the M1 South and M5 are among these, but are less important in the freight network of the city than the M4 and M7, which saw smaller declines.

Decreases in travel time uncertainty were less consistent but fell on the most highly-weighted routes and in the city-wide measure.

Several routes had a deeper reduction in morning peaks than afternoon peaks before 5pm, which became the most congested time of day. This may be because of more lasting reductions in commuting trips than in school-related travel.



 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 2019 and 2020

Source: BITRE estimates.

Size represents 2020 weights in citywide measure

Freight congestion in Australian Cities

Melbourne

Melbourne metropolitan area freight vehicle routes cover the following 11 motorway, highway and/or major arterial road routes:

- Route 32 Derrimut to Montrose / Montrose to Derrimut
- 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
- 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
- Western Freeway Bacchus Marsh to Derrimut / Derrimut to Bacchus Marsh.

Figure 5 shows all 11 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 11 selected Melbourne freight vehicle routes travel time congestion reduced across almost all routes but particularly on the longer and freight-intensive M1 East, which services the CBD and industrial areas in Melbourne's south east.

Unlike in Sydney, reduction in mean excess uncertainty was fairly systematic and correlated in some degree with mean excess time congestion, i.e. routes that experienced higher reductions in mean excess time also experienced reductions in mean excess travel time uncertainty.

Time congestion reduced across almost all routes but particularly on the lengthy and freight intensive M1 East servicing the CBD and industrial areas in the South East.



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 2019 and 2020

Source: BITRE estimates.

Size represents 2020 weights in citywide measure

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. Most routes in Brisbane experienced reductions in travel time congestion, though less substantial than the reductions in Melbourne and Sydney, presumably due to shorter lockdowns and less intense peaks in ordinary conditions. In particular, the highly-weighted M1 experienced reductions in both directions.

There was no clear pattern in changes in travel time uncertainty across the 10 Brisbane routes, despite an increase in the city-wide measure.

Figure 7



Brisbane route congestion and median travel time index^a, 2020

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



M6 - Gateway Motorway to Pacific Motorway -M6 - Pacific Motorway to Gateway Motorway -

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

> Route 2 - A7 to Gateway -Route 2 - Gateway to A7 -

> > -0.3

-0.2

-0.1

0.0

0.1

Brisbane route METR and MEUR changes between 2019 and 2020

Source: BITRE estimates.

Size represents 2020 weights in citywide measure

0

2

-2

0.2

-1

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 SE Freeway / SE 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 SE Freeway / SE 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 routes exhibited no consistent increase in travel time congestion although the city-wide measure showed a small increase. Adelaide was alone amongst the 5 capital cities in showing an increase in mean excess travel time between 2019 and 2020, likely because of shorter-lived COVID-19 restrictions and less motorway routes with distinct commuting peaks. The only motorway route, the A2-M2, showed no appreciable change in either direction.

Changes in travel time uncertainty congestion were correlated with changes in time congestion leading to a slight increase in the city-wide mean excess uncertainty index measure.



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 2019 and 2020

Source: BITRE estimates.

Size represents 2020 weights in citywide measure

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 2019 and 2020 across each of the 10 selected Sydney freight vehicle routes. Mean excess travel time congestion in Perth showed no clear pattern across routes, with some routes exhibiting increases mean excess travel time in one direction and reductions in the other, e.g. the highly-weighted Route 2. Reductions in mean travel time for the southbound direction of Route2, and smaller reduction on other highly-weighted routes, were sufficiently large to result in a reduction in the city-wide measure.

Reductions in travel time uncertainty were correlated with reductions in travel time congestion and, as such, saw a reduction in the city-wide measure of mean travel time uncertainty despite a lack of a clear pattern across the 10 freight vehicle routes.







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

mapbox

Ν	METR Change		MEUR Chan	ge
Route 1 - Roe Hwy to Tonkin Hwy-		·		-
Route 1 - Tonkin Hwy to Roe Hwy-		•		-
Route 2 (Kwinana) - Forrest Hwy to Mitchell Fwy-	•			
Route 2 (Kwinana) - Mitchell Fwy to Forrest Hwy-		<u> </u>		
Route 2 (Mitchell) - Hester Avenue to Swan River-		•		
Route 2 (Mitchell) - Swan River to Hester Avenue				
Route 3 (Reid) - Mitchell Fwy to Tonkin Fwy-				•
Route 3 (Reid) - Tonkin Fwy to Mitchell Fwy-		-		
Route 3 (Roe) - Great Northern Highway to Kwinana Freeway-				
Route 3 (Roe) - Kwinana Fwy to Great Northern Highway-				
Route 4 - Great Northern Highway to Thomas Rd		.		
Route 4 - Thomas Rd to Great Northern Highway				
Route 5 - Great Eastern Highway to Stirling Hwy, High St				
Route 5 - Stirling Hwy, High St to Great Eastern Highway-		•		•
Route 6 - Fremantle to Great Eastern Highway		•	:¥	
Route 6 - Great Eastern Highway to Fremantle			·	- 0 . •0
Route 7 - Stirling Hwy to Tonkin Fwy-		•		-
Route 7 - Tonkin Fwy to Stirling Hwy-		-	°	
Route 8 - Canning Road to Mitchell Fwy-		•		
Route 8 - Mitchell Fwy to Canning Rd				
-0	0.3 -0.2 -0.1	0.0 0.1 0.2	-2 -1	0 1 2

Figure 12 Perth route METR and MEUR changes between 2019 and 2020

Source: BITRE estimates.

Size represents 2020 weights in citywide measure

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 2019, not the particular hour.



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.





Source: BITRE estimates.

Table A.1	A22 route travel times and	congestion measures,	, 2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Glebe to Liverpool	0:39:08	0:49:03	1.092	0:23:16	0:46:05	1.273	29.2
Liverpool to Glebe	0:40:05	0:47:22	1.077	0:22:45	0:38:42	1.356	29.3
Source: BITRE estimates.							

The best travel times and lowest uncertainty travelling from Glebe to Liverpool were at 2am and 5am at just over 39 minutes and an interquartile range of 23 minutes, 2 and 3 minutes less than 2019. The longest travel times and most uncertain travel times were in the afternoon peak at 4pm with a median travel time of 49 minutes and an interquartile range of over 46 minutes, 2 minutes less and 1.5 minutes longer than 2019, respectively. Delays were apparent on Parramatta Road in particular.

The best travel times and lowest uncertainty travelling from Liverpool to Glebe were at 5am with a median travel time of 40 minutes and an interquartile range of 23 minutes, within a minute of 2019 levels. The longest travel times and greatest uncertainty were in the afternoon peak at 3 and 4 pm with the median travel time 47 minutes and an interquartile range of 38.5 minutes, down 4 and 10 minutes. Unlike the journey leaving the CBD (Glebe), travel into the CBD showed peaks in uncertainty in both the morning and afternoon, with delays most pronounced around the intersection of Liverpool and Parramatta Roads in Ashfield and near Canley Vale.

Figure A.2 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 Velley Way. It passes Wentworthville, Fairfield West, Liverpool and Casula and crosses the A44, M4 and M5 routes.





Source: BITRE estimates.

Table A.2	A28 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Casula to M2 Motorway	0:36:56	0:47:51	1.124	0:16:34	0:44:11	1.631	32.8
M2 Motorway to Casula	0:36:05	0:47:30	1.114	0:15:41	0:46:19	1.57	32.9
Source: BITRE estimates.							

The best travel times and lowest uncertainty travelling from Casula to the M2 Motorway were at midnight and 3am with a median travel time of 37 minutes and an interquartile range of 16 minutes, both slightly higher than 2019. The longest median travel times and most uncertain travel times were in the afternoon peak at 3 and 5pm, with a median travel time of 48 minutes and an interquartile range of 44 minutes. This reverses the finding of 2019 when the morning peak was more congested. Delays were most prominent between Parramatta and Carlingford.

The best travel times and lowest uncertainty travelling from the M2 Motorway to Casula were at 4am with a median travel time of 36 minutes and an interquartile range of 15.5 minutes, slightly up on 2019. The longest travel times were at 3pm with 47.5 minutes and the greatest uncertainty were at 4pm with an interquartile range of 46 minutes, both well down from 2019. Like the journey from Casula, two peaks are present in the journey to Casula in the morning and afternoon respectively. Delays were most pronounced around Parramatta, Granville and Liverpool.

Figure A.4 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 Ryde, Strathfield, Roselands and Hurstville along its way. It intersects with a number of other routes in this report including the M2, M4 and M5 motorways and the A34, A22 and A40.





Source: BITRE estimates.

A3 route travel times and congestion measures, 2020 Table A.3

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Blakehurst to Pymble	0:36:08	0:44:05	1.107	0:15:18	0:34:16	1.544	30.5
Pymble to Blakehurst	0:37:00	0:48:44	1.088	0:18:00	0:38:45	1.338	30.8
Source: BITRE estimates.							

2020

The best travel times for journeys from Blakehurst to Pymble were at 4am with a median of 36 minutes, while the lowest uncertainty were 5am with an interquartile range of 15 minutes, both slightly down on 2019. The longest median travel times and most uncertainty were in the "third peak" at 2am with a median of 44 minutes and the greatest uncertainty in the afternoon at 5pm with an interquartile range of 34 minutes, 5 and 11 minutes down on 2019. There was also a prominent peak in the morning. Delays were most apparent around Roselands in the South of the root, whereas delays around Macquarie Park, where many office workers commute, were eased.

The best travel times and lowest uncertainty travelling to Blakehurst were at 1pm and 11pm with a median of 37 minutes and an interquartile range of 18 minutes. The longest median travel times were at 3am with a median of 48 minutes, while the greatest uncertainty were in the afternoon peak at 5pm with an interquartile range of 39 minutes, down by 10.5 and 16 minutes, respectively. Delays were most apparent around Homebush.

In both directions there is an evident early morning peak which, though more significant for southbound trips, is the most delayed period of the day. The reason the "third peak" has become the most delayed period was because of improved speeds in other part of the day rather than a deterioration in that period.

Figure A.6 A3 route median and interquartile range travel times



Hour of day

Blakehurst to Pymble



2020

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 names including Canterbury Road and Milperra Road along its length.

Figure A.7 A34 route map



Source: BITRE estimates.

Table A.4	A34 route travel times and congestion measures, 2	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Liverpool to Newtown	0:31:19	0:44:01	1.198	0:15:36	0:48:29	1.89	26.1
Newtown to Liverpool	0:29:30	0:41:40	1.159	0:15:07	1:56:24	2.417	27.3
Source: PITRE actimates							

Source: BLIRE estimates.

The best travel times and lowest uncertainty travelling from Liverpool to Newtown were at 3 and 4am with a median travel time of 31 minutes and an interquartile range of 15.5 minutes respectively, slightly down on 2019. The longest median travel times and most uncertain travel times were in the afternoon peak at 2 and 4pm with a median of 44 minutes and an interquartile range of 48 minutes, 2 and 8 minutes down from 2019, respectively. Delays at this time were mostly evenly spread along the route but slightly more apparent at Newtown and Stanmore.

The best travel times and lowest uncertainty travelling from Newtown to Liverpool were at 4am and 9pm with a median travel time of 29.5 minutes and an interquartile range of 15 minutes, both several minutes better than 2019. The longest travel times and the greatest uncertainty were at 4pm with a median of 41 minutes and an interquartile range of nearly 2 hours, and improvement of 6 minutes and deterioration of nearly an hour on 2019, respectively. Delays were similarly distributed along the route but with a slight emphasis in the east.

Unlike the A3 route, the A34 no longer indicates a "third peak" as strong as in 2019.

Figure A.8 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 Street George region before meeting the A3 at Blakehurst. For most of its length it is known as the Princes Highway.





Source: BITRE estimates.

Table A.5	A36 route travel times and congestion measures, 2	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Broadway to Georges River	0:20:12	0:27:32	1.183	0:07:43	0:23:26	2.074	16.5
Georges River to Broadway	0:19:24	0:31:29	1.327	0:05:52	0:32:19	3.351	16.5
Source: BITRE estimates.							

The best travel times and lowest uncertainty travelling from Broadway to Georges River were at 2am with a median travel time of 20 minutes, and an interquartile range of 7.5 minutes, improvements of about 2 minutes on 2019. The longest median travel times were in the afternoon peak at 4pm with a median of 27.5 minutes and the most uncertain time were in the morning peak at 9pm experiencing an interquartile range of 23 minutes, improvements of 3 and 6.5 minutes on 2019, respectively. Travel times and uncertainty were higher throughout business hours than other times of the day with delays most apparent around Tempe and St Peters.

The best travel times and lowest uncertainty travelling from Georges River to Broadway were at 3 and 2am, respectively, with a median travel time of 19.5 minutes and an interquartile range of 6 minutes, similar to 2019. The longest median travel times and greatest uncertainty were in the afternoon peak at 3 and 1pm, respectively, with a median of 31 minutes and an interquartile range of 32 minutes, both reductions of 5-6 minutes on 2019 when the worst delays were in the morning peak. Like the opposite direction, travel times and uncertainty were heightened throughout business hours. Delays were most significant at Tempe and at Enmore.

Figure A.10 A36 route median and interquartile range travel times



Broadway to Georges River



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 way. It is known at different points as Victoria Road, James Ruse Drive and Old Windsor Road.





Source: BITRE estimates.

Table A.6	A40 route travel times and congestion measures, 2	020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Baulkham Hills to Rozelle	0:28:05	0:42:46	1.295	0:09:02	0:33:52	2.396	27.8
Rozelle to Baulkham Hills	0:31:49	0:45:22	1.138	0:10:53	0:43:23	2.04	28.1
Source: BITRE estimates.							

The best travel times and lowest uncertainty for journeys from Baulkham Hills to Rozelle were experienced at 1am with a median travel time of 28 minutes and an interquartile range of 9 minutes, respectively 5 and 4 minutes below 2019 levels. The longest median travel times and most uncertainty were in the morning peak at 8am with a median of 42 minutes and an interquartile range of 34 minutes, a 5.5- and 17-minute reduction, respectively. Delays were most apparent at Drummoyne but were also apparent at Northmead and Gladesville.

The best travel times and lowest uncertainty travelling to Baulkham Hills were at 11pm with a median travel time of 32 minutes and an interquartile range of 11 minutes, similar to 2019. The longest median travel times and greatest uncertainty were at 4 and 5pm, respectively, in the afternoon peak with a median of 45 minutes and an interquartile range of 43 minutes, improvements of 8 and 19.5 minutes. Delays were most apparent at Ryde, Rydalmere and Toongabbie.

Both directions experienced elevated uncertainty throughout business hours, especially in the direction to Rozelle.



20:00

16:00

12:00

Hour of day

Figure A.12 A40 route median and interquartile range travel times

0:00

4:00

8:00

0-

Source: BITRE estimates.

A6 - Carlingford to Padstow / Padstow to Carlingford

This route traverses Sydney linking Carlingford and Padstow roughly parallel to but more Westerly than the A3. It passes Rydalmere, Lidcombe and Bankstown. This route intersects with the M2, M4 and M7 motorways and passes the Chullora precinct.





Source: BITRE estimates.

Table A.7	A6 route travel	times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Carlingford to Padstow	0:22:48	0:29:25	1.099	0:10:23	0:21:45	1.47	19.9
Padstow to Carlingford	0:22:52	0:30:15	1.199	0:11:21	0:27:50	1.683	20.1
Source: BITRE estimates.							

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The best travel times and lowest uncertainty travelling from Carlingford were at 10 and 8pm with a median travel time of 23 minutes and an interquartile range of 10 minutes, similar to 2019. The longest median travel times were again at 2am with a median of 29 minutes and the most uncertainty now also at 2am with an interquartile range of 22 minutes, 3 and 8 minutes less than 2019. There was also a distinct morning peak. Delays were most apparent at Silverwater and Bankstown.

The best travel times and lowest uncertainty travelling to Carlingford were at 4 and 5am with a median travel time of 23 minutes and an interquartile range of 11 minutes, similar to 2019. The longest median travel times and greatest uncertainty were at 5 and 3pm in the afternoon peak with a median of 30 minutes and an interquartile range of 28 minutes, 5 and 8 minutes down on 2019. Delays were most apparent at Punchbowl and Dundas Valley. The afternoon peak is now larger than the morning peak.

Like the A3 and the A6 still shows a third early morning peak in both directions. This 'third peak' showed delays spread throughout the route but slightly more apparent at locations that also saw delays during peak periods. The reasons for this third peak are not apparent.

Figure A.14 A6 route median and interquartile range travel times











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.





Source: BITRE estimates.

Table A.8 M1 (North) route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Cahill Expressway to M2	0:05:58	0:09:20	1.18	0:00:44	0:08:47	5.333	7.3
M2 to Cahill Expressway	0:05:42	0:08:45	1.222	0:00:37	0:18:16	12.58	7.3
Source: BITRE estimates.							

The best travel times and lowest uncertainty travelling from the CBD (Cahill Expressway) to the M2 were at 4am with a median travel time of 44 seconds and an interquartile range of 1.5 minutes, similar to 2019. The longest median travel times and greatest uncertainty were at 3pm with a median of 9.5 minutes and an interquartile range of nearly 9 minutes. Both best and worst times were similar to 2019 even whilst the METR improved and MEUR deteriorated substantially. Delays were more apparent on the Cahill Expressway and in the Sydney Harbour Tunnel.

The best travel times and lowest uncertainty travelling from the M2 to the CBD were at 5am with a median travel time of 6 minutes and an interquartile range of less than a minute. The longest median travel times and greatest uncertainty were at 6pm with a median travel time of 9 minutes and an interquartile range of just over 18 minutes, 4.5 and 12 minutes down on 2019. There appear to be spikes in uncertainty throughout the day, but this is likely just due to relatively sparse data. Delays in both peaks were apparent in the Sydney Harbour Tunnel but not on Warringah Expressway near Neutral Bay and North Sydney as in 2019.

Figure A.16 M1 (North) route median and interquartile range travel times



Source: BITRE estimates.

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Freight congestion in 2020 Australian Cities

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

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







Table A.9	M1 (South) route travel times and congestion measures, 2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Cahill Expressway to M5	0:10:14	0:13:47	1.101	0:02:16	0:10:56	2.415	12.1
M5 to Cahill Expressway	0:10:18	0:15:05	1.092	0:02:04	0:18:20	2.213	12.0
Sources DITRE estimates							

Source: BITRE estimates.
The best travel times and lowest uncertainty travelling from the CBD (Cahill Expressway) to the M5 were at midnight and 5am with a median travel time of over 10 minutes and an interquartile range of 2 minutes, similar to 2019. The longest median travel times and greatest uncertainty were at 6pm with a median of 14 minutes and an interquartile range of 11 minutes, both marked improvements (5 and 7 minutes) on 2019. Delays were most apparent at the northerly and southerly extremes of the route on General Holmes Drive and the Eastern Distributor.

The best travel times and lowest uncertainty travelling from the M5 to the CBD (Cahill Expressway) were at 9 and 8 pm with a median travel time of over 10 minutes and an interquartile range of 2 minutes. The longest median travel times were in the morning peak at 7am with a median of nearly 15 minutes (12 minutes down on 2019), and uncertainty at 9am with an interquartile range of over 18 minutes (16 less than 2019). Delays in both peaks were most apparent in the southerly part of the route with particular delays near where General Holmes Drive meets Southern Cross Drive.

Like the M1 North, journeys towards the CBD showed much more distinct peak periods than the journey out of the CBD.



Figure A.18 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 M2 via the M2 motorway and the Lane Cove Tunnel. It is an important route for both commuter and freight traffic.

Figure A.19 M2 route map



Source: BITRE estimates.

Table A.10 M2 route travel times and congestion measures, 202

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
M1 to M7	0:17:24	0:20:21	1.039	0:03:40	0:14:47	1.863	24.5
M7 to M1	0:16:50	0:22:06	1.074	0:03:28	0:20:31	2.177	24.3

The best travel times travelling from the M1 to the M7 were at 7pm with a median travel time of over 17 minutes and the lowest uncertainty were at 7am with an interquartile range of nearly 4 minutes. However, there was little variation from 2am to 2pm and no morning peak. The longest median travel times and greatest uncertainty were at 4pm with a median of 20 minutes and an interquartile range of 15 minutes, and an improvement of 4.5 minutes on 2019. Delays were most apparent at the eastern end of the route and 2019 notable delays near Windsor Road were still visible but only in the afternoon peak. Delays near Pennant Hills Rd were no longer apparent.

The best travel times and lowest uncertainty travelling from the M7 to the M1 (Gore Hill Expressway) were at 5am with a median travel time of 17 minutes and an interquartile range of 3.5 minutes. The longest median travel times and greatest uncertainty was 22 minutes at 8am and the greatest uncertainty interquartile range of 20.5 minutes at 8am, similar to 2019. There was also a distinct peak of uncertainty, but not median time, during the evening. Delays were most apparent when approaching to the Lane Cove Tunnel at Macquarie Park.



Figure A.20 M2 route median and interquartile range travel times

M4 - Glenbrook to Strathfield / Strathfield to Glenbrook

This route runs connects the A32 at Glenbrook with the former terminus of the M4 at Strathfield. It intersects with several north–south routes 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.21 M4 route map

Source: BITRE estimates.

Table A.11	M4 route travel times and congestion measures, 2	020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Glenbrook to Strathfield	0:31:28	0:33:47	1.031	0:04:05	0:12:23	1.543	45.8
Strathfield to Glenbrook	0:31:26	0:35:57	1.025	0:05:35	0:14:13	1.199	45.8
Source: BITRE estimates.							

The best median travel times and lowest uncertainty travelling from Glenbrook to Strathfield were at 4am with a median travel time of 31 minutes and an interquartile range nearly 4 minutes. The longest median travel times and greatest uncertainty were in the morning peak at 7am with a median nearly 36 minutes and an interquartile range of just over 12 minutes, similar to 2019. Delays, though mild, were distributed evenly along the route.

The best median travel times from Strathfield to Glenbrook were 31 minutes at 4am and the lowest uncertainty were at 9am with an interquartile range of 5.5 minutes. The longest median travel times and greatest uncertainty were in the afternoon peak at 5pm with a median of 36 minutes and an interquartile range of just over 14 minutes, both slight improvements on 2019. Delays in the afternoon peak were most apparent between Silverwater and Wentworthville.

Travel times and uncertainty were very similar in both directions throughout most of the day except during the morning peak heading towards Strathfield or the afternoon peak heading towards Glenbrook. Delays in median travel times were more apparent heading towards Glenbrook.

Figure A.22 M4 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.23 M5 route map

Source: BITRE estimates.

Table A.12	M5 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hume Motorway to M1	0:20:55	0:27:28	1.068	0:05:50	0:27:11	1.816	29.3
M1 to Hume Motorway	0:21:09	0:32:19	1.07	0:04:00	0:29:14	2.227	29.3

Source: BITRE estimates.

Australian Cities

The best median travel times and lowest uncertainty for journeys from the Hume Motorway to the M1 were 21 minutes at 4am and an interquartile range of 6 minutes. The longest median travel times and greatest uncertainty was 27 minutes in the morning peak at 7am with an interquartile range of over 27 minutes, 10 and 5 minutes less, respectively, than in 2019. Delays were most apparent at the easterly end of the route, especially towards the mouth of the M5 tunnel. There was another, smaller afternoon peak.

The best median travel times and lowest uncertainty for journeys from the M1 to the Hume Motorway were at 5am at 21 minutes an interquartile range of nearly 4 minutes. The longest median travel times and lowest uncertainty were at 5pm with a median of just over 32 minutes and an interquartile range of 29 minutes, down 9 and 4 minutes, respectively, on 2019. Delays were again most apparent at the easterly end of the route, but more strikingly in the west between Milperra and Moorebank.

Unlike the eastbound route, the westbound route exhibited no significant morning travel peak. However, there was a clear heightened uncertainty in the early morning which was also evident in 2019.

Figure A.24 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.





Source: BITRE estimates.

Table A.13	M7 route travel times and congestion measures, 2	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
M2 to M5	0:23:47	0:33:01	1.058	0:02:39	0:19:47	2.07	38.4
M5 to M2	0:24:07	0:29:48	1.046	0:03:07	0:18:09	2.066	38.5

The best median travel times for journeys from the M2 to the M5 (Hume Motorway) was nearly 24 minutes at 1am and the lowest uncertainty were at 4am with an interquartile range of 3 minutes. The longest median travel times and greatest uncertainty were in the afternoon peak at 4pm with a median of 33 minutes and an interquartile range of near 20 minutes, largely unchanged on 2019. Delays were most apparent midway along the route around Eastern Creek, south of the M4 Motorway. Travel time and uncertainty were relatively stable throughout the day except the peak in the afternoon.

The best median travel times from the M5 to the M2 were at 1am with a median of 24 minutes and the lowest uncertainty at 4am with an interguartile range of just over 3 minutes. The longest median travel times and highest uncertainty were in the morning peak at 6am with a median nearly 30 minutes and an interquartile range of 18 minutes, improvement on 2019 of about 6 minutes in both cases. There was also a smaller peak of uncertainty in the afternoon. Delays were most apparent near the beginning of the M7 near Baulkham Hills, but also apparent just south of Cecil Park.





Source: BITRE estimates.



Route 32 - Derrimut to Montrose / Montrose to Derrimut

This surface route crosses Melbourne linking Derrimut in the West and Montrose in the east. Along its way, 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.27 Route 32 route map



Source: BITRE estimates.

Table A.14 Route 32 route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Derrimut to Montrose	1:09:58	1:24:34	1.112	0:44:40	1:26:19	1.426	52.9
Montrose to Derrimut	1:12:57	1:23:34	1.08	0:53:57	1:24:01	1.224	53.1
Source: BITRE estimates.							

The best median travel times and least uncertainty for journeys from Derrimut to Montrose were at 4am with a median travel time of 1 hour 10 minutes and an interquartile range of 45 minutes. The longest median travel times and greatest uncertainty were at 3pm with a median of 1 hour 25 minutes (a 9-minute improvement) and an interguartile range of 1 hour 26 minutes (a 151-minute improvement).

The best median travel time and least uncertainty for journeys from Montrose to Derrimut were at 5am with a median travel time of 1 hour 13 minutes and an interquartile range of 54 minutes. The longest median travel times and greatest uncertainty were at 3pm with a median of 1 hour 24 minutes and an interguartile range of 1 hour 24 minutes, significant improvements (14 minutes and one hour, respectively) on 2019.

The eastbound trip to Montrose and the westbound trip to Derrimut were similar in terms of travel time, travel time uncertainty and their patterns over the day. Elevated travel time and uncertainty were observed during business hours in both directions. There were no pronounced peaks in either direction but some signs of higher congestion around midnight. Delays were most noticeable around the CBD.





16:00

12:00 Hour of day 20:00

50 -

0-

0:00

Source: BITRE estimates.

4:00

8:00

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.





Source: BITRE estimates.

Table A.15	Route 55 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hume Freeway to Montague St	0:33:41	0:42:03	1.122	0:19:56	1:12:09	1.809	28.0
Montague St to Hume Freeway	0:34:51	0:44:22	1.114	0:19:46	1:02:21	1.808	28.0
Source: BITRE estimates.							

The best travel times and lowest uncertainty for journeys from the Hume Freeway to Montague Street were at 3am with a median travel time of 34 minutes and an interquartile range of 20 minutes. The longest median travel times were 42 minutes at 4pm and the greatest uncertainty were at 10 am with an interquartile range of 1 hour 12 minutes, a large improvement (11 minutes and over half an hour) on 2019. Delays were fairly evenly spread along the route but somewhat more apparent near the CBD and the M80 (Metropolitan Ring Road) at Broadmeadows.

The best median travel times for journeys from Montague Street to the Hume Freeway were 35 minutes at 5am and the lowest uncertainty was at midnight with an interquartile range of 20 minutes. The longest median travel times was 44 minutes at 4pm and the highest uncertainty were at 10am with an interquartile range of 1 hour 2 minutes (1 and 15 minutes down on 2019). Delays were spread fairly evenly throughout the route but slightly more apparent near south of Coburg.

Median travel times were similar in both directions throughout the day and uncertainty was also heightened throughout business hours, with distinct peaks in the morning.

Figure A.30 Route 55 route median and interquartile range travel times



Hume Freeway to Montague St





Route 56 - Laverton to Spotswood / Spotswood to Laverton

This surface route travels a short distance 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.31 Route 56 route map



Source: BITRE estimates.

Table A.16	Route 56 route travel times and congestion measures, 2	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Laverton to Spotswood	0:13:13	0:16:13	1.116	0:06:32	0:11:47	1.325	9.1
Spotswood to Laverton	0:13:27	0:16:56	1.112	0:07:10	0:14:43	1.4	9.1
Source: BITRE estimates.							

2020

The best travel times and lowest uncertainty travelling from Laverton to Spotswood were at midnight with a median travel time of 13 minutes and an interquartile range of 6.5 minutes. The longest median travel times and greatest uncertainty were at 2pm with a median of 16 minutes and an interquartile range of 12 minutes, slightly longer than 2019. Delays were most apparent on Blackshaws Road in Altona North and through Laverton. Travel time and uncertainty were heightened throughout business hours.

The best travel times and lowest uncertainty travelling from Spotswood to Laverton were at 3am with a median travel time of 13 minutes and an interquartile range of 7 minutes. The longest median travel times and highest uncertainty were in the afternoon peak at 2pm with a median of 17 minutes and an interquartile range of 15 minutes, similar to 2019. Delays were fairly evenly spread along the route but were slightly more pronounced towards Laverton.

The "third peak" observed in 2019 was less apparent. This route otherwise saw little change from 2019, possibly due to relatively less commuter traffic compared to other routes.

Figure A.32 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 crosses large part of Melbourne's northern fringe connecting Mickleham Road in the west and the intersection of Gorge Road and Yan Yean Road near Plenty in the east. It uses Somerton Road, Cooper Street, High Street and McDonalds Road.





Table A.17	Route 58 route travel times and congestion measures, 20	20
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Greenvale to Yan Yean Road	0:26:00	0:34:11	1.098	0:13:53	0:32:45	1.42	22.6
Yan Yean Road to Greenvale	0:25:50	0:32:17	1.105	0:13:22	0:30:51	1.576	22.2
Source: BITRE estimates.							

The best median travel time and lowest uncertainty travelling from Greenvale to Yan Yean Road were at 8pm with a median of 26 minutes and an interquartile range of 14 minutes. The longest median travel times and greatest uncertainty were in the afternoon peak at 3pm with a median of 34 minutes and an interquartile range of nearly 33 minute, down 1 and 5 minutes from 2019. Delays were spread evenly along the route but somewhat more apparent in High Street Epping.

The best median travel time travelling from Yan Yean Road to Greenvale were at 4am with a median of 26 minutes and the lowest uncertainty were at 2am with an interguartile range of 13 minutes. The longest median travel times and uncertainty were in the afternoon peak at 3pm with a median of 32 minutes and an interquartile range of 31 minutes, down 3 and 17 minutes from 2019. Delays were slightly more apparent near South Morang.

Figure A.34 Route 58 route median and interquartile range travel times



16:00

12:00

Hour of day

20:00

Source: BITRE estimates.

0:00

4:00

8:00

20 -

0-

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 south Melbourne. It serves extensive freight areas around Port Melbourne and in Melbourne's west.

Figure A.35 M1 (West) route map





Table A.18 M1 (West) route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
City to M80	0:07:18	0:10:57	1.159	0:01:35	0:12:08	2.98	9.0
M80 to City	0:07:23	0:08:47	1.079	0:01:41	0:04:44	2.003	9.0
Courses DITDE estimates							

The best travel times and lowest uncertainty travelling from the City to the Western Ring Road (M80) were at 5am with a median travel time of 7 minutes and an interquartile range of 95 seconds. The longest median travel times and greatest uncertainty were in the afternoon peak at 4pm with a median of 11 minutes and an interquartile range of 12 minutes, improvements of 7 minutes in both cases. Delays were spread evenly along the route, but were most severe in Yarraville, rather than near Port Melbourne as in 2019.

The best median travel times and lowest uncertainty for journeys from the Western Ring Road (M80) to the CBD were at 5am with a median travel time of over 7 minutes and an interquartile range of 101 seconds. The longest median travel times and highest uncertainty were in evening at 9pm with a median of 9 minutes and an interquartile range of 5 minutes, down 5 and 11 minutes from 2019.

The CBD bound route retained its single morning peak of travel time and uncertainty, whereas the reverse trip, which had two peaks in 2019, in 2020 had no distinct peaks.



Figure A.36 M1 (West) 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 fringes. It serves light industrial areas around Dandenong and interregional freight from Gippsland. For most of its length it is known as the Monash Freeway.





Source: BITRE estimates.

Table A.19 M1 (East) route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
City to M420	0:26:32	0:34:02	1.038	0:04:19	0:29:16	2.014	36.0
M420 to City	0:26:26	0:29:16	1.04	0:04:34	0:13:23	1.881	36.5

The best travel times and lowest uncertainty travelling from the CBD to Dandenong were at 5am with a median travel time of 27 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were in the afternoon peak at 4pm with a median of 34 minutes and an interquartile range of 29, improvements of 25 and 43 minutes, respectively, from 2019, amongst the largest in this report. Delays were most apparent near Kooyong and Glen Iris and speeds largely improved closer to Dandenong, with the exception of delays around Burke Road in Camberwell.

The best travel times and lowest uncertainty travelling from Dandenong to the CBD were at 2 and 4am with a median travel time of 26 minutes and an interquartile range of 4.5 minutes. The longest median travel times were in the morning peak at 6am with a median of 29 minutes and the greatest uncertainty was at 5pm with an interquartile range of 13 minutes, improvements of 17 and 43 minutes from 2019. Distinct peaks in travel time were effectively eliminated while peaks in uncertainty reduced.





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.39 M2 route map



Source: BITRE estimates.

Table A.20	M2 route travel times and	congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
CityLink then Tullamarine	0:14:42	0:15:18	1.02	0:01:28	0:04:51	1.676	19.8
Tullamarine then CityLink	0:14:30	0:14:54	1.012	0:01:13	0:03:04	1.611	19.8

The best travel times and lowest uncertainty from the City to the Airport were at 4am and midday with a median travel time of 15 minutes and an interquartile range of 88 seconds respectively. The longest median travel times and greatest uncertainty were in the evening at 10pm with a median travel time of 15 minutes an interquartile range of 5 minutes. However, there were no distinct peaks or variation throughout the day.

The best travel times and lowest uncertainty from the Airport to the CBD were at 5am and 1pm with a median travel time of 14.5 minutes and an interquartile range of 73 seconds. The longest median travel times were in the morning peak at 8am, only 24 seconds longer than the best travel times. Uncertainty was greatest at 8am with an interquartile range of 3 minutes, a marked reduction from 2019 (6 minutes).

In both directions delays were most apparent close to the M1.

Figure A.40 M2 route median and interquartile range travel times





2020

M3 - Frankston to Hoddle St / Hoddle St to Frankston

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

Figure A.41 M3 route map



Table A.21	M3 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Frankston to Hoddle St	0:33:59	0:36:09	1.027	0:04:08	0:09:27	1.639	53.0
Hoddle St to Frankston	0:34:02	0:41:13	1.037	0:04:32	0:27:11	1.869	53.3
Source: BITRE estimates.							

The best median travel times travelling from Frankston to Hoddle Street were 34 minutes at 1am and the lowest uncertainty were 2am with an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were in the afternoon at 5pm with a median of 36 minutes and an interquartile range of over 9 minutes, down 10 and 18 minutes on 2019. The morning peak evident in 2019 was eliminated. Delays were most severe near the Melba tunnel at Ringwood but delays near the city were no longer apparent.

The best travel times and lowest uncertainty travelling to Frankston were at 1am and midnight with a median travel time of 34 minutes and an interquartile range of 4.5 minutes. The longest median travel times and highest uncertainty were in the afternoon peak at 4pm with a median of 41 minutes and an interquartile range of 27 minutes, down 10 and 4 minutes on 2019. The afternoon peak was still apparent but reduced. Delays were most severe on the Eastern Freeway.

Figure A.42 M3 route median and interquartile range travel times



Frankston to Hoddle St

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.

M79 route map Figure A.43



Source: BITRE estimates.

Table A.22	M79 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Essendon to Gap Road	0:18:41	0:19:47	1.024	0:01:57	0:06:51	1.677	27.3
Gap Road to Essendon	0:17:00	0:18:10	1.045	0:01:43	0:05:00	1.677	27.2
Source: BITPE estimates							

The best median travel times and lowest uncertainty from Essendon to Gap Road were at 8pm with 19 minutes and an interquartile range of 2 minutes. The longest median travel times and highest uncertainty were in the afternoon peak at 5pm with a median of 20 minutes and an interquartile range of 7 minutes, down 3 and 6 minutes, respectively, from 2019. The afternoon peak was effectively eliminated.

The best travel times and lowest uncertainty travelling from Gap Road to Essendon were at 4am and 11pm with a median travel time of 17 minutes and an interquartile range of 103 seconds. The longest median travel times and greatest uncertainty were at 6am with a median of 18 minutes and an interquartile range of 5 minutes, down 1.5 and 3 minutes, respectively, on 2019. The morning peak was milder than 2019. Delays were most evident near the end of the motorway near the intersection with the Western Ring Road.

Figure A.44 M79 route median and interquartile range travel times



Source: BITRE estimates.

M80 - Altona to Greensborough / Greensborough to Altona

This 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.





Source: BITRE estimates.

Table A.23	M80 route travel times and congestion measures, 2	020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Altona to Greensborough	0:25:06	0:31:42	1.049	0:04:37	0:23:23	1.667	37.5
Greensborough to Altona	0:24:46	0:28:25	1.041	0:04:01	0:14:08	1.569	37.4
Source: BITRE estimates.							

The best travel times and lowest uncertainty for trips from Altona to Greensborough were at 4 and 1am with a median travel time of 25 minutes and an interquartile range of 4.5 minutes. The longest median travel times and greatest uncertainty were in the afternoon peak at 4pm with a median of 32 minutes and an interquartile range of 23 minutes, a reduction of 10 and 7 minutes, respectively on 2019. Delays were most evident near the end of the motorway at Bundoora with indications of delays near the intersections with the Westlink and Tullamarine Freeways. There was a mild morning peak with delays near Greensborough that was evident in 2019 but not in 2020.

The best travel times and lowest uncertainty for trips from Greensborough to Altona were at 4am with a median of 25 minutes and an interquartile range of 4 minutes. The longest median travel times and highest uncertainty were in the afternoon peak at 4pm with a median of 28 minutes and an interquartile range of 14 minutes, down 2 and 8 minutes, respectively, on 2019. The morning peak was effectively eliminated. Delays were most evident near the M8 (Western Freeway) at Derrimut.

Figure A.46 M80 route median and interquartile range travel times,



Altona to Greensborough

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).





Source: BITRE estimates.

Table A.24	Western Freeway route trave	times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Bacchus Marsh to Derrimut	0:21:45	0:23:04	1.04	0:02:35	0:07:18	1.807	35.7
Derrimut to Bacchus Marsh	0:22:49	0:27:27	1.053	0:03:52	0:19:29	1.922	35.6
Courses DITOE estimates							

The best travel times and lowest uncertainty travelling from Bacchus Marsh to Derrimut were at 3am with a median travel time of 22 minutes and an interquartile range of 2.5 minutes. The longest median travel times and greatest uncertainty were in the morning peak at 6am with a median of 23 minutes and an interquartile range of 7 minutes, similar to 2019. There is evidence of mild delays at Melton.

The best median travel times travelling from Derrimut to Bacchus Marsh were 23 minutes at midnight and the lowest uncertainty were at 5am with an interquartile range of 4 minutes. The longest median travel times and highest uncertainty were in the afternoon peak at 4pm with a median of 27 minutes and an interquartile range of 19 minutes, also similar to 2019. This peak was more pronounced than the increase in travel time uncertainty between 6 and 9am in the reverse direction and delays were concentrated close to where the motorway meets the Old Western Highway.

Overall this route displayed little change from 2019.

Figure A.48 Western Freeway route median and interquartile range travel times



Bacchus Marsh to Derrimut



M1 - Bruce Hwy to Pacific Motorway / Pacific Motorway to Bruce Hwy

This route crosses Brisbane from north to south. Travelling 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.49 M1 route map

Source: BITRE estimates.

Table A.25	M1 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Bruce Hwy to Pacific Motorway	0:24:06	0:25:42	1.02	0:02:14	0:08:14	1.435	37.7
Pacific Motorway to Bruce Hwy	0:23:45	0:36:28	1.067	0:01:43	0:26:54	3.19	37.5
Source: BITRE estimates							

The best travel times and least uncertainty heading south from the Bruce Highway to the Pacific Motorway were experienced at midnight with a median travel time of 24 minutes and an interquartile range of 2 minutes. The longest median travel times and most uncertainty were experienced in the afternoon peak at 4pm with a median of 26 minutes and an interquartile range of 8 minutes, improvements of 6 and 7 minutes, respectively, from 2019. Comparing to 2019, uncertainty in the afternoon peak was reduced but still apparent, but the travel time peak was eliminated.

The best travel times and lowest uncertainty heading north from the Pacific Motorway to the Bruce Highway were experienced at 7pm with a median travel time of 24 minutes and an interquartile range of 103 seconds. The longest median travel times and most uncertainty were experienced in the afternoon peak at 4pm with a median of 36 minutes and an interquartile range of 27 minutes, both of which were more severe than these of the southbound direction. Delays were most severe in the portion of the route north of Nudgee. The milder morning peak was largely eliminated but the afternoon peak remained largely unchanged.

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

Figure A.50 M1 route median and interquartile range travel times



Bruce Hwy to Pacific Motorway



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

This route consists of the Gateway Motorway section of the M2 linking the M1 and the Logan Motorway at Drewvale in Southern Brisbane.

Figure A.51 M2 (North) route map



Source: BITRE estimates.

Table A.26 M2 (North) route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Logan Motorway to Pacific Motorway	0:05:19	0:05:41	1.012	0:00:26	0:01:51	1.456	8.4
Pacific Motorway to Logan Motorway	0:05:08	0:05:22	1.017	0:00:20	0:00:42	1.485	8.3
Source: BITRE estimates.							

The best median travel time heading north from the Logan Motorway to the Pacific Motorway was 5 minutes at 4am and the least uncertainty were experienced at 7pm with an interquartile range of 26 seconds. The longest median travel times and greatest uncertainty were at 8am with median times of 5.5 minutes and an interquartile range of 2 minutes. There was a very mild peak in the morning at 7am but otherwise travel time and uncertainty were stable throughout the day time. High uncertainty during the night, as observed in 2019, was no longer apparent, supporting the supposition it was related to roadworks.

The best median travel times heading south from the Pacific Motorway to the Logan Highway were 5 minutes at 3am and the least uncertain travel times were experienced at 4am with an interquartile range of 20 seconds. The longest median travel times and most uncertainty were at 4pm with a median of 5.5 minutes and an interquartile range of 42 seconds. Like the northbound direction, travel times were stable during the day time and nighttime uncertainty were eliminated.

The best and longest travel time as well as the least and greatest uncertainty of both directions were the same or very similar with only seconds difference.

Figure A.52 M2 (North) route median and interquartile range travel times



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.





Source: BITRE estimates.

Table A.27 M2 (West) route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Gateway Motorway to Ipswich Motorway	0:10:15	0:10:48	1.02	0:00:53	0:03:02	1.477	16.1
Ipswich Motorway to Gateway Motorway	0:10:04	0:11:23	1.028	0:01:06	0:08:09	1.799	15.8
The best median travel times and lowest uncertainty heading west from the Gateway Motorway to the Ipswich Motorway were at 3am with a median travel time of 10 minutes and an interquartile range of 1 minute. The longest median travel times and highest uncertainty were at 7am with median times of 11 minutes and an interquartile range of 3 minutes. Travel times were relatively stable throughout the day.

The best median travel time heading east from the Ipswich Motorway to the Gateway Motorway were 10 minutes at 3am and the least uncertain travel times were experienced at 4am with an interquartile range of 1 minutes. The longest median travel times and the most uncertainty were experienced in the afternoon peak at 4pm with a median of 11 minutes and an interquartile range of 8 minutes, both of which were slightly down on 2019.

Travel times are relatively stable in both directions except during the afternoon peak for journeys heading east to the Gateway Motorway. Mildly increased travel time and uncertainty were present in both directions at night during 2019 but not 2020.

Figure A.54 M2 (West) route median and interquartile range travel times



Gateway Motorway to Ipswich Motorway

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.





Source: BITRE estimates.

Table A.28	M3-A3 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Airport Link to M1	0:13:05	0:19:19	1.158	0:04:52	0:18:06	1.866	13.0
M1 to Airport Link	0:11:15	0:15:34	1.19	0:02:12	0:12:17	3.263	13.0
Source: BITRE estimates.							

The best median travel times and least uncertainty heading north from the Airport Link to the Bruce Highway were at 5am and midnight with a median of 13 minutes and an interquartile range of 5 minutes. The longest median travel times and most uncertainty were experienced in the afternoon peak at 4 and 3pm with a median of 19 minutes and an interquartile range of 18 minutes down 1.5 and 4.5 minutes, respectively, on 2019. Delays were most significant at the southerly end of the A3 portion of the route near Chermside and at the southerly end of the M3 portion. Unusually amongst the routes in this report, travel time uncertainty increased gradually throughout business hours to a distinct afternoon peak, a pattern also evident in 2019, although congestion in the afternoon was reduced.

The best median travel times heading south from the M1 to the Airport Link was 11 minutes at 1am and the least uncertainty were experienced at 4am with an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were at 4pm in the afternoon peak with a median time of 16 minutes at an interquartile range of 12 minutes. Delays were most severe in the A3 section where it uses surface roads. As in 2019, travel time and uncertainty were slightly elevated throughout business hours rather than experiencing a distinct peak such as along the northbound route.

Figure A.56 M3-A3 route median and interquartile range travel times





Airport Link to M1



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.





Source: BITRE estimates.

Table A.29 M3 (South) route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Inner City Bypass to Pacific Motorway	0:16:00	0:21:28	1.055	0:02:47	0:17:50	2.059	20.1
Pacific Motorway to Inner City Bypass	0:14:58	0:19:23	1.088	0:01:25	0:11:30	3.096	20.1

The best travel times and the least uncertainty heading south to the Pacific Motorway were experienced at 7pm with a median travel time of 16 minutes and an interquartile range of 3 minutes. The longest median travel times and the greatest travel time uncertainty were at 3pm with a median of 21 minutes and an interquartile range of 18 minutes, reductions of 10 and 13 minutes respectively. There was also a milder and less prolonged morning peak. Delays were most severe near and south of the Brisbane River crossing and near the junction with the M1. The pattern of congestion was similar to 2019 but with much lower peaks in both congestion and uncertainty.

The best travel times and lowest uncertainty heading north from the Pacific Highway to the Inner City Bypass were experienced at 4am with a median travel time of 15 minutes an interquartile range of 85 seconds, both are very similar to 2019. The longest median travel times and the greatest range of variation were experienced during the morning peak at 8am with a median travel time of 19 minutes and an interquartile range of 11.5 minutes, down 6 and 9 minutes, respectively, from 2019. Like 2019, there were both morning and afternoon peak but both peaks were slightly lower in 2020. In both peaks, delays were most severe near the Brisbane River crossing.

Figure A.58 M3 (South) route median and interquartile range travel times



Inner City Bypass to Pacific Motorway

Pacific Motorway to Inner City Bypass



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.





Source: BITRE estimates.

Table A.30 M4 route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Gateway Motorway to Port of Brisbane	0:10:01	0:10:23	1.024	0:01:17	0:02:36	1.755	11.7
Port of Brisbane to Gateway Motorway	0:09:52	0:10:06	1.011	0:01:33	0:02:45	1.418	11.7
Source: BITRE actimates							

The best travel times and least uncertainty travelling to the Port were experienced at 3am with a median travel time of 10 minutes and an interquartile range of 77 seconds. The longest median travel times were at 8pm with a median of 10.5 minutes and the greatest uncertainty were experienced at 9pm with an interquartile range of 2.5 minutes. There were no distinct peak periods as this route has little or no commuter traffic.

The best median travel times travelling from the Port to the Gateway Motorway was 10 minutes at 10pm and the least uncertainty were experienced at 3am with an interquartile range of 1.5 minutes. The longest median travel times and the greatest uncertainty were experienced at 3 and 4 pm with a median of 10 minutes and an interquartile range of 3 minutes. Like the Port-bound route there were no distinct peak periods. There is little change over 2019 in travel time and uncertainty on this route.

Figure A.60 M4 route median and interquartile range travel times



Gateway Motorway to Port of Brisbane

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 is known at various points as the Inner City Bypass, Legacy Tunnel, Western Freeway and Centenary Highway.





Source: BITRE estimates.

Table A.31	M5 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Bowen Hills to Logan Motorway	0:18:28	0:24:46	1.071	0:04:35	0:23:12	1.647	24.1
Logan Motorway to Bowen Hills	0:18:36	0:22:22	1.056	0:04:03	0:14:14	1.622	24.2

The best travel times and least uncertainty travelling from Bowen Hills to the Logan Motorway were experienced at 5am with a median travel time of 18.5 minutes and an interquartile range of 4.5 minutes. The longest median travel times and greatest uncertainty were experienced in the afternoon peak at 4pm with a median of 25 minutes and an interquartile range of 23 minutes, down 4 and 25 minutes, respectively, on 2019. Apart from this period, both travel time and uncertainty were relatively stable throughout the day. Delays were most apparent on the Centenary Highway near where it crosses the Brisbane River. Whilst the afternoon peak from 2019 remained, travel times and especially uncertainty during the peak were lower in 2020.

The best median travel times travelling from the Logan Motorway to Bowen Hills were 19 minutes at midnight and the least uncertain travel times were experienced at 10pm with an interquartile range of 4 minutes. The highest median travel times and greatest uncertainty were experienced in the morning peak at 7am with a median of 22 minutes and an interquartile range of 14 minutes, down 4 and 13 minutes, respectively, from 2019. Like the southbound route, the peak of uncertainty was much more prominent than the peak of median travel time and also reduced by a larger amount in 2020. Delays were again most significant on the Centenary Highway near where it crosses the Brisbane River.

Figure A.62 M5 route median and interquartile range travel times



8:00

16:00

20:00

12:00

Hour of day

Bowen Hills to Logan Motorway

0:00

4:00

0-

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.63 M6 route map



Source: BITRE estimates.

Table A.32 M6 route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Gateway Motorway to Pacific Motorway	0:09:06	0:09:20	1.014	0:00:38	0:02:12	1.538	14.6
Pacific Motorway to Gateway Motorway	0:08:59	0:09:25	1.027	0:00:44	0:01:32	1.376	14.5
Source: BITRE estimates.							

The best median travel times travelling east from the Gateway Motorway to the Pacific Motorway was 9 minutes at 1am and the lowest uncertainty were experienced at 4am with an interquartile range of 38 seconds. The longest median travel times and highest uncertainty were experienced at 5pm with a median of 9.5 minutes and an interquartile range of 2 minutes. As in 2019 there was little variation in either measure throughout the day and no discernible peaks.

The shortest travel time and lowest uncertainty westbound from the Pacific Motorway to the Gateway Motorway were experienced at 4am with a median travel time of 9 minutes and an interquartile range of 44 seconds. The longest median travel times and greatest uncertainty were experienced in the morning peak at 7 and 6am with a median travel time of 9.5 minutes and an interquartile range of 1.5 minutes, down 2.5 and 6 minutes, respectively, from 2019. The distinct peak in the morning with delays near the western end of the route near the Gateway Motorway that was evident in 2019 was not apparent in 2020.

Figure A.64 M6 route median and interquartile range travel times



Gateway Motorway to Pacific Motorway

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.





Source: BITRE estimates.

M7-A7 route travel times and congestion measures, 2020 Table A.33

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Logan Motorway to Southern Cross Way	0:25:33	0:33:44	1.134	0:08:29	0:29:12	1.81	30.5
Southern Cross Way to Logan Motorway	0:26:10	0:34:01	1.122	0:09:28	0:26:52	1.577	30.5
Sources BITRE estimates							

The best travel times and lowest range of variation northbound from the Logan Motorway to Southern Cross Way were experienced at 4am with a median travel time of 26 minutes and an interquartile range of 8.5 minutes. The longest median travel times and greatest uncertainty were experienced at 7am in the morning peak with a median of 34 minutes and an interquartile range of 29 minutes, down 3.5 and 8 minutes, respectively, from 2019. Delays were most apparent on the surface section (Ipswich Road) of this route and the Ipswich Motorway near Oxley.

The best travel times and least uncertainty southbound from Southern Cross Way to the Logan Motorway were at 4am with a median travel time of 26 minutes and an interquartile range of 9.5 minutes. The longest median travel times and greatest range of variation were experienced in the afternoon peak at 4pm with a median of 34 minutes and an interquartile range of 27 minutes, down 3 and 5 minutes, respectively, from 2019. Congestion was most apparent near Route 2 at Rocklea.

Like 2019 the data exhibits morning and afternoon travel time peaks and uncertainty in both directions. The morning peak is more severe than the afternoon peak northbound to Southern Cross Way, but the opposite is true for the reverse journey. This makes the M7-A7 route one of the most symmetrical routes in this report.





Logan Motorway to Southern Cross Way



Route 2 - A7 to Gateway / Gateway to A7

This short 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.67 Route 2 route map



Source: BITRE estimates.

Table A.34	Route 2 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
A7 to Gateway	0:11:14	0:19:01	1.213	0:02:53	0:20:35	2.742	11.1
Gateway to A7	0:11:06	0:15:22	1.172	0:02:11	0:14:53	3.487	11.1
Courses DITOE estimates							

Eastbound from M7/A7 junction to the Gateway Motorway, the best travel times and lowest uncertainty were experienced at 3am with a median travel time of 11 minutes and an interquartile range of nearly 3 minutes. The longest median travel times and most uncertain travel time were experienced at 8am during the morning peak with a median of 19 minutes and an interquartile range of 21minutes, up 2 and 4.5 minutes, respectively, on 2019. Like 2019 there was also a prolonged afternoon peak. Delays were spread relatively evenly along the route but more apparent near the M3.

Westbound from the Gateway Motorway to the M7/A7 junction, the shortest median travel times and least uncertain travel time were at 3am with a median of 11 minutes and an interquartile range of 2 minutes. The longest median travel times and most uncertain travel times were experienced during the morning peak at 8am with a median of 15 minutes and an interquartile range of 15 minutes. There was also a similar afternoon peak. Again delays were more apparent near the M3 but also near Beaudesert Road in both peaks.

In both directions, average travel times were higher and the variation in travel greater during business hours. However, morning and afternoon peaks were more pronounced on the westbound route from the A7/M7 junction. The route was largely unchanged from 2019.





Source: BITRE estimates.



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.69 A14 route map



Source: BITRE estimates.

Table A.35 A14 route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Port Road to Southern Expressway	0:17:21	0:27:17	1.197	0:06:39	0:19:09	1.757	15.0
Southern Expressway to Port Road	0:18:37	0:23:08	1.128	0:07:28	0:17:10	1.65	15.0
Courses DITDE estimates							

For southbound trips, the lowest median travel times and uncertainty were at 6am with median travel times of 17 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were at 2am in the "third peak" with a median of 27 minutes and an interquartile range of 19 minutes, down 75 seconds and 15 minutes, respectively, on 2019. The morning and afternoon peaks witnessed in 2019 have been eliminated but the "third peak" with delays around Plympton remained.

The shortest median travel time and lowest travel time uncertainty northbound were at 1am and 11pm with a median travel time of 19 minutes and an interquartile range of 7.5 minutes. The longest median travel times were 23 minutes and the greatest travel time uncertainty with an interquartile range of 17 minutes, both at 3pm, down 3 and 5 minutes, respectively, on 2019. Unlike 2019 morning and afternoon peaks were not highly distinct although travel times and uncertainty were slightly elevated throughout business hours. There was a small "third peak" around 2am also apparent in this direction.

Figure A.70 A14 route median and interquartile range travel times



Port Road to Southern Expressway



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 in this report, but passes west of Adelaide Airport. This route is also known as Tapleys Hill Road.

Figure A.71 A15 route map



Source: BITRE estimates.

Table A.36	A15 route travel times and congestion measures, 2	020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
ANZAC Hwy to Port Road	0:12:57	0:17:24	1.139	0:01:39	0:09:58	3.366	13.1
Port Road to ANZAC Hwy	0:12:38	0:15:54	1.101	0:01:19	0:09:37	3.559	13.0
Source: BITRE estimates.							

2020

The best travel times and lowest uncertainty travelling north from Glenelg to Port Road were experienced at midnight with a median travel time of 13 minutes and an interquartile range of 2 minutes. The longest median travel times were in the afternoon peak at 5pm with a median of 17 minutes and the greatest uncertainty in the morning with an interquartile range of 10 minutes. Like 2019, there were two travel time peaks in 2020, but more equal than they were in 2019. Travel time uncertainty during business hours was higher than in 2019.

The shortest and least uncertain travel times southbound on the route were at midnight with a median travel time of 13 minutes an interquartile range of 79 seconds. The longest and most uncertain travel times were experienced in the afternoon peak at 3pm with a median time of 16 minutes and an interquartile range of 10 minutes, down 2 and 5 minutes, respectively, from 2019. Delays were fairly evenly distributed but were particularly evident near Sir Donald Bradman Drive and Grange Road.

The route exhibits significant travel time variability, in both directions, during business hours, presumably due to light vehicle traffic.



Figure A.72 A15 route median and interquartile range travel times

2020

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A16 - Hampstead Road to Outer Harbor / Outer Harbor to Hampstead Road

This route connects the Port of Adelaide, at Outer Harbor, and the 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.





Source: BITRE estimates.

Table A.37	A16 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hampstead Road to Outer Harbor	0:23:18	0:28:35	1.098	0:06:55	0:19:40	1.747	20.7
Outer Harbor to Hampstead Road	0:23:12	0:28:56	1.091	0:07:16	0:19:15	1.543	20.8
Source: BITPE octimator							

The best travel times and lowest uncertainty travelling from Hampstead Road to Outer Harbor were experienced at 4am with a median travel time of 23 minutes and an interquartile range of 7 minutes. The longest median travel times and the greatest uncertainty were in the afternoon peak at 4pm with a median travel time of 29 minutes and an interquartile range of 20 minutes. These were similar to 2019; however the morning peak was not as pronounced in 2020. Delays were spread fairly evenly along the route but more apparent on Grand Junction Road and most apparent near the intersection with the Princes Highway (A1) at Gepps Cross in the afternoon peak.

The best travel times and lowest uncertainty travelling from Outer Harbor to Hampstead Road were at 4am with a median travel time of 23 minutes and an interquartile range of 7 minutes. The longest median travel times and greatest uncertainty were experienced in the afternoon peak at 4pm with a median travel time of 29 minutes and an interquartile range of 19 minutes. This was also similar to 2019 but with a slightly smaller morning peak. Delays were also more apparent along Hampstead Road but most severe near Hampstead Road.

In both directions there was heightened uncertainty throughout business hours.

Figure A.74 A16 route median and interquartile range travel times



Hampstead Rd to Outer Harbor



Source: BITRE estimates.

A17 - Grand Junction to SE Freeway / SE Freeway to Grand Junction

This route follows the A17 south from the A16 (Grand Junction Road) through Adelaide's eastern suburbs and connects to the South Eastern Freeway and Cross Road at Glen Osmond. The route traverses Hampstead Road, Ascot Avenue and Portrush Road along its length.





Source: BITRE estimates.

Table A.38	A17 route travel times and	congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Grand Junction to SE Freeway	0:14:05	0:18:03	1.087	0:01:29	0:10:33	3.197	13.6
SE Freeway to Grand Junction	0:14:10	0:20:12	1.161	0:01:59	0:16:01	3.457	13.6
Source: BITRE estimates.							

The best travel times and lowest uncertainty southbound were at 4 and 3am with a median travel time of 14 minutes and an interquartile range of 1.5 minutes. The longest median travel times and greatest uncertainty were in the morning peak at 8am with a median travel time of 18 minutes and an interquartile range of 10.5 minutes. Whilst the AM peak travel time and uncertainty were similar to 2019 levels, the afternoon peak disappeared, and peak uncertainty was down by 11 minutes. This is a rare example in this report of an afternoon peak improving more than a morning peak. Delays were fairly evenly distributed along the route.

The best travel times and lowest uncertainty northbound were at 3am with median times of 14 minutes and an interquartile range of 2 minutes. The longest median travel times and greatest uncertainty were experienced during the morning peak at 8am with a median of 20 minutes and an interquartile range of 16 minutes, an increase of 1.5 and 5 minutes, respectively, from 2019. There was also a smaller but more extended peak in the afternoon. Delays were fairly evenly distributed along the route but with indications of greater delays at the intersection with North East Road (A10). This was largely unchanged from 2019.

The route exhibits greater travel time uncertainty throughout business hours in both directions.

Figure A.76 A17 route median and interquartile range travel times



Grand Junction to SE Freeway



5

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.





Source: BITRE estimates.

Table A.39	A20 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Grand Junction Road to Sturt Highway	0:25:12	0:33:27	1.199	0:03:16	0:29:24	5.192	32.4
Sturt Highway to Grand Junction Road	0:25:24	0:33:54	1.172	0:06:18	0:25:34	2.484	32.6
Sources BITRE actimates							

The best travel times and lowest uncertainty on the northbound lanes were experienced at 2am with a median travel time of 25 minutes and an interquartile range of 3 minutes. The longest median travel times were at 4pm with a median of 33 minutes and the greatest uncertainty were at 5pm with an interquartile range of 29 minutes. There was a distinct afternoon peak in uncertainty but not travel times. Delays were more apparent at the beginning of the route.

The best travel times and the lowest uncertainty travelling south were at 3 and 4am with a median travel time of 25 minutes and an interquartile range of 6 minutes. The longest median travel times and the greatest uncertainty were, like the reverse direction, experienced in the afternoon peak at 4pm with a median of 34 minutes and an interquartile range of 26 minutes. Delays were again more evident in the southern portions of the route.

This route, like other key routes in Adelaide, exhibits greater travel time uncertainty throughout business hours in both directions. Moreover, the increase in travel time variation is more significant than the increase in median travel times, suggesting that a small but significant proportion of road users experience significant delays on this route. Overall there was little change from 2019 although the "third peak" was slightly more apparent.

Figure A.78 A20 route median and interquartile range travel times,



Grand Junction Rd to Sturt Highway



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

This route follows the A22 north from Park Terrace at north Adelaide and meets the Princes Highway (A1, Port Wakefield Road) at Gepps Cross. It uses Churchill Road and Cavan Road, crossing Grand Junction Road (A16) along its way.





Source: BITRE estimates.

Table A.40	A22 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Park Terrace to Port Wakefield Road	0:08:30	0:09:48	1.084	0:02:14	0:05:25	1.626	7.7
Port Wakefield Road to Park Terrace	0:08:05	0:11:15	1.148	0:02:29	0:07:16	1.721	7.6
Source: BITPE estimates							

The best median travel time northbound from Park Terrace to Port Wakefield Road was 8.5 minutes at 5am and the lowest uncertainty were experienced at 9pm with an interquartile range of over 2 minutes. The longest median travel times and the greatest uncertainty were during the afternoon peak at 3pm with a median travel time of 10 minutes and an interquartile range of 5 minutes. Delays were slightly more apparent near the intersection with Park Terrace. These were largely unchanged from 2019.

The best median travel time travelling south was 8 minutes at 5am and the lowest uncertainty were at 6am with an interquartile range of 2.5 minutes. The longest median travel times and the greatest uncertainty were experienced during the "third peak" at 2am and 4pm with a median travel time of 11 minutes and an interquartile range of 7 minutes, down 2 and 8 minutes, respectively, on 2019. Although there was still a distinct afternoon peak in uncertainty this was much milder than 2019 and the median time afternoon peak had vanished. Delays were fairly evenly distributed along the route but were particularly evident near the CBD.

Figure A.80 A22 route median and interquartile range travel times



Park Terrace to Port Wakefield Rd

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.81 A3 route map



Source: BITRE estimates.

Table A.41	A3 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
ANZAC Highway to SE Freeway	0:09:33	0:14:10	1.205	0:02:48	0:12:29	2.49	8.7
SE Freeway to ANZAC Highway	0:09:08	0:14:18	1.275	0:02:03	0:14:04	3.535	30.5
Source: BITRE estimates							

The best travel times and lowest uncertainty travelling eastbound from ANZAC Highway to the South Eastern Freeway were experienced at 5 and 4am with a median travel time of 10 minutes and an interquartile range of 3 minutes. The longest median travel times were during the morning peak at 8am with a median travel time of 14 minutes and an interquartile range of 12.5 minutes experienced at 4pm, slightly down on 2019. Morning and afternoon peaks were similar. Delays were spread evenly along the route, but with indications of more apparent delays near South Road in the morning and closer to the South Eastern Freeway in the afternoon.

The best travel time and lowest uncertainty travelling west was at 4am with a median time of 9 minutes and an interquartile range of 2 minutes. The longest median travel times was 14 minutes experienced during the morning peak at 8am and the greatest uncertainty were at 4pm with an interquartile range of 14 minutes. Morning and afternoon peaks were similar and the main difference from 2019 was lower uncertainty in the afternoon peak and higher uncertainty in the morning peak. Delays were fairly evenly distributed along the route.



Figure A.82 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.





Source: BITRE estimates.

A9 route travel times and congestion measures, 2020 Table A.42

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Nelson St to Port Wakefield Road	0:08:21	0:08:41	1.013	0:01:24	0:02:59	1.396	10.2
Port Wakefield Road to Nelson St	0:08:13	0:09:19	1.083	0:01:51	0:04:57	1.763	10.2
Source: PITPE estimates							

The best travel times travelling east were experienced at 7pm with a median travel time of 8.5 minutes and the lowest uncertainty were at 11pm with an interquartile range of 1.5 minutes. The longest median travel times at 2am with a median of time only 20 seconds longer than the best time. The highest uncertainty was during the afternoon peak at 5pm with an interquartile range of 3 minutes. There was also a milder peak in uncertainty in the morning, similar to that in 2019, but the afternoon uncertainty peak was less pronounced than in 2019. Overall there was little variation over the day.

The best travel time and lowest uncertainty westbound was at 3am with a median time of 8 minutes and an interquartile range of 2 minutes. The longest and most uncertain travel times were at 7am with a median travel time of 9 minutes and an interquartile range of 5 minutes. Uncertainty was somewhat higher than 2019.

Figure A.84 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 and merging with 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.





Source: BITRE estimates.

A2-M2 route travel times and congestion measures, 2020 Table A.43

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Main South Road to Port River Expressway	0:34:42	0:46:36	1.098	0:08:04	0:36:26	2.101	40.1
Port River Expressway to Main South Road	0:33:13	0:43:48	1.119	0:07:00	0:33:26	2.31	39.8
Source: PITPE octimator							

The best median travel time travelling north from Noarlunga to the Port River Expressway was 35 minutes at 5am and the lowest uncertainty were experienced at 4am with an interquartile range of 8 minutes. The longest median travel times and the greatest uncertainty were at 4pm during the afternoon peak with a median travel time of 47 minutes and an interquartile range of 36 minutes, down 3 and 9 minutes, respectively, from 2019. Delays during both peaks were more apparent in the surface road sections west of the CBD and on the North-South Motorway.

The best travel times and the lowest uncertainty for southbound trips were at 4 and 5am with a median travel time of 33 minutes and an interguartile range of 7 minutes. The longest and most uncertain travel times were experienced during the afternoon peak at 4pm with a median of 44 minutes and an interguartile range of 33 minutes, down 2 and 7 minutes, respectively, from 2019. There was also a small increase in median travel times in the morning peak. Delays were most apparent on the surface route sections and the northern parts of the Southern Expressway.

In both directions there was increased uncertainty throughout business hours.

The locations of the travel delays suggest both directions were congested primarily due to afternoon traffic leaving inner parts of Adelaide in opposite directions. Compared to 2019, the afternoon peak reduced but the morning peak showed little change in both directions.





8:00

12:00

Hour of day

16:00

20:00

4.00

Main South Road to Port River Expressway

0:00

20 -

0 -



Route 1 - Roe Hwy to Tonkin Hwy / Tonkin Hwy to Roe Hwy

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 way. The BITRE telematics data shows it is a major route for freight heading north out of Perth.





Source: BITRE estimates.

Table A.44	Route 1 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Roe Hwy to Tonkin Hwy	0:26:37	0:29:31	1.054	0:04:24	0:08:55	1.681	34.5
Tonkin Hwy to Roe Hwy	0:23:17	0:26:38	1.107	0:02:16	0:05:32	1.588	34.5

The best travel times and least uncertainty travelling north were at 4am with a median time of 27 minutes and an interquartile range of 4.5 minutes. The longest median travel times and the greatest uncertainty were during the morning 11am with a median travel time of 29.5 minutes and an interquartile range of 9 minutes. Travel times and uncertainty were slightly higher throughout the day and were largely unchanged from 2019. Mild delays were more apparent in the southern part of the route near the Pearce RAAF Base at Bullsbrook.

The best travel times and the lowest uncertainty travelling south were at midnight and 4am with a median travel time of 23 minutes and an interquartile range of 2 minutes. The longest median travel times and the greatest uncertainty were experienced in the morning at 8 and 2am with a median of 27 minutes and an interquartile range of 6 minutes. There were no distinct peaks. The route was largely unchanged from 2019.





Roe Hwy to Tonkin Hwy

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 some traffic from the north coast of Western Australia.





Table A.45	Route 2 (Mitchell)	route travel times and	congestion measures, 20)20
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Hester Avenue to Swan River	0:23:19	0:35:35	1.121	0:01:56	0:26:44	4.1	35.9
Swan River to Hester Avenue	0:24:22	0:36:13	1.065	0:01:32	0:26:53	3.664	35.9
Source: BITRE estimates.							
The best travel time and lowest uncertainty southbound from Hester Avenue to the Swan River was at 3am with a median time of 23 and an interquartile range of 2 minutes. The longest median travel times and the greatest uncertainty were during the morning peak at 7 and 8am with a median travel time of 36 minutes and an interquartile range of 27 minutes, down 11 and 5.5 minutes, respectively, on 2019. There was also a smaller, but still significant, increase in travel time and uncertainty in the afternoon peak that was also less than in 2019. Like 2019 delays were most apparent in two sections: one near Edgewater (south of Joondalup) and the other near Stirling (closer to the CBD).

The best median travel time travelling north was 24 minutes at 5am and the lowest uncertainty were at 3am with an interquartile range of 1.5 minutes. The longest median travel times were at 4pm with a median travel time of 36 minutes and the greatest uncertainty were experienced at 5pm with an interquartile range of 27 minutes, slight increases from 2019. This afternoon peak was more congested than 2019 highlighting the lessened effect of COVID 19 led changes in commuting behavior on afternoon peaks. Unlike the southbound direction, there was no observable morning peak in northbound journeys, reflecting the significance of this route as a corridor for commuter's heading south towards the CBD. Congestion was again most apparent near Stirling.

Figure A.90 Route 2 (Mitchell) route median and interquartile range travel times



Hester Avenue to Swan River





Route 2 (Kwinana) - Forrest Hwy to Mitchell Hwy / Mitchell Freeway to Forrest Hwy

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.





Source: BITRE estimates.

Table A.46	Route 2 (Kwinana)	route travel times and	congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Forrest Hwy to Mitchell Hwy	0:45:44	0:52:04	1.046	0:05:19	0:29:35	2.245	70.7
Mitchell Freeway to Forrest Hwy	0:44:32	0:58:08	1.06	0:03:50	0:32:26	2.21	70.7
Source: BITPE actimates							

The best median travel time for northbound travel was 46 minutes at 2am and the lowest uncertainty were experienced at 1am with an interquartile range of 5 minutes. The longest median travel times and greatest uncertainty were experienced at 8 and 7am during the morning peak with a median of 52 minutes and interquartile range of 30 minutes, down 19 and 9 minutes on 2019. Travel times and uncertainty remained elevated throughout business hours but to a lesser extent than 2019. Delays were again most apparent immediately south of the Swan River and near the intersection with the Roe Highway at Leeming.

The best travel times and lowest uncertainty heading south were at 11pm with a median time of 45 minutes and an interquartile range of 4 minutes. The longest median travel times and the greatest uncertainty were experienced during the afternoon peak at 4pm with a median travel time of 58 minutes and an interquartile range of 32 minutes, up 5 and 8 minutes, respectively, on 2019. Unlike the northbound reverse route, travel time and uncertainty remained stable throughout the whole day except the peak hours in the afternoon, likely reflecting the significance of this route as a corridor for commuter traffic heading north towards the CBD. Like many afternoon peaks this route was largely unchanged from 2019 and actually saw an increase in peak period travel times and uncertainty.

Figure A.92 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.





Source: BITRE estimates.

Table A.47	Route 3 (Roe Highway) route travel times and congestion measures, 2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Great Northern Highway to Kwinana Freeway	0:25:34	0:29:37	1.052	0:06:57	0:16:34	1.314	34.1
Kwinana Freeway to Great Northern Highway	0:23:49	0:28:52	1.081	0:04:15	0:15:41	1.751	34.2
Source: BITRE estimates.							

The best median travel times and lowest uncertainty for southbound travel were at 1am and 11pm with a median of 26 minutes and an interquartile range of 7 minutes. The longest median travel times and the greatest uncertainty were during the afternoon peak at 4pm with a median travel time of 30 minutes and an interquartile range of 17 minutes. Like many afternoon peaks this did not change in 2020. Travel time and uncertainty remained elevated throughout business hours. As in 2019 delays were most apparent near intersections with Route 1 at Middle Swan, Route 4 at Forrestfield and the Kwinana Freeway (Route 2) at Leeming.

The best travel times and the lowest uncertainty travelling north were at 3 and 4am with a median travel time of 24 minutes and an interquartile range of 4 minutes. The longest median travel times and greatest uncertainty were at 7am with a median of 29 minutes and an interquartile range of over 16 minutes, slight increases compared to 2019.

Figure A.94 Route 3 (Roe Highway) route median and interquartile range travel times



Great Northern Highway to Kwinana Freeway

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.





Source: BITRE estimates.

Table A.48 Route 3 (Reid Highway) route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Mitchell Freeway to Tonkin Freeway	0:07:36	0:09:53	1.071	0:00:48	0:06:14	3.036	10.3
Tonkin Freeway to Mitchell Freeway	0:07:32	0:09:33	1.067	0:00:54	0:05:32	2.287	10.5

The best median travel time eastbound on the route was 8 minutes at 2am and the lowest uncertainty were experienced at 3am with an interquartile range of 48 seconds. The longest median travel times and greatest uncertainty were during the afternoon peak at 3 and 4pm with a median travel time of 10 minutes and an interquartile range of 6 minutes. There was also a smaller peak between 7 and 9am in the morning. Like 2019 delays were most apparent near the Kwinana Freeway but were largely unchanged.

The best median travel time travelling west was 7.5 minutes at 4am and the lowest uncertainty was at 1am with an interquartile range of 54 seconds. The longest median travel times and the greatest uncertainty were experienced during the afternoon peak at 4pm with 9.5 minutes and an interguartile range of 5.5 minutes respectively. Unlike 2019 there was a mild morning peak observed in westbound trips. Again delays were most apparent near the Kwinana Freeway, but the route was broadly similar to 2019.

Figure A.96 Route 3 (Reid Highway) route median and interquartile range travel times



20:00

16:00

12:00 Hour of day

4:00

8:00

Source: BITRE estimates.

0:00

5 -

0-

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.





Source: BITRE estimates.

Table A.49 Route 4 route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Great Northern Highway to Thomas Road	0:53:55	1:01:10	1.058	0:08:58	0:32:49	1.96	79.9
Thomas Road to Great Northern Highway	0:53:02	1:07:10	1.074	0:08:22	0:25:48	1.716	79.9

The best travel times and the lowest uncertainty for southbound travel to Thomas Road were experienced at 3am with a median travel time of 54 minutes and an interquartile range of 9 minutes. The longest median travel times and greatest uncertainty were experienced at 7am with a median of 1 hour 1 minute and an interquartile range of 33 minutes, both of which occurred during the morning peak and improved by 6 and 11 minutes, respectively, from 2019. There was a mild afternoon peak in uncertainty as well.

The best travel times for northbound trips were at 2 and 3am with a median travel time of 53 minutes and the lowest uncertainty were at 3am with an interquartile range of 8 minutes. The longest and most uncertain travel times were at 4pm in the afternoon peak with a median of 1 hour 7 minutes and an interquartile range of 26 minutes, down 2 and 5 minutes, respectively, from 2019. Like 2019, there was a "third peak" observed in between midnight and 2am, but in 2020 this was restricted to uncertainty, with median travel times unaffected. There was also a small increase in travel time uncertainty during the morning peak.

In both directions, as in 2019, delays were most apparent near the Swan River between Redcliffe and Bayswater. This was true for the morning, afternoon and "third" peaks.

Figure A.98 Route 4 route median and interquartile range travel times



8:00

4.00

12:00

Hour of day

16:00

20:00

Great Northern Highway to Thomas Rd

0-

0:00

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 the Stirling Highway, Mounts Bay Road, Riverside Drive and the Causeway.





Source: BITRE estimates.

Table A.50 Route 5 route travel times and congestion measures, 2020

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	0:21:07	0:28:09	1.204	0:03:31	0:18:21	3.479	20.3
Stirling Hwy, High Street to Great Eastern Highway	0:22:41	0:29:43	1.176	0:05:26	0:20:46	2.474	20.7
Courses DITDE estimates							

The best median travel time travelling from Burswood to Fremantle (i.e. Great Eastern Highway to Stirling Highway) was 21 minutes at 1am and the lowest uncertainty were experienced at 2am with an interquartile range of 3.5 minutes. The longest median travel times were experienced at 5pm with a median travel time of 28 minutes and the greatest uncertainty were at 4pm with an interquartile range of 18 minutes, down 1 and 11 minutes, respectively, from 2019. There were no distinctive peaks in travel time along this route and unlike 2019 uncertainty across business hours was elevated but stable. There may also be a sign of a third peak not evident in 2019.

The best travel times and the lowest uncertainty travelling in the reverse direction (from Fremantle to the CBD (and Burswood) were experienced at 2 and 3am with a median travel time of 23 minutes and an interquartile range of 5.5 minutes. The longest median travel times and greatest uncertainty were at 2pm with a median travel time of 30 minutes and an interquartile range of 21 minutes, down 2.5 and 6.5 minutes, respectively, from 2019. The distinct morning peak from 2019 was no longer evident and uncertainty was higher but stable throughout business hours. Delays were more apparent near the CBD and near Claremont.

Figure A.100 Route 5 route median and interquartile range travel times



Great Eastern Highway to Stirling Hwy, High St



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.





Source: BITRE estimates.

Table A.51 Route 6 route travel times and congestion me	easures, 2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Fremantle to Great Eastern Highway	0:18:08	0:24:35	1.139	0:06:19	0:20:13	1.745	16.0
Great Eastern Highway to Fremantle	0:16:33	0:23:58	1.177	0:02:48	0:18:21	3.194	15.8
Sources BITDE actimates							

The best travel times and the lowest uncertainty for eastbound travel to the CBD were experienced at 1am with a median travel time of 18 minutes and an interquartile range of 6 minutes. The longest median travel times and the greatest uncertainty were at 11am with a median travel time of 25 minutes and an interquartile range of 20 minutes. Travel time uncertainty gradually increased between 4am and 11am where it formed a distinct peak, which is not necessarily associated with commuter traffic flows, making this route unique in this report. There was also a smaller peak in the afternoon. This pattern was largely unchanged from 2019. Delays were more apparent closer to Fremantle.

The best median travel time travelling west to Fremantle was 17 minutes at midnight and the lowest uncertainty were experienced at 1am with an interquartile range of 3 minutes. The longest and most uncertain travel times were at 10am with a median time of 24 minutes and an interquartile range of 18 minutes. Like the reverse direction, and more distinctly than in 2019, there was a distinct peak in business hours, albeit earlier. Delays were fairly evenly distributed across the route.

Elevated median travel time and uncertainty were observed during business hours in both directions.

Figure A.102 Route 6 route median and interquartile range travel times



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.103 Route 7 route map



Source: BITRE estimates.

Table A.52	Route 7 route travel times and congestion measures,	2020
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Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Stirling Hwy to Tonkin Freeway	0:19:58	0:24:53	1.139	0:04:29	0:18:16	2.335	21.9
Tonkin Freeway to Stirling Hwy	0:21:58	0:25:49	1.075	0:05:21	0:18:59	2.134	22.1

The best and least uncertain travel times for eastbound trips from Fremantle to the Tonkin Freeway were at 2am with a median time of 20 minutes and an interquartile range of 4.5 minutes. The longest median travel times and the greatest uncertainty were during the morning peak at 8am with a median travel time of 25 minutes and an interquartile range of 18 minutes, similar to 2019. There were also smaller peaks in median travel time and travel time uncertainty in the afternoon. Delays were evenly distributed along the route but slightly more apparent around Welshpool.

The best median travel time for westbound travel from the Tonkin Freeway to Fremantle was 22 minutes at 1am and the lowest uncertainty were experienced at 3am with an interquartile range of 5.5 minutes. The longest median travel times 8am with a median of 26 minutes and the greatest uncertainty in the afternoon at 4pm with an interquartile range of 19 minutes. Similar to 2019, morning and afternoon peaks were of similar size, and the route was largely unchanged. Delays were more apparent near Fremantle and Welshpool.

Figure A.104 Route 7 route median and interquartile range travel times



Stirling Hwy to Tonkin Fwy

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.105 Route 8 route map



Source: BITRE estimates.

Table A.53 Route 8 route travel times and congestion measures, 2020

Direction	Best travel time	Longest median travel time	METR	Least uncertainty range	Most uncertainty range	MEUR	Distance
Canning Road to Mitchell Freeway	0:25:36	0:29:17	1.054	0:11:50	0:21:13	1.255	24.1
Mitchell Freeway to Canning Road	0:25:02	0:29:04	1.058	0:11:00	0:21:01	1.297	24.1

The best median travel time travelling west to the CBD (Canning Road to the Mitchell Freeway) was 26 minutes at 6am and the lowest uncertainty were experienced at 1am with an interquartile range of 12 minutes. The longest median travel times and the greatest uncertainty were at midnight with a median travel time of 29 minutes and an interquartile range of 21 minutes, down 2 and 3 minutes, respectively, from 2019. The reasons for these delays at a time that would ordinarily be assumed to be free running conditions are not apparent, but delays were most apparent on Orrong Road near Carlisle. This midnight peak was also evident in 2019.

The best travel times and the lowest uncertainty eastbound (Mitchell Freeway to Canning Road) were experienced at 11pm and 3am with a median travel time of 25 minutes and an interquartile range of 11 minutes. The longest travel times and greatest uncertainty was in the afternoon at 4 and 5pm with a median time of 29 minutes and an interquartile range of 21 minutes. This was largely unchanged from 2019. Delays were most evident near the Swan River crossing near the CBD.

Figure A.106 Route 8 route median and interquartile range travel times





Mitchell Fwy to Canning Rd



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 a few 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 interguartile 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 a 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 affect 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 nearly 190 million observations from over 5 000 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).



BITRE 2020, Freight route performance under COVID-19, Information Sheet 107, BITRE, Canberra. URL: https://www.bitre.gov.au/publications/2020/freight-route-performance-under-covid-19

BITRE 2021a, Freight vehicle congestion in Australia's five major cities - 2019, BITRE, Canberra. URL: https://www.bitre.gov.au/publications/2021/freight-vehicle-congestion-australias-five-major-cities-2019.

BITRE 2021b, BITRE Yulo telematics data project repository. URL: https://github.com/BITRE-Telematics/Yulo.

- BITRE 2021c, *Regional port catchment for road freight*, Information Sheet 110, BITRE, Canberra. URL: https://www.bitre.gov.au/publications/2021/regional-port-catchments-road-freight
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