

15. Traffic, transport and access

The road network in the vicinity of the airport site is currently relatively uncongested, with only sections of Narellan Road and Camden Valley Way experiencing congested conditions in peak periods. While there is currently spare capacity on much of the network near the airport site, there is congestion on the broader strategic network including the M4 Motorway, M5 Motorway, M7 Motorway and M31 Hume Highway.

The construction of Stage 1 would generate an estimated 1,254 additional vehicle movements per day on the surrounding road network during the construction period. This includes 314 peak hour vehicle movements during the AM peak period. In the context of the broader Western Sydney region, this would not be considered a significant increase. A community awareness programme would be implemented during construction, to ensure that the local community and road users are kept informed about any construction activities and expected delays. A traffic and access management plan would also be implemented to ensure that construction traffic (including any oversize vehicles) is appropriately managed.

The operation of Stage 1 is expected to result in approximately 41,858 vehicles entering and leaving the airport site each day by 2030. With the introduction of the M12 Motorway, this additional traffic is not likely to significantly affect the operation of the surrounding road network but is expected to result in:

- a small increase in congestion at The Northern Road / M4 intersection; and
- a small increase in congestion on Mamre Road.

Significant road improvement works are proposed as part of the Western Sydney Infrastructure Plan, in addition to those identified in the Broader Western Sydney Employment Area and South West Priority Growth Area. These are expected to provide sufficient capacity to cater for the forecast passenger and employee traffic demand associated with the proposed airport in 2030.

The public transport, walking and cycling systems proposed by the NSW Government and local councils in the region would also have sufficient capacity to cater for the expected airport passenger and employee demand at the proposed airport. An assessment of the surface traffic impacts of the longer term development is presented in Chapter 35. It considers the possible extension of the South West Rail Link to the airport site in response to increasing demand.

15.1. Introduction

This chapter provides a review of the expected traffic and transport impacts associated with the construction and operation of the proposed airport. The chapter draws on a comprehensive Surface Transport and Access Study (included at Appendix I), summarising its main findings and identifying mitigation measures to address potential impacts.

The assessment addresses the requirements of the *Guidelines for the Content of a Draft Environmental Impact Statement – Western Sydney Airport* (EIS guidelines) issued by the Commonwealth Department of the Environment. The EIS Guidelines include a requirement to assess all relevant impacts including specific consideration of changes in traffic movements during construction and operation (associated with both passenger movements and workers).

15.2. Methodology

15.2.1. Assessment approach

Assessment of the potential traffic, transport and access impacts has involved a consideration of both the construction and operation of the proposed Stage 1 airport development.

For the construction phase, the assessment focuses on traffic impacts that would be associated with the haulage of materials, plant and equipment, as well as the traffic generated by construction workers. For the purpose of analysing the potential construction impacts, 2021 was selected as representative of the peak construction year, during which the highest number of construction vehicle movements are likely to be generated.

For the operation phase, the assessment focuses on the impact of the proposed airport, operating at its intended capacity of 10 million annual passengers, operating at its intended capacity of 10 million annual passengers, on wider transport networks in the Western Sydney region. Two modelling 'scenarios' were developed for the purpose of this assessment:

- 'Do minimum' which represents the minimum transport network improvements required to maintain status quo, without consideration of the expected additional demand generated by the proposed airport; and
- 'With airport' which includes consideration of the expected additional demand generated by the proposed airport.

The operational assessment involved:

- determination of the trips expected to be generated by the proposed airport;
- analysis of how those trips are likely to be distributed across the transport system;
- assessment of the resulting impacts on the transport system; and
- identification of appropriate mitigation measures to alleviate the impacts.

Assessment of the road traffic impacts of the long term development is included in Chapter 35 (Volume 3).

15.2.2. Transport modelling and analysis

15.2.2.1. Strategic Travel Model

The potential impacts of constructing and operating the proposed Stage 1 airport were assessed using the Strategic Travel Model (Version 3). The Strategic Travel Model is a best practice tool, operated by the NSW Bureau of Transport Statistics and is used for projecting travel patterns in Sydney, Newcastle and Wollongong under different land use, transport and pricing scenarios. The model is typically used to test alternative settlement, employment and transport policies, to identify likely future capacity constraints, or to determine potential usage levels of proposed new transport infrastructure or services. The Strategic Travel Model is programmed to model the years 2011, 2016, 2021, 2026, 2031 and 2036. The 2031 model year was therefore adopted for the assessment of the potential impacts of the Stage 1 development.

15.2.2.2. Modelling process

Transport modelling typically comprises four main stages:

1. determination of trip generation, or travel frequency (how many trips would occur to and from a nominated travel zone with regard to the demographics and land uses of that zone);
2. trip distribution (where these trips are likely to go);
3. assignment of travel mode choice (car, bus, rail, ferry or a combination); and
4. assignment of route (chosen for each trip and mode, and between each origin and destination). This stage provides the detail for the number of vehicles on each road and people on each public transport service.

For the purposes of this assessment the following adjustments to the model were necessary:

- removal of trips destined for airport travel zones in the Strategic Travel Model. This allows assessment of a scenario that does not include the proposed airport (the 'do minimum' scenario), which can then be used to identify the specific impact of the proposed airport in addition to other development forecasts for Western Sydney;
- changes to the number of trips to and from the airport site for cars, light goods, rigid and articulated vehicles. This represents construction traffic in 2021 and Stage 1 operational traffic in 2031;
- inclusion of additional road infrastructure in the form of the proposed M12 Motorway and associated connections. This project is currently in the planning phase. The proposed motorway is expected to run generally parallel to Elizabeth Drive and provide direct motorway-grade access to the proposed airport. The project and any associated environmental assessment and approval requirements are the responsibility of NSW Roads and Maritime Services (Roads and Maritime). It is assumed that the proposed M12 would be operational when the proposed airport opens and it is therefore included in all 'with airport' model scenarios, but excluded from the 'do minimum' scenarios; and
- inclusion of a railway extension from Leppington in the east, linking the airport with St Marys, to the north for the long term assessment scenario.

The proposed corridor for the Outer Sydney Orbital has not yet been defined and was not included in the modelling undertaken for this assessment.

Following these model alterations, the revised travel demand was reassigned to the road network. This was done for the AM peak (7:00 am to 9:00 am), the PM peak (3:00 pm to 6:00 pm), the period between these peaks (9:00 am to 3:00 pm), and the evening period (6:00 pm to 7:00 am). Only the AM peak and PM peak are reported here because these are the periods during which the capacity of the road network is most constrained. The assignment occurred in two stages:

- assignment of heavy vehicle demand; and
- assignment of the car demand. This was divided into toll-paying trips and non-toll-paying trips on the motorway network.

15.2.2.3. Trip generation and modelling assumptions

For the assessment of construction impacts, daily light vehicle numbers were estimated using the assumption that 80 per cent of construction personnel would drive to and from the airport site on any given day, and that the remainder would either use public transport or car-pooling. Heavy vehicle volumes were estimated following an analysis of the indicative construction schedule described in Section 6.2.1.

Trip generation and traffic generation associated with the operation of the proposed Stage 1 airport were estimated using the Sydney Airport Land Transport Model. This model describes the types of trips to Sydney Airport and is based on surveys completed in 2008.

The modelling process has also taken into account recent developments in airport operation, such as self-check-in and notification of customers and security clearance times, which generally allow people to arrive at the airport closer to their flight departure time and depart from the airport more quickly.

It was also assumed that the main airport access road would be limited to three traffic lanes and one bus lane in each direction. This would act as a capacity constraint over the longer term, resulting in a shift away from cars towards public transport.

15.2.2.4. Assessment criteria

Assessment of the potential traffic, transport and access impacts has been undertaken with reference to the *Guide to Traffic Generating Developments* (RTA 2002). This guideline suggests a process and methodology for assessment which is familiar to NSW stakeholders and the community. The operational traffic assessment process outlined in the guidelines stipulates that the operating characteristics need to be compared with agreed performance criteria as described below.

Midblock capacity

The capacity of urban roads is generally determined by the capacity of the intersections or the 'mid-block' capacity (the sections of roads between intersections). The mid-block capacities for roads can be estimated and compared to the existing traffic volumes in terms of volume to capacity ratios.

The volume/capacity ratio (VCR) is a measure of the amount of traffic carried by a section of road compared to its nominal capacity. As VCR nears one, the speed on the link decreases and both the likelihood and the duration of flow breakdowns increase.

The Austroads *Guide to Traffic Management*² outlines Level of Service (LoS) criteria for mid-block sections of road based on the VCR. A summary of LoS criteria is presented in Table 15–1.

² Part 3: Traffic Studies and Analysis (2009)

Table 15–1 – Level of Service descriptions for roads

Level of Service (LoS)	Uninterrupted flow facilities (motorways)	Uninterrupted flow facilities (arterial and collector roads)	Volume/capacity ratio
A	Free flow conditions in which individual drivers are 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.	Primarily free flow operations at average travel speeds, usually about 90% of the free flow speed (FFS) for the given street class. Vehicles are completely unimpeded in their ability to manoeuvre within the traffic stream. Control delay at signalised intersections is minimal.	0.00 to 0.34
B	Zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is less than with LoS A.	Reasonably unimpeded operations at average travel speeds, usually about 70% of the FFS for the street class. The ability to manoeuvre within the traffic stream is only slightly restricted and control delays at signalised intersections are not significant.	0.35 to 0.50
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.	Stable operations; however ability to manoeuvre and change lanes in mid-block locations may be more restricted than at LoS B, and longer queues, adverse signal coordination or both may contribute to lower average travel speeds of about 50% of the FFS for the street class.	0.51 to 0.74
D	Close to the limit of stable flow and is 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 will generally cause operational problems.	A range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LoS D may be due to adverse signal progression, inappropriate signal timing, high volumes or a combination of these factors. Average travel speeds are about 40% of FFS.	0.75 to 0.89
E	Occurs when 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 will cause breakdown.	Characterised by significant delays and average travel speeds of 33% of the FFS or less. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections and inappropriate signal timing.	0.90 to 0.99
F	In the zone of forced flow. With LoS F, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs and queuing and delays result.	Characterised by urban street flow at extremely low speeds, typically 25% to 33% of the FFS. Intersection congestion is likely at critical signalised locations, with high delays, high volumes and extensive queuing.	1.0 or greater

Source: Adapted from Austroads Guide to Traffic Management – Part 3: Traffic Studies and Analysis.

15.3. Existing environment

15.3.1. Existing road network

Roads and Maritime define four levels in a typical functional road hierarchy, ranging from high mobility and low accessibility, to high accessibility and low mobility. These road classes are:

- Arterial Roads – controlled by Roads and Maritime typically no limit in flow and designed to carry vehicles long distances between regional centres;
- Sub-Arterial Roads – can be managed either by council or by Roads and Maritime under a joint agreement. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through-traffic between specific areas in a sub region, or provide connectivity from arterial road routes (regional links);
- Collector Roads – provide connectivity between local sites and the arterial road network, and typically carry between 2,000 and 10,000 vehicles per day; and
- Local Roads – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

A description of the roads within and servicing the airport site, including their functional category is provided in Table 15–1. The location of these roads and the broader land use context are shown in Figure 15–1.

Table 15–2 – Existing roads servicing the airport site

Road	Functional category	Description
Westlink M7 Motorway	Arterial	The M7 Motorway connects Western Sydney with the broader road network and Sydney CBD by providing an uninterrupted journey between the M2, M4 and M5 motorways. It is a fully electronic toll road with no toll booths that uses a distance based tolling system. In the vicinity of Elizabeth Drive, the M7 has two lanes in each direction separated by a grass median around 14 metres wide. The M7 provides for travel at variable speeds up to 100 kilometres per hour. An off-road shared cycle / pedestrian pathway traverses the motorway and connects with the Sydney Cycleway network.
The Northern Road	Arterial	The Northern Road connects Narellan in the south west to the Great Western Highway in Penrith. In the vicinity of Luddenham, The Northern Road has an undivided carriageway with one lane in each direction and a sign posted speed limit of 80 kilometres per hour.
Elizabeth Drive	Arterial	Elizabeth Drive connects The Northern Road at its western end, and the M7 Motorway to the Hume Highway at Liverpool. Between The Northern Road and the Mamre Road roundabout, Elizabeth Drive has an undivided carriageway with one lane in each direction and a sign posted speed limit of 80 kilometres per hour. Elizabeth Drive between Mamre Road and the M7 has two eastbound lanes and one westbound lane. In the vicinity of Wallgrove Road, Elizabeth Drive carries around 26,000 vehicles per day.
Bringelly Road	Collector	Bringelly Road connects to The Northern Road at Bringelly and to Camden Valley Way at Horningsea Park. Bringelly Road is around 10 kilometres in length and has

Road	Functional category	Description
		an undivided carriageway with one lane in each direction, unsealed shoulders and a sign posted speed limit of 80 kilometres per hour for the majority of its length.
Badgerys Creek Road	Collector	Badgerys Creek Road connects The Northern Road at a roundabout to the north of Bringelly to Elizabeth Drive, and is around seven kilometres in length. The carriageway is undivided with one lane in each direction, unsealed shoulders and a sign posted speed limit of 80 kilometres per hour. The on-site component of Badgerys Creek Road was compulsorily acquired by the Australian Government.
Adams Road	Collector	Adams Road connects The Northern Road at Luddenham to Elizabeth Drive. The carriageway is undivided with one lane in each direction and a sign posted speed limit of 70 kilometres per hour.
Mamre Road	Arterial	Mamre Road connects the Great Western Highway in St Marys to Elizabeth Drive. Mamre Road has an undivided carriageway with one lane in each direction and has a sign posted speed limit of 80 kilometres per hour.
Local roads within the airport site	Local	The following local roads are located within the airport site: Ferndale Road; Fuller Street; Gardiner Road; Jackson Road; Jagelman Road; Leggo Street; Longleys Road; Pitt Street; Taylors Road; Vicar Park Lane; and Winston Close. These roads were compulsorily acquired, in part or in full, by the Australian Government in July 1991 and are currently maintained by Liverpool City Council under an agreement with the Australian Government.

Existing land use in the vicinity of the proposed airport is shown in Figure 15–1. The areas surrounding the airport site are mostly rural properties with a few residential areas adjacent to The Northern Road and Park Road intersection and further south of The Northern Road.

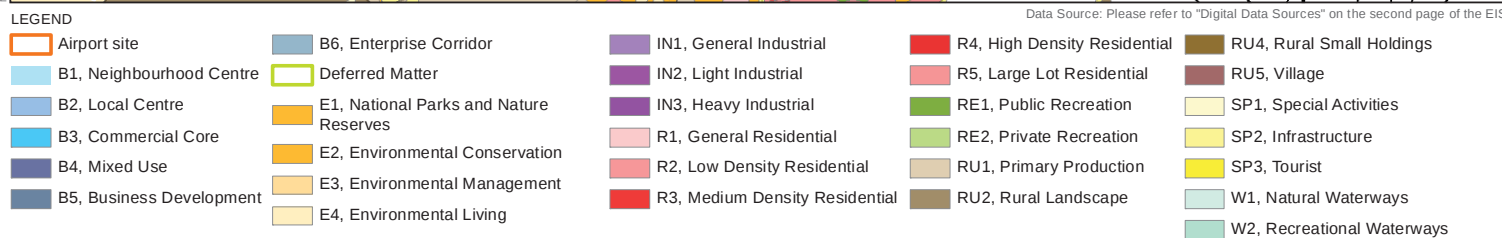
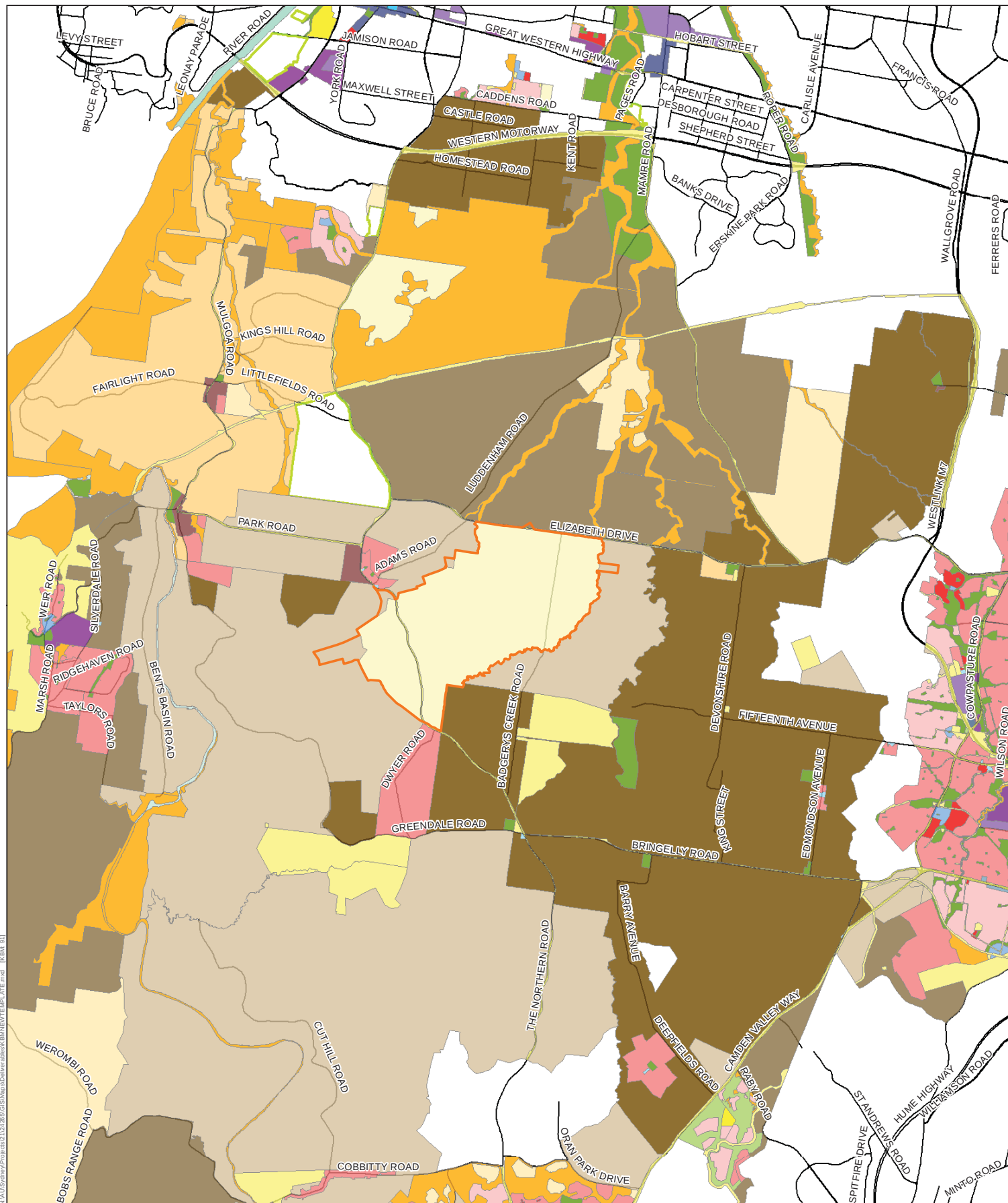


Figure 15.1 - Road network and land use



15.3.2. Traffic volumes and profile

Daily traffic volumes recorded for roads within the vicinity of the proposed airport are provided in Table 15–3. Data presented are for 2005 (the last year these counters were in operation) and represent a combination of vehicle counts and axle pair counts. An axle pair is the equivalent of a passenger car (passenger car unit) with two axles and is a standard method of determining the volume of traffic passing a counting location. A correction factor is applied to the axle spacing to determine a volume for heavy vehicles.

Table 15–3 – Average annual daily traffic 2005

Location	Average annual daily traffic	Count type
The Northern Road north of Bringelly Road	16,944	Vehicle
The Northern Road north of Elizabeth Drive	16,654	Vehicle
Elizabeth Drive east of The Northern Road	7,311	Axle pairs
Mamre Road south of Erskine Park Road	13,793	Vehicle
Bringelly Road west of Camden Valley Way	8,900	Axle pairs
Bringelly Road east of The Northern Road	6,212	Axle pairs

Roads and Maritime have permanent counting stations on Elizabeth Drive at Cecil Hills and Bonnyrigg. Recent results from these counters and the percentage growth per annum are presented in Table 15–4.

Table 15–4 – Elizabeth Drive traffic volumes and growth rate

Location	Direction	2008	2008 combined	2014	2014 combined	% growth per annum compounding
Elizabeth Drive at Cecil Hills	Westbound	10,927	22,523	12,923	26,598	2.8%
	Eastbound	11,596		13,675		
Elizabeth Drive at Bonnyrigg	Westbound	16,726	35,600	17,989	38,121	1.2%
	Eastbound	18,874		20,132		

Table 15–5 provides a summary of the 2015 traffic counts undertaken by Roads and Maritime for The Northern Road and Bringelly Road.

Table 15–5 – Existing daily traffic volumes 2015

Location	Vehicles per day (weekday)	Vehicles per day (weekend)	Vehicles per day (7 day average)
The Northern Road north of Bringelly Road	16,916	12,286	15,593
The Northern Road south of Bringelly Road	14,745	11,100	13,704
Bringelly Road east of The Northern Road	6,462	4,908	6,018

15.3.3. Existing road network performance

The Sydney Strategic Travel Model provides a mechanism for assessing the impact of land use and transport infrastructure changes. In order to provide an understanding of the current transport system, the 2011 base year model has been analysed to provide an insight into the prevailing peak period performance in the area surrounding the proposed airport site. No changes were made to the 2011 model for this analysis.

Modelling indicates that the road network in the vicinity of the airport site is currently relatively uncongested (2011 base model), with only sections of Narellan Road and Camden Valley Way showing a level of service (LoS) of D or worse in either the AM or PM peak periods.

While there has been development in the area since 2011, including the Broader Western Sydney Employment Area and the South West Priority Growth Area, there remains spare capacity on much of the network near the airport site. Figure 15–2 and Figure 15–3 show the existing (2011) network conditions.

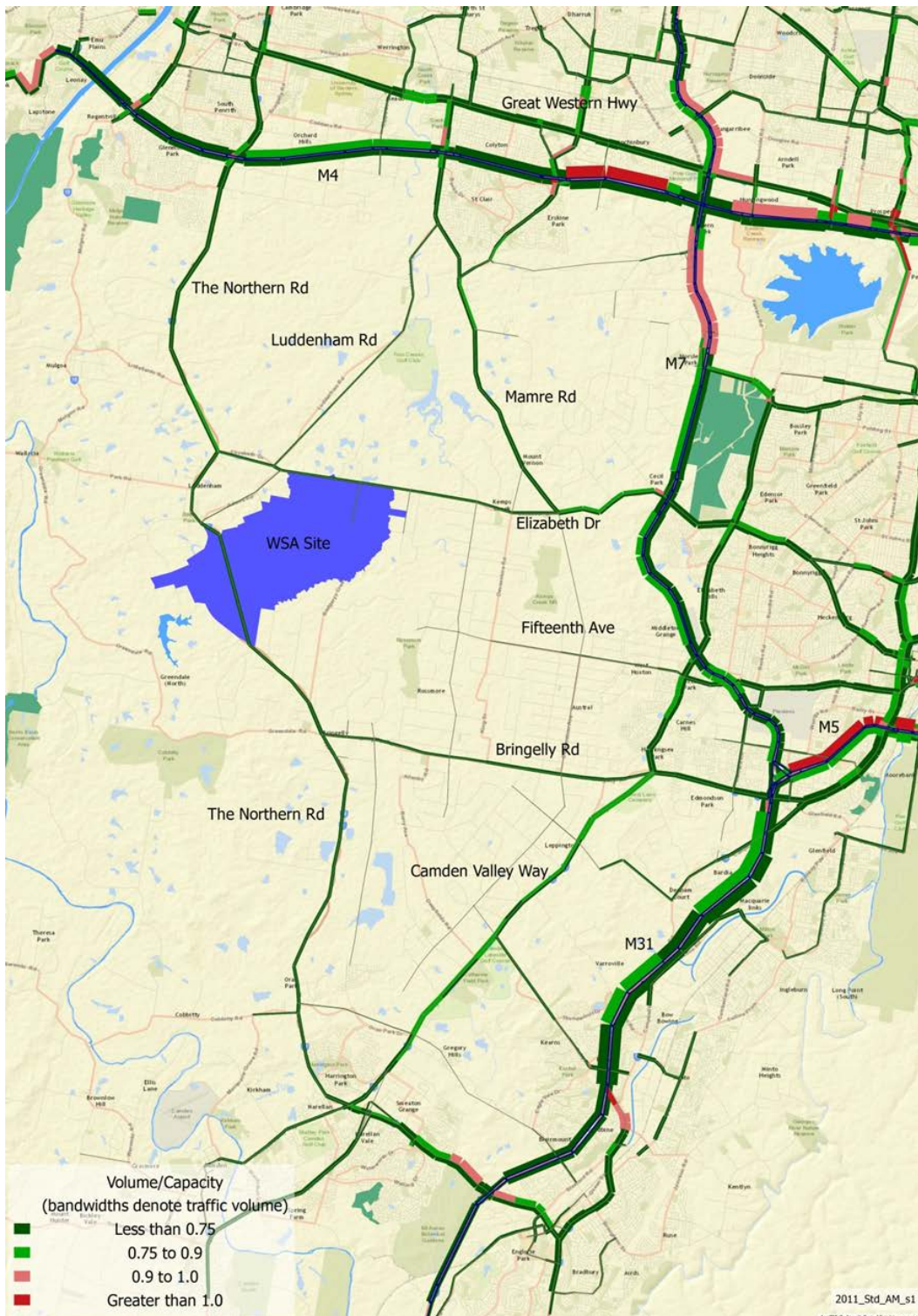
While roads near the airport site are relatively unconstrained, there are constraints on the broader strategic motorway network for the 2011 scenario. For the AM peak, the model shows capacity constraints on the following components of the network:

- M4 Motorway:
 - LoS F eastbound to the west of the M7; and
 - LoS E eastbound to the east of the M7;
- M7 Motorway:
 - LoS E in both directions south of the M4; and
 - LoS E southbound to the north of the M4;
- M5 Motorway:
 - LoS F eastbound, east of the M7; and
- Narellan Road:
 - LoS E southeast-bound towards the M31 Hume Motorway.



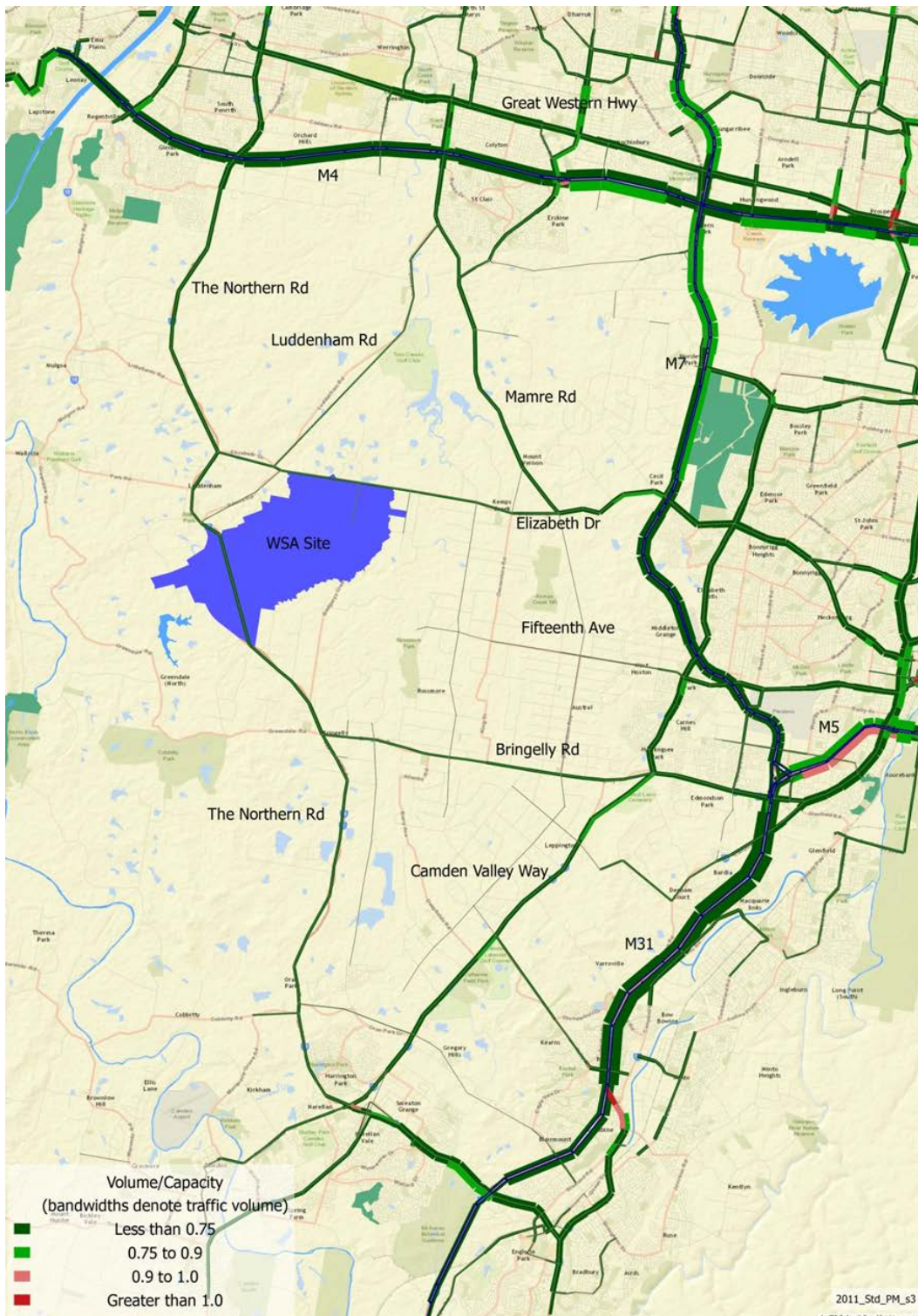
In the PM peak, capacity constraints are generally less acute, but the model still shows constraint for the following motorway locations:

- M5 Motorway:
 - LoS E, westbound, east of the M7.
- M4 Motorway:
 - LoS D, westbound along much of the length of the M4; and
- M7 Motorway:
 - LoS D in both directions, particularly close to the M4 intersection.



Note: Volume/capacity ratio bandwidth definitions are outlined in Table 15–1

Figure 15–2 – 2011 AM peak volume/capacity – existing conditions



Note: Volume/capacity ratio bandwidth definitions are outlined in Table 15–1

Figure 15–3 – 2011 PM peak volume/capacity – existing conditions

15.3.4. Road safety and crash history

Roads and Maritime crash data were available for the major roads in the vicinity of the proposed airport. The data are summarised in Table 15–6. Crash rates are generally consistent with the traffic volumes carried by these roads.

Table 15–6 – Crash data for key roads near the airport site

Location	Period	Crashes	% resulting in injury (fatality)
The Northern Road – between Maxwell Street and Mersey Street	January 2009 to December 2013	304	43% (1%)
The Northern Road – between Badgerys Creek Road and Mersey Street	July 2009 to June 2014	16	38% (6%)
Bringelly Road – between The Northern Road and Camden Valley Way	July 2009 to June 2014	113	54% (2%)
Elizabeth Drive – between The Northern Road and M7 Motorway	July 2009 to June 2014	157	48% (1%)
Mamre Road – between Elizabeth Drive and M4 Motorway	July 2009 to June 2014	159	50% (1%)
Badgerys Creek Road – between Elizabeth Drive and The Northern Road	July 2009 to June 2014	24	9% (0%)
Adams Road – between Elizabeth Drive and The Northern Road.	July 2009 to June 2014	6	67% (0%)

15.3.5. Public transport

There are currently four bus routes that traverse the airport site and/or service the immediate surrounds:

- Route 789 Penrith Interchange to Luddenham;
- Route 801 Liverpool Interchange to Badgerys Creek Road;
- Route 855 Austral to Liverpool via Prestons and Churchill Gardens; and
- Route 856 Bringelly to Liverpool via Prestons and Churchill Gardens.

The following train interchanges are closest to the airport site:

- T1 Western Line – Penrith Interchange;
- T2 Inner West and South Line – Liverpool Interchange; and
- South West Rail Link – Leppington.

Penrith and Leppington railway stations are around 15 kilometres from the site and Liverpool is around 21 kilometres from the site.

15.3.6. Pedestrians and cyclists

Pedestrian and cycling infrastructure in the area is currently limited, reflecting the predominantly rural character of the area.

As the South West Priority Growth Area lands develop, additional cycleway links will be provided and integrated within the Liverpool cycleway network. By 2018, the expected Bringelly Road Stage 1 and Stage 2 upgrades described in the Western Sydney Infrastructure Plan will deliver more than 10 kilometres of shared pedestrian and cyclist paths between Leppington and The Northern Road.

According to the Western Sydney Infrastructure Plan, The Northern Road is expected to have shared pedestrian and cyclist paths between Narellan and the M4 Motorway by 2019.

15.4. Assessment of impacts during construction

15.4.1. Construction traffic volumes and distribution

Construction vehicles would access the site via Elizabeth Drive, Anton Road, The Northern Road and Badgerys Creek Road. Construction vehicle generation would be expected to reach its peak in 2021. Table 15–7 provides the expected traffic volumes by period and vehicle type.

Table 15–7 – Peak construction vehicle generation

Vehicles	Direction	AM peak	Inter-peak	PM peak	Evening	Total (vtpd)
Light vehicles	In	264	88	0	88	440
	Out	0	66	220	154	440
Semi-trailers	In	4	11	5	2	22
	Out	4	11	5	2	22
B-Double and Truck and Dog	In	21	63	31	50	165
	Out	21	63	31	50	165
Total		314	302	292	346	1,254

The following vehicle distribution assumptions were made for the purposes of assessment:

- the majority of light vehicles would arrive and depart the site between 5.00 am and 7.00 pm; and
- heavy vehicles would operate to and from the site 24 hours per day during aviation infrastructure works.

The geographic distribution of light vehicles was assumed to be consistent with existing vehicle movements in this area derived from the existing 2021 Strategic Travel Model.

Detailed information on a probable distribution for heavy vehicles was not available; however the following assumptions are considered reasonable:

- 50 per cent of trips to and from the M31 Hume Motorway;
- 20 per cent of trips to and from the M5;

- 10 per cent of trips to and from the M4 (east);
- 10 per cent of trips to and from the M4 (west); and
- 10 per cent of trips to and from the M7 (north).

15.4.2. Effect on road network performance

The expected distribution and volume of construction traffic discussed in Section 15.4.1 suggests there would be approximately 160 additional vehicle movements (to and from the airport site) on Elizabeth Drive during the AM peak and 150 additional vehicle movements (to and from the airport site) on Elizabeth Drive during the PM peak.

Modelling indicates that this level of additional traffic volume would not result in operating conditions worse than LoS C on Elizabeth Drive in the vicinity of the airport site.

There would be capacity constraints on the wider network, principally on the M4, M5 and M7 motorways; however:

- these constraints currently exist;
- the LoS does not deteriorate when construction traffic is included; and
- the proportion of construction traffic compared to overall traffic, reduces with distance from the airport site and therefore the impact of construction is reduced with distance from the site.

The types of vehicle movements associated with the construction of the proposed airport would not significantly impact on the surrounding transport system, with the exception of potential oversized vehicle movements required for the delivery of equipment. These movements may require temporary road closures or suitable escorts.

15.5. Assessment of impacts during operation

To assess the potential transport network impacts of the proposed Stage 1 airport operation, consideration was given to the travel demand associated with passengers, employees and freight. The expected trip generation for each of these groups is considered in Section 15.5.1, Section 15.5.2 and Section 15.5.3 respectively. The consequential transport network impacts are discussed in Section 15.5.6. Road infrastructure providing access to the proposed airport is described in Chapter 5 (Section 5.9).

The assessment has not considered traffic associated with future commercial development. While the proposed airport includes authorisation for future non-aeronautical commercial development, the details of such development would be developed by the ALC and would be subject to authorisation under the Airports Act.

15.5.1. Future transport network

15.5.1.1. Road network

As part of the Western Sydney Infrastructure Plan the Commonwealth and New South Wales governments have committed \$3.6 billion over 10 years in major road infrastructure upgrades in Western Sydney. These upgrades would relieve pressure on existing infrastructure and provide connectivity to the new airport and surrounding areas before the proposed airport begins operation. The key projects which comprise the Western Sydney Infrastructure Plan are listed in Table 15–8.

Table 15–8 – Key Western Sydney Infrastructure Plan projects

Initiative	Description
The Northern Road	Upgrade to a minimum of four lanes from Narellan to the M4 Motorway.
M12 Motorway	Construction of a new four-lane motorway between the M7 Motorway and The Northern Road.
Bringelly Road	Upgrade to a minimum of four lanes from Camden Valley Way to The Northern Road.
Werrington Arterial	Construction of the Werrington Arterial by upgrading Kent Road and Gipps Street to four lanes between the Great Western Highway and the M4 Motorway.
Ross Street, Glenbrook	Upgrade of the intersection of Ross Street and the Great Western Highway to reduce congestion.
Local roads	\$200 million package for local roads upgrades.

15.5.1.2. Public transport network

There are three additional bus routes identified by Transport for NSW to services the proposed airport. These routes are:

- Liverpool-Badgerys Creek-Penrith (suburban);
- Campbelltown-Oran Park-Badgerys Creek (suburban); and
- Leppington-Badgerys Creek-Mt Druitt (local).

The service frequencies would be determined based on the demand for travel to the proposed airport.

15.5.1.3. Rail

While no rail connection to the proposed airport is currently expected until after 2031, planning for the proposed airport preserves flexibility for several possible rail alignments including a potential express service. Potential rail corridors are shown by Figure 15–4. A final alignment would be determined in consultation with the New South Wales Government and some enabling work may be required during Stage 1 to future-proof the corridor.



Figure 15-4 – Potential future rail corridors

15.5.2. Passenger trip generation

In 2031, it is estimated that the proposed airport would be handling up to 10 million passengers per year. In order to understand the transport impact these passenger movements may have, they need to be translated into 'trips' and assigned to the surrounding road network using the Strategic Transport Model. This process is illustrated in Figure 15–5.

While this figure shows rail as a mode of transport, the proposed Stage 1 development does not currently include a rail service. Planning for the proposed airport preserves flexibility for several possible rail alignments including a potential express service. A final alignment will be determined in consultation with the New South Wales Government.

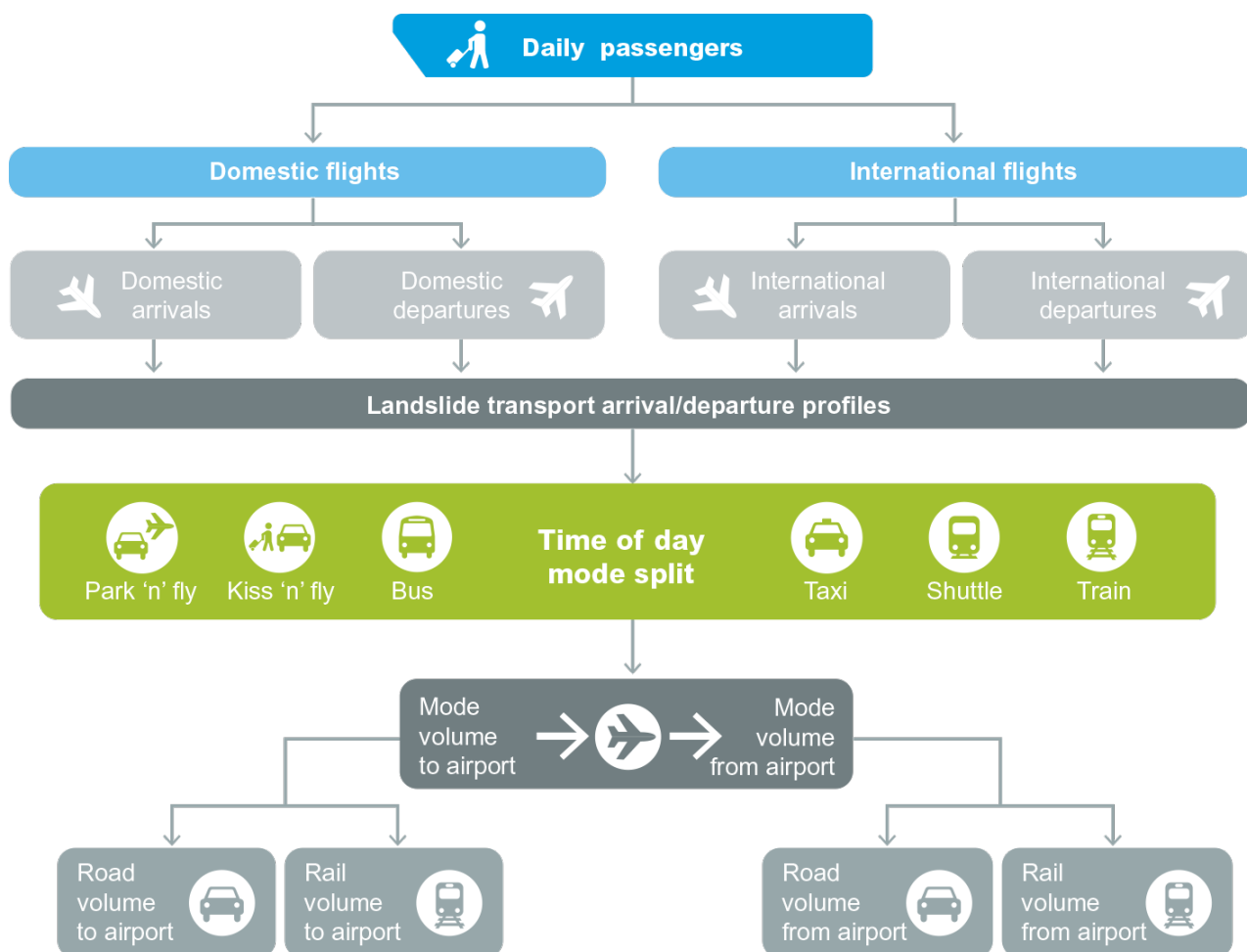


Figure 15–5 – Process for determining passenger trip generation

15.5.2.1. Flight movements

A passenger flight profile for Stage 1 was developed based on the number of daily and peak hour passenger flights. The profile for 2031 is shown in Figure 15–6.

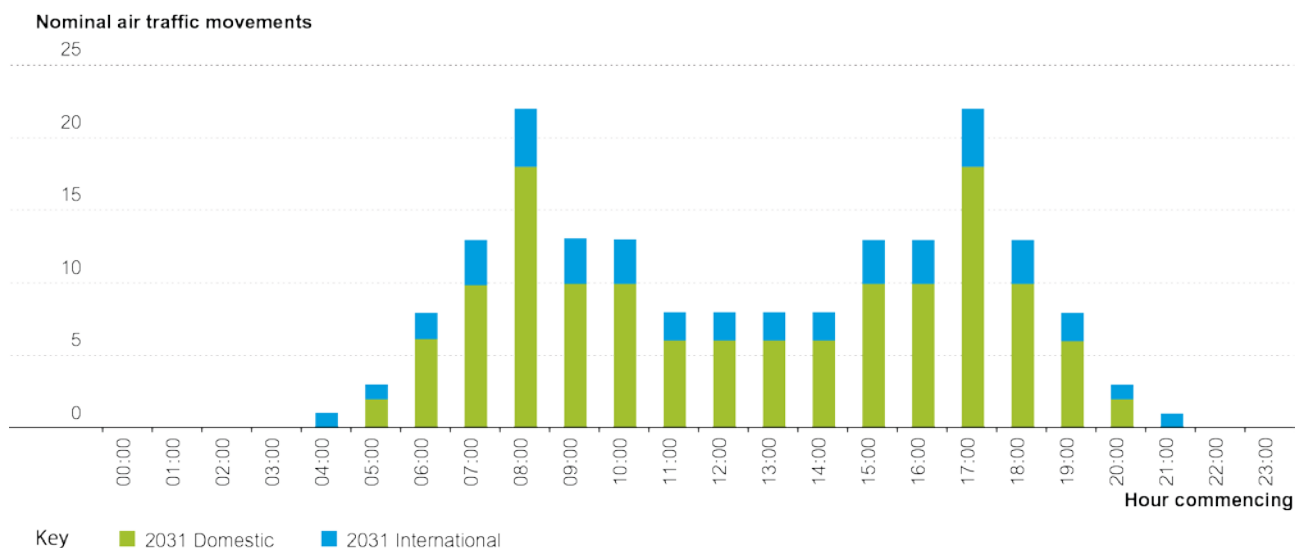


Figure 15–6 – Flight arrivals/departures profile 2031

In 2031 a total of 170 passenger flights per day would be expected, of which 149 flights are assumed to be domestic and 21 international. During the peak hour, anticipated to be between 7 am and 8 am, there is predicted to be 22 passenger flights, split evenly between arrivals and departures (for both domestic and international sectors).

15.5.2.2. Passenger movements

For each domestic and international flight, a profile for the passengers entering and exiting the airport was determined based on the Sydney Airport Land Transport Model, as explained in Section 15.2.2. The following assumptions were made for the purposes of calculating passenger volumes:

- for each domestic aircraft, an average capacity of 180 passengers with an average flight occupancy of 90 percent; and
- for each international aircraft, an average capacity of 420 passengers with an average flight occupancy of 90 percent.

Using the passenger profile and the above assumptions, a passenger arrival/departure profile was developed in order to determine the associated demand for ground transport services. The resulting profile is illustrated in Figure 15–7.



Figure 15–7 – 2031 Ground transport demand per hour (2031)

15.5.2.3. Transport mode split

The Sydney Airport Land Transport Model (and its assumed mode split) was used to assign the calculated ground transport demand to the modes listed in Table 15–9.

Table 15–9 – 2031 assumed mode split

Mode	2031 assumed mode split			
	Domestic		International	
	Drop-off	Pick-up	Drop-off	Pick-up
Kiss and fly	30%	30%	40%	40%
Park and fly	35%	35%	30%	30%
Taxi	20%	20%	20%	20%
Shuttles	5%	5%	5%	5%
Bus	10%	10%	5%	5%

Rail was not considered because no rail connection to the proposed airport is currently expected until after 2031. Walking and cycling to the airport (as passengers) was assumed to be minimal.

Suitable dwell times for each mode were then applied (with, for example, longer times assumed for international kiss and fly passengers when compared to their domestic counterparts).

Figure 15–8 shows the number of expected passenger arrivals via ground transport at the proposed airport. Figure 15–9 shows the total departures expected via ground transport from the proposed airport.

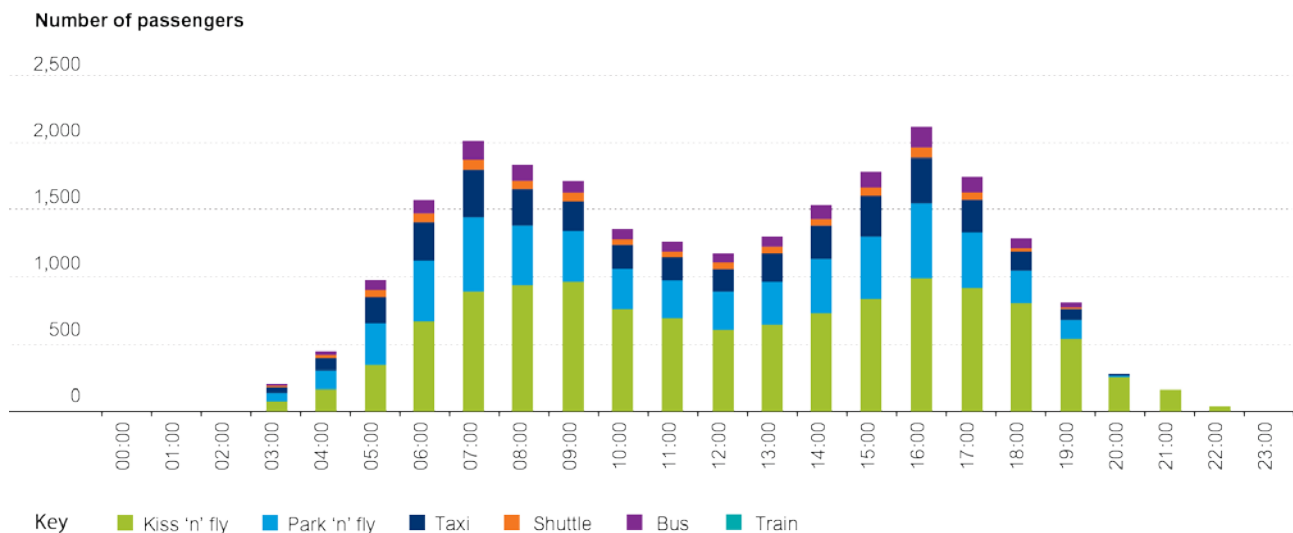


Figure 15–8 – Total passenger arrivals at the proposed airport via ground transport

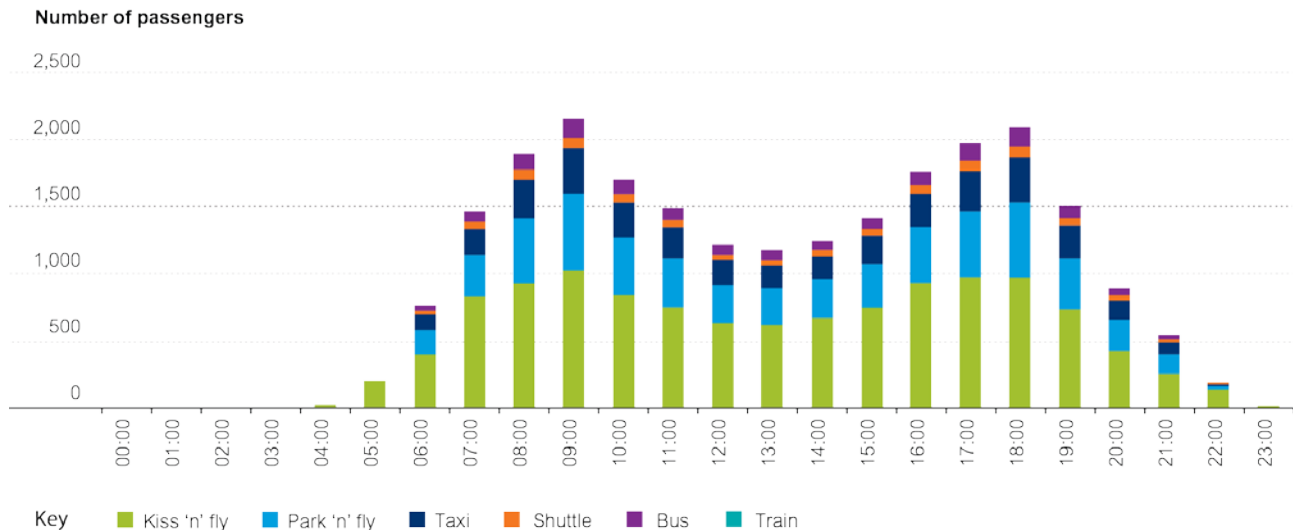


Figure 15–9 – Total passenger departures from the proposed airport via ground transport

15.5.2.4. Traffic generation

The trips (by mode) shown in Figure 15–8 and Figure 15–9 were assigned to vehicles entering and exiting the airport site to determine the passenger related traffic generation (excluding vehicle movements that only circulate internally within the airport site, such as some taxi movements).



Figure 15–10 shows that in 2031, 1,359 vehicles would be expected to enter the airport site during the AM peak period and 1,425 vehicles would be expected to enter the airport site during the PM peak period.

Figure 15–11 shows that in 2031, 1,453 vehicles would be expected to leave the airport during the AM peak and 1,388 would be expected to leave the airport during the PM peak.

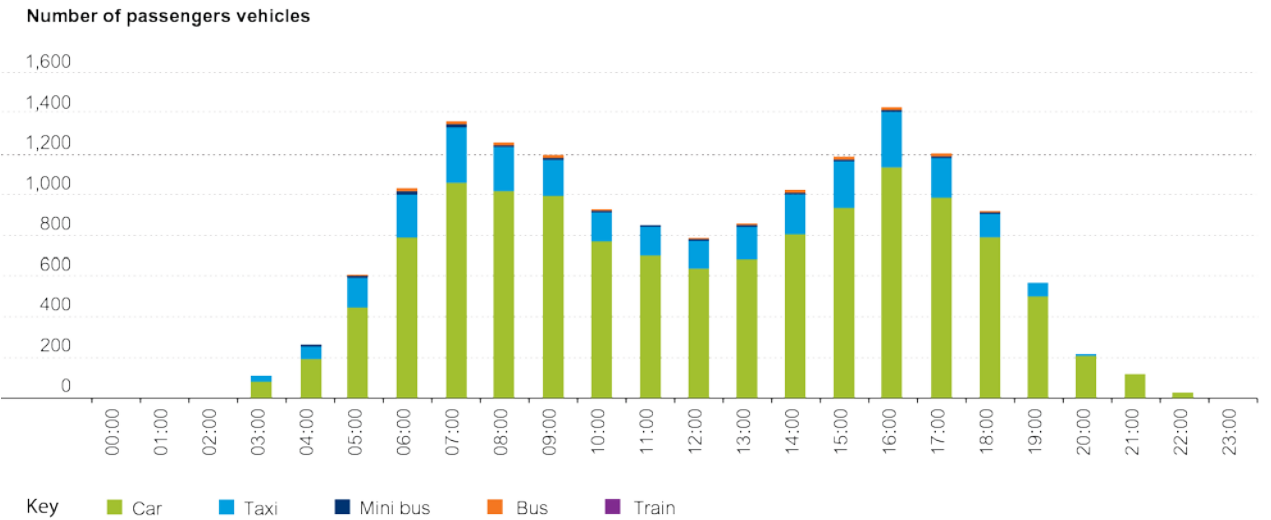


Figure 15–10 – Passenger vehicles entering the proposed airport site

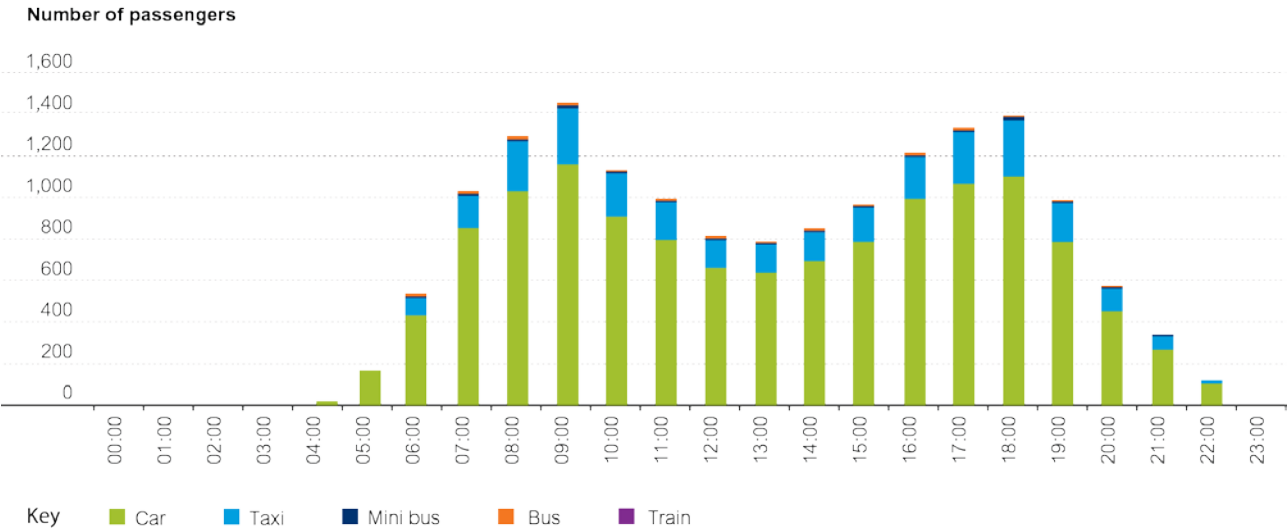


Figure 15–11 – Passenger vehicles leaving the proposed airport site

15.5.3. Employee trips

Airfield, terminal and airside employment estimates are directly related to the volume of passengers expected to pass through the proposed airport. A ratio of 750 workers per one million annual passengers has been used as a reasonable basis on which to estimate the number of full time employees at the airport.

In order to determine the expected number of trips generated by these employees; they were allocated into shifts across the proposed 24-hour operation of the airport and then assigned to a transport mode. Figure 15–12 illustrates the process.

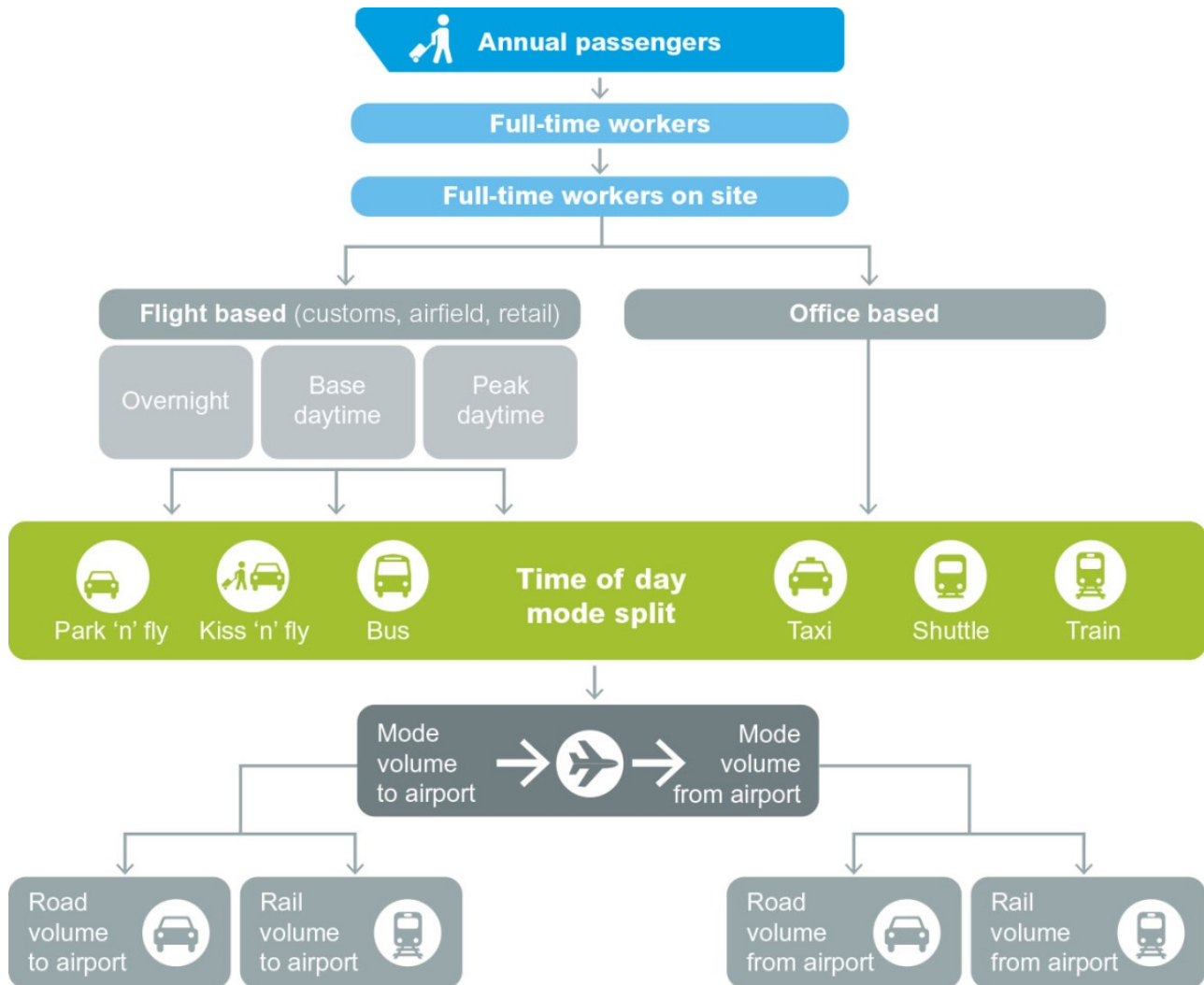


Figure 15–12 – Employee trip generation

15.5.3.1. Employees and shifts

Up to 7,600 employees would likely be required to service the proposed airport in 2031. Consistent with the experiences at Sydney Airport and other international airports, it was assumed that up to 80 per cent of employees (6,158) would be on-site during Stage 1 on any given day.

The airport employees were categorised as follows:

- airfield operations (three shifts of 8.5 hours);
- terminal support (two shifts of 7 hours plus two split-shifts of four hours); and
- office workers (two shifts of nine hours, offset by one hour).

15.5.3.2. Employee arrival and departure profiles

A profile for employee arrivals and departures prior to and after their shifts was developed and is shown in Figure 15–13. The profile acknowledges that some employees would arrive in the hour before their shift starts and/or leave in the hour after their shift finishes.

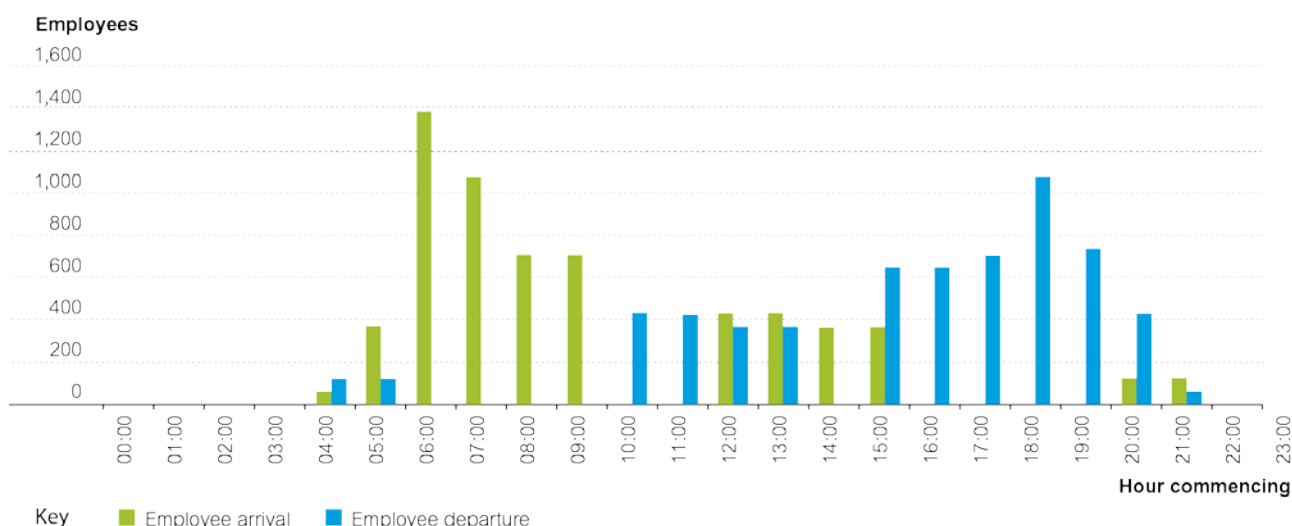


Figure 15–13 – Employee arrival and departure profile (2031)

Figure 15–13 shows that the peak arrival for the AM peak period is expected to be around 1,386 employees and the PM peak departure for employees (between 7.00 pm and 8.00 pm) is 1,086 employees.

15.5.3.3. Mode split

The employee mode split has been determined using the Sydney Airport overall mode splits for journey to work, but reassigning the 11 per cent of trips taken by train (to Sydney Airport) to car based modes for the proposed airport. This recognises that the proposed airport is not expected to have a railway line until after 2031.

Additionally, it was assumed that no employees would use public transport during early morning hours due to service limitations.

Figure 15–14 and Figure 15–15 show the expected distribution of arrivals and departures. It can be seen that the AM arrival volume for employees is expected to be 1,345 employees during the AM traffic peak hour (7.00 am to 8.00 am), with the majority arriving by car. The departure volume for employees is predicted to be greater than 1,300 during the PM traffic peak hour.

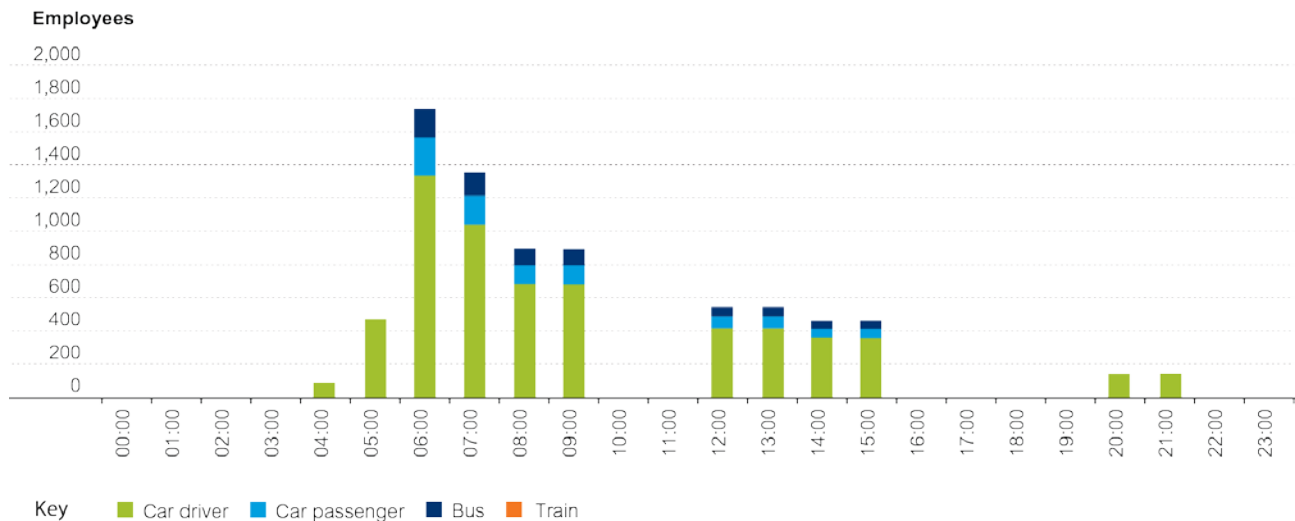


Figure 15–14 – Employee arrivals by mode and time of day

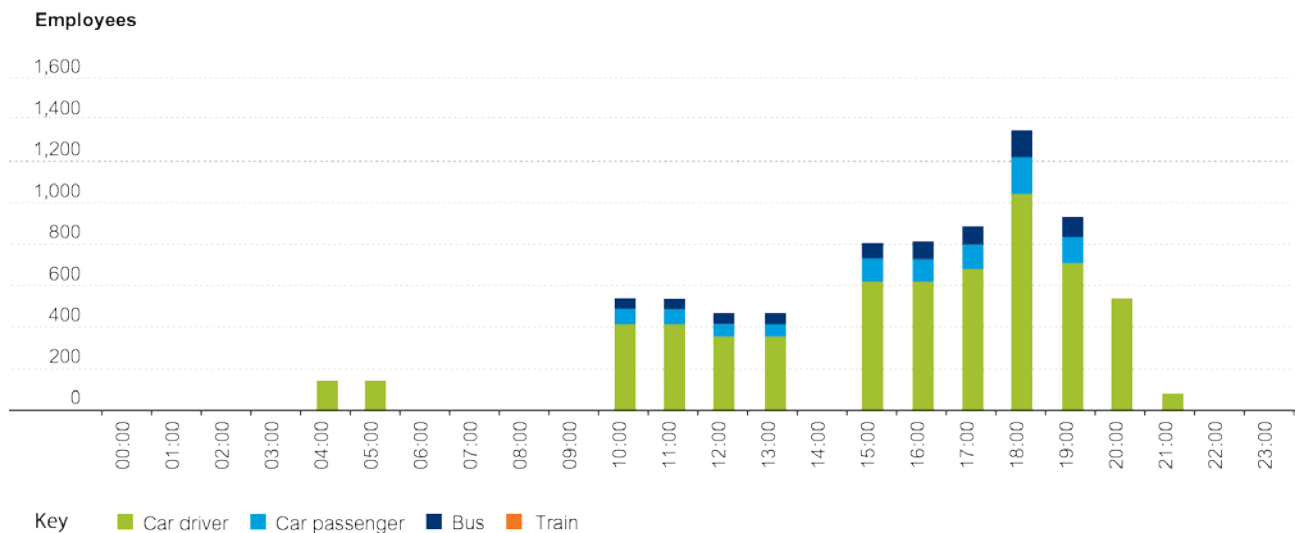


Figure 15–15 – Employee departures by mode and time of day

15.5.3.4. Traffic generation

The calculated employee arrivals and departures were assigned to vehicles to determine the number of vehicles entering and leaving the airport site throughout the 24-hour operational period. The results are shown in Figure 15–16 for arrivals and Figure 15–17 for departures. Employee traffic generation peaks would be expected to be outside the main traffic peak periods of 7–9 am and 4–6 pm.

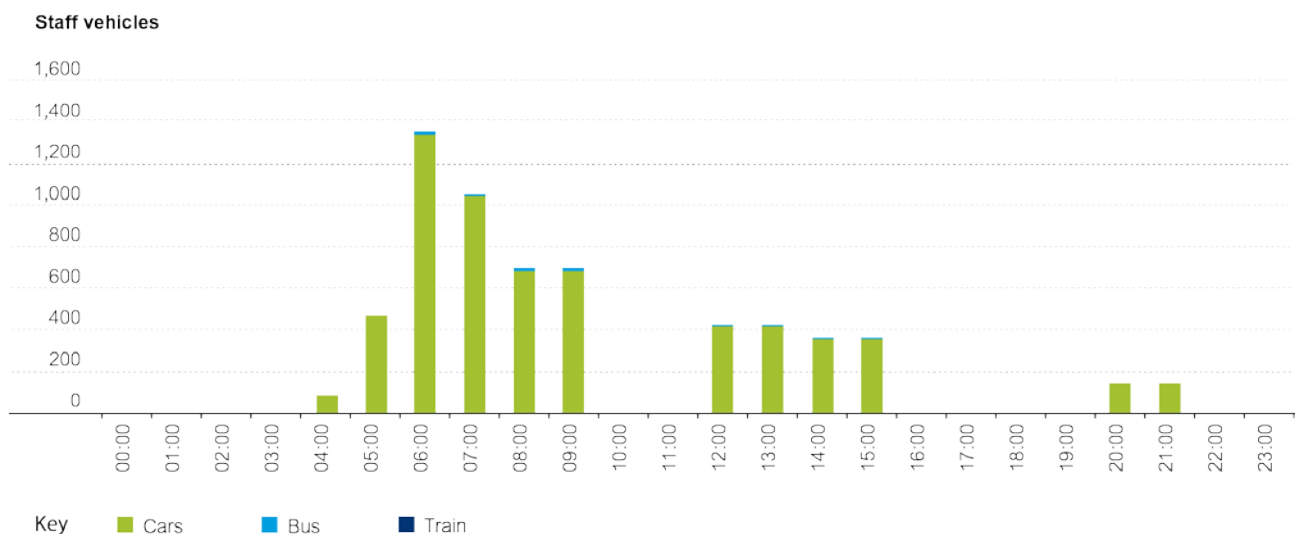


Figure 15–16 – Employee vehicle arrivals by mode (2031)

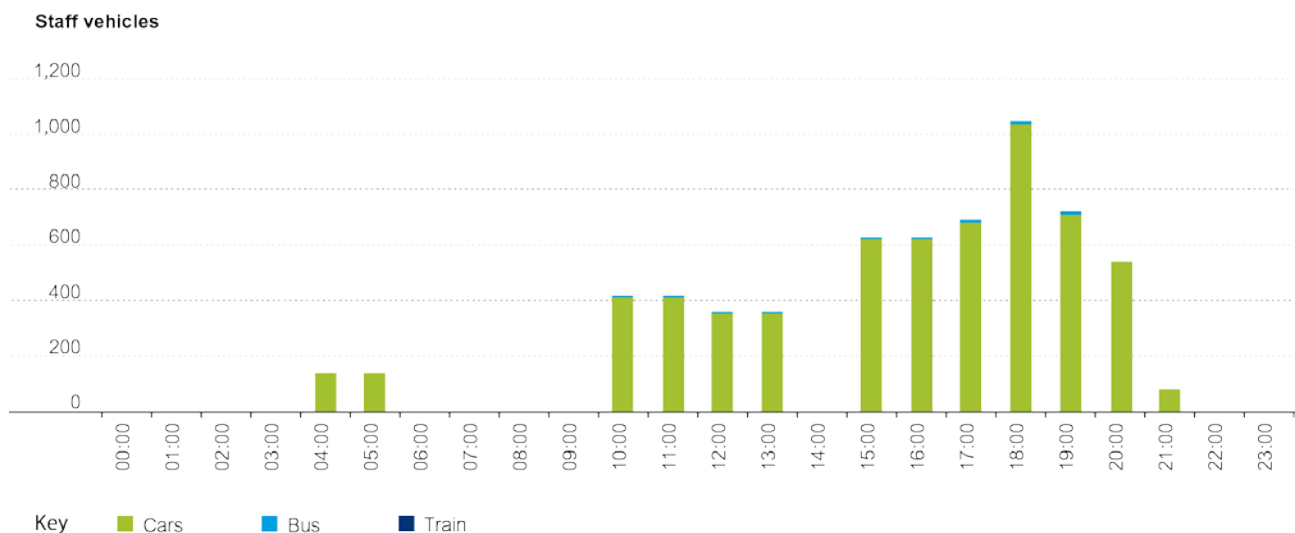


Figure 15–17 – Employee vehicle departures by mode (2031)

15.5.4. Freight trips

Freight demand has been identified for air freight cargo and for the delivery of aviation fuel to the fuel farm. Demand estimates for airport consumables (e.g. food, retail items) or waste removal cannot be calculated before a detailed terminal plan is developed and have therefore been excluded from the assessment.

The freight demand for air cargo is estimated to be 190,793 tonnes in 2031. It has been assumed that the cargo freight arrives at and departs from the airport on heavy rigid trucks, semi-trailers and B-doubles. Table 15–10 gives the estimated heavy vehicle volumes (and car equivalents).

Table 15–10 – 2031 two-way truck movements

Vehicle type	2031 annual movements	2031 daily movements	2031 hourly movements	2031 car equivalents per hour
Heavy Rigid Truck (12.5 metres long)	53,051	152	6	13
Semi-Trailer (19 metres long)	6,376	17	1	2
B-Double (23 -26 metres long)	1,822	10.59	0	1

15.5.4.1. Fuel deliveries

Assuming a fuel supply pipeline is not available to service the proposed airport, it has been estimated that in 2031 approximately 43 B-doubles of fuel per day would be required to meet Stage 1 fuel use requirements. This would be equivalent to about two B-doubles per hour, or 35 passenger car units (pcus) per hour on average entering and leaving the airport site.

15.5.5. Total airport traffic generation estimate

A total airport trip generation estimate has been calculated using the totals for passengers, employees and freight provided in the previous sections. Table 15–11 presents the results divided into representative two-hour periods, with a 24-hour total.

Table 15–11 – Total modelled traffic to / from the proposed airport in 2031

	AM peak 2 hour	Interpeak 2 hour	PM peak 2 hour	Evening 2 hour	24 hour
Arriving at airport					
Passengers	2,582	1,862	2,518	1,276	15,774
Airport workers	1,375	498	190	573	4,871
Freight (TNR)	9	26	13	57	277
Total (arriving)	3,966	2,386	2,721	1,905	20,922

	AM peak 2 hour	Interpeak 2 hour	PM peak 2 hour	Evening 2 hour	24 hour
Departing from Airport					
Passengers	2,286	1,983	2,312	1,357	15,774
Airport workers	0	411	1,027	704	4,885
Freight (TNR)	9	26	13	57	277
Total (departing)	2,295	2,420	3,353	2,117	20,936

15.5.6. Effect on network performance

As noted in Section 15.5.4, operation of the proposed Stage 1 development is expected to result in 20,992 vehicles accessing the site and 20,936 vehicles leaving the site each day. This would increase traffic on nearby north–south routes in the area including The Northern Road. At the same time, the opening of the M12 Motorway would attract traffic from the M4 corridor, Elizabeth Drive, Bringelly Road and Fifteenth Avenue, reducing the volumes on these east–west routes.

There are two drivers of the changes in volumes. Firstly, the proposed airport would introduce more trips on the network in this area. Secondly the M12, which would provide primary access to the airport, would have a diversionary effect on traffic movements in the wider area, attracting vehicles to the M12 corridor that would otherwise have used Elizabeth Drive, Bringelly Road or the M4 Motorway. This would have the effect of:

- reducing volumes on the M4;
- reducing volumes on Bringelly Road and Elizabeth Drive; and
- increasing volumes on The Northern Road.

Table 15–12, Figure 15–18 and Figure 15–19 show the 2031 network conditions for the ‘do minimum and ‘with airport’ assessment scenarios, for the respective AM and PM peak periods.

The following specific network effects would be expected:

- improved LoS on Elizabeth Drive as a result of the diversion of trips on to the M12;
- a deterioration in LoS on The Northern Road:
 - to LoS D on sections of The Northern Road between the M12 and M4 (AM/PM peaks);
 - to LoS E just north of Elizabeth Drive (AM peak); and
 - to LoS F just south of the M4 (AM/PM peaks);
- increase in LoS on sections of Mamre Road near the M12;
- reduction in LoS on Mamre Road north of Erskine Park Road; and
- the M12 motorway maintains a LoS no worse than B.



Having regard to the proposed road developments in the vicinity of the airport site, by 2031 it is predicted that the proposed airport would not generate the level of traffic required to significantly impact the operation of the surrounding road network.

15.5.7. Public transport, walking and cycling

The public transport, walking and cycling networks proposed by the NSW Government and local councils are expected to have sufficient capacity to cater to the expected airport passenger and employee demand.

Bus routes 789 and 801 currently traverse the airport site and would therefore need to be appropriately altered in consultation with the bus operator and Transport for NSW.

15.5.8. Access

Ground transport infrastructure to service the proposed airport is discussed in Section 5.9 (Chapter 5 in Volume 1).

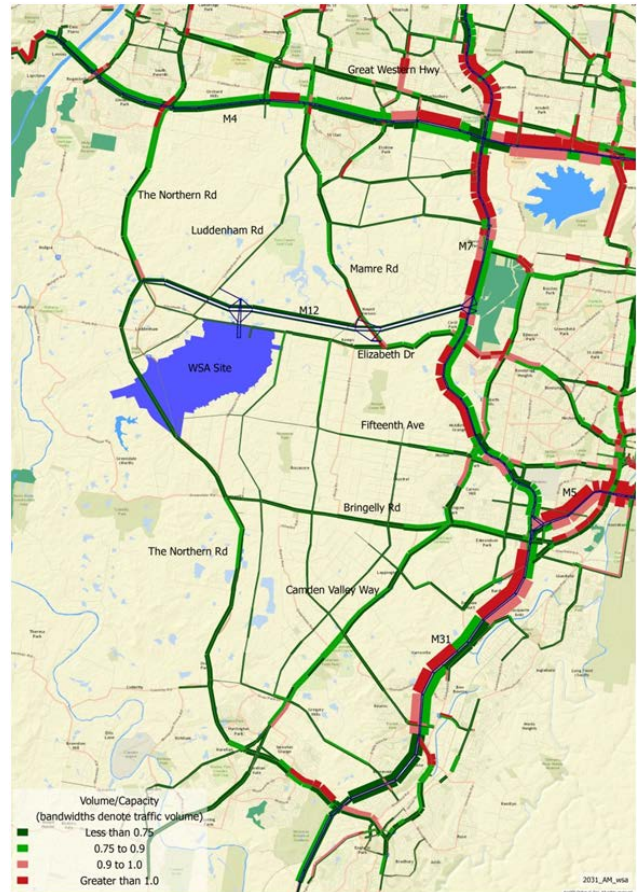
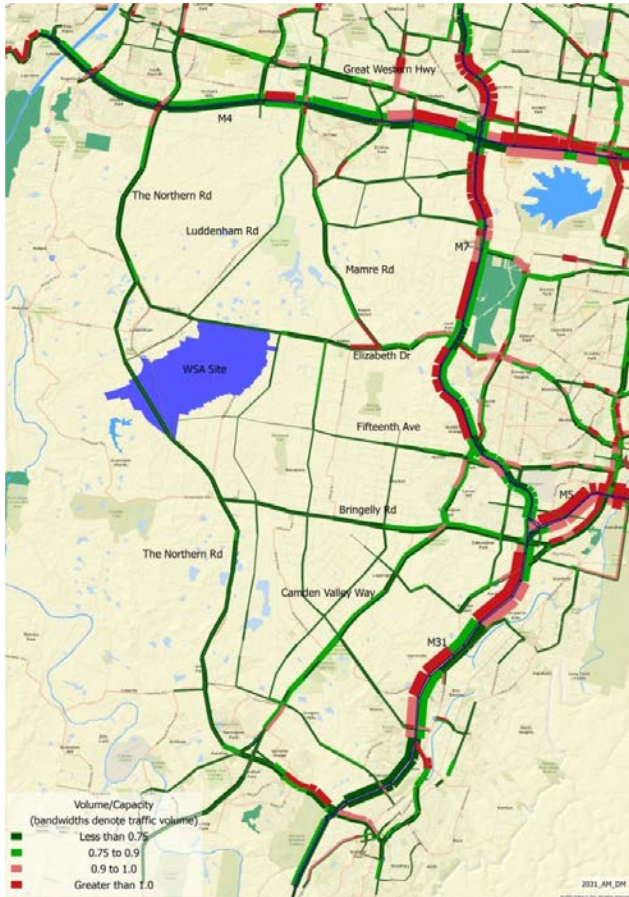
Local traffic originating in Bringelly which currently travels north to Elizabeth Drive via Badgerys Creek Road would no longer be able to do so. A high standard alternative route (via The Northern Road and the proposed M12 Motorway) is expected to be available to service this traffic.

Table 15–12 – Level of Service for 2031 with and without the proposed airport

Id	Road	Location	Without the airport				With the airport			
			AM Peak		PM Peak		AM Peak		PM Peak	
			Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd
1	The Northern Road	North of Elizabeth Drive	C	D	C	C	C	E	D	C
2	The Northern Road	South of M4	F	C	D	F	F	D	D	F
3	The Northern Road	South of Bringelly Road	C	B	B	C	D	B	B	C
4	M4	West of Mamre Road	F	D	D	F	F	D	D	F
5	M4	West of M7	F	D	D	E	F	D	D	E
6	M7	South of M4	F	F	F	E	F	F	F	E
7	M7	South of Elizabeth Drive	F	D	D	D	F	D	D	E
8	M5	East of M7	F	E	E	F	F	E	E	F
9	M31	South of Campbelltown Road	F	E	D	E	F	E	D	E
10	Narellan Road	North of Tramway Drive	D	F	D	D	D	F	D	D
11	Bringelly Road	West of Cowpasture Road	D	C	C	C	D	C	C	C
12	Cowpasture Road	At M7	F	E	D	F	F	E	D	F
13	Elizabeth Drive	East of M7	D	F	D	C	E	F	E	D
14	Elizabeth Drive	West of M7	E	D	C	D	D	C	C	C
15	Elizabeth Drive	West of Mamre Road	F	B	B	D	C	B	B	C
16	Elizabeth Drive	East of the Northern Road	C	A	A	B	A	A	A	A
17	Mamre Road	North of Elizabeth Drive	F	C	C	F	F	E	D	F
18	Mamre Road	South of M4	D	F	E	D	D	F	E	D

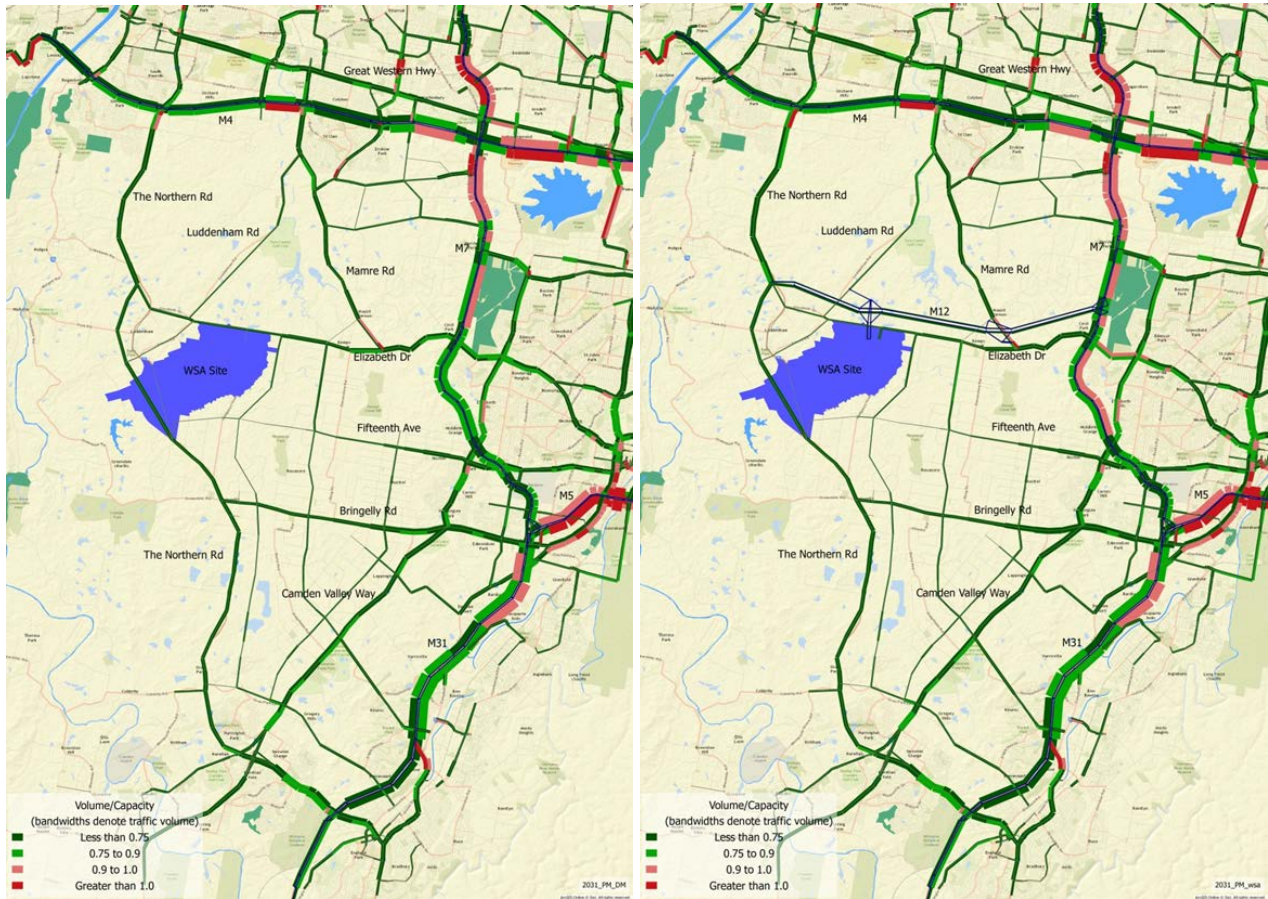
Id	Road	Location	Without the airport				With the airport			
			AM Peak		PM Peak		AM Peak		PM Peak	
			Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd	Nbd/Ebd	Sbd/Wbd
19	Luddenham Drive	West of Mamre Road	D	C	C	C	C	C	C	D
20	Lawson Road	South of Elizabeth Drive	C	A	A	C	D	A	A	C
21	Western Road	South of Elizabeth Drive	D	A	B	C	D	B	B	D
22	Fifteenth Avenue	West of Cowpasture Road	C	A	A	C	C	A	A	C
23	M12	West of M7	-	-	-	-	A	A	A	A
24	M12	West of Mamre Road	-	-	-	-	B	A	A	A

Note: Improvements are indicated in **green bold**. Deteriorations are indicated in **red bold**.



Note: Volume/capacity ratio bandwidth definitions are outlined in Table 15–1

Figure 15–18 – AM peak Volume/Capacity – Do minimum (left), with proposed airport (right)(2031)



Note: Volume/capacity ratio bandwidth definitions are outlined in Table 15–1

Figure 15–19 – PM peak volume/capacity – Do minimum (left), with proposed airport (right) (2031)

15.6. Mitigation and management measures

Table 15–13 outlines the broad mitigation and management measures that are proposed to address the expected traffic and transport effects associated with the proposed Stage 1 development.

Table 15–13 – Mitigation and management measures – surface traffic and access

ID	Issue	Mitigation/management measure	Timing
15.1	Construction related traffic and transport impacts	A community awareness programme would be implemented prior to construction commencing and would continue throughout the entire construction period. The programme would aim to make road users (including local residents) aware of construction traffic and safety issues, such as diversions, temporary road closures, traffic signalling and speed limits.	Pre-Construction
15.2	Construction related traffic and transport impacts	A traffic and access management plan would be developed prior to construction of the proposed airport as part of the construction environmental management framework. The plan would collate measures to mitigate and manage potential traffic impacts. The plan would consider the following elements: • management for the temporary and permanent closures of roads within the airport site; • a community engagement strategy; • ongoing consultation with Roads and Maritime, local councils as appropriate and emergency services; • induction for drivers working on the project to cover safety measures particularly for night works; • review of speed environments along transport corridors; • restriction of construction related traffic within the AM and PM peak periods where required; • management of the transportation of construction materials to optimise vehicle loads in order to minimise vehicle movements; • traffic control measures to manage and regulate traffic movements during construction; • identification of potential disruption to road users; • identification of any road closures and/or road upgrades that may be required; • construction vehicle routes, including the use of arterial roads, haulage routes, access to the airport site and procedures for oversize and heavy vehicles; and • parking facilities for construction workers. The plan would be developed in consultation with relevant stakeholders prior to the commencement of construction. The plan would provide the overall plan and staging for managing traffic through and around each work site. This would be in accordance with the Roads and Maritime's <i>Road Design Guide</i>, the Roads and Maritime Services <i>Traffic Control at Work Sites</i> manual and AS1742.3 <i>Manual of Uniform Traffic Control Devices – Traffic control for works on roads</i>, and any other relevant standard, guide or manual. The draft plan would be reviewed by relevant stakeholders including NSW Police, Transport for NSW, Road and Maritime Services and affected local councils.	Pre-Construction

ID	Issue	Mitigation/management measure	Timing
15.3	Operational traffic and transport impacts	A ground transport plan would be prepared as part of the detailed design of Stage 1 and before the proposed airport begins operating. The plan would address: • road design speeds; • security issues; • traffic loads from airport and other developments on site; • connections with off-site/external roads, including matching capacity, speeds and road geometry; • forecast traffic flows, including public transport requirements; • car parking; • commercial and operational vehicles and storage; • terminal interface; • passenger pick-up and drop-off by private and commercial vehicles; • pedestrian linkages between terminals and all transport drop-off/pick-up areas; • pedestrian, cycle or road networks for movement around the Airport Site; • use of dedicated busways; • ability to continue to provide access to and from the Airport when key intersections are unavailable; and • the ability to expand, with minimal disruption, to meet future airport and business development requirements.	Pre-operations

15.7. Conclusion

The construction phase of the proposed Stage 1 development is expected to generate an additional 1,254 vehicle movements per day on the surrounding road network. This equates to around 314 peak hour vehicle movements during the AM peak period. The predicted construction traffic would be dispersed throughout broader road network and would not be significant in the context of the broader Western Sydney region.

Elizabeth Drive would receive the greatest impact of the major roads during construction, due to its proximity to the site. The forecast AM peak traffic equates to about an 8% increase in traffic on this road. This increase would not be expected to lower the level of service on Elizabeth Drive.

A community awareness programme and traffic and access management plan would be implemented to provide information to road users and manage construction traffic, including oversize vehicles.

During operation, Stage 1 would be expected to result in 20,922 vehicles accessing the site each day, with 20,936 leaving the site. With the introduction of the M12 Motorway, this additional traffic is not likely significantly to affect the operation of the surrounding road network but would be expected to result in:

- small increases in congestion at The Northern Road/M4 intersection; and
- small increases in congestion on Mamre Road.

A significant amount of road improvement works is proposed as part of the Western Sydney Infrastructure Plan, in addition to those identified in the Broader Western Sydney Employment Area and South West Priority Growth Area. These upgraded roads are expected to provide sufficient capacity to cater for the expected passenger and employee traffic demand associated with the proposed airport in 2031.

The public transport, walking and cycling systems proposed by the NSW Government and local councils would also have sufficient capacity to cater to the expected airport passenger and employee demand at the proposed airport.

An assessment of the surface traffic impacts of the longer term development is presented in Chapter 35. It considers the possible extension of the South West Rail Link to the airport site in response to increasing demand.



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