

7. Assessment of key issues

7.2 Transport and traffic

This section provides a summary of the potential transport and traffic impacts that may be generated by construction and operation of the project and presents a proposed approach to the management of these impacts. **Table 7-28** outlines the SEARs that relate to transport and traffic and identifies where they are addressed in this EIS. The full assessment of transport and traffic impacts is provided in **Appendix F**.

Table 7-28 SEARs (transport and traffic)

Secretary's requirement	Where addressed in this EIS
6. Transport and traffic	
1. The Proponent must assess construction transport and traffic (vehicle, marine, pedestrian and cyclists) impacts, including, but not necessarily limited to:	Traffic management measures, haulage routes and construction traffic and access are discussed in Section 5.24.17 (Haulage routes and heavy vehicle movements)
a. a considered approach to route identification and scheduling of transport movements	
b. the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements)	Details of construction-related vehicles are presented in Section 7.2.5
c. construction worker parking	Construction worker parking is discussed in Section 7.2.5
d. the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements)	The existing transport and traffic environment is presented in Section 7.2.3 Existing network performance is presented in Section 7.2.4
e. access constraints and impacts on public transport, pedestrians and cyclists	Impacts on public transport, pedestrians and cyclists are assessed in Section 7.2.5 and Section 7.2.6
f. the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the project.	Road closures, detours and other temporary transport and traffic arrangements are discussed in Section 7.2.5
2. The Proponent must assess (and model) the operational transport impacts of the project, including:	Forecast demand and traffic volumes are presented in Section 7.2.6
a. forecast travel demand and traffic volumes for the project and the surrounding road, cycle and public transport network	
b. travel time analysis	Travel time analysis is presented in Section 7.2.6
c. performance of key interchanges and intersections by undertaking a level of service analysis at key locations	Level of service analysis is presented in Section 7.2.6
d. wider transport interactions (local and regional roads, cycling, public and freight transport)	Impacts on local and regional roads, active transport and freight transport are presented in Section 7.2.6 Cumulative wider transport interactions are presented in Section 7.2.7 .

Secretary's requirement	Where addressed in this EIS
e. induced traffic and operational implications for public transport (particularly with respect to strategic bus corridors and bus routes) and consideration of opportunities to improve public transport	<p>Consideration of induced traffic in the modelling of impacts is discussed in Section 7.2.2 and expected impacts in Section 7.2.6</p> <p>Potential impacts on public transport are discussed in Section 7.2.6</p>
f. impacts on cyclists and pedestrian access and safety	<p>Impacts on cyclist and pedestrian safety and access are presented in Section 7.2.5 and Section 7.2.6</p> <p>A more detailed discussion of health and safety impacts that may result from the project is provided in Section 8.3, including impacts associated with cyclist and pedestrian safety</p>
g. opportunities to integrate cycling and pedestrian elements with surrounding networks and in the project.	<p>The inclusion of the shared user path as part of the urban design for the project is discussed in Section 7.3.4</p> <p>The design of the shared user path is presented in Section 5.21</p> <p>The impacts associated with these facilities, including connections and integration, are discussed in Section 7.2.6</p>

7.2.1 Policy and planning setting

The transport and traffic assessment was carried out in accordance with the following relevant guidelines:

- Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads, 2013)
- Highway Capacity Manual 2010 (Transportation Research Board, 2010)
- Traffic Modelling Guidelines (Roads and Maritime, 2013)
- Guide to Traffic Generating Developments Version 2.2 (NSW Roads and Traffic Authority (RTA), 2002).

7.2.2 Assessment methodology

This section documents the assessment methodology carried out to determine the transport and traffic impacts of the project, including impacts of construction, operation and the cumulative impacts of the project in conjunction with other projects being planned and delivered in the vicinity of the project.

Operational assessment methodology

The operational component of the project was assessed both at 2026, with the opening of the Western Sydney Airport, and 2036, 10 years after the opening of the airport, to ensure that the opening year assessment included the traffic generated by the airport, and that the project would fulfil its objectives.

The transport and traffic assessment considered the following aspects of the transport network both during construction and operation:

- Regional and local road network – this was assessed using traffic modelling of the project to forecast traffic volumes, travel times and road network performance during both construction and operation, accounting for both changes in road network arrangements and traffic volumes

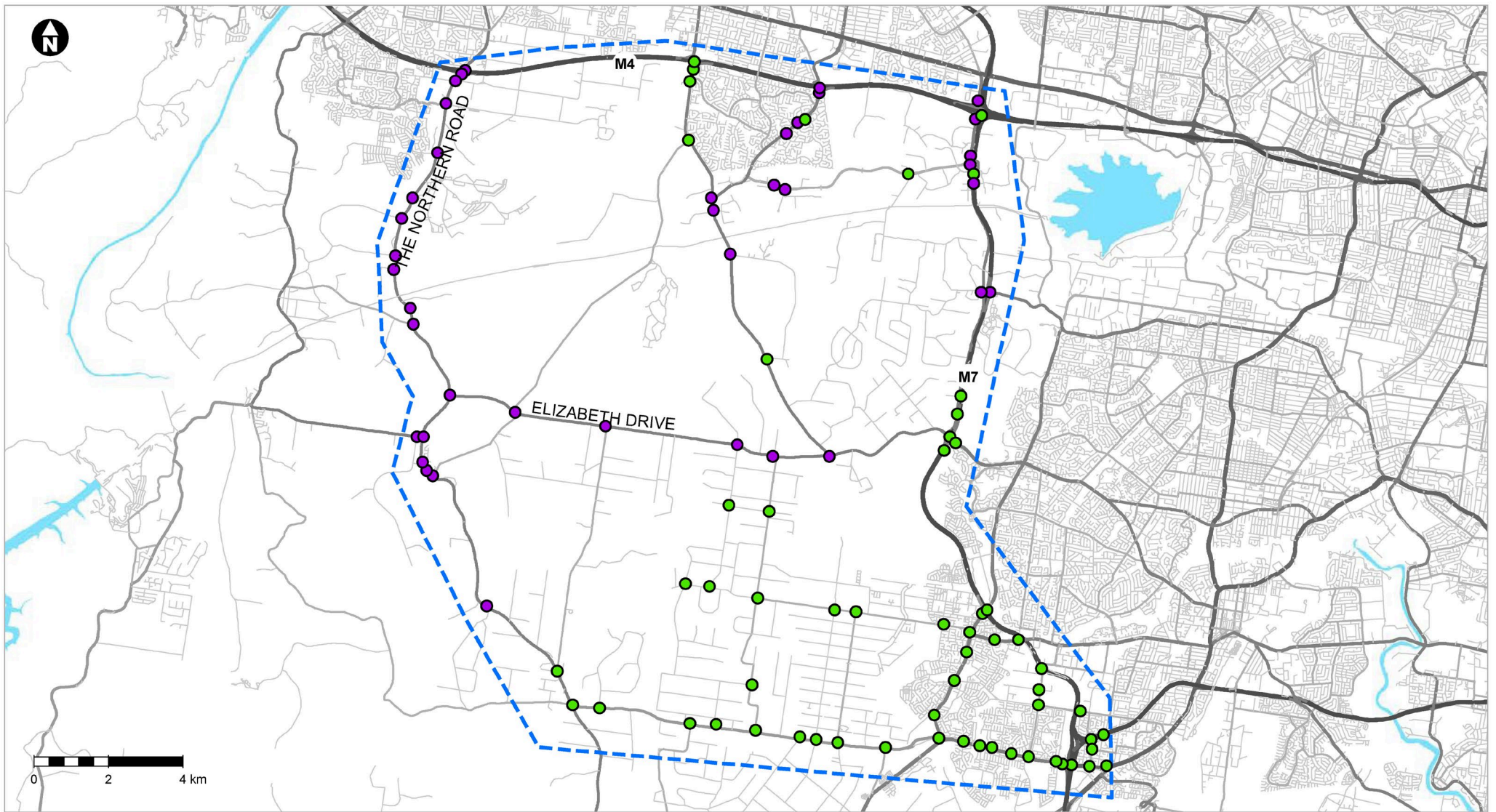
- Road safety – this was assessed through analysis of existing road safety trends and forecast traffic volumes during operation, and the effects of proposed construction activities on motor vehicles and sensitive road users (pedestrians and cyclists)
- Access to local roads and properties – this was assessed based on the changes to property access arrangements caused by the project during both construction and operation
- Public transport network – this was assessed using traffic modelling of the project to forecast changes in travel times that would impact on-road public transport during both construction and operation
- Freight network – this was assessed using traffic modelling of the project to forecast changes in travel times that would impact freight movement on the road network during both construction and operation
- Walking and cycling network – this was assessed through analysis of existing walking and cycling facilities and demands in operation and the impacts that construction would have on pedestrians and cyclists travelling through the study area
- Parking – this was assessed through analysis of any increase or loss in on-street and off-street parking as part of the project during both construction and operation.

Data collection and collation

The following data was collected to inform the existing conditions of the project footprint and surrounding traffic and transport environment:

- Intersection turning movement counts were carried out at key intersections shown in **Figure 7-13** during morning and evening peak periods between 2015 and 2017 (with analysis and adjustment of older counts to account for any growth in the interim)
- Automatic traffic counts were carried out at key locations shown in **Figure 7-14** between 2015 and 2018, providing a record of traffic volumes every hour over a 24-hour period
- Travel time surveys were carried out in 2017 along the following key corridors:
 - The M4 Motorway between The Northern Road and the M7 Motorway
 - The M7 Motorway between the M4 Motorway and Camden Valley Way
 - The Northern Road between the M4 Motorway and Bringelly Road, Bringelly
 - Mamre Road between the M4 Motorway and Elizabeth Drive
 - Luddenham Road between Mamre Road and Elizabeth Drive
 - Elizabeth Drive between The Northern Road and the M7 Motorway
 - Bringelly Road/Camden Valley Way between The Northern Road and the M7 Motorway
 - Cowpasture Road between Bringelly Road and the M7 Motorway
- Surveys of pedestrian and cyclist volumes on the M7 Motorway shared user path, at two locations adjacent to the Elizabeth Drive interchange and the pedestrian/cycle bridge across the motorway to Western Sydney Parklands, were carried out in 2019.

Traffic associated with the construction of the Western Sydney Airport is not included in the above data as surveys were carried out prior to the start of the airport construction works, which began in 2018. The peak construction period according to the WSA EIS is 2021 which is prior to the start of project construction. Publicly available data from the Western Sydney Airport EIS not presented in a format that can be incorporated into the project traffic model. Construction traffic was, therefore, addressed qualitatively (see **Section 7.2.7**).

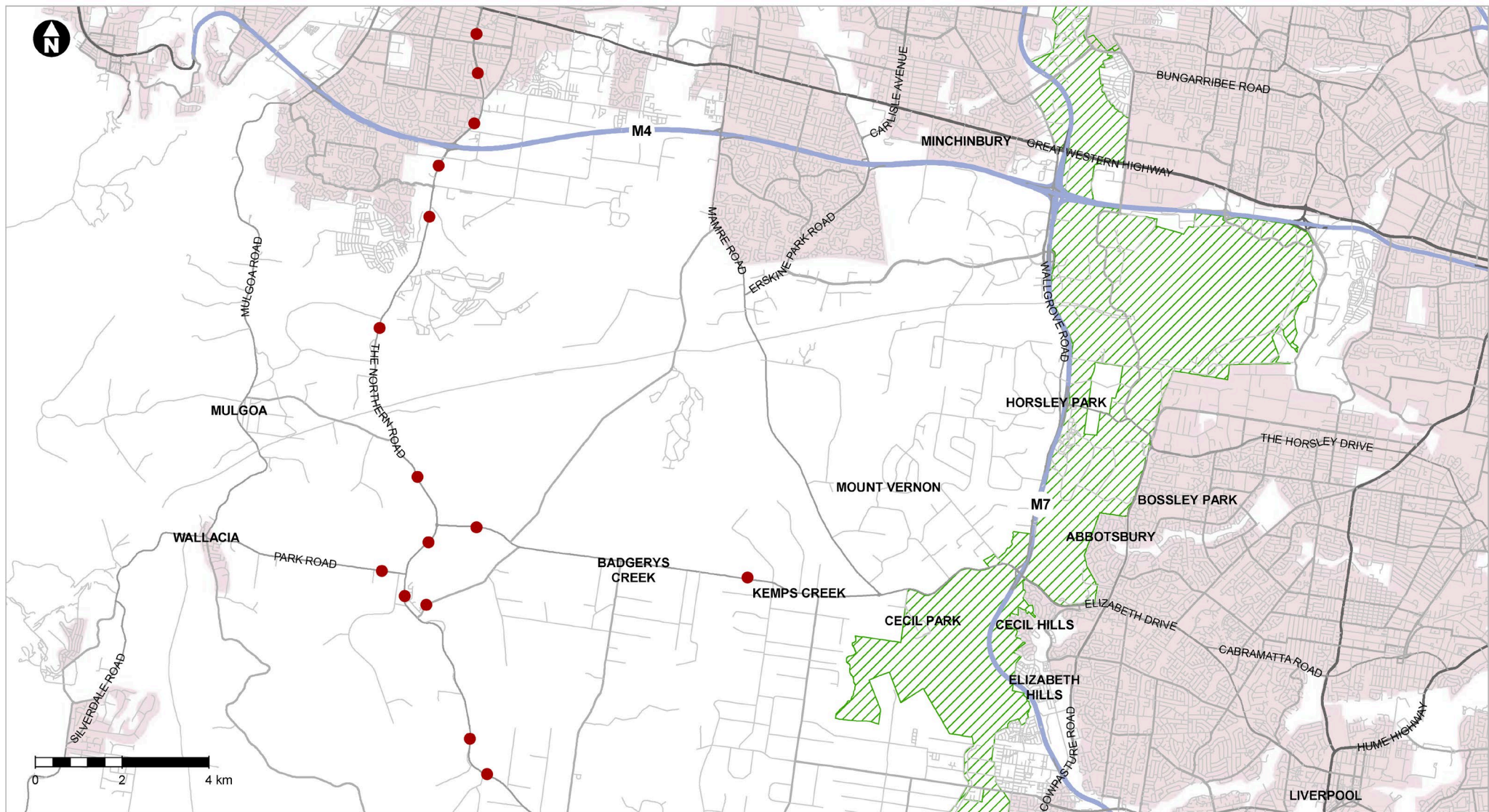


- Model area
- 2014-16 Counts
- 2017 Counts



Figure 7-13 Intersection count locations

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- Midblock counts
- ▨ Western Sydney Parklands
- Urban areas



Figure 7-14 Automatic traffic count locations

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The following data was also collated to inform model development and impact assessment:

- Census data from 2011 and 2016
- Population and employment forecasts were used to develop travel demand forecasts, supplied by TfNSW as part of the 2014 version of land use (population and employment) projections for the Sydney Greater Metropolitan Area produced by TfNSW (LU14 standard land use scenario); this 2014 land use data has been supplemented with traffic data from 2015 and 2017
- Existing and future bus routes, stopping patterns and frequencies were used to model bus routes through the wider study area, supplied by TfNSW
- Traffic generation and distribution for the Western Sydney Airport were used to refine traffic generation forecasts, supplied by WSA Co in early 2018
- Transport network project assumptions were used to develop the future year transportation networks, supplied by TfNSW
- Aerial photography was used to validate road network coding of existing condition in traffic and transport models.

Transport forecasting and modelling

Transport modelling is a fundamental component of the methodology used to assess the quantitative impacts of the project on the road network. It involves a multi-stage transport modelling approach to carry out a comprehensive assessment of the current and future performance of the project on the road network.

Transport modelling for assessment of the project was carried out by Roads and Maritime using a combination of the following models (see **Figure 7-15**):

- Sydney Strategic Travel Model (STM)
- WestConnex Road Toll Model (WRTM)
- Western Sydney Airport Growth Area mesoscopic traffic Model (WSAGA model).

Detailed information on these models and information sources are presented in Section 7.2.2 of **Appendix F**, and this information is summarised below.

Stage 1 – Sydney Strategic Travel Model

The STM forecasts travel demand in the future by using land use transport network inputs and land use assumptions, including the following:

- The demands of the Western Sydney Airport
- Population and employment projections
- Opening of the Sydney Metro Greater West by 2036
- Construction of the proposed Western Sydney Freight Line
- Provision of rapid bus services from the metropolitan centres of Penrith, Liverpool and Campbelltown to the Western Sydney Airport before it opens in 2026.

Stage 2 – WestConnex Road Toll Model

The WRTM uses car and heavy vehicle forecast numbers from the STM to forecast future traffic volumes and induced traffic demand for the years 2026 and 2036. As well as the data from the STM, the WRTM also:

- Refines the traffic predicted to occur from the operation of the Western Sydney Airport
- Anticipates future road infrastructure projects
- Considers driver behaviour, including patronage of toll roads.



Strategic Travel Model (STM)

GENERAL DESCRIPTION

Projects travel pattern across Sydney, Newcastle and the Illawarra under proposed land use, multi-modal transport, and pricing scenarios

PROJECT CONTEXT

Provides road traffic demands for more detailed assignment modelling within WRTM.



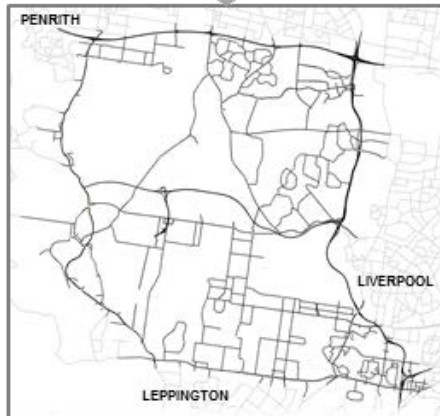
WestConnex Road Toll Model (WRTM)

GENERAL DESCRIPTION

Strategic road traffic forecasting model used to develop and evaluate Sydney motorway projects.

PROJECT CONTEXT

Inform project definition and evaluation, provide road traffic growth forecasts for input to operational traffic modelling.



Western Sydney Airport Growth Area (WSAGA) Traffic Model

GENERAL DESCRIPTION

More comprehensively evaluates the performance of the road network through simulating more complex traffic operations.

PROJECT CONTEXT

Evaluate the road network performance with and without the project.

Figure 7-15 Overview of transport modelling approach

Induced demand results from improved travel times between homes and destinations, such as workplaces, shopping centres and education facilities, which cause changes to region-wide trip patterns.

Even with no growth in regional population and economic activity, a new or substantially upgraded road can induce changes in trip patterns which then results in induced traffic demand. The WRTM includes the changes in traffic associated with this induced demand. Induced demand analysis carried out for the project showed that the impacts would be local, with the majority of (induced) traffic changes occurring within the core study area and negligible impact in or outside the wider study area. Induced demand would equate to about 0.2 per cent additional daily trips in the Sydney metropolitan area in 2036, which represents the change in utility across the network as a result of the project being built.

The WRTM was established in 2012 when the NSW Government announced the (then) proposed WestConnex project. Hence, 2012 is referred to as the 'base year' for the calibrated WRTM as referred to in this assessment.

Stage 3 – Western Sydney Airport Growth Area mesoscopic traffic Model

The WSAGA model uses the forecast toll patronage data information from the WRTM to model more detailed operation of the road network during peak periods. This includes the following:

- Development of a base model based on the 2017 road network and land use
- Development and optimisation of 'do minimum' 2026 and 2036 scenarios that reflect the predicted traffic volumes from the WRTM and the proposed road network without the project
- Development of 2026 and 2036 scenarios that compare the 'do minimum' project scenarios with the implementation of the project
- Reporting of traffic volumes, network statistics, travel times and intersection performance from the 'do minimum' and project scenarios.

Construction assessment methodology

Assessment of the potential transport and traffic impacts during construction was carried out using a similar methodology to the assessment of the operational impacts of the project. In order to determine the operation of the road network in the core study area under construction conditions, the following scenarios were developed within the WSAGA mesoscopic traffic model:

- Future construction year (2024) without construction
- Future construction year (2024) with construction traffic.

The year 2024 was modelled as it corresponds to the peak construction year for the project.

The construction scenario includes the following changes to the traffic network associated with construction:

- Additional heavy vehicles associated with spoil and material haulage
- Additional light vehicles associated with the construction workforce
- Traffic management measures including traffic control, road closures, detours, diversions, work site traffic control and reduced speed zones to maintain safety for construction traffic
- Additional access points from the public road network to the proposed construction support sites.

In addition to the changes in performance of the road network associated with construction, the following aspects of the transport network in the core study area have also been assessed for construction:

- On-street parking
- Public transport
- Pedestrians and cyclists.

Modelled scenarios

In order to assess the performance of the road network with and without the project and identify the impacts of the project, under both construction and operation, traffic modelling of the following scenarios was carried out:

- **2017 existing situation** – reflects the transport network as it was in 2017 with no new projects or upgrades. The year 2017 was adopted as the existing year because the majority of traffic counts were carried out at this time, with other data adjusted to account for any time difference.
- **2024 ‘do minimum’** – reflects the forecast transport network and traffic demand without the project in 2024, which includes the completion of The Northern Road upgrade between Mersey Road and Jamison Road and the Bringelly Road upgrade between Camden Valley Way and The Northern Road
- **2024 with project construction** – as per 2024 ‘do minimum’ but includes construction traffic and traffic management measures to facilitate access for construction vehicles to construction compounds during the peak period of construction
- **2026 ‘do minimum’** – includes The Northern Road upgrade, Bringelly Road upgrade, Elizabeth Drive upgrade between the M7 Motorway and Mamre Road, along with the opening and operation of the Western Sydney Airport and two access intersections along Elizabeth Drive between Adams Road and Taylors Road. It includes forecast traffic growth to 2026 based on the LU14 standard land use scenario as well as the operation of the Western Sydney Airport and the on-site business parks
- **2026 with project** – as per 2026 do minimum, but includes the project complete and open to traffic
- **2036 ‘do minimum’** – includes all upgrades assumed in 2026 do minimum, as well as:
 - Upgrade of the M7 Motorway to three lanes in each direction
 - Upgrade of Cowpasture Road between the M7 Motorway and Camden Valley Way
 - Realignment and upgrade of the Luddenham Road and Adams Road intersection
 - Realignment of the Mamre Road and Devonshire Road intersection
 - Upgrade of Elizabeth Drive between The Northern Road and Mamre Road
 - Upgrade of Fifteenth Avenue between Cowpasture Road and Fourth Avenue
 - Forecast traffic growth to 2036 based on the LU14 standard land use scenario as well as the operation of the Western Sydney Airport and on-site business parks
- **2036 with project** – as per 2036 do minimum, but includes the project.

Note that in the discussion of noise and vibration impacts in **Section 7.7**, the ‘do minimum’ scenario is also referred to as the ‘no build’ scenario, and the project scenario is also referred to as the ‘build’ scenario.

Note also that the 2036 ‘do minimum’ scenario includes future road upgrade projects such as the widening of the M7 Motorway and upgrade of Luddenham Road, which are under early stages of investigation, but which are not committed projects. They are included in the modelling as they are considered to be integral to future network operations and have therefore been factored into network planning assumptions.

In addition, the modelling land use data that incorporates future land use associated with the Western Sydney Aerotropolis has not yet been released. The modelling data won’t be released until mid-2020, following consultation on Stage 2 of LU1P. However, traffic demand from the airport and business parks has been included into the M12 Motorway traffic model.

Assessment criteria

Traffic operational performance can be assessed in several ways, including:

- At a network level, including average speed, total distance travelled, and total time travelled within the modelled network
- For single-point assessment:
 - At a mid-block level (ie the volume of vehicles crossing an arbitrary line at a chosen point some distance away from an intersection), showing changes to travel routes and potential traffic and transport impacts (adverse and beneficial) as a result of these changes
 - At an intersection level, showing changes to the performance of intersections, which are typically constraining elements of urban road networks.

The operation of the modelled road network as a whole is regarded as being of prime importance, as this takes into account that there may be certain locations (ie an intersection) where there may be improvement, while others may deteriorate in performance.

Network level performance

Assessment of the performance of the road network as a whole is based on the following network-wide statistics extracted from the WSAGA Traffic Model for the morning and evening peak periods are as follows:

- Total throughput – vehicles completing their trips through the study area
- Average network travel speed – kilometres per hour
- Latent demand – vehicles waiting outside the study area
- Total vehicle hours travelled in the study area (VHT)
- Total vehicle kilometres travelled across the study area (VKT).

Each of the above statistics was used to compare the performance of each modelled scenario across the assessment periods and horizon years. VHT and VKT were treated as secondary measures as they can differ depending on the network arrangements for each scenario. Presenting VHT and VKT in isolation can be misleading when considering them in the context of network performance. For this reason, average network speed (which is the ratio of VKT to VHT) was used as a primary performance metric.

Midblock level of service

Level of service (LoS) is a measure to describe the operational conditions and efficiency of a roadway or intersection as perceived by motorists and/or passengers. It generally includes:

- Speed and travel time
- Freedom to manoeuvre
- Traffic interruptions
- Comfort and convenience
- Road safety.

The performance of surface roads is defined by the midblock LoS which is based on the volume to capacity (V/C) ratio. The LoS for freeways and motorways is calculated from vehicle density, which is the traffic volume divided by the average passenger car speed. Density is measured in passenger car units (PCU) per kilometre per lane. The LoS criteria for midblock sections is shown in **Table 7-29**, overleaf.

Travel times and travel speeds provide an alternative means of assessing the functional performance of a road under interrupted flow conditions. The LoS criteria for midblock section based on travel speed is shown in **Table 7-30**, overleaf.

Table 7-29 Level of Service criteria for midblock sections (based on volume and capacity)

LoS	Definition	Multi-lane roads ¹	Freeways/ motorways ²
		V/C ratio	Density (PCU/km/lane)
A	A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.	≤ 0.26	≤ 7.0
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with LoS A.	0.27 to 0.41	7.1 to 11.0
C	Also, in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	0.42 to 0.59	11.1 to 16.0
D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow would generally cause operational problems.	0.60 to 0.81	16.1 to 22.0
E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream would cause breakdown.	0.82 to 1.00	22.1 to 28.0
F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.	> 1.00	> 28.0

Source: Austroads, *Guide to Traffic Management – Part 3 Traffic Studies and Analysis, Second Edition 2013*

Notes: ¹Where free flow speed is taken as 70 kilometres per hour; ²Where free flow speed is taken as 90 kilometres per hour

Table 7-30 Level of Service criteria for midblock sections (based on travel speed)

Travel speed as a percentage of free-flow travel speed	LoS (volume to capacity <1)	LoS (volume to capacity >1)
>85%	A	F
67-85%	B	F
50-67%	C	F
40-50%	D	F
30-40%	E	F
<30%	F	F

Intersection LoS

Average delay is commonly used to assess the operational performance of intersections, with LoS used as an index. A summary of the intersection LoS criteria is shown in **Table 7-31**.

It is generally accepted that the target LoS for intersection performance should be D or better. However, when assessing intersection performance for parts of the road network that already experiences substantial congestion over the course of the day or with future demand, achieving LoS D or better may not represent good value for money, or not be physically possible within the constraints of the project. In these locations, consideration need to be given to whether achieving LoS D is practical within the constraints of the project. If not, a minimum of LoS E is set as a performance target for intersections that are within the scope of works of the project.

Many intersections within the wider study area currently operate at a reasonable level of service under existing 2017 conditions during the morning and afternoon peak periods. This is due to the rural nature of the study area with its low population and employment densities that would change in future without the project when the area becomes fully developed.

Table 7-31 Level of Service criteria for intersections

LoS	Average delay per vehicle (seconds/vehicle)	Traffic signals and roundabouts	Give way and stop signs
A	14 or less	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause delays	At capacity; requires other control mode
F	Greater than 70	Extra capacity required, Roundabouts require other control mode	At capacity; requires other control mode

Source: Roads and Traffic Authority (2002) *Guide to Traffic Generating Developments*

7.2.3 Existing environment

This section provides an overview of the existing traffic and transport environment within the study area. A detailed description of the existing traffic and transport environment is included in **Appendix F**.

All data presented in this section represent the base case or existing traffic and transport conditions and are based on the latest publicly available information and survey carried out for the project.

Study area

For the purposes of the project's transport and traffic assessment, the study area was defined as the area bounded by the following roads:

- The M4 Motorway
- The M7 Motorway
- The Northern Road
- Bringelly Road.

The area bordered by these roads is referred to as the wider study area and covers the strategic road network that is likely to be affected by the changes in travel patterns that would result from the project, for the purposes of assessing the regional impacts of the project.

Given the size of the wider study area, the assessment also focused on the project's likely impacts on the local road network over a smaller area, referred to as the core study area, covering those roads that directly interface with the project, including:

- Elizabeth Drive between The Northern Road and the M7 Motorway and its associated intersection with other local roads
- The M7 Motorway in the vicinity of Elizabeth Drive
- The Northern Road in the vicinity of Elizabeth Drive.

The locations and coverage of the wider study area and core study area are shown in **Figure 7-16**.

Existing road network

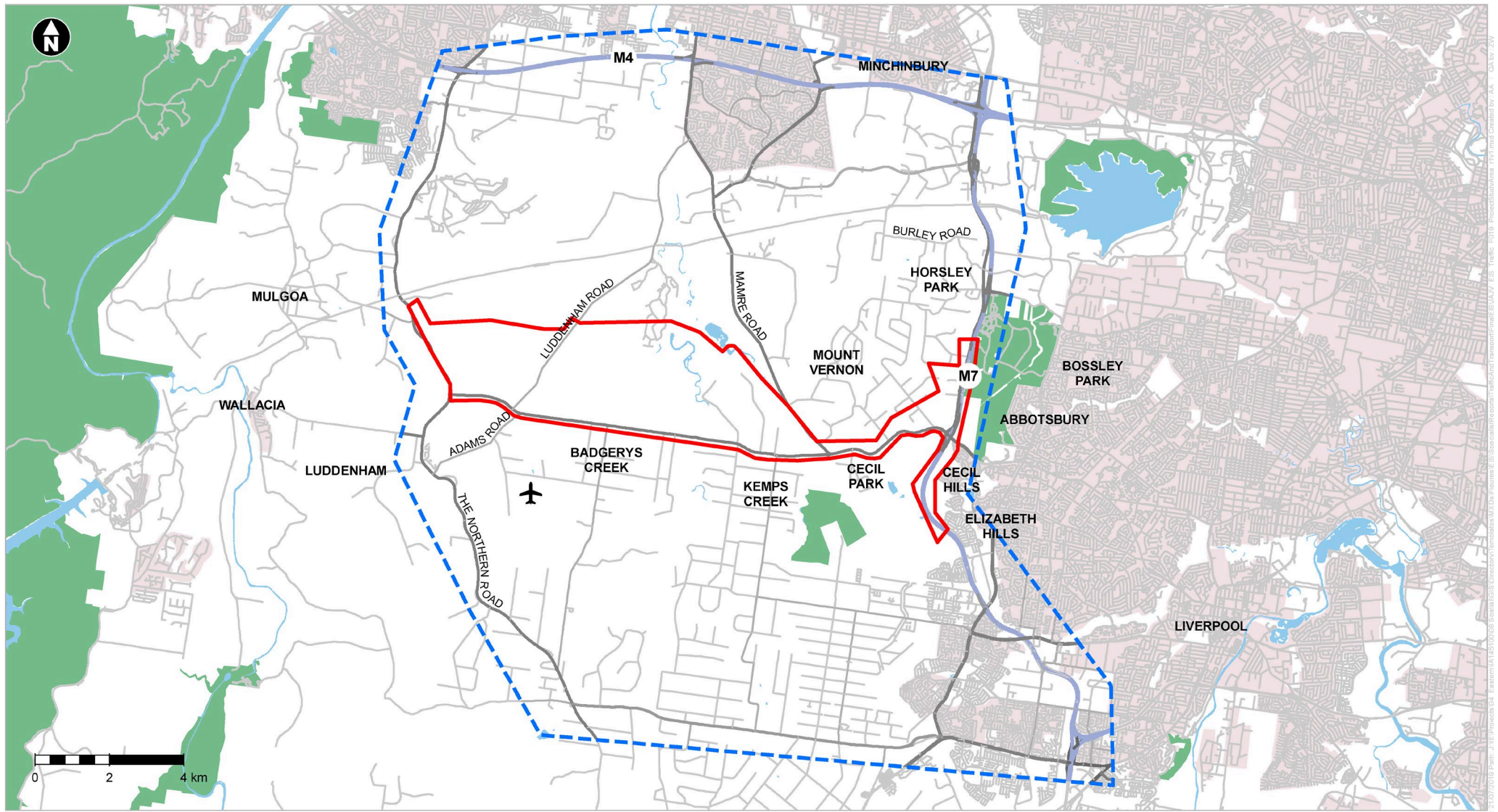
Roads and Maritime uses a classification system that designates the road network into a number of categories to define their functions within the road network. The classification is based on a hierarchical system that covers roads from primarily movement, with minimal access, to those with predominately access function to local developments carrying low volumes of traffic. The functional hierarchy of the existing road network within the study area is presented in **Figure 7-17**.

Within the wider study area shown in **Figure 7-16**, the regional road network comprises the strategic motorways and arterial roads, including:

- The M7 Motorway
- The M4 Motorway
- Elizabeth Drive
- The Northern Road
- Wallgrove Road
- Mamre Road.

Of these roads, those that interface directly with the project are part of the core study area (the M7 Motorway, Elizabeth Drive, The Northern Road and Mamre Road). The core study area also comprises the sub-arterial, collector and local roads (the local road network) that immediately surround the project but which do not have a direct interface with the project, including:

- Badgerys Creek Road
- Devonshire Road
- Luddenham Road
- Adams Road
- Erskine Park Road.

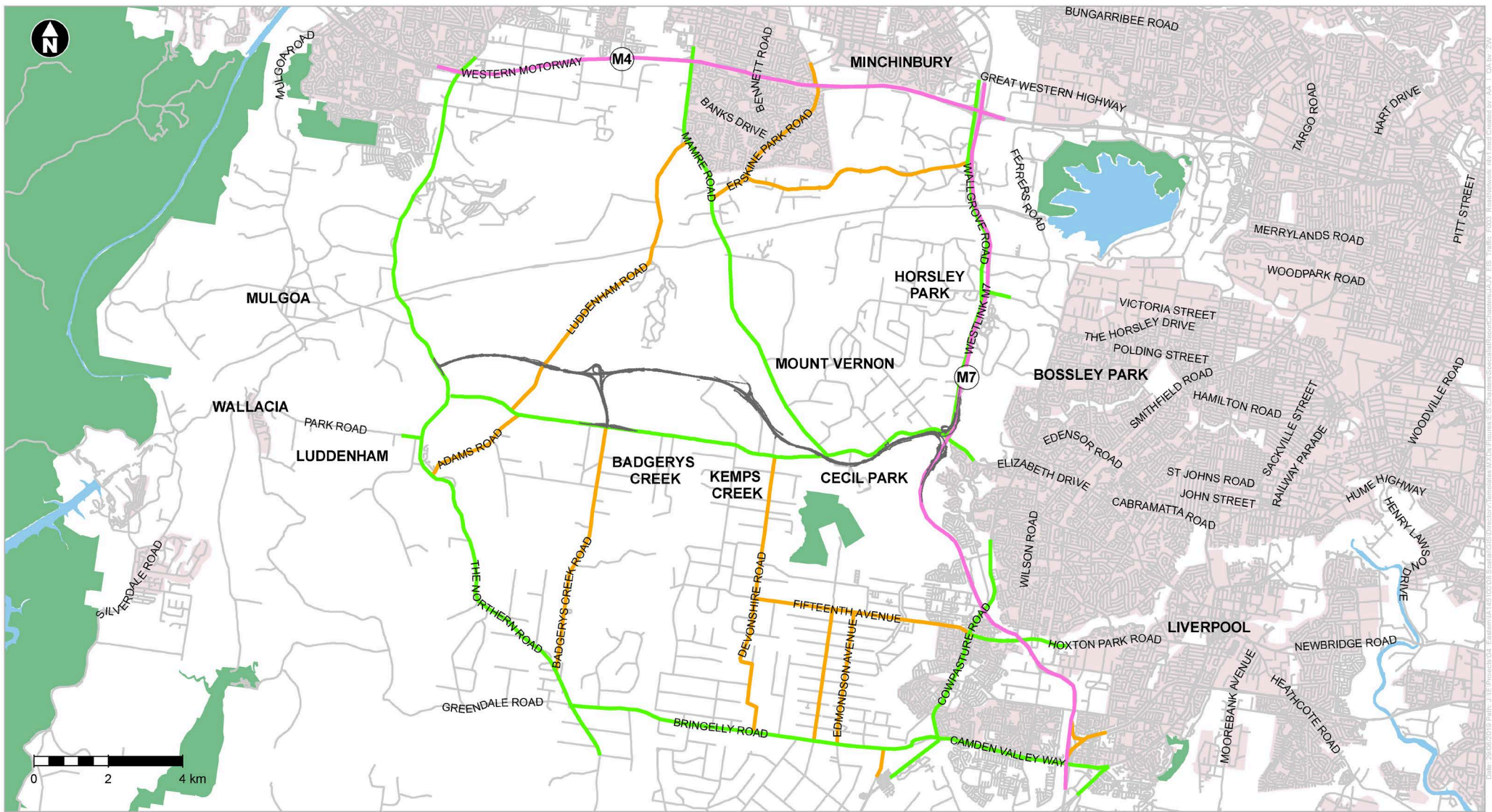


- Wider study area
- Core study area
- Main waterbodies
- NPWS estate / reserves
- Urban areas



Figure 7-16 Project location, wider study area and core study area boundaries

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- The project
- Motorway
- Arterial Road
- Sub-arterial Road
- Collector/Local road
- NPWS estate / reserves
- Main waterbodies
- Urban areas



Figure 7-17 Road network hierarchy surrounding the project

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Due to the largely rural nature of the surrounding land, there is minimal or no demand for on-street parking, as the surrounding properties have ample space for off-street parking and are not intensively developed. While at many locations there is sufficient space, on-street parking along roads within the core study area is either discouraged or forbidden.

Existing traffic volumes and patterns

The roads discussed in this section relate to roads that would be impacted during the construction and operation of the project, including proposed construction access routes (see **Section 5.24.17**). Existing traffic volumes on key roads in the study area provide an understanding of how many vehicles use these roads over the course of an average weekday and during the average morning and afternoon peak hours. The proportion of heavy vehicles that make up this traffic volume provides an understanding of the importance of these roads as heavy vehicle corridors. This is of particular importance for single-lane roads such as Elizabeth Drive, as cars are unable to overtake slower heavy vehicles, which can reduce travel speeds.

Surveyed traffic volumes, based on automatic traffic counts carried out in July 2015 at key locations within the core study area, including the proportions of heavy vehicles at these locations, are provided in **Table 7-32**, overleaf.

It is noted that average daily traffic volumes, while useful for purposes of understanding the project context, were not used as inputs to the models for developing traffic forecasts. Instead, traffic forecast models rely on intersection counts taken in the morning and evening peak periods. Peak period data is more useful in modelling because they provide a more reliable and definitive picture of intersection capacity and performance. Hence the traffic modelling and assessment described in **Section 7.2.2** used as inputs the morning and evening peak intersection count data from 2016 and 2017.

Analysis of existing traffic volumes on key roads through the core study indicates that current traffic flows on both The Northern Road and Elizabeth Drive are low compared to other urban arterials which generally carry more than 10,000 vehicles per day and 1000 vehicles per hour in the peak hour, such as Great Western Highway at St Marys (20,000 vehicles per day in each direction) or the Hume Highway at Casula (35,000 vehicles per day in each direction). The proportion of heavy vehicles on these roads is relatively high, between 15 per cent and 24 per cent over the day, indicating that these roads are significant heavy vehicles routes.

Existing modes of travel

An analysis of the Journey to Work data based on the 2011 Census data¹ (TfNSW, 2017b) shows that car (driver and passenger) is the dominant mode of travel for people living and working in the study area. Employment trips provide a good indication of the total mode share of the area and are particularly relevant given that the proposed land uses surrounding the Western Sydney Airport would be primarily employment-related.

In 2011, there were 3479 jobs and 15,323 residents within the travel zones identified in the study area over an area of about 14,300 hectares. This represents an average population density of 1050 persons per square kilometre, which is lower than the urban Sydney average of 2040 persons per square kilometre.

¹ 2011 is the latest census year for which Journey To Work data is available from Transport for NSW Bureau of Transport Statistics

Table 7-32 Existing traffic volumes on key roads through the study area (2015)

Road	Location	Direction	Average weekday traffic flow		Morning peak (7.30am to 8.30am)		Evening peak (5.30pm to 6.30pm)	
			Vehicles/day	Trucks	Vehicles/hour	Trucks	Vehicles/hour	Trucks
The Northern Road	North of Bradley Street	Northbound	11,542	16%	1215	11%	924	14%
		Southbound	11,634	13%	672	13%	1069	8%
	North of Kings Hill Road	Northbound	9055	13%	862	9%	840	10%
		Southbound	9486	12%	638	10%	816	8%
	North of Elizabeth Drive	Northbound	8092	12%	694	9%	844	6%
		Southbound	8063	14%	606	12%	649	8%
	South of Elizabeth Drive	Northbound	8383	12%	797	8%	673	8%
		Southbound	8260	15%	483	15%	834	9%
	North of Adams Road	Northbound	6977	14%	577	12%	662	10%
		Southbound	6778	14%	403	13%	575	8%
	North of Dwyer Road	Northbound	6805	11%	561	10%	632	8%
		Southbound	6951	19%	410	17%	607	12%
Elizabeth Drive	West of Luddenham	Eastbound	4633	14%	470	11%	238	7%
		Westbound	4611	15%	251	16%	570	7%
	East of Western Road	Eastbound	6268	20%	697	16%	329	9%
		Westbound	6457	24%	345	25%	783	14%
Adams Road	East of The Northern Road	Northbound	3312	0%	346	0%	152	0%
		Southbound	3171	0%	158	0%	389	0%

Note: data sourced from automatic traffic counts carried out in July 2015

It is noted that the traffic volumes associated with the construction of the Western Sydney Airport is not included in the above as construction began in 2018. The peak construction period according to the WSA EIS is 2021 which is prior to the M12 Motorway commencing construction. In addition, the traffic volume data provided in 15.4.1 of the Western Sydney Airport EIS is not presented in a format that can be incorporated into the M12 Motorway traffic model. To incorporate the data into the model it would need to be broken down into vehicles per volume type per road.

Table 7-33 indicates that only 14 per cent of trips to work into the study area were made by public transport, which is significantly lower than in urban areas with better access to public transport. This proportion of trips by public transport is lower for residents living in the study area who work outside of the study area with six per cent of these trips using public transport and reflects a general lack of public transport options within the core study area. Cars remain the dominant mode of travel, with 78 per cent of trips from the study area made by car, either as a driver or passenger.

Table 7-33 Journey to Work mode share

Mode	Destination (trips to the study area)	Origin (trips from the study area)
Car driver	35%	72%
Car passenger	3%	6%
Mode not stated	24%	2%
Train	5%	5%
Bus	9%	1%
Walk	3%	1%
Worked at home or did not go to work	10%	12%
Other	11%	1%

Source: TfNSW (2017b)

Existing public transport network

Public transport in the core study area is currently served by bus services only with very limited coverage and frequency. TransitSystems operates the following routes via Elizabeth Drive:

- Route 813 (Liverpool town centre to Badgerys Creek Road) runs to the east of Mamre Road on Elizabeth Drive. This is a local bus service that operates on weekdays only with four services a day in each direction between 9.30am and 6.20pm
- Route 801 (Bonnyrigg to Fairfield) runs to Badgerys Creek Road. There are no bus services or bus facilities west of Badgerys's Creek Road on Elizabeth Drive. This is a local bus route that operates on weekdays only with two services in the peak direction in the morning and evening peak.

Busways operates the following route via The Northern Road:

- Route 789 operates along The Northern Road between Penrith and Luddenham. This is a peak hour only service and operates twice a day on weekdays with no services provided on weekends.

Bus services within the core study area are very poor, with very few services provided at very low frequencies, that operate long and circuitous routes primarily to provide local coverage. This reflects the low population density in the core study area, which generates very little demand for public transport trips.

Existing active transport network

There is currently limited pedestrian and cycling infrastructure in the area, reflecting the predominately peri-urban land use character and low population densities, which do not support construction of off-road active transport facilities. Existing active transport includes:

- Cycleways in the Western Sydney Parklands for recreational cycling use
- A new shared user path between Narellan and the M4 Motorway being constructed as part of The Northern Road upgrade
- An off-road separated cycleway adjacent to the M7 Motorway with entry and exit ramp facilities provided at Elizabeth Drive
- The M7 Motorway cycleway connecting to a shared user path into the Western Sydney Parklands
- The Wylde mountain bike trail in the Western Sydney Parklands.

Pedestrian and cyclist surveys of the M7 Motorway shared user path were carried out in February 2019 over nine days during fair weather and recorded daily and hourly pedestrian and cycle movements along the M7 Motorway shared user path and the shared user bridge across the M7 Motorway south of Elizabeth Drive.

Analysis of the pedestrian and cyclist surveys shows the following:

- The overwhelming majority of traffic along the M7 Motorway shared user path comprises cyclists. Pedestrians represent less than 10 per cent of the travel along this facility
- Weekend volumes are five times higher than weekday volumes, indicating that the majority of cyclists using this facility are recreation rather than commuter cyclists
- Of the cyclists that travel along the M7 Motorway cycleway, about 25 per cent use the M7 Motorway shared user bridge to access Western Sydney Parklands on weekends. This drops to about 10 per cent during weekdays.

Existing freight network

Within the wider study area, the key freight routes that provide transport to key industrial and employment areas in western Sydney are the M7 Motorway and the M4 Motorway. These strategically important freight routes are designated national freight routes and allow freight vehicles to travel uninterrupted at high speed between western Sydney, Greater Sydney (including Port Botany) and other regional centres in NSW including Port Kembla. These roads are critical parts of the NSW freight network carry freight trips across the day.

In the core study area, Elizabeth Drive, The Northern Road, Mamre Road, Badgerys Creek Road, Bringelly Road, Devonshire Road and Erskine Park Road are all approved routes for 26-metre B-doubles, which make up a substantial proportion of heavy and long-distance freight travel and are also suitable for use by construction haulage vehicles.

Observed traffic volumes on Elizabeth Drive show heavy vehicle flows to be generally higher east of Mamre Road due to the presence of a number of industrial and commercial businesses that are located along Elizabeth Drive near Mamre Road.

7.2.4 Existing road network performance

This section provides a summary of the performance of key roads within the study area. The assessment of existing operational performance focused on the following performance indicators:

- Individual travel times and travel speeds on key roads
- Intersection delay and LoS at key intersections
- Road safety performance and crash history.

Regional road network conditions

A summary of the existing traffic conditions at key road corridors within the wider study area is provided in **Table 7-34**. The travel conditions throughout the study area, particularly on arterial and collector roads indicate that these roads are generally performing adequately.

Table 7-34 Summary of existing traffic conditions on regional roads

Road	Existing traffic conditions
M7 Motorway	Typically experiences high traffic volumes in the northbound direction between the M5 Motorway and Elizabeth Drive in the morning peak period. In the southbound direction it experiences congestion between the M4 Motorway and The Horsley Drive and at the M4 Motorway/M7 Motorway interchange in the evening peak. High levels of congestion occur at Bernera Road, Cowpasture Road and Old Wallgrove Road interchanges. This congestion is caused by the high volumes of heavy vehicles that use the M7 Motorway and is influenced by uphill grades between the M5 Motorway and Elizabeth Drive.
The Northern Road	The Northern Road experiences moderate congestion between Glenmore Parkway/Wentworth Road and Bradley Street, and near Bringelly Road, Bringelly which experience moderate congestion.
Elizabeth Drive	Elizabeth Drive typically experiences moderate delays around key constraint points at the Elizabeth Drive/Devonshire Road and Elizabeth Drive/Duff Road intersections primarily due to traffic volumes arriving and departing from schools. Congestion during peak periods also occur at its intersection with Wallgrove Road and the M7 Motorway interchange where traffic from Elizabeth Drive enters the M7 Motorway southbound ramp.
M4 Motorway	Congestion along the M4 Motorway is frequently observed eastbound in the morning and westbound in the evening. The primary eastbound constraint is the interchange with the M7 Motorway, where eastbound traffic on the M4 Motorway merges with traffic from both directions on the M7 Motorway. These merges also generate delays on the M7 Motorway, with entry ramp queues frequently extending on to the M7 Motorway northbound in the morning peak and southbound in the evening peak.
Bringelly Road	Bringelly Road typically experiences low congestion in the peak hours, with the exception of its intersections with The Northern Road and Cowpasture Road/Camden Valley Way. Ongoing construction works associated with the upgrade of Bringelly Road has increased delays along Bringelly Road east of King Street.
Luddenham Road	During peak hours, Luddenham Road experiences little to no delay, with the only source of congestion along Luddenham Road being on approach to Twin Creeks Drive where traffic travelling along Luddenham Road is required to give way to traffic turning right into and out of Twin Creeks Drive at this roundabout.
Mamre Road	Moderate congestion occurs on Mamre Road between the M4 Motorway and Bakers Lane. This is due to residents and employees accessing the nearby residential and commercial developments. South of Bakers Lane, there is little to no delay experienced during peak hours.

Existing travel times and travel speeds

Travel times and travel speeds provide a means of assessing the functional performance of the road network in a way that is consistent with the experience of road users through their day-to-day travel. A summary of travel times, travel speeds and LoS along key routes within the project study area is provided in **Table 7-35** and **Table 7-36**.

Analysis of observed average speeds (based on travel time surveys and modelled travel times calibrated to these surveys) along The Northern Road between Glenmore Parkway and Dwyer Road shows that there is a good level of service in both morning and afternoon peak hours. Elizabeth Drive also shows a good level of service with observed travel speeds very close to signposted speed limits during the weekday morning and afternoon peak periods. This is expected as the area is predominately rural with low population and employment density.

Average travel times along the M7 Motorway during peak periods also show the corridor currently performs at an adequate level of service along its length through the wider study area. However localised delays are observed between Elizabeth Drive and Cowpasture Road, where steep grades cause reductions in travel speed for heavy vehicles. During peak periods in these sections, variable speed zones are used to limit travel speeds to 60 kilometres per hour and reduce the safety risks of trucks travelling at much lower speeds than surrounding traffic.

Table 7-35 2017 travel times and travel speeds on key roads in the core study area (morning peak)

Segment	Direction	Travel time (mm:ss)	Average travel speed (km/h)	LoS
M7 Motorway between Camden Valley Way and Elizabeth Drive	Northbound	11:46	54	C
	Southbound	07:27	84	B
M7 Motorway between Elizabeth Drive and the M4 Motorway	Northbound	07:45	77	B
	Southbound	07:05	85	A
Elizabeth Drive between the M7 Motorway and The Northern Road	Eastbound	12:59	64	B
	Westbound	13:49	60	B
The Northern Road between Bringelly Road and Elizabeth Drive	Northbound	09:54	61	B
	Southbound	03:31	56	B
The Northern Road between Elizabeth Drive and the M4 Motorway	Northbound	09:34	60	B
	Southbound	15:08	65	B

Table 7-36 2017 travel times and travel speeds on key roads in the study area (evening peak)

Segment	Direction	Travel time (mm:ss)	Average travel speed (km/h)	LoS
M7 Motorway between Camden Valley Way and Elizabeth Drive	Northbound	07:25	86	A
	Southbound	07:26	85	B
M7 Motorway between Elizabeth Drive and the M4 Motorway	Northbound	06:51	87	A
	Southbound	09:06	66	C
Elizabeth Drive between the M7 Motorway and The Northern Road	Eastbound	13:12	63	B
	Westbound	13:18	63	B
The Northern Road between Bringelly Road and Elizabeth Drive	Northbound	09:42	62	B
	Southbound	03:34	55	B
The Northern Road between Elizabeth Drive and the M4 Motorway	Northbound	09:55	58	B
	Southbound	15:22	64	B

Existing intersection performance

Intersection LoS for key intersections that would be potentially affected by the project within the study area during the morning and afternoon peak periods is provided in **Table 7-37**. These results are based on modelled average delay from the WSAGA Traffic Model.

Modelled existing intersection LoS indicates that the majority of intersections along Elizabeth Drive in the core study area are operating at a satisfactory LoS (D or better).

The western intersection in this interchange at Wallgrove Road is currently close to capacity and is operating and LoS D in the evening peak. Delays at this location are caused by the conflict between vehicles travelling east–west on Elizabeth Drive and those turning right onto the M7 Motorway northbound and southbound. The interchange also has existing traffic constraints on Elizabeth Drive that include:

- A double-point interchange configuration that limits the capacity of the interchange for right-turn demand from the M7 Motorway
- Steep gradients on the approach to Elizabeth Drive/Wallgrove Road from the M7 Motorway exit ramps, which slows heavy vehicles and causes queues extending from the exit ramps into the motorway through lanes with increased heavy vehicle volumes.

Table 7-37 Modelling intersection performance within the study area – 2017 morning and evening peak hour

Key intersection	2017 Morning peak		2017 Evening peak	
	Average delay (sec)	LoS	Average delay (sec)	LoS
Elizabeth Drive/Northern Road	12	A	11	A
Elizabeth Drive/Luddenham Road	13	A	18	B
Elizabeth Drive/Martin Road	9	A	12	A
Elizabeth Drive/Western Road	14	A	9	A

Key intersection	2017 Morning peak		2017 Evening peak	
	Average delay (sec)	LoS	Average delay (sec)	LoS
Elizabeth Drive/Devonshire Road	13	A	12	A
Elizabeth Drive/Mamre Road	14	A	14	A
Elizabeth Drive/Duff Road	12	A	9	A
Elizabeth Drive/Wallgrove Road	31	C	48	D
Elizabeth Drive/M7 Motorway	20	B	17	B
Wallgrove Road/M7 Motorway	2	A	10	A

Existing road safety performance

A summary of crash data provided by Roads and Maritime for the five-year period between July 2012 and June 2017 on roads within the study area is presented in **Table 7-38**.

Key crash statistics for key roads in the study area are:

- Sixty per cent of crashes where at least one injury occurred or a tow-away was required (137 crashes)
- Four crashes resulted in a fatality within the analysed time period; two on Elizabeth Drive and two on The Northern Road
- Fifty-two per cent of crashes (124 crashes) involved a heavy vehicle, with the majority occurring on Elizabeth Drive
- One per cent of crashes (two crashes) involved a cyclist or pedestrian
- The three most common crash types involved a rear-end collision (22 per cent), vehicles turning left off the carriageway into an object or a parked vehicle (12 per cent), a head on collision (eight per cent) and a rear-end collision from a right turn (eight per cent)
- Sixty-one per cent of crashes occurred at a midblock, while 39 per cent of crashes occurred at an intersection.

Table 7-38 Summary of crash history

Road segment	Number of crashes by severity			
	Fatality	Injury	Non-casualty	Total
Elizabeth Drive (M7 Motorway to The Northern Road)	2	94	54	150
M7 Motorway (The Horsley Drive to Cowpasture Road)	0	15	21	36
The Northern Road (Glenmore Parkway to Adams Road)	2	28	14	44
Total	4	137	89	230

7.2.5 Assessment of potential construction impacts

This section provides an assessment of the potential transport and traffic impacts of construction of the project and addresses the impacts of changed conditions and additional traffic as a result of construction activities on traffic, public transport, pedestrians and cyclists.

During construction, the project may affect the surrounding road network as a result of:

- Construction vehicles using the surface road network, especially heavy vehicles transporting spoil
- Surface roadworks requiring temporary traffic, cyclist and/or pedestrian diversions, road occupation and temporary road closures
- Temporary changes to speed limits.

Construction of the project is expected to take about four years, which includes commissioning that would occur concurrently with the final stages of construction. Peak construction activity would occur in 2024 during the bulk earthworks and pavement activities. These periods would generate the most construction traffic for deliveries of spoil to build reinforced earth structures and pavement materials.

The primary construction ancillary facilities would be AF1, AF2/3, AF4 and AF5, where parking and site offices would be located. The other construction ancillary facilities would be smaller sites that would be in operation for shorter periods, with workers travelling to them from the main construction ancillary facilities and would not have significant parking demand or parking provision.

Construction haulage routes

During the construction period, haulage of bulk earthwork materials is expected to be the main contributor to additional vehicle movements in the area. Where possible, haulage of materials would generally be carried out within the construction footprint along the project alignment to minimise construction vehicle movements on public roads.

Haulage through the construction footprint would be subject to scheduling for construction of the bridges spanning local roads such as Luddenham Road, Elizabeth Drive and Range Road. The proposed indicative schedule of bridge construction is shown in **Figure 5-25**. Before the completion of bridge works, at-grade or alternative haulage routes along public roads may be used. The potential impact of their use would be determined in the detailed design phase, when the scope of bridge works is more defined.

As identified in **Table 5-20**, temporary creek crossings would be established across Cosgroves Creek, Badgerys Creek, South Creek and Kemps Creek. These would be used to haul material along the construction footprint and enable construction of the bridges spanning these creeks. The impacts of these temporary creek crossings are assessed in **Section 7.1.4** and **Section 7.8.4**. In summary, temporary creek crossings are not anticipated to result in significant biodiversity, flooding or groundwater impacts.

The development of haulage routes on public roads was based on minimising impacts on the Elizabeth Drive/M7 Motorway/Wallgrove Road interchange. Various configurations for access to the project for construction purposes were modelled. The haulage routes described in **Section 5.24.17** produced traffic performance results with the least impact on the Elizabeth Drive/M7 Motorway/Wallgrove Road interchange. The use of this interchange provides access to the surrounding motorway network and, as such, could not be avoided.

The haulage routes to the ancillary facilities are as follows (see **Figure 5-24**):

- AF1, AF2/AF3 and AF4 would be accessed via The Northern Road and Elizabeth Drive
- AF5 would be accessed via The Northern Road, Elizabeth Drive and Mamre Road
- Range Road, AF6, Wallgrove Road and AF9 would be accessed via the M7 Motorway and Elizabeth Drive.

Work site and construction support site traffic generation

The forecast light and heavy vehicle traffic generation from each of the ancillary facilities is provided in **Table 7-39**. Light vehicle traffic would be generated by workers and personnel. Light vehicle traffic generation in the morning peak would not affect morning peak traffic conditions, as the construction workers would generally be expected to arrive at the site before the start of the morning peak traffic period.

Construction hours would commence at 7am, with any pre-start meetings to be carried out before this time. As a result, construction workers would generally be expected to arrive at the site before 7am, which is early in the peak period of 6am to 9am.

Spoil haulage vehicles are assumed to use truck-and-dog trailer configurations (17 metres long) and were modelled as fully-loaded travelling to the project (40 tonnes) and empty leaving the project (24 tonnes).

Table 7-39 Construction traffic generation (inbound and outbound)

Site	Daily heavy vehicle generation	Morning peak light vehicle generation	Morning peak heavy vehicle generation	Evening peak light vehicle generation	Evening peak heavy vehicle generation
AF1	280	208	28	208	28
AF2/3	220	208	22	208	22
AF4	140	208	14	208	14
AF5	160	208	16	208	16
Range Road	220	-	22	-	22
AF6	220	-	22	-	22
AF9	160	-	16	-	16
Wallgrove Road	160	-	16	-	16
Total	1,560	832	156	832	156

Road closures, detours and other temporary traffic management

To allow for safe construction adjacent to or over live traffic, the following short-term traffic management measures would be in place during critical construction activities. Potential detour routes associated with these measures are shown in **Figure 7-18**.

Elizabeth Drive and the M7 Motorway bridge installation

The construction of bridges over Elizabeth Drive and new ramps connecting with the M7 Motorway would involve construction activities near existing traffic lanes and bridge works over live traffic. Full road closures requiring detours would be in place when works over live traffic are required. This would generally apply when work is carried out on ramps and would be carried out outside of peak periods to minimise impacts of road closures on traffic. These works would not involve full closure of the M7 Motorway, but may require lane closures to ensure that works are conducted safely.

During the installation of these bridges, the following detours may be implemented:

- Northbound trips on the M7 Motorway would exit at Elizabeth Drive exit ramp and re-enter via Wallgrove Road entry ramp
- Southbound trips on the M7 Motorway would exit at The Horsley Drive, and use The Horsley Drive and Cowpasture Road to re-enter the M7 Motorway at the Cowpasture Road Interchange
- Eastbound trips on Elizabeth Drive would travel to the north via Mamre Road, Lenore Drive and Old Wallgrove Road
- Eastbound trips on Elizabeth Drive would travel east via Devonshire Road, Fifteenth Avenue, and Cowpasture Road
- Westbound trips on Elizabeth Drive would travel west via Cowpasture Road, Fifteenth Avenue and Devonshire Road.

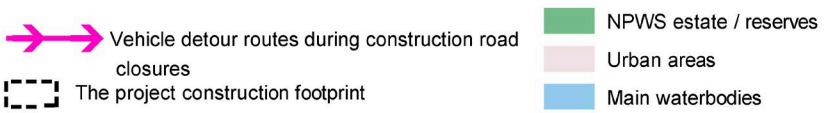
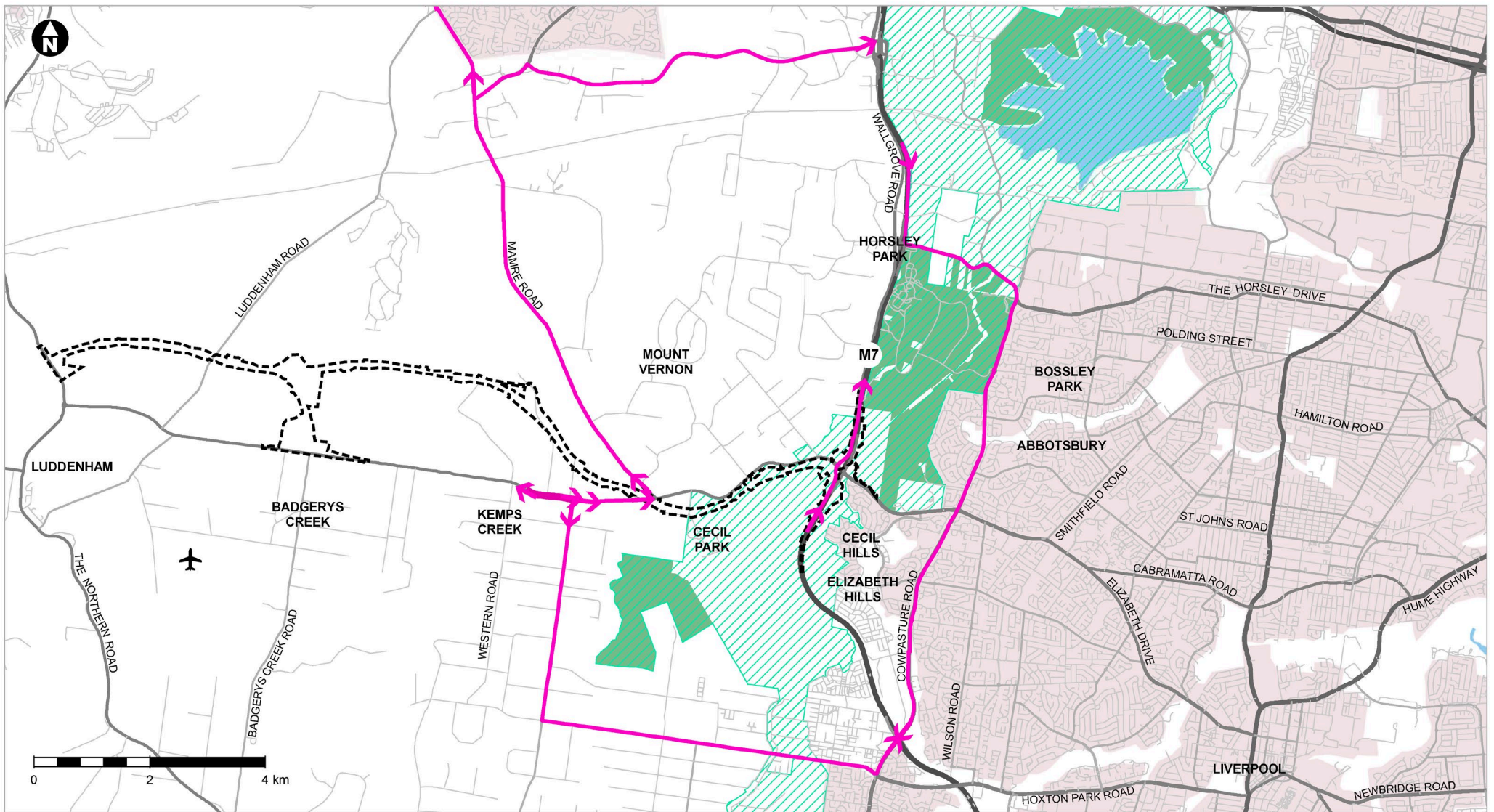


Figure 7-18 Proposed vehicle detours around construction road closures

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The Northern Road tie-in

the M12 Motorway would intersect with The Northern Road at a new signalised intersection and would involve adding new left and right turning lanes on The Northern Road. Temporary traffic barriers would be installed along the shoulder of The Northern Road and along the median side to facilitate construction of the left and right turning lanes on The Northern Road. Existing capacity would be maintained throughout construction. Any traffic switches or temporary lane closures would occur outside the peak periods. There may be periods when vehicles would be required to travel on temporary pavement. Traffic speeds would be maintained as much as possible, with any reduction in speed limited to outside the peak periods.

Luddenham Road bridge installation

The installation of a bridge over Luddenham Road would involve construction activities near existing traffic lanes and bridge works over live traffic. Full road closures requiring detours would be in place when works over live traffic are considered unsafe and would be carried out outside of peak periods to minimise impacts. During installation of this bridge, northbound and southbound trips travelling along Luddenham Road would use Mamre Road and Elizabeth Drive.

Clifton Avenue realignment

Construction of the new motorway formation and a bridge over Clifton Avenue would require its realignment. A new road would be built to the west of the existing road, connecting to the new bridge over the M12 Motorway and a new service road to the east of the existing alignment of Clifton Avenue. This would maintain north–south connectivity for properties along both sides of Clifton Avenue. The new road would be built and open before the construction of the motorway formation.

Temporary traffic management

The majority of construction activities would occur on greenfield land. However, at the tie-in locations work would need to be carried out adjacent to live traffic. At these locations, temporary traffic management would be required to ensure traffic travelling adjacent to workers is at an appropriate speed and with sufficient separation. This may require reduced speed limits and temporary realignments around tie-in locations.

Consultation with the Traffic Management Centre and Northwest Roads will continue regarding the management of potential construction traffic impacts. Northwest Roads is the operator of the M7 Motorway. Northwest Roads would review construction traffic management plans to ensure impacts to traffic using the M7 Motorway would be minimised. They would also place conditions on Roads and Maritime relating to hours of work and lane closures. The Traffic Management Centre has a similar role for all State roads as well as the M7 Motorway.

Impacts on intersection performance

WSAGA mesoscopic traffic modelling (for the core study area only) for intersection performance for the 2024 scenario, with and without construction traffic is summarised in **Table 7-40** and **Table 7-41** for the morning and evening peak hours respectively.

Without construction traffic, the following intersections would operate at LoS D or worse in 2024:

- Elizabeth Drive/Devonshire Road (morning and evening peak)
- Elizabeth Drive/M7 Motorway northbound ramp/Wallgrove Road (evening peak)
- Elizabeth Drive/M7 Motorway southbound ramps (evening peak).

With construction traffic added to the road network, the performance of the following intersections would operate at LoS D or worse as a result:

- Elizabeth Drive/Cecil Road (evening peak) – would change from LoS A to LoS F
- Elizabeth Drive/Duff Road (evening peak) – would change from LoS A to LoS F
- Elizabeth Drive/Badgerys Creek Road (evening peak) – would change from LoS C to LoS D
- Elizabeth Drive/M7 Motorway northbound ramp/Wallgrove Road (morning peak) – Would change from LoS C to LoS D
- Elizabeth Drive/M7 Motorway southbound ramps (evening peak) – would change from LoS D to LoS F
- Elizabeth Drive/Luddenham Road (evening peak) – would change from LoS B to LoS F.

These increases in delay would impact all traffic including freight traffic, and are generally due to the addition of construction heavy vehicle traffic, which would contribute to additional delays because of the following:

- Additional delays in accelerating up steep grades while fully-loaded. This is generally the case when exiting the M7 Motorway to Elizabeth Drive from the south, which is a steep uphill grade
- Additional delays in waiting for a gap in traffic when turning right or left. Due to their length, construction heavy vehicles require longer gaps in traffic to safely turn from minor roads at priority intersections. Increased construction traffic volumes along Elizabeth Drive would also increase delays at priority intersections including Luddenham Road southbound and from Elizabeth Drive into Adams Road southbound.

Table 7-40 Construction scenario morning peak modelled intersection performance

Intersection	2024 no construction		2024 construction	
	Average delay (s)	LoS	Average delay (s)	LoS
Elizabeth Drive/M7 Motorway southbound ramps	26	B	28	B
Elizabeth Drive/M7 Motorway northbound ramps/Wallgrove Road	43	C	48	D
Elizabeth Drive/Cecil Road	9	A	15	A
Elizabeth Drive/Duff Road	20	B	29	C
Elizabeth Drive/Mamre Road	28	B	34	C
Elizabeth Drive/Range Road	8	A	13	A
Elizabeth Drive/Devonshire Road	> 100	F	> 100	F
Elizabeth Drive/Clifton Avenue	12	A	15	B
Elizabeth Drive/Western Road	16	B	20	B
Elizabeth Drive/Martin Road	8	A	9	A
Elizabeth Drive/Lawson Road	7	A	9	A
Elizabeth Drive/Badgerys Creek Road	61	E	63	E
Elizabeth Drive/Adams Road	9	A	9	A
Elizabeth Drive/Luddenham Road	15	A	16	B
Elizabeth Drive/The Northern Road	37	C	38	C

Table 7-41 Construction scenario evening peak modelled intersection performance

Intersection	2024 no construction		2024 construction	
	Average Delay (s)	LoS	Average Delay (s)	LoS
Elizabeth Drive/M7 Motorway southbound ramps	49	D	81	F
Elizabeth Drive/M7 Motorway northbound ramps/Wallgrove Road	> 100	F	> 100	F
Elizabeth Drive/Cecil Road	9	A	> 100	F
Elizabeth Drive/Duff Road	13	A	77	F
Elizabeth Drive/Mamre Road	16	B	30	C
Elizabeth Drive/Range Road	13	A	33	C
Elizabeth Drive/Devonshire Road	> 100	F	> 100	F
Elizabeth Drive/Clifton Avenue	4	A	49	D
Elizabeth Drive/Western Road	19	B	26	B
Elizabeth Drive/Martin Road	13	A	15	A
Elizabeth Drive/Lawson Road	9	A	14	A
Elizabeth Drive/Badgerys Creek Road	31	C	55	D
Elizabeth Drive/Adams Road	11	A	23	B
Elizabeth Drive/Luddenham Road	29	B	> 100	F
Elizabeth Drive/The Northern Road	41	C	43	C

Construction worker parking and impacts on on-street parking

Parking for construction personnel would be provided at all ancillary facilities. It is not expected that surplus parking demand from construction activities would reduce the availability of surrounding public parking as there is currently limited or no on-street parking in the core study area.

Impacts on public transport

Bus routes 801 and 813 operate along Elizabeth Drive between the M7 Motorway and Badgerys Creek Road and Route 789 operates on The Northern Road. During construction of the project, the following impacts on buses and bus customers are likely:

- Reductions in speed when travelling through construction activity areas, resulting in longer travel times
- Temporary relocation of bus stops away from construction zones requiring some passengers to walk further, while other passengers may have a shorter distance to walk to their desired bus stop.

Alternative access to relocated bus stops may need to be provided, in some cases requiring passengers to walk further to reach their desired bus stop.

Impacts on sensitive road users (pedestrians and cyclists)

The existing off-road shared user path along the M7 Motorway would need to be relocated to the east for about two kilometres between Villiers Road and south of Elizabeth Drive to accommodate the new off-ramps and on-ramps between the M7 Motorway and the M12 Motorway. The realignment would tie-in to the existing shared user path to the north and south of Elizabeth Drive. The extent of the proposed realignment is shown in **Figure 7-19**.

The realigned path would be constructed and opened to sensitive road users before the existing path is decommissioned to maintain access along the length of the facility. Safety barriers would separate users from the construction zone during construction of the new path and the decommissioning of the old path to provide safe passage during the realignment works. At tie-in locations any potential temporary disruptions (eg with final surfacing) would be managed to ensure users would be able to continue their journey.

Based on the surveys of pedestrians and cyclists that currently use the M7 Motorway shared user path and the shared user path into Western Sydney Parklands, this is likely to affect up to 1000 people per day on weekends and up to 250 people per day on weekdays.

The increase in construction vehicles would have a negligible impact on sensitive road users given the existing low volumes of pedestrians and cyclists using the proposed construction access routes.

7.2.6 Assessment of potential operational impacts

Consideration of future traffic growth without building the project

This section provides a summary of the changes to the transport network for the 2026 and 2036 forecast year if the project was not built (the ‘do minimum’ scenario) accounting for forecast traffic growth and incorporating other road infrastructure that is likely to be under construction or operational in the area. This reflects the main features of the transport network and the operation of the road network under the assumption that the M12 Motorway is not built and represents a business-as-usual ‘do minimum’ when the Western Sydney Airport is operational, with access provided directly from Elizabeth Drive.

Changes to the transport network

Changes to the transport network experienced under the ‘Do minimum’ scenario for the 2026 and 2036 years are summarised in **Table 7-42**.

Table 7-42 Summary of changes to the transport network under the ‘do minimum’ scenario for the years 2026 and 2036

	‘Do minimum’ 2026 scenario	‘Do minimum’ 2036 scenario
Changes to the road network	<p>The following road projects assumed to be in place for 2026:</p> <ul style="list-style-type: none"> • Bringelly Road upgrade: under construction • The Northern Road upgrade: under construction • Elizabeth Drive upgrade (intersection upgrades only): under investigation. 	<p>The following road projects assumed to be in place by 2036:</p> <ul style="list-style-type: none"> • Elizabeth Drive upgrade (M7 Motorway to The Northern Road): under investigation • Mamre Road and Devonshire Road realignment: under investigation • Luddenham Road and Adams Road realignment: under investigation • The M7 Motorway upgrade: identified through traffic modelling as required to meet forecast demands • Cowpasture Road Upgrade: under investigation • Fifteenth Avenue Upgrade: under investigation.

	'Do minimum' 2026 scenario	'Do minimum' 2036 scenario
Changes to the public transport network	Sydney Metro Greater West between Western Sydney Airport and St Marys	Extension of the Sydney Metro Greater West to Macarthur
Changes to pedestrian and cycle network	The following pedestrian and cycle network changes are assumed under the 'do minimum' scenario for both 2026 and 2036: <ul style="list-style-type: none"> Shared user path adjacent to The Northern Road as part of The Northern Road upgrade from Narellan to Penrith Shared user path adjacent to Bringelly Road as part of the Bringelly Road upgrade project between Camden Valley Way and The Northern Road. 	
Changes to parking and access	There are no proposed changes to parking and access assumed as part of the 'do minimum' scenario.	

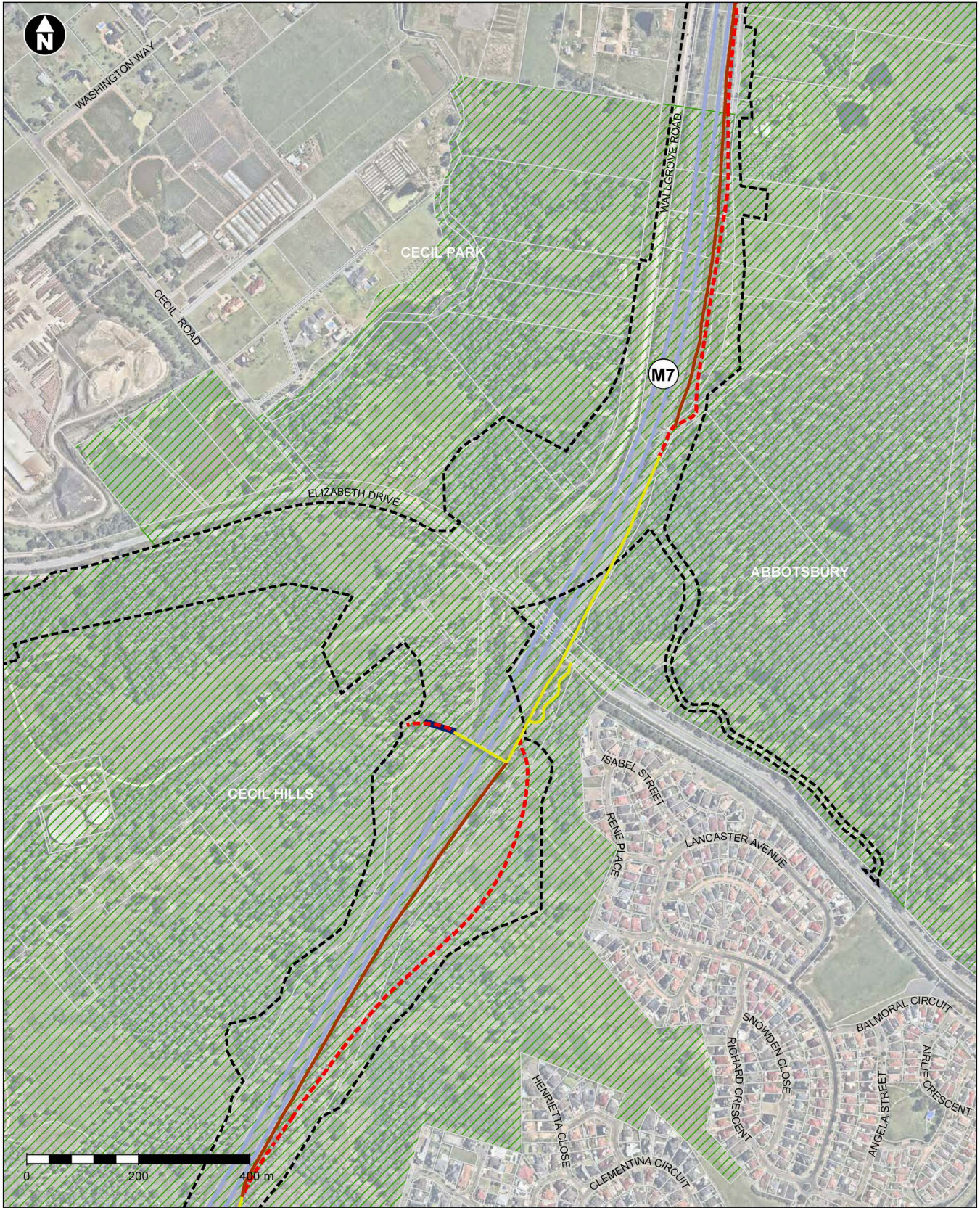
Changes to traffic volumes

Forecast traffic volumes across the core study area indicate that the traffic growth associated with the Western Sydney Airport and the on-site business parks, and other development in the Western Sydney Aerotropolis and the South West Growth Area would result in traffic demands on many key arterial roads that are already at or over capacity. Traffic volumes on these roads, particularly Elizabeth Drive, Luddenham Road and Devonshire Road generally exceed capacity during morning and evening peak hours.

Analysis of modelled traffic volumes across the wider study area associated with the 'do minimum' scenario indicates the following:

- North–south traffic volumes across the study area are forecast to increase substantially in the future, almost doubling between 2017 and 2036. The majority of this growth in north–south traffic would occur on the M7 Motorway, Mamre Road and The Northern Road, which are the primary north–south arterial roads through the study area. This reflects the substantial increase in forecast land use in and around the study area, including the Western Sydney Aerotropolis and the South West Growth Area.
- The assumed widening of the M7 Motorway to three lanes in each direction would substantially reduce traffic volumes on Mamre Road west of the proposed Devonshire Street connection. As a result of this realignment, the north–south traffic that currently travels between Devonshire Road and Mamre Road would travel directly north south along the extension of Devonshire Road at a new intersection with Elizabeth Drive.
- Traffic volumes along Luddenham Road would increase substantially by 2036, reflective of the increased traffic from the Western Sydney Airport and the realignment and connection of Luddenham Road to Adams Road and through to The Northern Road. This would create an alternative route to The Northern Road for trips to the M4 Motorway via Mamre Road and the Great Western Highway.
- East–west traffic volumes are also forecast to increase by up to 260 per cent by 2036. Most of this growth in east–west traffic would occur on the M4 Motorway, Luddenham Road, Elizabeth Drive and Bringelly Road.
- Increased traffic volumes along Elizabeth Drive would be primarily a result of the Western Sydney Airport and the on-site business parks within the Western Sydney Airport.

Table 7-43 to **Table 7-46** present a summary of traffic demand for the 2017 base year and the 2026 and 2036 'do minimum' scenarios for the morning and evening peak.



- The project construction footprint
- Western Sydney Parklands
- Motorway
- New bridge
- Existing M7 shared user path to be removed
- Existing M7 shared user path to be retained
- New M7 shared user path



Figure 7-19 Proposed pedestrian and cycle detours

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Table 7-43 Morning peak screen line volume summary (east–west screen line)

Road	Location	2017 (vehicles)		2026 (vehicles)		2036 (vehicles)	
		7am to 8am	8am to 9am	7am to 8am	8am to 9am	7am to 8am	8am to 9am
East–west Screen Line (southbound)							
M7 Motorway main line	N of Elizabeth Drive	2666	2624	3092	3043	4343	4041
Wallgrove Road	N of Elizabeth Drive	327	333	184	241	228	160
Cecil Road	N of Elizabeth Drive	231	236	178	174	204	33
Duff Road	N of Elizabeth Drive	52	51	65	57	72	103
Mamre Road	N of Elizabeth Drive	574	532	1248	1239	513	525
Devonshire Road	N of Elizabeth Drive	N/A	N/A	N/A	N/A	868	936
Luddenham Road	N of Elizabeth Drive	118	143	263	385	518	804
The Northern Road	N of Elizabeth Drive	804	660	1792	1708	1828	1659
Total		4772	4579	6822	6847	8574	8261
East–west Screen Line (northbound)							
M7 Motorway main line	N of Elizabeth Drive	3291	3378	3367	3683	4556	4292
Wallgrove Road	N of Elizabeth Drive	645	592	823	679	941	782
Cecil Road	N of Elizabeth Drive	113	112	39	31	50	36
Duff Road	N of Elizabeth Drive	89	65	173	175	142	153
Mamre Road	N of Elizabeth Drive	547	671	1070	1154	303	277
Devonshire Road	N of Elizabeth Drive	N/A	N/A	N/A	N/A	1084	1332
Luddenham Road	N of Elizabeth Drive	271	263	763	1237	842	915
The Northern Road	N of Elizabeth Drive	758	744	1088	1271	1086	1159
Total		5714	5825	7323	8230	9004	8946

Table 7-44 Morning peak screen line volume summary (north–south screen line)

Road	Location	2017 (vehicles)		2026 (vehicles)		2036 (vehicles)	
		7am to 8am	8am to 9am	7am to 8am	8am to 9am	7am to 8am	8am to 9am
Eastern North–south Screen Line (eastbound)							
M4 Motorway	W of Mamre Road	4057	3830	4014	4368	4588	3194
Luddenham Road	W of Mamre Road	431	364	956	1229	1152	1080
Elizabeth Drive	W of Western Road	950	879	1088	918	1479	1637
Bringelly Road	W of Masterfield Street	647	572	1320	1381	2381	1980
Total		6085	5645	7378	7896	9600	7891
Eastern North–south Screen Line (westbound)							
M4 Motorway	W of Mamre Road	2229	2752	3223	3728	3205	3703
Luddenham Road	W of Mamre Road	178	232	387	459	677	865
Elizabeth Drive	W of Western Road	555	418	1079	1206	2123	2152
Bringelly Road	W of Masterfield Street	233	294	956	1082	1030	1051
Total		3195	3696	5645	6475	7035	7771
Western North–south Screen Line (eastbound)							
M4 Motorway	W of Kent Road	3501	3306	3339	3566	3793	2801
Lansdowne Road	W of Kent Road	102	114	169	429	324	533
Elizabeth Drive	W of Luddenham Road	697	546	1452	1450	1935	1974
Adams Road	E of The Northern Road	70	74	132	181	149	180
The Northern Road	W of Mersey Road	567	439	741	709	896	915
Total		4937	4479	5833	6335	7097	6403
Western North–south Screen Line (westbound)							
M4 Motorway	W of Kent Road	1949	2422	2676	3086	2687	3043
Lansdowne Road	W of Kent Road	37	46	136	180	197	190
Elizabeth Drive	W of Luddenham Road	310	355	224	390	347	650
Adams Road	E of The Northern Road	8	24	191	269	535	457
The Northern Road	W of Mersey Road	672	485	935	978	1015	961
Total		2976	3332	4162	4903	4781	5301

Table 7-45 Evening peak screen line volume summary (east–west screen line)

Road	Location	2017 (vehicles)		2026 (vehicles)		2036 (vehicles)	
		4pm to 5pm	5pm to 6pm	4pm to 5pm	5pm to 6pm	4pm to 5pm	5pm to 6pm
East–west Screen Line (southbound)							
M7 Motorway main line	N of Elizabeth Drive	3078	2577	3933	3781	4961	4398
Wallgrove Road	N of Elizabeth Drive	929	924	845	865	843	917
Cecil Road	N of Elizabeth Drive	189	131	21	230	17	22
Duff Road	N of Elizabeth Drive	33	28	203	281	227	239
Mamre Road	N of Elizabeth Drive	869	682	1974	1877	1004	877
Devonshire Road	N of Elizabeth Drive	N/A	N/A	N/A	N/A	872	946
Luddenham Road	N of Elizabeth Drive	270	299	670	675	1055	1019
The Northern Road	N of Elizabeth Drive	791	723	1052	948	1718	1767
Total		6159	5364	8698	8657	10,697	10,185
East–west Screen Line (northbound)							
M7 Motorway main line	N of Elizabeth Drive	3088	2631	2923	2496	3976	4128
Wallgrove Road	N of Elizabeth Drive	344	421	500	676	340	323
Cecil Road	N of Elizabeth Drive	153	137	88	92	42	1
Duff Road	N of Elizabeth Drive	120	97	187	119	208	193
Mamre Road	N of Elizabeth Drive	632	543	1091	1152	407	396
Devonshire Road	N of Elizabeth Drive	N/A	N/A	N/A	N/A	1316	1724
Luddenham Road	N of Elizabeth Drive	162	184	726	802	934	563
The Northern Road	N of Elizabeth Drive	983	829	2053	2108	1992	2302
Total		5482	4842	7568	7445	9215	9630

Table 7-46 Evening peak screen line volume summary (north–south screen line)

Road	Location	2017 (vehicles)		2026 (vehicles)		2036 (vehicles)	
		4pm to 5pm	5pm to 6pm	4pm to 5pm	5pm to 6pm	4pm to 5pm	5pm to 6pm
Eastern North–south Screen Line (eastbound)							
M4 Motorway	W of Mamre Road	2787	2633	4307	4018	5217	5241
Luddenham Road	W of Mamre Road	201	172	1077	1011	1227	625
Elizabeth Drive	W of Western Road	408	351	607	480	1793	2258
Bringelly Road	W of Masterfield Street	373	401	1700	1776	1774	1893
Total		3769	3557	7691	7285	10,011	9817
Eastern North–south Screen Line (westbound)							
M4 Motorway	W of Mamre Road	4163	4512	5193	5593	5570	6083
Luddenham Road	W of Mamre Road	415	448	940	914	1169	848
Elizabeth Drive	W of Western Road	931	790	1281	1112	2286	2272
Bringelly Road	W of Masterfield Street	675	762	1851	2225	1409	1563
Total		6184	6512	9265	9844	10,434	10,766
Western North–south Screen Line (eastbound)							
M4 Motorway	W of Kent Road	2405	2271	3165	3113	3796	3808
Lansdowne Road	W of Kent Road	74	85	458	408	637	631
Elizabeth Drive	W of Luddenham Road	235	322	369	447	1096	1349
Adams Road	E of The Northern Road	42	26	77	188	199	230
The Northern Road	W of Mersey Road	655	698	896	829	1543	1544
Total		3411	3402	4965	4985	7271	7562
Western North–south Screen Line (westbound)							
M4 Motorway	W of Kent Road	3686	3974	4309	4594	4723	5080
Lansdowne Road	W of Kent Road	124	142	196	247	275	303
Elizabeth Drive	W of Luddenham Road	560	535	1012	1032	1669	1873
Adams Road	E of The Northern Road	59	111	140	156	722	911
The Northern Road	W of Mersey Road	689	650	1543	1638	996	1145
Total		5118	5412	7200	7667	8385	9312

Forecast traffic volumes across the study area show that the proposed traffic growth associated with the Western Sydney Airport and the on-site business parks, as well as development in the Western Sydney Aerotropolis and the South West Growth Area would result in increasing traffic demands on arterials through the study area that are currently single-lane rural roads. The forecast volumes on these roads, particularly Elizabeth Drive, Luddenham Road and Devonshire Road, would generally exceed their capacity, particularly during morning and evening peak hours.

Changes to freight transport

The Western Sydney Airport will be a significant attractor of heavy vehicle traffic, generating new freight movements between air and road freight modes. The main arterial roads in the study area are forecast to carry increasingly high proportions of heavy vehicles, with heavy vehicle volumes along Elizabeth Drive increasing by up to 250 per cent from the 2012 base year (2012 is the base year in the calibrated WRTM). More broadly, freight volumes are likely to increase as a result of the proposed growth in the western Sydney and greater Sydney metropolitan areas as described in the Greater Sydney Region Plan.

Freight demand forecasts have been included in the traffic modelling.

Without the project, by 2036 Mamre Road is forecast to carry heavy vehicle volumes more than five times greater in the northbound direction (431 per cent) and up to eight times greater (682 per cent) in the southbound direction than it did in 2012. In particular the growth in southbound heavy vehicle traffic is mostly forecast to occur by 2026. As previously discussed, the reason for this is because without the project, the M7 Motorway Elizabeth Drive interchange is forecast to be over capacity by 2026, making Mamre Road and Devonshire Road an attractive toll-free alternative. By 2036 this growth in northbound and southbound heavy vehicle traffic on Mamre Road is forecast to have slowed, which reflects the improved conditions that would be provided by the (assumed) upgrade of the M7 Motorway.

Table 7-47 presents a summary of the forecast heavy vehicle volumes on key roads within the core study area.

Table 7-47 Daily heavy vehicle forecasts on key roads in the study area

Road location	Direction	2012* base	2026	% Change from 2012	2036	% Change from 2012
The Northern Road north of Elizabeth Drive	Northbound	600	1430	138%	1370	128%
	Southbound	810	1600	98%	610	-25%
The Northern Road south of Elizabeth Drive	Northbound	620	1120	81%	1290	108%
	Southbound	890	1560	75%	560	-37%
Elizabeth Drive west of Adams Road	Eastbound	180	130	-28%	630	250%
	Westbound	240	430	79%	600	150%
Elizabeth Drive west of Devonshire Road	Eastbound	590	610	3%	1540	161%
	Westbound	920	1110	21%	1450	58%
Elizabeth Drive east of Mamre Road	Eastbound	840	1290	54%	2390	185%
	Westbound	1460	1610	10%	2420	66%
Elizabeth Drive East of Wallgrove Road	Eastbound	1040	1650	59%	2770	166%
	Westbound	1660	1930	16%	2790	68%

Road location	Direction	2012* base	2026	% Change from 2012	2036	% Change from 2012
Mamre Road north of Wallgrove Road	Northbound	390	1080	177%	2070	431%
	Southbound	220	1270	477%	1720	682%
Wallgrove Road north of Elizabeth Drive	Northbound	430	1050	144%	810	88%
	Southbound	740	1500	103%	1270	72%

*WRTM calibrated base year is 2012

Changes to network performance

A summary of the future network performance statistics for the wider study area under the 'do minimum' scenario is provided in **Table 7-48** and **Table 7-49** for the morning and evening peaks respectively.

Analysis of the network performance without the project indicates the following:

- Traffic demand for the study area is forecast to increase by up to 104 per cent during afternoon peak from 2017 to 2036 (from 223,148 vehicles to 455,336 vehicles). This is reflective of the large increase in residential land that is planned for release as part of the Western Sydney Aerotropolis and the South West Growth Area, as well as employment land associated with Western Sydney Airport.
- Total travel distance through the wider study area (see **Section 7.2.3**) would increase by up to 74 per cent during afternoon peak from 2017 to 2036 (from 1,828,324 kilometres to 3,185,503 kilometres), and total travel time through the wider study area would increase by up to 300 per cent during afternoon peak from 2017 to 2036 (from 31,893 hours to 96,743 hours) Thus would result in average speeds across the network (ie within the wider study area) reducing by up to 42 per cent during afternoon peak by 2036 (from 57 kilometres per hour to 33 kilometres per hour).
- Up to 18 per cent (80,179 out of 455,336 trips) of the forecast demand over the four-hour peak periods would be unable to enter the wider study area by 2036, with the majority of this unreleased traffic distributed at the periphery of the study area in the following locations:
 - South of Bringelly Road between The Northern Road and Camden Valley Way
 - Hoxton Park Road east of the M7 Motorway
 - Elizabeth Drive east of the M7 Motorway
 - The Horsley Drive east of the M7 Motorway
 - The M4 Motorway east of the M7 Motorway
 - Wallgrove Road north of the M4 Motorway
 - Archbold Road north of the M4 Motorway
 - Western Sydney Airport on-site business park accesses.

This indicates that the future road network at these locations would have insufficient capacity to carry the traffic that would be generated by the land use surrounding and within the wider study area and that many roads surrounding the study area would be at or near capacity in the future, including:

- The M7 Motorway northbound and southbound between Hoxton Park Road and the M4 Motorway
- Elizabeth Drive east and west of the M7 Motorway interchange
- Wallgrove Road in the vicinity of the M7 Motorway, The Horsley Drive and Elizabeth Drive
- Cowpasture Road between the M7 Motorway and Hoxton Park Road.

Table 7-48 Modelled 'do minimum' morning peak network performance

Network measure	2017	2026 'do minimum'	2036 'do minimum'
Network statistics for all vehicles			
Total traffic demand (vehicles)	193,949	276,206	344,333
Total vehicle kilometres travelled through network	1667,587	2,350,227	2,673,216
Total vehicle travel time through the network (hours)	28,699	60,008	74,249
Average network speed (kilometres per hour)	58	39	36
Total vehicles entering the network	196,113	268,058	305,541
Unreleased traffic			
Total unreleased trips	204	10,383	37,133
Per centage of demand unreleased	0%	4%	11%

Table 7-49 Modelled 'do minimum' afternoon peak¹ network performance

Network measure	2017	2026 'do minimum'	2036 'do minimum'
Network statistics for all vehicles			
Total traffic demand (vehicles)	223,148	345,296	455,336
Total vehicle kilometres travelled through network	1,828,324	2,802,008	3,185,503
Total vehicle travel time through the network (hours)	31,893	78,157	96,743
Average network speed (kilometres/hr)	57	36	33
Total vehicles entering the network	227,661	332,230	376,363
Unreleased traffic			
Total unreleased trips	807	23,351	80,179
Per centage of demand unreleased	0%	7%	18%

¹Note that the evening peak is larger than the morning peak as these numbers generally include additional trips for shopping and leisure in addition to commute to work trips.

Changes to intersection performance

The modelled future intersection performance at key intersections within the core study area under the 'do minimum' scenario is provided in **Table 7-50** and **Table 7-51** for the morning and evening peaks respectively. Modelled intersection performance indicates the following:

- Many intersections along Elizabeth Drive would operate at an unsatisfactory LoS of E or worse by 2026, reflecting forecast traffic demands that exceed available capacity at most of these intersections, even after road upgrades. The intersections that would operate at an unsatisfactory LoS by 2026 include:
 - Elizabeth Drive and The Northern Road (change from A to F)
 - Elizabeth Drive and Luddenham Road (change from A to E)
 - Elizabeth Drive and Martin Road (change from A to D)
 - Elizabeth Drive and Western Road (change from A to F)
 - Elizabeth Drive and Devonshire Road (change from A to F)
 - Elizabeth Drive and Mamre Road (change from A to F)
 - Elizabeth Drive and Duff Road (change from A to F)
 - Elizabeth Drive, Wallgrove Road and the M7 Motorway (change from B to F)
- The assumed widening of Elizabeth Drive to two lanes in each direction between Mamre Road and the M7 Motorway (by 2026), as well as the proposed upgrade of the Elizabeth Drive and Mamre Road roundabout to traffic signals would improve intersection performance along this section. However, capacity limitations at the M7 Motorway interchange would still result in unsatisfactory performance of intersections at the eastern end of Elizabeth Drive in the vicinity of the M7 Motorway.
- By 2036 additional improvements are assumed to be made to the network, including further upgrading of Elizabeth Drive between The Northern Road and Mamre Road, widening of the M7 Motorway to three lanes in each direction, and realignments at Luddenham Road/Adams Road, and Mamre Road/Devonshire Road to create improved north–south connections.
- The proposed eastern and western business park accesses would have sufficient capacity to serve the forecast demand into and out of the Western Sydney Airport in 2026. However, by 2036 these accesses would be operating at unsatisfactory levels of service and would be unable to support the level of growth forecast for Western Sydney Airport.

Overall intersection performance under the 'do minimum' scenario indicates that even with assumed upgrades along Elizabeth Drive, the corridor would have insufficient capacity to carry forecast traffic demand that is expected to accompany the Western Sydney Airport and its associated land uses.

Changes to intersection performance with the project are assessed in the following section.

Table 7-50 Morning peak intersection Levels of Service without the project

Intersection	2017 base		2026 do minimum		2036 do minimum	
	Av delay	LoS	Av delay	LoS	Av delay	LoS
Elizabeth Drive/Northern Road	12	A	67	E	>100	F
Elizabeth Drive/Luddenham Road	13	A	77	F	41	C
Elizabeth Drive/Business Park East	N/A	N/A	30	C	33	C
Elizabeth Drive/Business Park West	N/A	N/A	25	B	>100	F
Elizabeth Drive/Martin Road	9	A	36	C	44	D
Elizabeth Drive/Western Road	14	A	61	E	42	C
Elizabeth Drive/Devonshire Road	13	A	>100	F	80	F
Elizabeth Drive/Mamre Road	14	A	>100	F	36	C
Elizabeth Drive/Duff Road	12	A	17	B	23	B
Elizabeth Drive/Wallgrove Road	31	C	45	D	74	F
Elizabeth Drive/M7 Motorway	20	B	>100	F	>100	F
Wallgrove Road/M7 Motorway	2	A	20	B	13	A

Table 7-51 Evening peak intersection Levels of Service without the project

Intersection	2017 base		2026 do minimum		2036 do minimum	
	Av delay	LoS	Av delay	LoS	Av delay	LoS
Elizabeth Drive/Northern Road	11	A	51	D	64	E
Elizabeth Drive/Luddenham Road	18	B	>100	F	66	E
Elizabeth Drive/Business Park East	N/A	N/A	33	C	34	C
Elizabeth Drive/Business Park West	N/A	N/A	31	C	31	C
Elizabeth Drive/Martin Road	12	A	85	F	48	D
Elizabeth Drive/Western Road	9	A	>100	F	45	D
Elizabeth Drive/Devonshire Road	12	A	>100	F	73	F
Elizabeth Drive/Mamre Road	14	A	56	D	38	C
Elizabeth Drive/Duff Road	9	A	>100	F	26	B
Elizabeth Drive/Wallgrove Road	48	D	>100	F	>100	F
Elizabeth Drive/M7 Motorway	17	B	>100	F	>100	F
Wallgrove Road/M7 Motorway	10	A	80	F	>100	F

Note: Improvements in LoS are due to improvements to local roads assumed as part of the modelled scenarios (see **Section 7.2.2**)

Changes to travel times

Analysis of the modelled general traffic travel times on key routes through the core study area under the ‘do minimum’ scenario is presented in **Figure 7-20** to **Figure 7-25**. Analysis of the modelled travel times under the ‘do minimum’ scenario indicates that:

- Travel times on the M7 Motorway, particularly in the vicinity of Elizabeth Drive would increase substantially by 2026. This is a result of the existing capacity issues that are currently observed on the M7 Motorway between Hoxton Park Road and Elizabeth Drive, where steep grades, particularly northbound on approach to Elizabeth Drive, cause heavy vehicles to slow down. As traffic volumes increase along the M7 Motorway in these locations, increased delays are expected even under the existing reduced speed zones that operate in this area.
- The assumed widening of the M7 Motorway by 2036 would relieve delays associated with heavy vehicle speeds, allowing trucks to remain in the kerbside lane and provide sufficient passing capacity for general traffic. By 2036, widening of the M7 Motorway would reduce delays and facilitate travel time along this motorway that are in line with existing performance.
- Eastbound and westbound travel times on Elizabeth Drive would increase substantially, even with localised intersection upgrades in 2026 and widening to four-lanes in 2036. These delays would be a result of the capacity constraints at the Elizabeth Drive/M7 Motorway interchange, where limited work is possible to increase the capacity of the already constrained double-point interchange. Traffic turning right onto the M7 Motorway from Elizabeth Drive conflicts with through traffic eastbound and westbound on Elizabeth Drive, which would result in queues that extend as far as Duff Road by 2036.
- Travel times on The Northern Road would increase in 2026 and 2036. However, this would largely be limited to the approaches to Elizabeth Drive, which would be the primary access route to the Western Sydney Airport from Penrith.

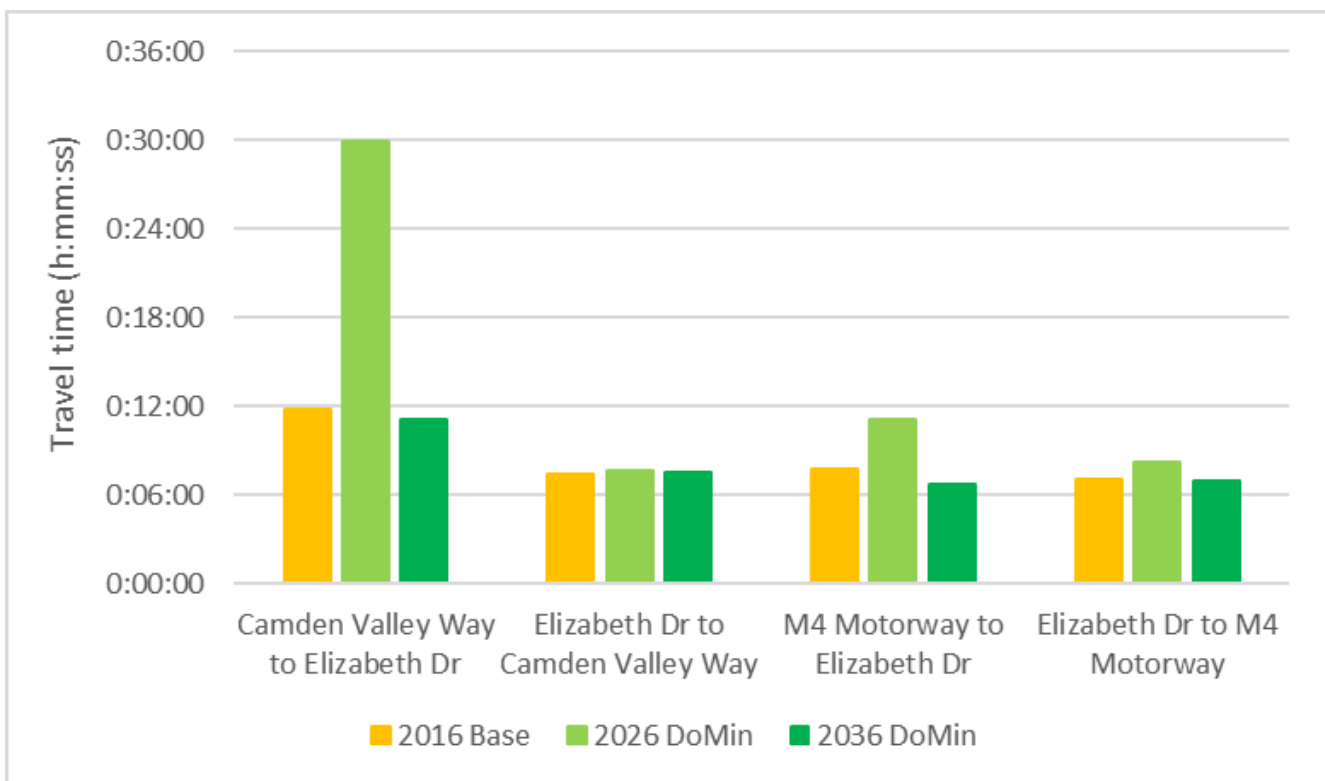


Figure 7-20 The M7 Motorway morning peak travel times (8am to 9am)

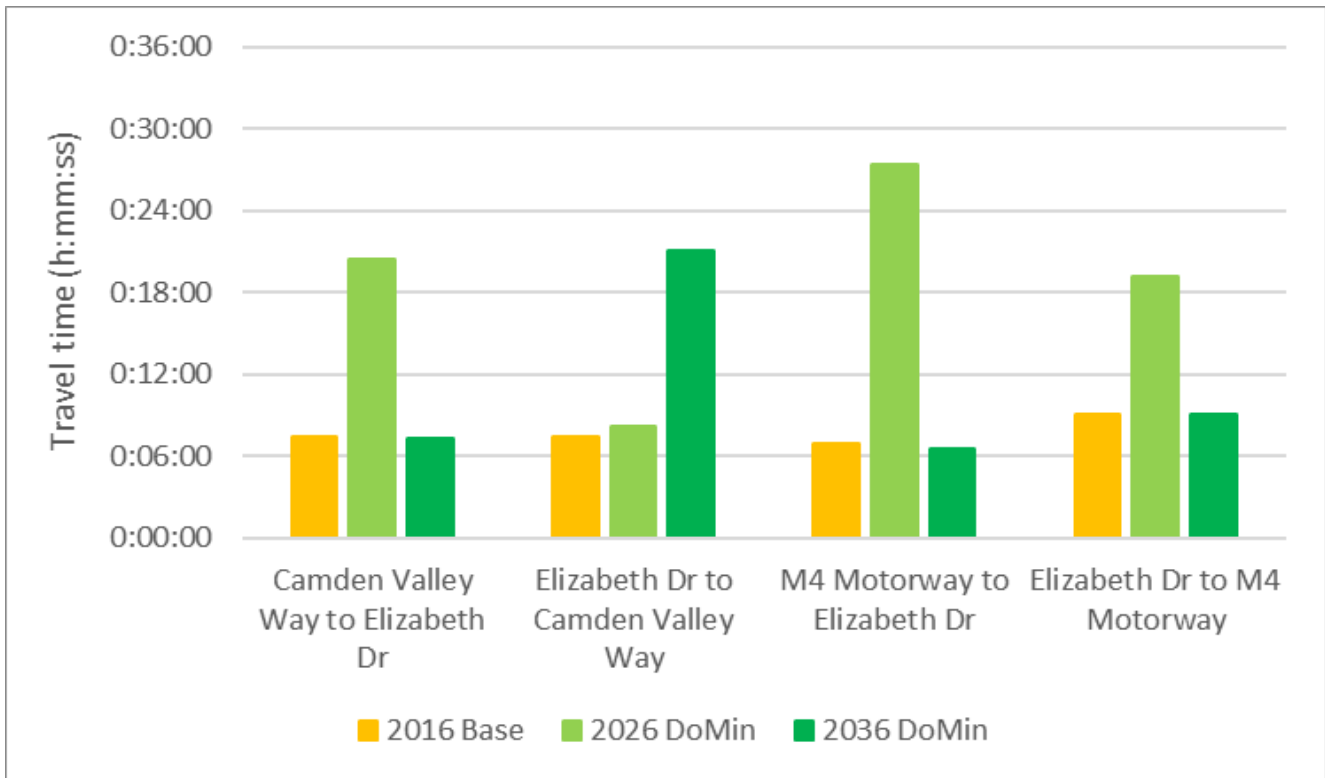


Figure 7-21 The M7 Motorway evening peak travel times (5pm to 6pm)

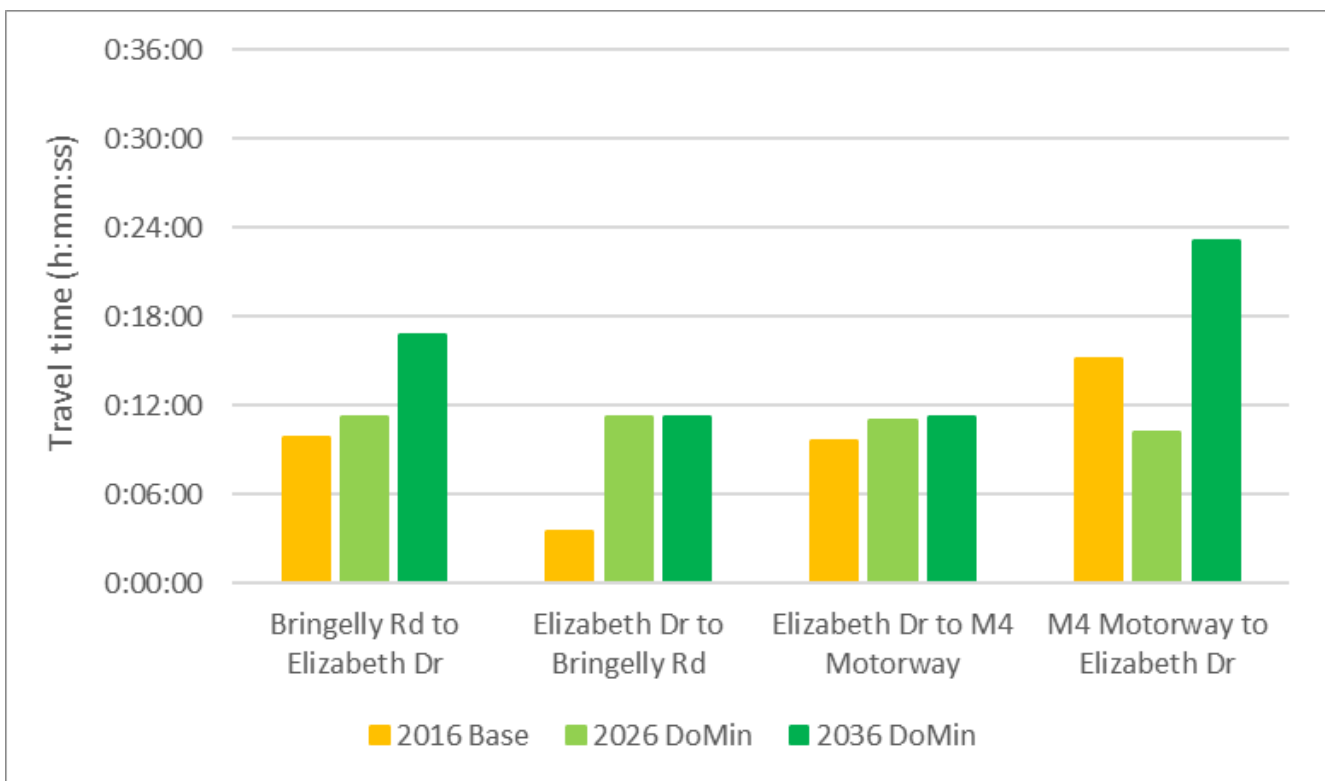


Figure 7-22 The Northern Road morning peak travel times (8am to 9am)

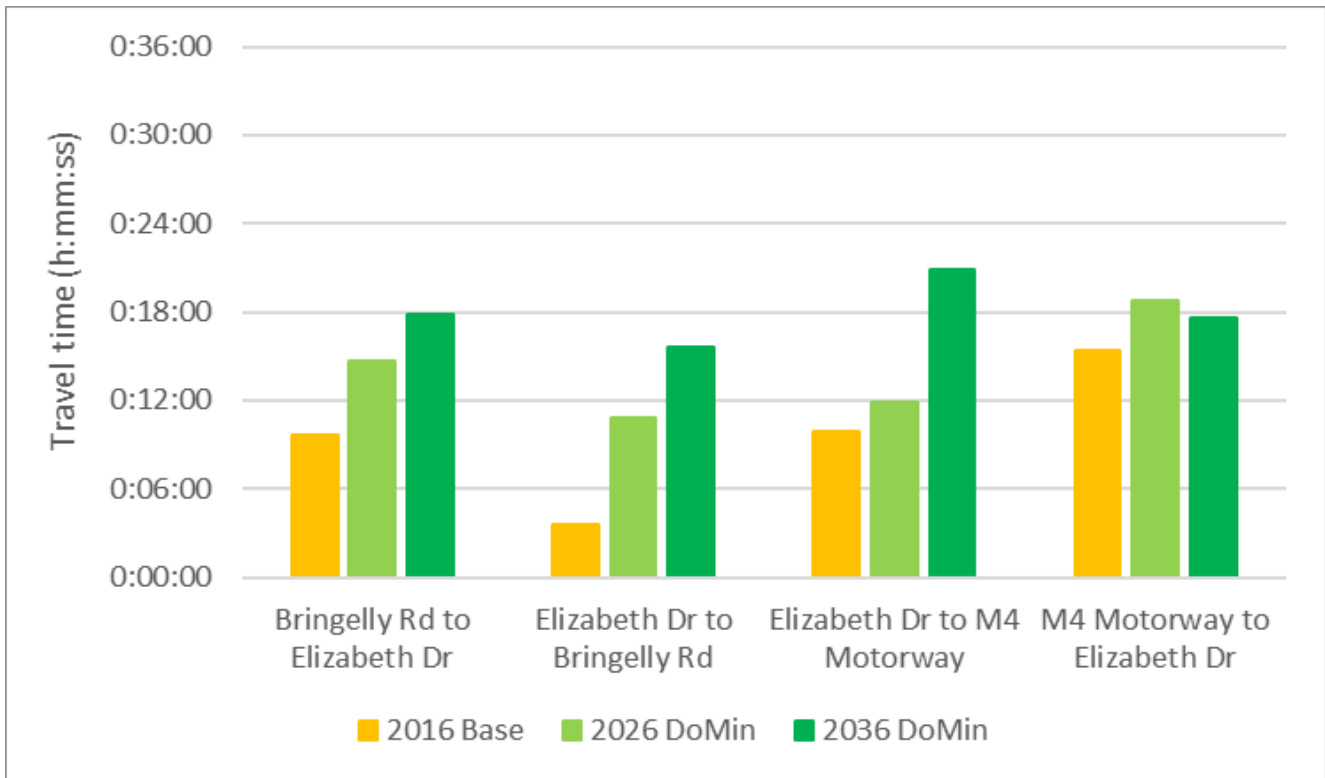


Figure 7-23 The Northern Road evening peak travel times (5pm to 6pm)

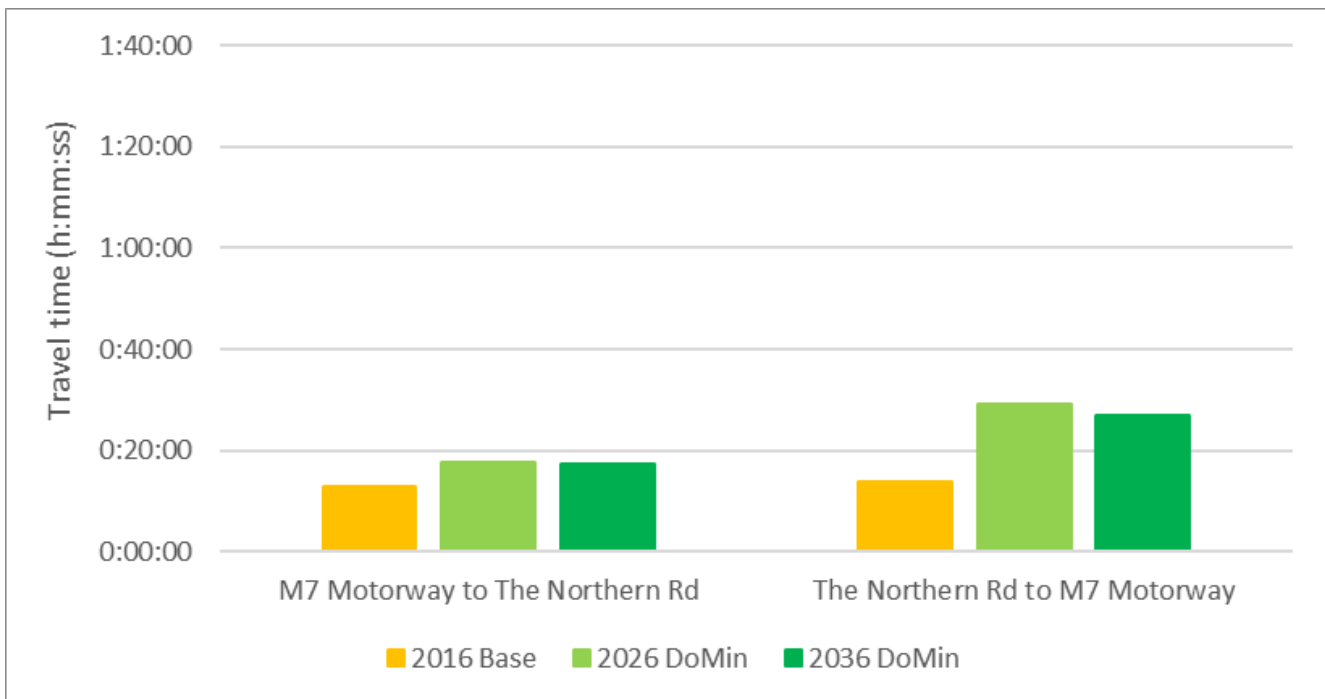


Figure 7-24 Elizabeth Drive morning peak travel times (8am to 9am)

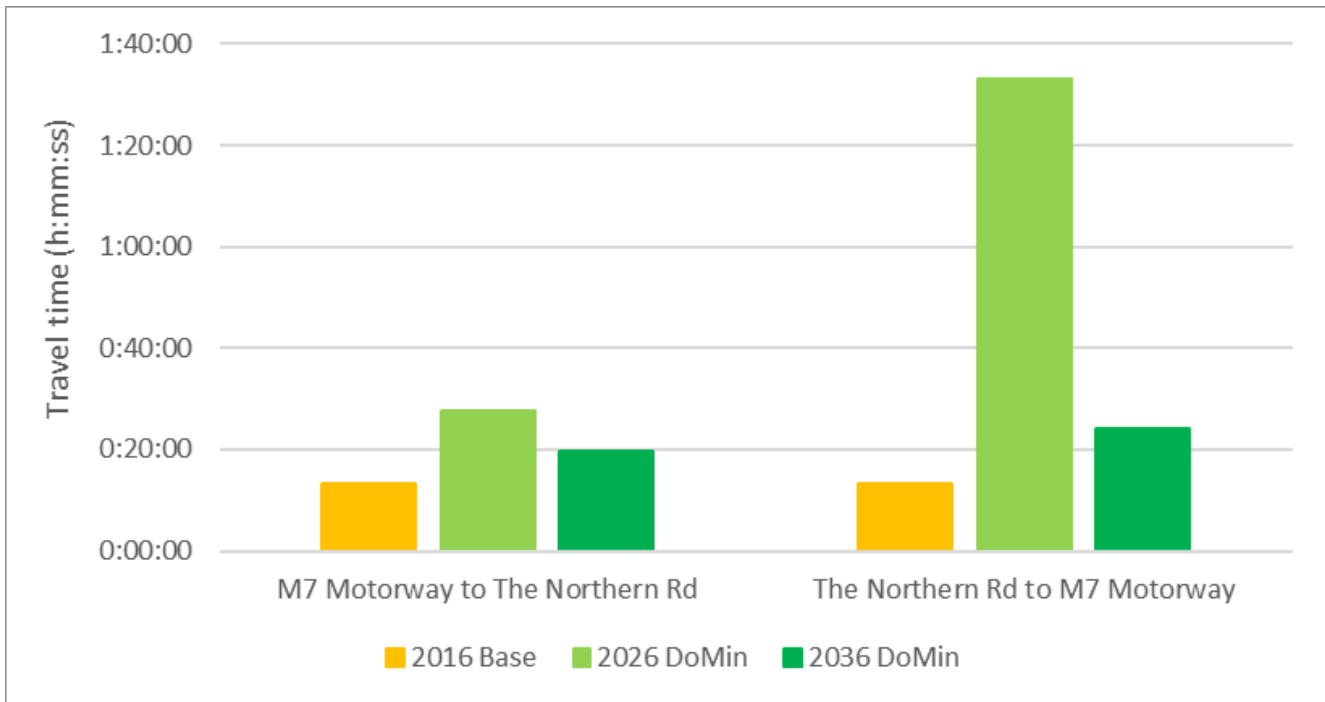


Figure 7-25 Elizabeth Drive evening peak travel times (5pm to 6pm)

Assessment of impacts with the project

This section provides an assessment of the road network performance in 2026 and 2036 with the project (the project scenario).

Changes to traffic volumes

The project would result in redistribution of traffic primarily along the Elizabeth Drive corridor by shifting traffic off Elizabeth Drive and onto the M12 Motorway, with minimal changes to other regional roads in the study area. This redistribution would also improve traffic flows on the M7 Motorway by reducing the volume of traffic that would need to travel through the existing Elizabeth Drive interchange which is a significant capacity constraint in the core study area.

Detailed analysis of the modelled traffic volumes indicates that:

- By 2036, the project would result in increased flows southbound across the study area in the morning peak (12.6 per cent overall) and northbound (14 per cent overall) in the evening peak.
 - The introduction of the M12 Motorway interchange at the M7 Motorway would allow for free-flow movement for traffic travelling to and from the Western Sydney Airport via the M12 Motorway instead of through the existing Elizabeth Drive interchange, which would reach capacity (without the project) by 2026. By 2036, this would allow a much greater volume of traffic to travel along the M7 Motorway in the peak direction unimpeded by the existing capacity constraints at Elizabeth Drive.
 - From 2026 to 2036, northbound traffic on the M7 Motorway in the morning peak (north of Elizabeth Drive) would increase by 44 per cent with the project, compared to an increase of 26 per cent if the M12 Motorway were not built.

- Eastbound and westbound volumes across the study area in peak periods would increase as a result of the project, in both morning and evening peak periods.
 - The majority of this additional traffic would be along the Elizabeth Drive and the M12 Motorway corridor. About 50 per cent of the traffic volumes that would travel along Elizabeth Drive in the ‘do minimum’ scenario would transfer to the M12 Motorway, freeing up capacity along Elizabeth Drive for trips that would otherwise be unable to enter the wider study area either at the Western Sydney Airport Access or on Elizabeth Drive to the east of the M7 Motorway during the peak period.
 - For example, by 2036 traffic volumes on Elizabeth Drive during the morning peak with the project would decrease by eight per cent (eastbound) and 38 per cent (westbound) compared to the ‘do minimum’ scenario. In the evening peak, traffic volumes on Elizabeth Drive with the project would decrease by 31 per cent (eastbound) and 22 per cent (westbound) compared to the do-minimum scenario.
 - By freeing up capacity in these locations, the project would facilitate more travel that would otherwise not be made during the peak periods, although this demand would still exist with or without the project.
- The transfer of traffic from Elizabeth Drive to the M12 Motorway would reduce right turning traffic travelling from Elizabeth Drive to the M7 Motorway at the existing M7 Motorway interchange.
 - This would allow for more traffic to travel east–west along Elizabeth Drive at the M7 Motorway interchange from the east than would be possible without the project.
- Traffic volumes on the M12 Motorway in the morning peak period would increase by 64 per cent (eastbound) and 140 per cent (westbound) between 2026 and 2036. Over the same time frame, evening peak traffic volumes on the M12 Motorway would increase by 133 per cent (eastbound) and 89 per cent (westbound).
 - The transfer of traffic from Elizabeth Drive to the M12 Motorway is clearly evident in the modelled forecasts. When combined with additional traffic that would be able to enter the study area at the Western Sydney Airport and on Elizabeth Drive east of the M7 Motorway, this would result in reduced traffic volumes along Elizabeth Drive of up to 43 per cent by 2036.

Appendix F (Table 6-16 to Table 6-21) presents a summary of traffic demand for the 2026 and 2036 ‘do minimum’ and project scenarios for the morning and evening peak.

Changes to network performance

The project would generally improve traffic conditions in the study area in both 2026 and 2036, particularly in the evening peak, although the improvements would be more pronounced in 2036. Overall, the project would reduce delays and increase average speeds across the network.

Analysis of the modelled network performance during the operation of the project shows that:

- The project would result in increased average network speed by 2036, in the morning peak by three per cent and in the evening peak by eight per cent
- The project would not substantially change the amount of traffic that would be unable to enter the wider study area by the end of the peak period, as this traffic is generally south of Bringelly Road and removed from the project
- The project would increase the total distance travelled through the network by seven per cent in the morning peak and evening peak, due to the additional distance along the alignment of the M12 Motorway. However, this would be at a much higher travel speed than Elizabeth Drive, resulting in lower total hours of travel.

A summary of the future network performance statistics for the wider study area under the project scenario is provided in **Table 7-52** and **Table 7-53**.

Table 7-52 Modelled project morning peak network performance

Network measure	2026 'do minimum'	2026 project	2036 'do minimum'	2036 project
Network statistics for all vehicles				
Total traffic demand (vehicles)	276,206	269,769	344,333	338,577
Total vehicle kilometres travelled through network	2,350,227	2,414,354	2,673,216	2,845,037
Total vehicle travel time through the network (hours)	60,008	61,348	74,249	75,995
Average network speed (kilometres per hour)	39	39	36	37
Total vehicles entering the network	268,058	269,648	305,541	307,046
Unreleased traffic				
Total unreleased trips	10,383	10,207	37,133	39,182
Per centage of demand unreleased	4%	4%	11%	12%

Table 7-53 Modelled project evening peak network performance

Network measure	2026 'do minimum'	2026 project	2036 'do minimum'	2036 project
Network statistics for all vehicles				
Total traffic demand (vehicles)	345,296	338,126	455,336	449,659
Total vehicle kilometres travelled through network	2,802,008	2,875,652	3,185,503	3,411,466
Total vehicle travel time through the network (hours)	78,157	70,063	96,743	95,691
Average network speed (kilometres/hr)	36	41	33	36
Total vehicles entering the network	332,230	328,467	376,363	378,351
Unreleased traffic				
Total unreleased trips	23,351	21,866	80,179	81,972
Per centage of demand unreleased	7%	6%	18%	18%

Induced demand

Induced demand accounts for the potential new trips that would not be carried out if the project was not built. This induced demand is calculated at the Sydney-wide level in the traffic model as a result of the project, and represents the change in utility across the network as a result of the project being built. As discussed in **Section 7.2.2**, the WRTM considers the changes in traffic associated with this induced demand. This equates to about 0.2 per cent additional daily trips in the Sydney metropolitan area in 2036 and represents the change in utility across the network as a result of the project being built.

It is not expected that the induced demand more locally to the project would exceed this figure accounted for by the WRTM, since the project is primarily providing improved access to new development.

Changes to intersection performance

Modelled future intersection performance for key intersections within the core study area with the project are provided in **Table 7-54** and **Table 7-55**, for the morning and evening peak periods respectively.

The project would result in improved intersection performance along the Elizabeth Drive corridor between The Northern Road and Mamre Road. For intersections east of Mamre Road, trips using this section of Elizabeth Drive would not have access to the M12 Motorway as an alternative route, so although there would be some improvements in intersection performance in this section, it would be lesser than for intersections further west on Elizabeth Drive.

Table 7-54 Intersection performance with the project – morning peak

Intersection	2017 base		2026 project		2036 project	
	Av delay	LoS	Av delay	LoS	Av delay	LoS
Elizabeth Drive/The Northern Road	12	A	59	E	75	F
Elizabeth Drive/Luddenham Road	13	A	>100	F	52	D
Elizabeth Drive/Business Park East	N/A	N/A	37	C	30	C
Elizabeth Drive/Business Park West	N/A	N/A	21	B	19	B
Elizabeth Drive/Martin Road	9	A	39	C	34	C
Elizabeth Drive/Western Road	14	A	35	C	42	C
Elizabeth Drive/Devonshire Road	13	A	>100	F	73	F
Elizabeth Drive/Mamre Road	14	A	>100	F	38	C
Elizabeth Drive/Duff Road	12	A	16	B	24	B
Elizabeth Drive/Wallgrove Road	31	C	84	F	49	D
Elizabeth Drive/M7 Motorway	20	B	>100	F	>100	F
The Northern Road/M12 Motorway	-	-	44	D	27	B

Table 7-55 Intersection performance with the project – evening peak

Intersection	2017 base		2026 project		2036 project	
	Av delay	LoS	Av delay	LoS	Av delay	LoS
Elizabeth Drive/The Northern Road	11	A	65	E	71	F
Elizabeth Drive/Luddenham Road	18	B	63	E	49	D
Elizabeth Drive/Business Park East	N/A	N/A	36	C	39	C
Elizabeth Drive/Business Park West	N/A	N/A	22	B	19	B
Elizabeth Drive/Martin Road	12	A	37	C	44	D
Elizabeth Drive/Western Road	9	A	32	C	45	D
Elizabeth Drive/Devonshire Road	12	A	26	B	88	F
Elizabeth Drive/Mamre Road	14	A	>100	F	43	C
Elizabeth Drive/Duff Road	9	A	49	D	26	B
Elizabeth Drive/Wallgrove Road	48	D	66	E	73	F
Elizabeth Drive/M7 Motorway	17	B	>100	F	97	F
The Northern Road/M12 Motorway	-	-	46	D	34	C

Detailed analysis of the modelled intersection performance under the project scenario indicates that:

- The project would reduce traffic volumes and delays along Elizabeth Drive, particularly in the westbound direction. Under the 2026 scenario, this would make Devonshire Road, Elizabeth Drive and Luddenham Road a more attractive toll-free alternative to the M7 Motorway, which would have substantial increases in delay under the 2026 forecast years. This would create more demand for the right turn from Elizabeth Drive to Luddenham Road northbound, increasing delays at this location.
- The project would lead to reduced flows along Elizabeth Drive as it would improve the performance of most intersections along Elizabeth Drive, including the intersections of Elizabeth Drive with:
 - The Northern Road
 - Luddenham Road
 - Eastern and Western Business Park Accesses
 - Western Road
 - Devonshire Road
 - Wallgrove Road.
- The M7 Motorway/Elizabeth Drive interchange would continue to perform poorly in the morning and evening peak period. While the project would reduce demand for traffic travelling between Western Sydney Airport and the M7 Motorway through this interchange, the remaining demand for this intersection, which would exist with or without the project would still exceed its capacity.

- The intersection of Mamre Road and Elizabeth Drive would perform worse under the project scenario due to the conflict of additional right turning traffic that would use Elizabeth Drive and Mamre Road as a toll-free alternative to the M7 Motorway to travel from east to north through the study area. Without the project, this traffic would be held back on Elizabeth Drive to the east of the M7 Motorway. However, reduced traffic between Elizabeth Drive and the M7 Motorway through this interchange would allow more traffic to travel west along Elizabeth Drive and would conflict with eastbound traffic at this roundabout, causing increased eastbound delays.
- The inclusion of a loop ramp providing access to the M7 Motorway from Elizabeth Drive would remove the existing priority intersection that provides access to the M7 Motorway from Wallgrove Road. This would effectively remove any delays associated with this movement, allowing for a free-flow access to the M7 Motorway from Elizabeth Drive and substantially reduce delays for this movement.

Changes to travel times

Modelled general traffic travel times for key routes through the study area are presented in **Figure 7-26** to **Figure 7-33**.

Figure 7-26 shows that travel times along the M7 Motorway would generally increase in the project scenario when compared to the ‘do minimum’ scenario in the 2026 morning peak. These generally small increases in travel time would be due to additional merging of traffic at the locations where the M12 Motorway interfaces with the M7 Motorway. This merging would generate additional delay, particularly in the northbound direction. However, most of these delays would be reduced following the assumed widening of the M7 Motorway in the 2036 scenario, which would reduce the conflict between merging traffic and traffic on the main line. The exception is from the M4 Motorway to Elizabeth Drive. This is due to the project creating an alternative route to the Northern Road for trips travelling to the M4 Motorway via Mamre Road and the Great Western Highway.

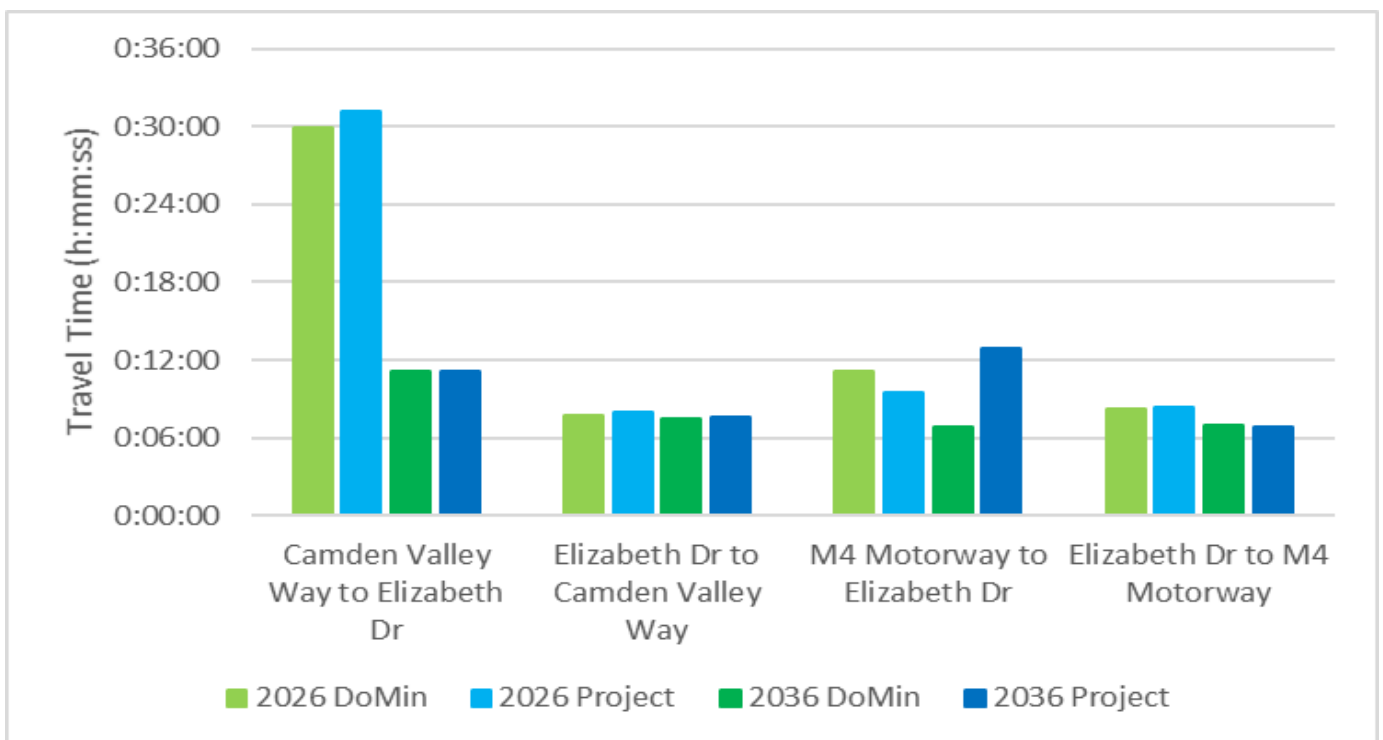


Figure 7-26 The M7 Motorway morning peak travel times (8am to 9am)

During the evening peak along the M7 Motorway (see **Figure 7-27**), travel times would be generally shorter with the project in 2026, with the exception of from Elizabeth Drive to Camden Valley Way where localised intersection upgrades would be occurring in 2026. The travel times in 2036 would be shorter with the project between Elizabeth Drive and Camden Valley Way as Elizabeth Drive would be widened to four-lanes. Travel times will increase with the project in 2036 from M4 Motorway to Elizabeth Drive. The increase during morning peak time in the 2036 scenario is due to the project creating an alternative route to The Northern Road for trips travelling to the M4 Motorway via Mamre Road and the Great Western Highway.

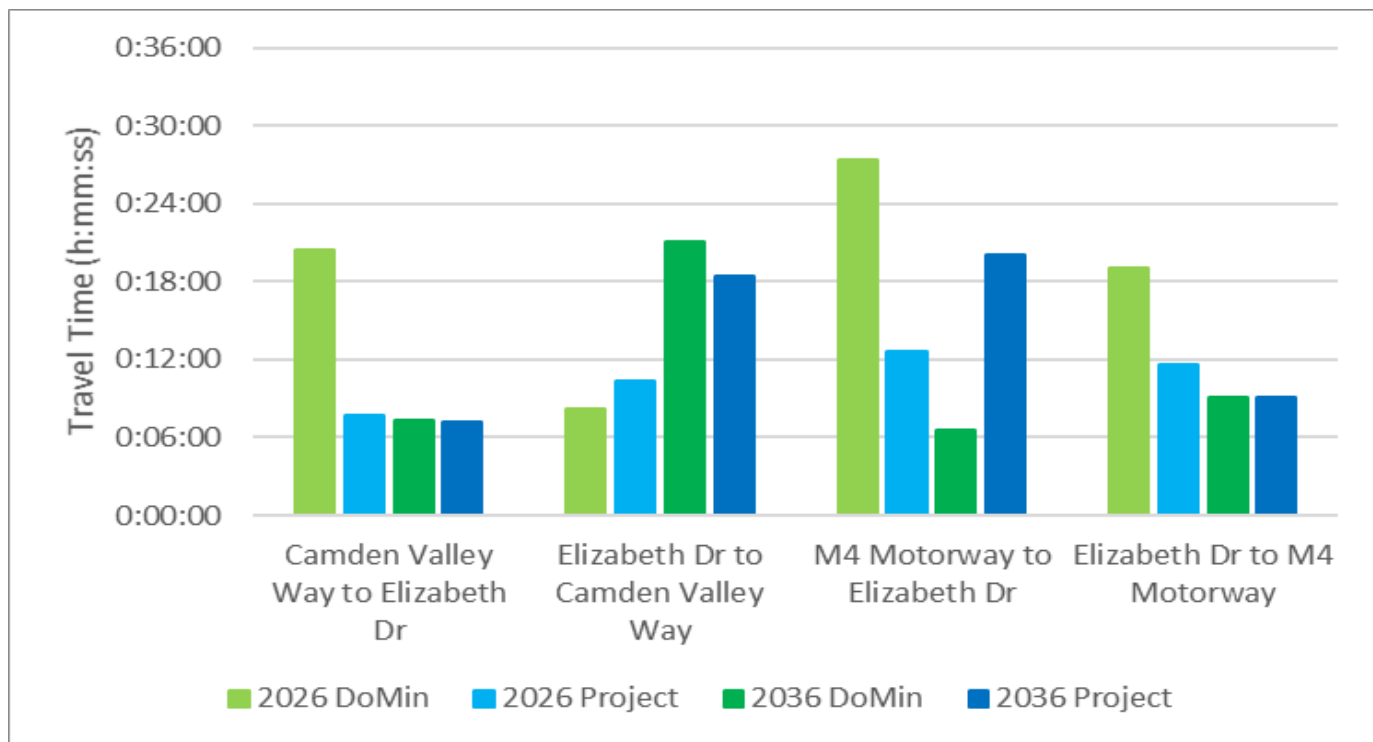


Figure 7-27 The M7 Motorway evening peak travel times (5pm to 6pm)

Figure 7-28 shows that travel times on The Northern Road northbound between Elizabeth Drive and the M4 Motorway in the morning peak would generally decrease with the project. There will be slight increases in travel times with the project, however, in 2026 between Elizabeth Drive and the M4 Motorway and in 2036 from Bringelly Road to Elizabeth Drive. This increase in travel times along Elizabeth Drive in the 2026 morning peak is due to the increased volumes of traffic travelling west along Elizabeth Drive and turning right from Elizabeth Drive into Mamre Road.

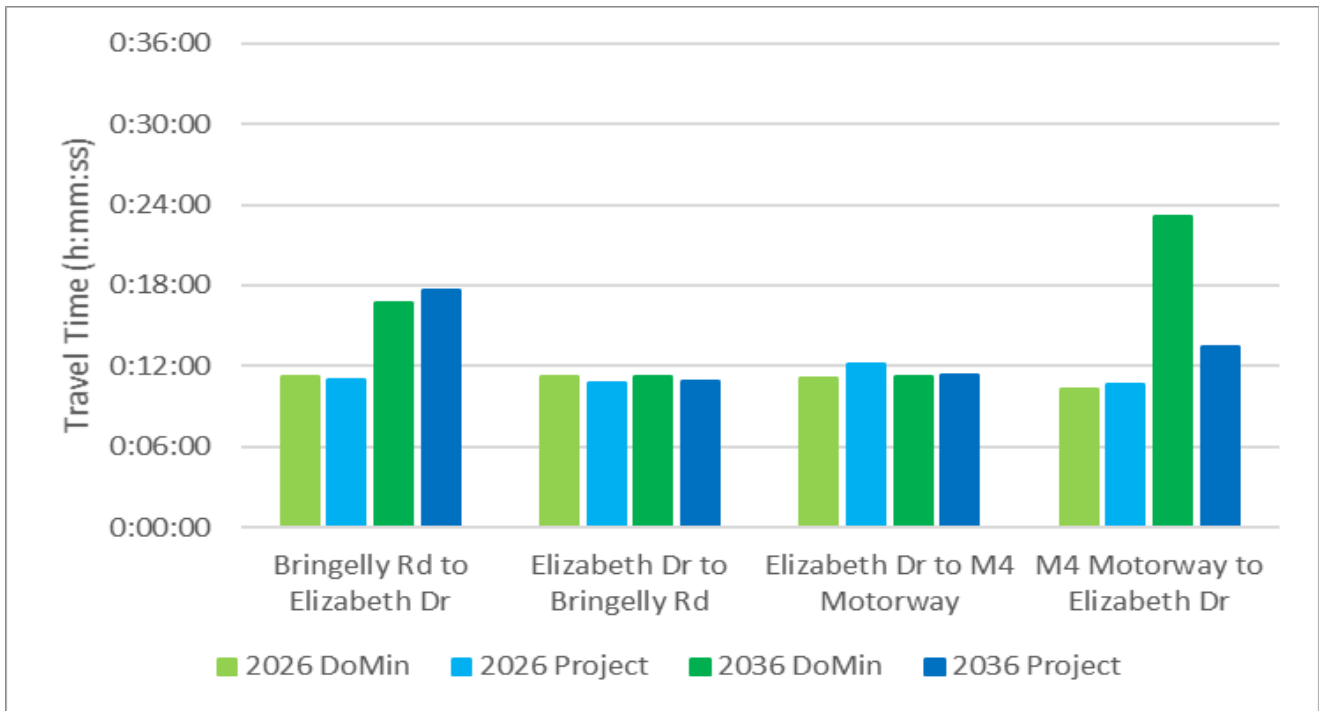


Figure 7-28 The Northern Road morning peak travel times (8am to 9am)

Figure 7-29 shows that travel times on The Northern Road northbound between Elizabeth Drive and the M4 Motorway in the evening peak would increase with the project), due to the changes in access to the Western Sydney Airport. Without the project, some traffic from the Western Sydney Airport would travel north to the M4 Motorway via Luddenham Road, as this route would be more direct, and Luddenham Road would be generally free flow, while The Northern Road would have several signalised intersections along its length once The Northern Road upgrade project is complete. With the project, access to The Northern Road via the M12 Motorway would make The Northern Road a more attractive alternative to Luddenham Road.

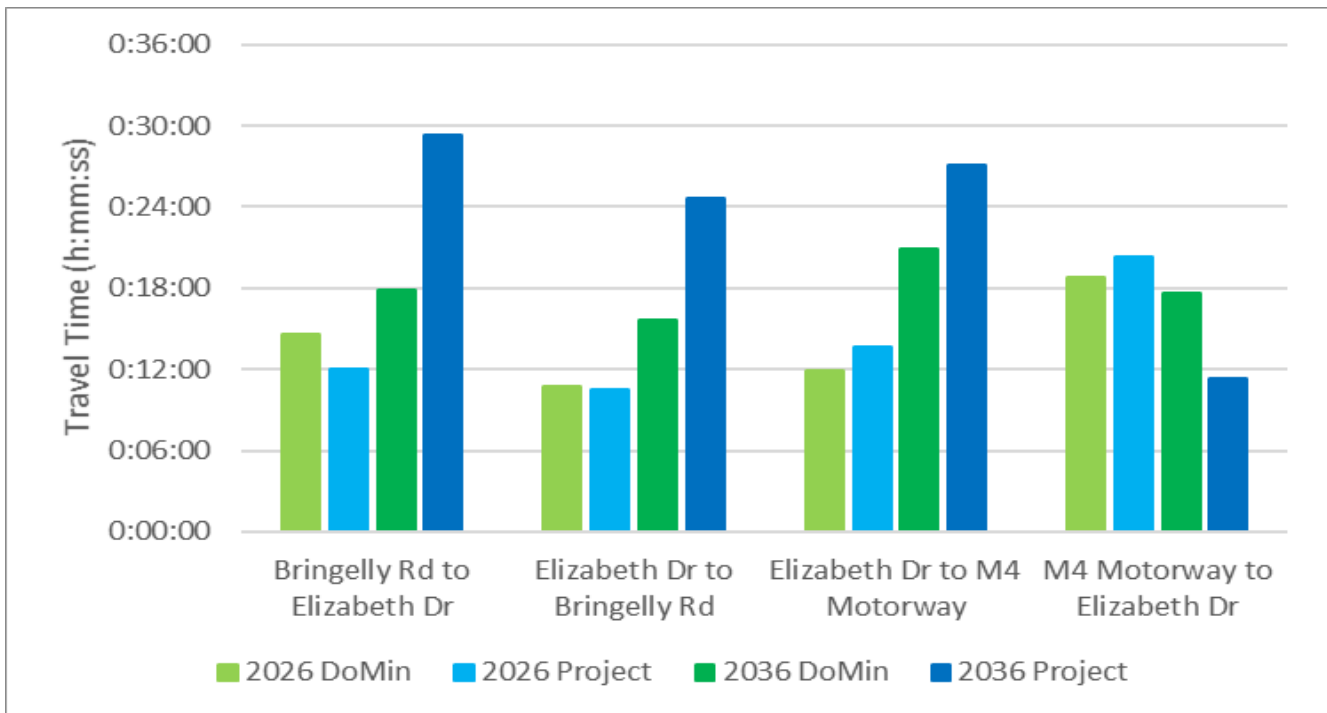


Figure 7-29 The Northern Road evening peak travel times (5pm to 6pm)

Figure 7-30 and Figure 7-31 show that:

- Travel times on Elizabeth Drive between the M7 Motorway and The Northern Road would increase in 2026 and decrease in 2036. This slight increase is due to proposed intersection upgrades along Elizabeth Drive in 2026 and full widening of the corridor to four lanes in 2036
- Travel times on Elizabeth Drive between The Northern Road and the M7 Motorway would decrease substantially, except for the 2026 scenario during the morning peak. This increase in travel times along Elizabeth Drive in the 2026 morning peak would be due to the increased volumes of traffic travelling west along Elizabeth Drive and turning right from Elizabeth Drive into Mamre Road. This increased right turn volume would delay opposing eastbound traffic. However, upgrading this intersection to traffic signals would eliminate this eastbound delay by 2036.

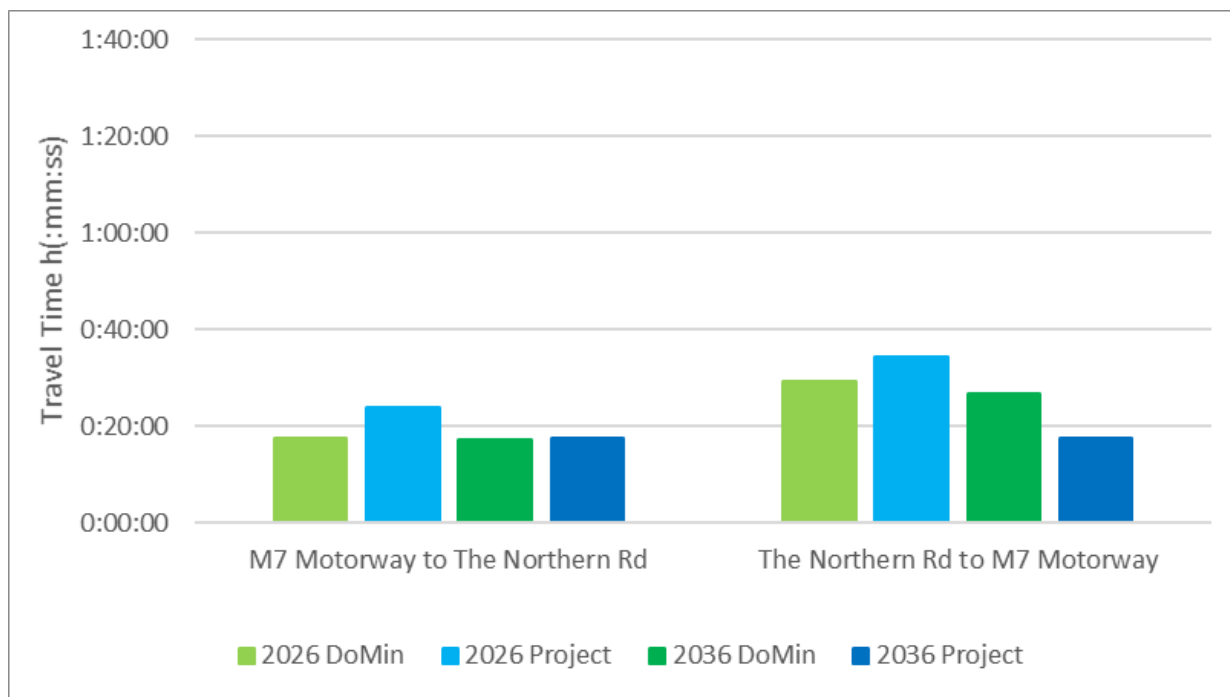


Figure 7-30 Elizabeth Drive morning peak travel times (8am to 9am)

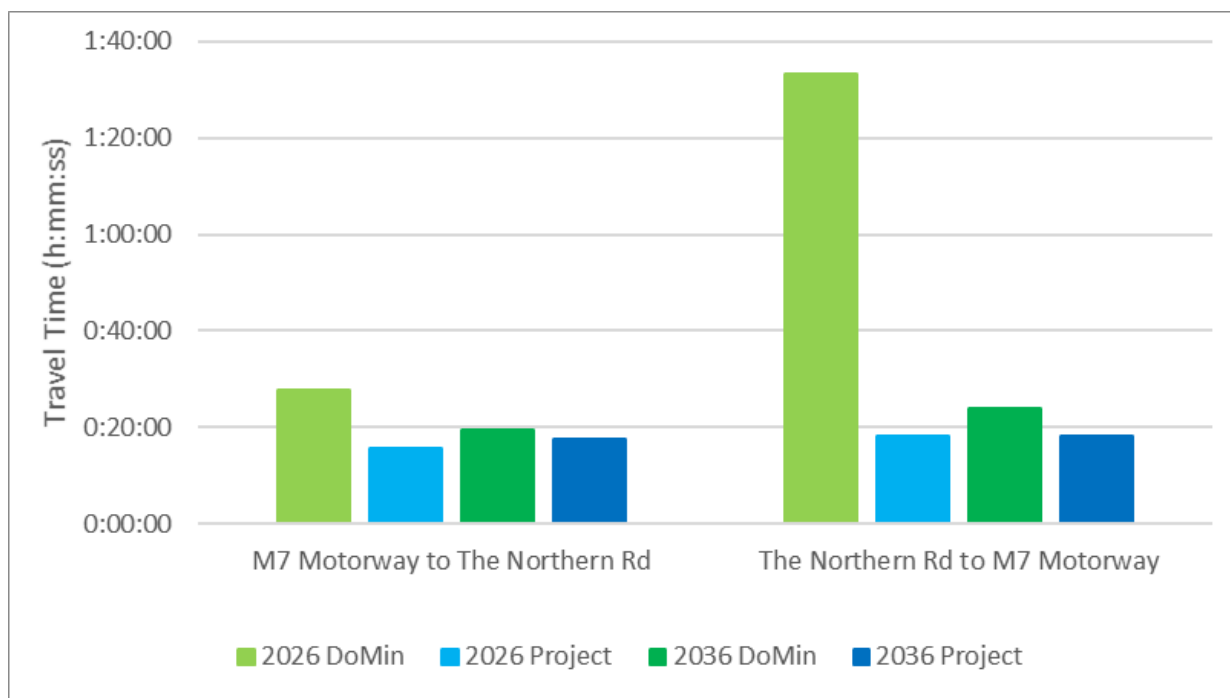


Figure 7-31 Elizabeth Drive evening peak travel times (5pm to 6pm)

Travel time on the M12 Motorway would increase between 2026 and 2036 for both morning (see **Figure 7-32**) and evening (see **Figure 7-33**) peaks. This reflects the forecast growth in traffic volumes associated with the Western Sydney Airport, particularly eastbound to the M7 Motorway, where the increased volumes of heavy vehicles travelling to the M7 Motorway would experience increased delays due to the steep grade between Mamre Road and Cecil Road. Although travel times on the M12 Motorway would increase over time as traffic demand grows, the change would be small (less than five minutes along the length of the motorway) and demonstrates that the project has sufficient capacity to perform acceptably with forecast 2036 traffic volumes.

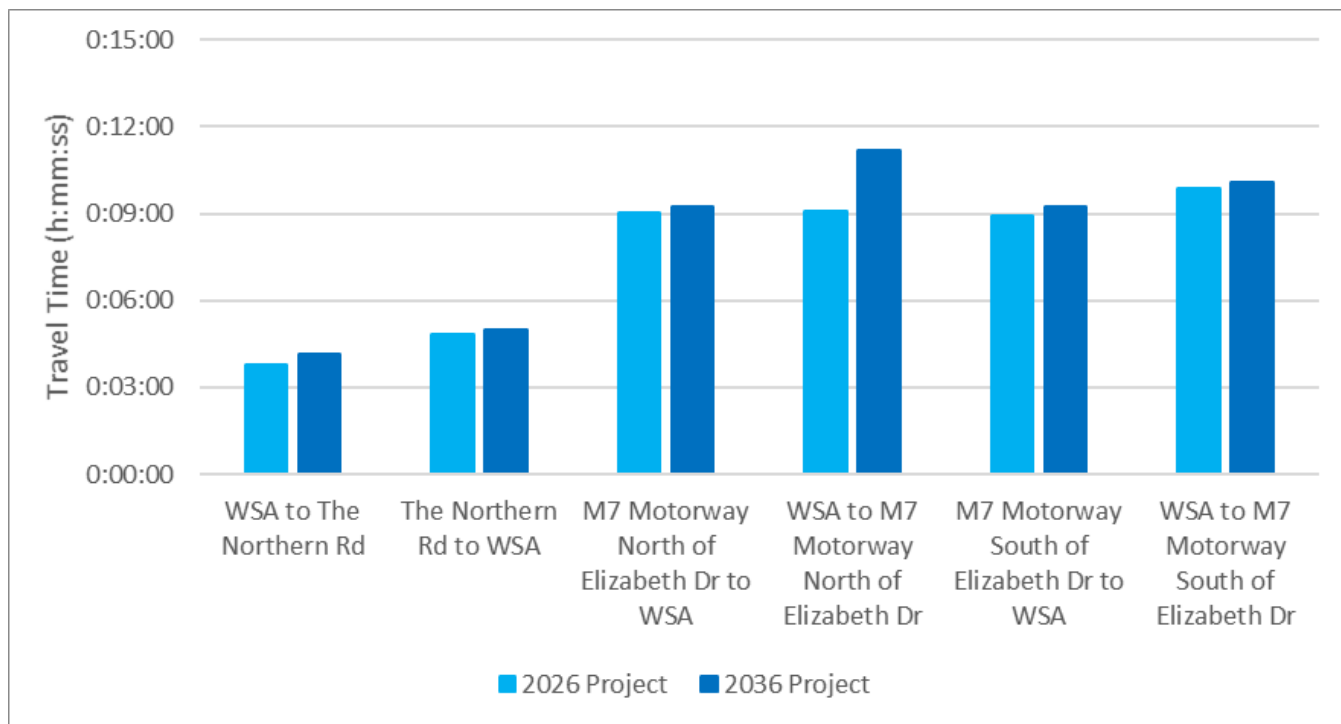


Figure 7-32 The M12 Motorway morning peak travel times (8am to 9am)

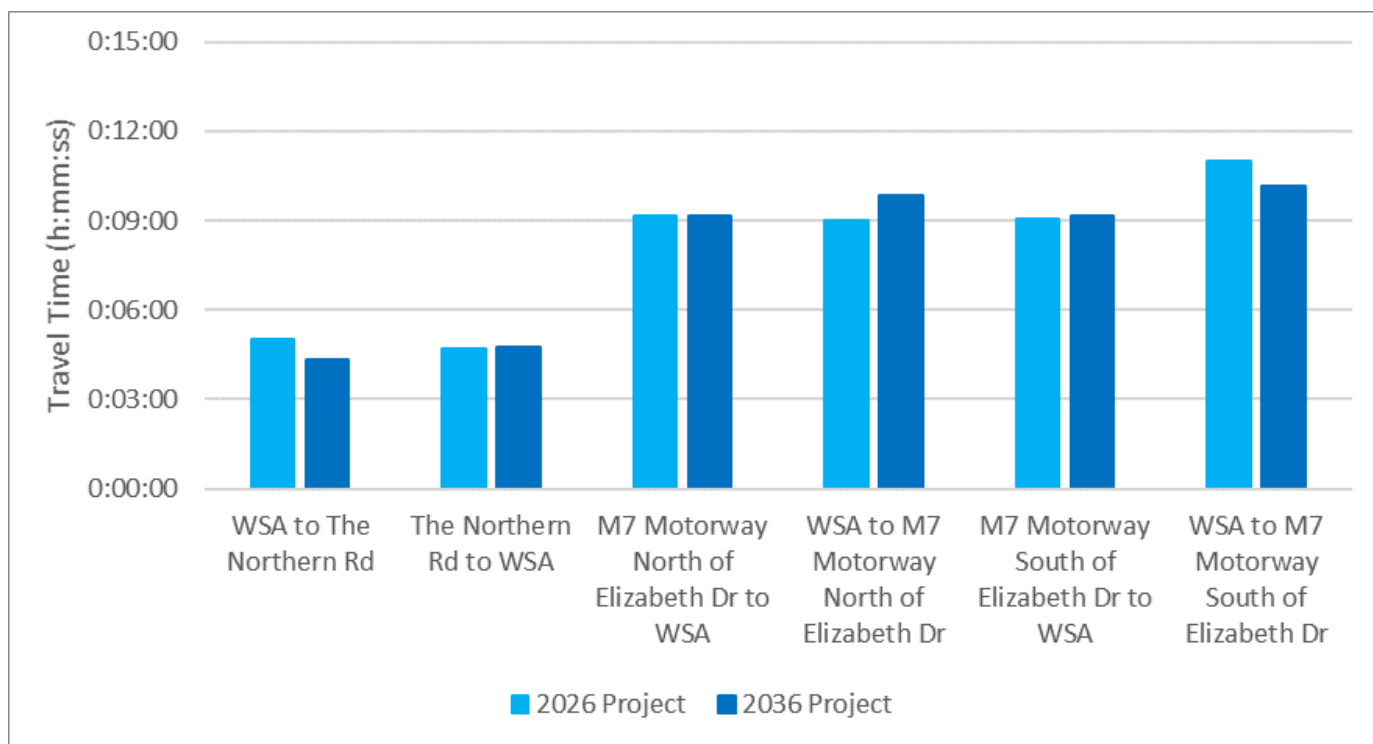


Figure 7-33 The M12 Motorway evening peak travel times (5pm to 6pm)

Impacts on freight transport

The project is expected to improve reliability and travel times for all traffic, including freight traffic that would be travelling to and from the Western Sydney Airport. It would achieve this by providing additional traffic capacity and motorway standard access to the Western Sydney Airport, minimising travel times and reducing wear and tear on trucks.

The project would also reduce travel time and improve reliability and speed for trucks travelling between The Northern Road and the M7 Motorway. Currently, trucks use the Elizabeth Drive which is single-lane in each direction and is capacity-constrained at its intersections with the M7 Motorway. With the upgrade of The Northern Road to a primary north–south freight route from the emerging South West Growth Area and other growth areas within the Western Parkland City, freight traffic travelling between The Northern Road and the M7 Motorway is expected to increase. The M12 Motorway would provide a safe and reliable route between major roads and to the airport. This would improve the reliability of freight shipments transferring between air and road modes.

Forecast daily heavy vehicle volumes (see Table 6-26 of **Appendix F**) show that the primary impact of the project on heavy vehicle volumes would be a reduction of up to 40 per cent in heavy vehicle trips along Elizabeth Drive, with most of these trips transferring to the M12 Motorway to travel between The Northern Road and the M7 Motorway.

Impacts on road safety

The M12 Motorway would reduce the volume of future traffic travelling on Elizabeth Drive. Motorways are generally safer than arterial roads as they have:

- Higher design speed and wider curve geometry
- Wider lanes
- Higher quality pavement
- Fewer intersections and less stop-start-traffic
- Better lighting and intelligent transport systems
- Separation of sensitive road users from vehicular traffic.

The change in arterial and motorway vehicle kilometres of travel, when combined with the associated average crash rates for arterial roads in the study area and the M7 Motorway indicate that overall crashes across the core study area could decrease by up to 217 crashes per year by 2036 with the project.

In addition to these likely road safety benefits associated with a reduction in the number of crashes, the project is expected to result in the following improvements to road safety:

- Reduce the number of heavy vehicles needing to use Elizabeth Drive for access to the Western Sydney Airport or travelling between the M7 Motorway and The Northern Road. This would improve road safety by reducing overtaking of heavy vehicles and the associated risk of head-on crashes
- Provide cyclists with a safe off-road facility and remove the risks associated with cycling on road adjacent to general traffic on Elizabeth Drive
- Reduce congestion at the M7 Motorway/Elizabeth Drive interchange, which is expected to reduce the likelihood of vehicle crashes, especially rear-end crashes.

Sensitive road user safety is described in **Section 8.3.4**. The project would provide safer access for pedestrians and cyclists by the provision of a shared user path. The shared user path has been designed to accommodate increased numbers of sensitive road users resulting from the proposed land use and infrastructure changes. This shared user path would create a safe pedestrian and cyclist facility for the wider western Sydney area.

In summary, the project is expected to positively impact road safety and improve access and safety for pedestrians and cyclists.

Impacts on local roads and access

The project would impact property access by blocking existing internal access to properties, or by closing or blocking an existing access to the public road network. Specific properties affected by access changes as well as the nature of the access impact on these properties once the motorway is built are provided in **Appendix F** (Table 6-28). These affected properties would have their access reinstated, as part of the project and in consultation with the property owner, unless property acquisition or amalgamation would make this unnecessary.

the M12 Motorway would be generally located over undeveloped land, which would minimise impacts on access to the surrounding properties. Design standards for motorways require that cross-traffic must be grade-separated, and intersections permitted only at interchanges via entry and exit ramps. Consequently, access to the M12 Motorway would only be provided at limited locations.

The project has also been designed to ensure that a possible connection from Devonshire Road and Mamre Road via an interchange can be built in the future. The crossings of the M12 Motorway with Luddenham Road, Mamre Road and a possible future extension of Devonshire Road would be grade-separated, and traffic would be able to continue using both roads uninterrupted. The current design also allows sufficient space for the upgrade of the intersection of Mamre Road and Elizabeth Drive to traffic signals in the future (assumed for the purposes of this study to be built by 2036).

Impacts on public transport

Operation of the M12 Motorway would not generate adverse impacts on existing bus routes and bus stops through the study area. The NSW Government proposes to establish rapid bus services from the metropolitan centres of Penrith, Liverpool and Campbelltown to the Western Sydney Aerotropolis and to the Western Sydney Airport before it opens. The frequencies of these bus services would be determined based on the demand for travel to the proposed airport. The design of the project does not preclude the operation of these buses along the M12 Motorway.

It is likely that buses that offer direct services to and from the Western Sydney Airport would use the M12 Motorway for access into and out of the airport site.

Operation of the M12 Motorway would not impact on existing rail services and the project has been planned to integrate with the planned Sydney Metro Greater West, which would be grade-separated as it passes south through the operational footprint and under the proposed realignment of Elizabeth Drive.

It is not feasible to accurately forecast travel demand for the public transport network at this stage of the project.

Impacts on active transport

A shared user path about four metres wide would be provided along the M12 Motorway, from The Northern Road at the western end of the project up to Range Road, in the Western Sydney Parklands. Ultimately, the shared user path would extend through the Parklands to connect to the existing shared user path along the M7 Motorway. The shared user path would complete a connection between the existing M7 Motorway cycleway and the shared user path adjacent to The Northern Road that will be built as part of The Northern Road upgrade.

The shared user path would be grade-separated at all road crossings and floodplains and would underpass the airport access road. It would run adjacent to the M12 Motorway from The Northern Road to the Western Sydney Airport interchange, separated by a barrier. Between The Northern Road and the Western Sydney Airport interchange the shared user path would be located on the southern side of the M12 Motorway. It would then cross under the airport to the M12 Motorway westbound entry ramp before overpassing the M12 Motorway at the Western Sydney Airport interchange and continuing along the northern side of the M12 Motorway as far as Clifton Avenue. At Clifton Avenue, the shared user path would again cross the motorway along the proposed Clifton Avenue bridge. The shared user path would then continue along the southern side of the M12 Motorway to Range Road.

The two existing pedestrian bridges crossing the M7 Motorway south of Elizabeth Drive, Cecil Hills, would be retained, with the northernmost of these two bridges lengthened to span across the M7 Motorway northbound exit ramp.

The section of the shared user path through the Western Sydney Parklands would not form part of this project and would be implemented by the Western Sydney Parklands Trust, in accordance with the Trust's broader strategic plans for the Western Sydney Parklands. Roads and Maritime is liaising with the Western Sydney Parklands Trust regarding the development of the shared user path location.

The shared user path would extend along the western side of the airport access road up to the boundary of the Western Sydney Airport and tie into Elizabeth Drive. Connections to local roads and places of interest would be provided as part of the shared user path facility including a connection to Clifton Avenue in Kemps Creek.

Connecting two major regional cycling facilities some 14 kilometres apart, the project would substantially improve cycling and walking connectivity through the wider study area. In addition to connecting these two major cycling facilities, the project would also provide access from this adjacent cycleway to the following roads:

- Western Sydney Parklands Gate G access road
- Elizabeth Drive at Duff Road
- Range Road and Wylde Mountain Bike Trail
- Elizabeth Drive at Mamre Road
- Salisbury Avenue
- Clifton Avenue
- Elizabeth Drive at the Western Sydney Airport
- Luddenham Road
- The Northern Road.

This level of pedestrian and cycle connectivity would be a transformative addition to the regional active transport network in the wider study area, allowing pedestrians and cyclists to access currently very poorly accessible streets and properties on Elizabeth Drive and its adjacent cross-streets. In addition to the connectivity benefits, shared user facility would also substantially improve safety for cyclists and pedestrians, by providing an off-road active transport corridor separated from vehicles, and removing conflicts on-road and at crossing points.

It is not feasible to accurately forecast travel demand for the cycle network at this stage of the project.

Impacts on parking

As the M12 Motorway would be built on primarily undeveloped land, there would be no impacts on existing parking in the study area. Arterial and motorway roads generally do not permit on-street parking and there is currently no parking permitted on Elizabeth Drive or The Northern Road in the study area.

7.2.7 Cumulative impacts

Cumulative transport and traffic impacts may arise from the interaction of construction and operation activities of the project and other approved or proposed projects in the area. When considered in isolation, specific project impacts may be considered minor, but when considered with the impact of multiple projects, they may be considered more substantial. As such, the transport and traffic impacts were assessed in consideration of recently completed, ongoing and proposed projects, which are described in **Table 7-3** and assessed in **Table 7-56**. The cumulative impact assessment involved both qualitative and quantitative assessments, which are identified in the table overleaf.

In addition to the projects listed in the table, the traffic and transport assessment included the following potential projects in the network scenarios underpinning the traffic models for 2024, 2026 and 2036:

- Bringelly Road upgrade
- Cowpasture Road upgrade – M7 Motorway to Camden Valley Way
- Fifteenth Avenue upgrade – Cowpasture Road to Fourth Avenue
- M7 Motorway widening.

Luddenham Road/Adams Road intersection upgrade. The assessment of cumulative transport and traffic impacts is based on the most current and publicly available information and in many instances, is a high-level qualitative assessment. Overall, the project would have minor cumulative transport and traffic impacts associated with the construction of other transport projects in south-western Sydney, where the construction schedules of those projects overlaps with that of the project.

Table 7-56 Cumulative transport and traffic impacts

Project and status	Cumulative impacts
<p>Western Sydney Airport</p> <p>Approved.</p> <p>Under construction</p>	<p>Traffic associated with the construction of the Western Sydney Airport was not included in the construction impact assessment (see Section 7.2.5), as surveys were carried out prior to the start of the airport construction works. A qualitative assessment was carried out for the cumulative construction impacts below.</p> <p>Peak construction for the Western Sydney Airport is associated with the bulk earthworks required to prepare the runway and terminal pads. There is expected to be some overlap in construction traffic generation between the two projects. Terminal works for the Western Sydney Airport would need to be completed before opening in 2026, and bulk earthworks would need to be completed before this. As a result, the bulk earthworks for the Western Sydney Airport would overlap with the early phases of the M12 Motorway construction. However, this overlap is not anticipated to be during the peak construction period for either the Western Sydney Airport or the M12 Motorway.</p> <p>There would be minor cumulative heavy vehicle impacts associated with the construction of the project and the Western Sydney Airport. This would be associated with the overlap in construction traffic generated from the two projects. This overlap is not anticipated to be during the peak construction period for either the Western Sydney Airport or the M12 Motorway. The Northern Road would carry the bulk of heavy vehicles expected for construction works. In its upgraded state, The Northern Road will have ample capacity to accommodate any crossover between traffic generated by both projects. As such, the combined construction traffic would not substantially impact capacities along The Northern Road, but would result in a longer period of higher than normal heavy vehicle activity along The Northern Road.</p> <p>A quantitative assessment of the cumulative impacts of the operation of the project and the Western Sydney Airport was undertaken as part of the impact assessments described in Section 7.2.6.</p> <p>The Western Sydney Airport and the project would be operational at the same time. the M12 Motorway would carry the majority of traffic into the Western Sydney Airport, this being one of the key design considerations for the project. As this is a fundamental component of the assessment of the transport and traffic impacts of the project, the operation of the Western Sydney Airport, along with the traffic that is generated by it, is included in the impact assessment of the project (see Section 7.2.6).</p>

Project and status	Cumulative impacts
<p>Sydney Metro Greater West</p> <p>Not yet approved</p>	<p>A qualitative assessment of the cumulative construction impacts of the project and the Sydney Metro Greater West was undertaken and is discussed below. The details of these impacts are not available for a quantitative assessment as this project is currently in early planning.</p> <p>There would be moderate cumulative heavy vehicle impacts associated with the construction of the project and the Sydney Metro Greater West . This would be associated with the overlap in construction timeframes. During any timeframes where construction activities are concurrent, increased construction heavy vehicle impacts may be likely. This would depend on the specific construction locations and the different construction activities.</p> <p>A qualitative assessment of the cumulative operational impacts of the project and the Sydney Metro Greater West was undertaken as part of the impact assessments described in Section 7.2.6.</p> <p>The Sydney Metro Greater West and the project would both be operational in the longer term (ie opening of the Sydney Metro Greater West may occur after the opening of the project). The public transport mode share for trips travelling to and from the Western Sydney Airport via Sydney Metro Greater West were included in the traffic generation inputs to the traffic modelling (see Section 7.2.2).</p>
<p>The Northern Road upgrade</p> <p>Approved.</p> <p>Construction has begun</p>	<p>A quantitative assessment of the cumulative impacts of the project and The Northern Road upgrade was undertaken as part of the impact assessments described in Sections 7.2.5 and 7.2.6.</p> <p>There would be minor cumulative construction heavy vehicle impacts associated with the construction of the project and The Northern Road upgrade This would be associated with the minimal overlap between the two projects and limited to mobilisation and early works relating to the establishment of construction support sites and property access adjustment.</p> <p>Construction activities for The Northern Road upgrade are expected to be completed by 2022. As the peak construction period for the project is likely to be in 2024, it is assumed that the upgrade The Northern Road will be available for use as a heavy vehicle haulage route. In the event that the completion of Stages 5 and 6 of The Northern Road are delayed, more construction heavy vehicles will be required to travel via the M7 Motorway and Elizabeth Drive during the early stages of the project's construction. However, construction heavy vehicle generation in the early stages of the project would be substantially lower than the peak period, minimising impacts on the M7 Motorway during this period.</p> <p>The Northern Road upgrade is a fundamental component of the strategic road network in Western Sydney and is required to support the development of the Western Sydney Airport and the South West Growth Area. As The Northern Road upgrade is currently being constructed and due to be completed before the opening of the project, it was included as an assumption in all traffic modelling. Therefore, impacts associated with the operation of The Northern Road were incorporated into the impact assessment for the project.</p>
<p>Other existing road network upgrades and potential road projects, including:</p> <ul style="list-style-type: none"> • Elizabeth Drive upgrade • Mamre Road upgrade • Outer Sydney Orbital <p>Not yet approved</p>	<p>A quantitative assessment of the cumulative impacts of the project and the other existing road network upgrades was undertaken as part of the impact assessments described in Sections 7.2.5 and 7.2.6. As explained in Section 7.2.2, all of these projects, with the exception of the Outer Sydney Orbital, were included in the network scenarios underpinning the traffic models for 2024, 2026 and 2036.</p> <p>There would be moderate cumulative construction heavy vehicle impacts associated with the construction of the project and other road projects. The timing for construction of these projects has not yet been announced. However, there is potential for overlaps in construction timing between the project and some of these road upgrade works. Should this occur, the cumulative impacts would likely be minimal, and would depend on the timing, type and location of simultaneous construction activities.</p> <p>The upgrade of Elizabeth Drive and Mamre Road are fundamental components of the strategic road network in western Sydney and would be required to support the development of the Western Sydney Airport and the South West Growth Area. The cumulative impacts of the operation of the Elizabeth Drive and Mamre Road upgrades are included in the impact assessment presented in Section 7.2.6.</p>

Project and status	Cumulative impacts
<p>Major land releases, including:</p> <ul style="list-style-type: none"> • Western Sydney Aerotropolis • South West Growth Area • Western Sydney Employment Area. <p>Future strategic government project</p>	<p>A qualitative assessment of the cumulative impacts of the project and the major land releases was undertaken and is described below.</p> <p>The timing for the construction of developments within the growth areas has not yet been announced. There is potential for overlaps in construction timing between some developments and the project. Should this occur the cumulative impacts would likely be minor and depend on the timing, type and location of simultaneous construction activities.</p> <p>The development associated with the Western Sydney Aerotropolis, South West Growth Area, and Western Sydney Employment Area are critical design considerations for the project. As the transport and traffic demand generated by these land use changes are fundamental to the assessment of the transport and traffic impacts of the project, the travel demand generated by these land release areas is included in the operational traffic impact assessment of the project.</p>

7.2.8 Environmental management measures

The environmental management measures that will be implemented to minimise the traffic and transport impacts of the project, along with the responsibility and timing for those measures, are presented in **Table 7-57**. In addition, consultation with the Traffic Management Centre and Northwest Roads will continue regarding the management of potential construction and operational traffic impacts. Table 9-1 of **Appendix F** presents the proposed property access measures that would be implemented in addition to these environmental management measures.

Table 7-57 Environmental management measures (traffic and transport)

Impact	Reference	Environmental management measure	Responsibility	Timing
Construction transport and traffic	TT01	<p>A construction transport and traffic management plan (CTTMP) will be prepared as part of the CEMP in consultation with relevant local councils, and in accordance with relevant guidelines. The CTTMP will outline:</p> <ul style="list-style-type: none"> • Staging and planning of works to minimise the need to occupy roads where practicable, including identification of haulage routes • Safe alternative routes for pedestrians and cyclists in accordance with relevant safety and accessibility standards. • The requirements for traffic control plans to be prepared for each work area which will include details of site access and specific traffic control measures (including signage) to manage traffic movements • Road safety audit requirements • Parking arrangements for construction staff • Identification of access arrangements at construction sites detailing vehicle access movements 	Contractor	Prior to construction and during construction

Impact	Reference	Environmental management measure	Responsibility	Timing
		<ul style="list-style-type: none"> Measures to minimise changes to the existing road network, property access, bus stops and pedestrian/cyclist facilities where feasible Measures to communicate and notify of any changes in traffic conditions on roads or paths to road users, emergency services, public transport operators, and other relevant stakeholders Measures to manage construction traffic interfaces and access arrangements with Western Sydney Airport and Sydney Metro Greater West <p>Requirements for appropriate warning and signage for traffic and other road users such as cyclists and pedestrians in the vicinity of work areas and work site access, and road diversions.</p>		
	TT02	Changes to bus stops will be implemented in consultation with TfNSW, relevant councils, and relevant bus operators. Alternative temporary bus stops will be provided with appropriate signage to direct commuters. Safe access will be provided in accordance with relevant safety and accessibility standards.	Contractor	Prior to construction, during construction and after construction
	TT03	Movements of haulage vehicles will be planned to minimise movements on the road network during the AM and PM peak periods where practicable.	Contractor	Prior to construction and during Construction
Impacts on M7 Motorway traffic and shared user path users	TT04	Consultation will be carried out with the operators of the M7 Motorway to develop measures to manage the potential impacts of construction within the operating M7 Motorway corridor.	Roads and Maritime/ Contractor	Detailed design, prior to construction, and during construction
	TT05	Roads and Maritime will continue to work with Western Sydney Parklands Trust to support the delivery of a shared user path within Western Sydney Parklands to connect from Range Road to the existing M7 Motorway shared user path. If it is determined during consultation that the shared user path connection through the Western Sydney Parklands will not be delivered, Roads and Maritime will provide an alternative alignment for the shared user path in this section via either Elizabeth Drive, or alongside the M12 Motorway from Range Road to the M7 shared user path network.	Roads and Maritime	Detailed design, during construction
Damage or impacts on local road infrastructure	TT06	A road dilapidation report will be prepared before impacts on local roads in consultation with relevant councils and other relevant stakeholders. The report will document the existing conditions of local roads and outline measures to repair damage to roads from heavy vehicle movements associated with the project.	Contractor	Prior to construction

Impact	Reference	Environmental management measure	Responsibility	Timing
Impacts on property access	TT07	Existing property access will be maintained at all times. Any changes to access arrangements or alternative access that are necessary during construction will be done in consultation with the landowner. Any changes to access will provide the same equivalent pre-existing level of access unless agreed to by the land owner Property access that is physically affected by the project will be reinstated to at least an equivalent standard, in consultation with the landowner.	Roads and Maritime / Contractor	Detailed design, prior to construction, and during construction
Impacts on businesses	TT08	A signage strategy will be prepared as part of the CTTMP to provide appropriate signage for businesses where existing signage is obscured or no longer visible or where customers are required to use alternative access to reach the businesses during construction.	Contractor	Prior to construction