Chapter 11
Traffic, transport and access

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11. Traffic, transport and access

Chapter 11 provides an assessment of the existing and proposed transportation network surrounding the Moorebank Intermodal Terminal (IMT) (the Project), as well as potential traffic, transport and access impacts resulting from construction and operation of the Project. This chapter summarises the detailed assessment in Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment, which was prepared by Parsons Brinckerhoff and is included in Volume 3 of this Environmental Impact Statement (EIS). In particular, the assessment addresses the Commonwealth Department of the Environment (DoE)'s Environmental Impact Statement (EIS) Guidelines and the Secretary for the NSW Department of Planning and Environment (NSW DP&E)'s Environmental Assessment Requirements (NSW SEARs) for the Project listed in Table 11.1.

Table 11.1 Relevant Commonwealth EIS Guidelines and NSW SEARs

Requirement	Where addressed
Commonwealth EIS Guidelines under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	
Details of any proposed public transport services which will operate throughout the site.	No public transport services are proposed through the Project site; however, sections 11.2.3 and 11.4.5 of this chapter and sections 2.5 and 8.4 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of the EIS describe existing and proposed public transport in the vicinity of the Project site.
Provide a description of the current traffic conditions in the vicinity of the proposed site and along proposed road transport routes, including traffic volumes, peak times, points of congestion and road conditions.	Section 11.2 of this chapter and section 2 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
Provide a detailed analysis of the contribution or changes to existing vehicle traffic at the local and regional scale resulting from the construction and operation of the proposed facility. The analysis must be carried out in accordance with the Guide to Traffic Generating Developments and the Integrating Land Use and Transport Package, NSW Roads and Traffic Authority.	Section 11.4 of this chapter and sections 3, 4, 5 and 6 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of the EIS.
Comprehensive monitoring of traffic congestion.	Intersection surveys were undertaken as part of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of the EIS (summarised in section11.2.4 of this chapter). Future traffic monitoring is addressed in the Provisional Environmental Management Plan for traffic in Volume 1, Appendix G.
NSW SEARs under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act)	
Traffic, transport and access – including but not limited to:	
• a Transport and Accessibility Impact Assessment demonstrating how the development will facilitate freight transport objectives, meet freight infrastructure requirements and address impacts to local and regional road and rail transport networks;	Impacts on regional road and rail transport networks are covered in this chapter (primarily section 11.4). Chapter 3 – Strategic context and need for the Project also demonstrates how the development would facilitate freight transport objectives and meet freight infrastructure requirements in relevant NSW and Australian Government policies.

Requirement	Where addressed
• access to and from the development (including truck routes and rail access to the Southern Sydney Freight Line [SSFL]), and interaction and integration with existing and planned transport infrastructure and services; and details of internal transport and logistics requirements to minimise external transport impacts and maximise access to public transport for employees;	Sections 11.3 and 11.4 of this chapter and section 3 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS. Details of internal transport and logistical requirements are further outlined in Chapter 7 – Project built form and operations.
• the number of train and truck movements, origin and destination, time of movements, modal split targets, types of road transport likely to be used (for example B-Doubles) and the capacity of existing and proposed road and rail routes to handle predicted increases in traffic, based on appropriate empirical analysis and modelling, including freight and non-freight movements and vehicle utilisation;	Section 11.4 of this chapter and sections 2, 4, 5 and 6 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• a breakdown of the split of import and export container movements by rail, including the proportion of empty container movements;	Section 11.4.1 of this chapter and section 4 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• proportion of port shuttle services, regional and interstate rail being serviced by the Moorebank IMT, including predicted daily port shuttle movements;	Section 11.4.1 of this chapter and section 4 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• demonstrate plans and capacity for empty container storage within the site, including the transport of empty containers to regional areas (if required);	Section 7.6 of Chapter 7 – Project built form and operations and sections 4 and 6 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• consideration of the cumulative impacts of this proposal with the adjacent SIMTA proposal and other existing and proposed freight distribution facilities in the locality and on local and regional road and rail networks;	Chapter 27 – Cumulative impacts and section 7 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• identification of required road and rail infrastructure upgrades within proximity of the site, including the M5 and M7 motorways and interchanges, the Moorebank Avenue/Heathcote Road intersection, the Moorebank Avenue/Newbridge Road intersection and Cambridge Avenue;	Section 11.3 of this chapter and section 3 and section 6 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• a consideration of road safety in the vicinity of the site including the identification of any 'black spots';	Section11.2.5 of this chapter and sections 2.7 and 2.8 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• identification of cycleway and pedestrian links between Liverpool, Holsworthy, Wattle Grove, Moorebank, M5 Motorway corridor, Casula and Macquarie Fields to maximise active transport options to the site;	Sections 11.2.3 and 11.4.5 of this chapter and sections 2.5 and 2.6 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS.
• impacts on users of the Georges River, including an assessment of bridge clearance to ensure safe passage of water vessels; and	Chapter 24 – Social and economic impacts.
• taking into account the Guide to Traffic Generating Developments (RMS) and the Integrating Land Use and Transport Package (DUAP).	These documents were considered in the assessment (as explained in section 4 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS).

11.1 Assessment approach

This section provides an overview of the assessment approach taken for the traffic, transport and access assessment. Further detail is provided in Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment in Volume 3 of this EIS. An independent peer review of Technical Paper 1 has been undertaken by Mike Veysey Consulting. A letter endorsing the technical paper and the approach described therein is included in Appendix G to this EIS (Volume 2).

The objective of the transport assessment is to analyse how future traffic conditions with the Project compare with how the transport network would have operated without the Project. Wherever possible the outcome sought would as a minimum be that the 'with Project' conditions are not significantly worse than the 'without Project' conditions. This would be generally achieved through infrastructure capacity enhancement, as outlined in sections 11.3 and 11.4.2. A key focus of the traffic assessment for this Project was therefore to assess the Project's potential impact on the surrounding transport network during construction and operation along with the operation of the proposed upgrades to Moorebank Avenue.

The traffic impact assessment comprised two main components:

- Development of a strategic transport model to assess the impacts of articulated truck movements on the Sydney greater metropolitan area (GMA) network. This model provided traffic forecasts for 2031. The strategic model was developed using elements of the following NSW Government models: Sydney Strategic Travel Model (STM); Sydney Freight Movement Model (FMM) and Sydney Light Commercial Vehicle Model (LCVM). Each of these models was calibrated and validated to 2011 by the Bureau of Transport Statistics (BTS).
- Intersection performance modelling using Signalised and unsignalised Intersection Design and Research Aid (SIDRA) modelling software to assess the performance of the following intersections in the local and wider road network in 2030 without and with the Moorebank IMT:
  - Hume Highway and Orange Grove Road;
  - Hume Highway and Elizabeth Drive;
  - Hume Highway and Memorial Avenue;
  - Hume Highway, Hoxton Park Road and Macquarie Street;
  - Hume Highway and Reilly Street;
  - Moorebank Avenue and Newbridge Road;
  - Moorebank Avenue and Heathcote Road;
  - Moorebank Avenue and Industrial Park Access;
  - Moorebank Avenue and Church Road;
  - Heathcote Road, Wattle Grove Road and Nuwarra Road;
  - Newbridge Road and Nuwarra Road;
  - Newbridge Road, Governor Macquarie Drive and Brickmakers Drive;
  - Moorebank Avenue and M5 Motorway interchange;

> Hume Highway and M5 Motorway interchange;
> Cambridge Avenue, Canterbury Road, Glenfield Road and Railway Parade;
> Moorebank Avenue and Bapaume Road;
> Moorebank Avenue and Anzac Road;
> Moorebank Avenue and Defence Support access;
> Moorebank Avenue and Defence National Storage and Distribution Centre (DNSDC) access;
> Moorebank Avenue and Chatham Avenue; and
> Moorebank Avenue and proposed Moorebank IMT accesses.

Intersection performance analysis is rated in terms of a Level of Service (LoS), as described in Table 11.2. Analysis is usually restricted to the AM and PM peak hours as these represent the worst case traffic congestion conditions. Whether the impact on existing traffic is acceptable depends on the balance of overall Project benefits.

11.1.1 Methodology

The methodology for the traffic impact assessment involved:

- collecting data including traffic survey counts (refer to section 11.2.4) to determine the existing traffic network demands and performance;
- determining the expected traffic generation from all developments proposed within the Project site, for both construction and operation;
- distributing the expected traffic generated to the network via a number of intersections along Moorebank Avenue;
- determining the peak traffic years to be tested based on construction and operational traffic demands and AM peak hour and PM peak hour periods;
- modelling the impacts at a strategic level (using the NSW Roads and Maritime Services (RMS) Road Assignment Model (EMME/2)) to determine the impacts of traffic route choice through the area and the predicted future level of background traffic and distribution;
- modelling the proposed future intersection upgrades along Moorebank Avenue using SIDRA 6 (intersection analysis software) to forecast the operation of the network for the following Project design years:
    > Early Works (2015) – Scenario 1: This considers construction only impacts generated by remedial earthworks and demolition of buildings;
    > Phase A (2016) – Scenario N1: This considers peak construction impacts occurring for Phase A, generated by spoil removal and the upgrade of Moorebank Avenue (and associated intersections);

  - Phase B (2023) – Scenario N2: This considers a combination of construction and operational impacts. Under this scenario operations on site would be 24 hours a day, 7 days a week with the exception of the operation of the truck gate, which would only be operational 16 hours a day, 5.5 days a week;
  - Phase C (2028) – Scenario N3: This considers a combination of construction and operational impacts. Under this scenario operations on site would be 24 hours a day, 7 days a week with the exception of the operation of the truck gate, which would only be operational 16 hours a day, 5.5 days a week; and
  - Full Build (2030) - Scenario N4: This considers operational impacts only. Under this scenario operations on site would be 24 hours a day, 7 days a week and truck movements would occur 24 hours a day, 7 days a week
- modelling the proposed Moorebank Avenue and Project access intersections for the northern rail access option only. This option is considered the worst case scenario as it would involve the greatest volume of Project related vehicle movements entering and exiting the southernmost Moorebank IMT access intersection on Moorebank Avenue (also referred to as the Main Access); and
- recommendations for future intersection and other required upgrades to mitigate any other impacts.

In addition to the road modelling assessment described above, an assessment of the existing road safety of Moorebank Avenue and sections of the M5 South Western Motorway (M5 Motorway) was also undertaken, using crash data obtained for the five-year period between 2008 and 2013 to assess the potential road safety impacts that may result from the development of the Project and upgrade of Moorebank Avenue. This assessment was undertaken in accordance with the RMS Accident Reduction Guide Version 1.1 (RMS 2005). Both assessments considered the section of Moorebank Avenue between the East Hills Railway Line and the intersection with the M5 Motorway, as well as the section of the M5 Motorway between the Hume Highway and Heathcote Road intersections.

Through initial consultation and discussions with the Australian Rail Track Corporation Limited (ARTC), the Project's planned rail infrastructure requirements – including the rail link to the SSFL and the provision of rail capacity within the SSFL – were confirmed. This included a demand and capacity assessment for the Project, and confirmation that the assessed capacity of the SSFL would meet the future demand for the Project.

A qualitative assessment of potential impacts on existing rail operations is included in this chapter. As the Project would not interact with the existing passenger rail lines in the area, impacts on these have been omitted, while some potential temporary impacts on the SSFL have been discussed.

An overall assessment of the Project's interaction with existing transport systems (rail, road, pedestrian, cyclist, parking and access) has also been described and, where necessary, mitigation has been proposed.

Finally, a number of design and management recommendations have been provided for future intersections and other required upgrades to mitigate impacts identified through the assessment.

11.1.2 Cumulative assessment

In accordance with the NSW SEARs, this EIS includes a cumulative assessment of the traffic and transport impacts of the Project in combination with the Sydney Intermodal Terminal Alliance (SIMTA) project and other planned developments within the surrounding region. The findings of the cumulative assessment are provided in Chapter 27 – Cumulative impacts and within section 7 of Technical Paper 1 – Traffic Impact Assessment (Volume 3).

11.2 Existing environment

11.2.1 Road network

The existing road network surrounding the Project site comprises National and State roads, local roads owned and maintained by the Liverpool City Council (LCC), and private roads owned and maintained by the Department of Defence (Defence). The LCC local roads include Moorebank Avenue (between the M5 Motorway and Anzac Road), Anzac Road and Bapaume Road, each of which has a speed limit of 60 kilometres per hour (km/h). Defence roads include Moorebank Avenue south of Anzac Road, and roads within the Project site, some of which connect to Moorebank Avenue (i.e. Chatham Avenue) (refer to Figure 11.1).

The Project site is close to a number of major roads, including:

- Hume Highway (National Road);
- M5 Motorway (State Road) until it reaches the Camden Valley Way Interchange (northbound traffic) and the Hume Highway on ramp (southbound traffic) where it is classified as a National Road;
- Newbridge Road (State Road);
- Heathcote Road (State Road); and
- Westlink M7 Motorway (privately operated toll road).

The section of the M5 Motorway over the Georges River between Moorebank Avenue and the Hume Highway is a recognised congestion point within the motorway network, due in part to the short distance available for vehicles joining and leaving the motorway at this location. This effect could be compounded by the RMS' planned widening of the M5 Motorway to both the east and west of Moorebank Avenue.

A number of 'rat-runs' have developed through the area to avoid the M5 Motorway. In particular, turning volumes from Cambridge Avenue to Moorebank Avenue indicate it is used as an alternative to the M5 Motorway for access from the Hume Highway and suburbs further south. In addition, Anzac Road may be used to access Heathcote Road to avoid using the M5 Motorway.

Regional and interstate road network

Regional and interstate road network routes affected by the Project are expected to include:

- M5 Motorway – extending from Botany to Casula. The M5 Motorway is the key link between Port Botany and the Hume Highway and M7 Motorway in Sydney's south and south-west. The M5 Motorway is the most significant road connection that links the Project site to the surrounding major road network and interstate road transit routes;
- M7 Motorway – extending from Casula to Seven Hills. The M7 Motorway links Sydney's greater west to the M5, M4 and M2 Motorways, thereby linking Sydney's road network to regional and interstate road networks to the south, west and north of Sydney;
- Hume Highway (south) – extending from Casula to Campbellfield in Victoria. The Hume Highway is the major road transport link between Sydney and Melbourne;
- Hume Highway (north) and Cumberland Highway. These routes represent a major transport link to the north and destinations such as Wetherill Park;
- M1 Pacific Motorway – extending from North Wahroonga in Sydney to Wallsend in Newcastle. The M1 Pacific Motorway is a key link for road transit between Sydney and Newcastle that would be used by the Project's interstate road haulage travelling to and from areas such as Newcastle and Brisbane;
- M4 Motorway/Great Western Highway: Together the M4 Motorway and Great Western Highway extend from Sydney's suburbs of Concord and Parramatta to Bathurst in regional NSW. The M4 Motorway/Great Western Highway would be used by the Project's interstate road haulage travelling to locations in western NSW and interstate; and
- Pacific Highway – extending from Warringah in Sydney to North Quay in Brisbane. The Pacific Highway is the major costal road link between Sydney and Brisbane. The Pacific Highway would be used for interstate road journeys to and from Brisbane and other areas of Queensland.

11.2.2 Rail and public transport network

The existing local rail and public transport network is shown in Figure 11.1. The broader regional rail network is shown in Figure 2.1 in Chapter 2 – Site context and environmental values of this EIS.

The SSFL has been constructed between Birrong and Macarthur and provides a dedicated freight line corridor between Port Botany and Macarthur. The SSFL is proposed to improve the efficiency and cost effectiveness of rail freight services by removing current restrictions created by the need to share railway lines operated by Sydney Trains. The SSFL provides an additional railway track that allows passenger and freight services to operate independently. The SSFL, along with the Main South Railway Line, are located on the western side of the Georges River. The East Hills Railway Line is also located to the south of the Project site.

The area surrounding the Project site is currently serviced by Liverpool, Holsworthy, Glenfield and Casula railway stations. The largest of these is Liverpool Station, which is a major transport interchange with direct services to and from the City via the Inner West, the South and Bankstown lines (providing 20 two-way train services per hour during peak hours). Liverpool Station is also located on the Cumberland Line, which provides direct travel to Blacktown with 2 two-way train services per hour during peak hours.

Current upgrades to Glenfield Station, and the development of the Glenfield to Leppington Rail Line (under construction, with operations anticipated to start in 2015) are likely to result in even better train services in this area.

Moorebank Avenue is currently serviced by one bus route (Route 901) between Liverpool and Holsworthy via Wattle Grove (using Anzac Road). There is also a single AM and PM diverted Route 901 service, which travels further south along Moorebank Avenue to Chatham Avenue.

Interstate rail network routes

Interstate rail network routes affected by the Project would include:

- SSFL – extending between Sefton/Birrong and Macarthur. The SSFL, which opened in January 2013, connects the Port Botany Rail Link (Sydney metropolitan freight network) to the North–South Rail Corridor, which links southern interstate rail between Sydney and Melbourne. All interstate freight rail travelling to the Project site would use the SSFL as the connection point to the site;
- Metropolitan Freight Network (MFN) and Port Botany Rail Line – extending from Port Botany to the Northern Sydney Freight Corridor (NSFC) at North Strathfield and to the SSFL at Sefton and Birrong. The MFN facilitates the movement of Sydney's freight by rail from Port Botany directly to Sydney's existing Enfield and Chullora IMTs, as well as connecting to a number of shared passenger/freight rail lines. Interstate freight rail movements travelling to and from regions north of Sydney would use the MFN before connecting to the NSFC;
- Northern Sydney Freight Corridor (NSFC) – extending from North Strathfield in Sydney to Newcastle, the NSFC connects the MFN to the North–South Rail Corridor, which links northern interstate rail between Sydney and Brisbane. Interstate freight rail travelling to and from the Project site would use the NSFC to travel to places such as Newcastle and Brisbane; and
- Impacts on the SSFL have been discussed with ARTC and further analysis would be undertaken during detailed design and staging of the Project. As noted in section 11.5.1, further analysis, design refinement and ongoing consultation with ARTC in relation to the Project's rail connection with the SSFL would occur as part of the Project's management and mitigation measures.

11.2.3 Pedestrian and cyclist facilities

Existing and planned pedestrian and cyclist facilities are shown in Figure 11.1.

Currently, there are limited pedestrian and cyclist facilities on Moorebank Avenue south of Anzac Road. A shared path is provided on the eastern side of Moorebank Avenue between the M5 Motorway and Anzac Road, which continues on the southern side of Anzac Road to connect to Holsworthy Station. This is the only identified cycleway in the area. On the western side of Moorebank Avenue, in front of the Project site, there is a wide road shoulder (except at the signalised intersections) which can accommodate cyclists; however, there is no footpath or separated cycleway.

LCC has proposed a number of cyclist and pedestrian routes in its Bike Plan 2009, which would improve pedestrian and cyclist access to the Project site and surrounds. These routes may provide additional options for cyclists and improve the connection between the Project site, neighbouring suburbs and local train stations, as shown in Figure 11.1.

11.2.4 Existing traffic conditions

Existing intersection performance

Intersection surveys were undertaken on Tuesday 7 December 2010 during the AM peak (between 6.00 am and 9.00 am) and the PM peak (between 4.00 pm and 7.00 pm) at the following intersections:

- M5 Motorway and the Hume Highway;
- Moorebank Avenue and the M5 Motorway;
- Moorebank Avenue and Bapaume Road;
- Moorebank Avenue and Anzac Road;
- Moorebank Avenue and Defence support access (and a secondary access to the DNSDC);
- Moorebank Avenue and DNSDC access (including car park access on the western side of Moorebank Avenue); and
- Moorebank Avenue and Chatham Avenue.

Further surveys were undertaken at the above intersections and at the following locations on Tuesday 18 March 2014 during the AM peak (between 6.00 am and 9.00 am) and PM peak (between 4.00 pm and 7.00 pm:

- Hume Highway and Orange Grove Road;
- Hume Highway and Elizabeth Drive;
- Hume Highway and Memorial Avenue;
- Hume Highway, Hoxton Park Road and Macquarie Street;
- Hume Highway and Reilly Street;
- Moorebank Avenue and Newbridge Road;
- Moorebank Avenue and Heathcote Road;
- Moorebank Avenue and Industrial Park Access;
- Moorebank Avenue and Church Road;
- Heathcote Road, Wattle Grove Road and Nuwarra Road;
- Newbridge Road and Nuwarra Road;
- Newbridge Road, Governor Macquarie Drive and Brickmakers Drive; and
- Cambridge Avenue, Canterbury Road, Glenfield Road and Railway Parade.

The location of these intersections is shown in Figure 11.1.

Seven-day automatic traffic counts were also undertaken for the week from Tuesday 7 December 2010 to Monday 13 December 2010 at the following locations:

- Moorebank Avenue between the M5 Motorway and Bapaume Road;
- Moorebank Avenue north of Cambridge Avenue; and
- Anzac Road east of Moorebank Avenue.

The intersection surveys and automatic counts provided an indication of average daily and peak hour traffic, light and heavy vehicle proportions and pedestrian volumes. The traffic surveys described above are considered representative of the conditions currently experienced at these intersections and the traffic models were validated to the conditions observed during the surveys. All counts were conducted outside of school and university holidays. Although December and March are relatively busy traffic months the influence of seasonality on traffic conditions is reduced when forecasts of future traffic year flows are made. This is because the proportion of extra traffic generated by the growth factor is far more significant than any seasonal differences. None of the surveys used in the analysis were significantly affected by construction activity in the area.

IMT boundary
Intersection survey locations
Bus stop
Railway station
Bus route 901
Limited service bus route

Cycleway routes
Existing on road cycleway
Existing off road cycleway
Proposed on road cycleway
Proposed off road cycleway

Figure 11.1 Intersection survey locations, local public transport and pedestrian/cycleway network

The intersection surveys indicate that the majority of the traffic currently using Moorebank Avenue is through traffic, travelling between the Glenfield area and the Moorebank Avenue and M5 Motorway interchange. The network peaks for Moorebank Avenue are between 6.45 am and 7.45 am and between 5.00 pm and 6.00 pm on regular weekdays.

As detailed in section 11.1, a base case SIDRA intersection analysis was undertaken to provide an understanding of the current traffic operations along Moorebank Avenue and to provide a basis for the qualitative and quantitative impact assessments for the Project. The SIDRA model was used to analyse intersection capacity, level of service (LoS) and performance. The LoS criteria for intersections are shown in Table 11.2.

Table 11.2 LoS criteria for intersections

LoS	Average delay (seconds per vehicle)	Traffic signals, roundabout	Give-way and stop signs
A	Less than 14	Good operation.	Good operation.
B	15 to 28	Good with acceptable delays and spare capacity.	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 excessive delays; roundabouts require other control mode.	At capacity; requires other control mode.
F	Greater than 71	Unsatisfactory with excessive queuing.	Unsatisfactory with excessive queuing; requires other control mode.

Source: RMS Guide to Traffic Generating Developments, Version 2.2, 2002

Table 11.3 shows the existing performance of the intersections along Moorebank Avenue (refer Figure 11.1 for locations), based on the SIDRA modelling results under existing (2014) traffic conditions.

Table 11.3 Existing intersection performance (2014)

Intersection	Intersection control type	Peak hour	DoS	Average delay (s)	LoS	Max queue (m)
Moorebank Avenue and Bapaume Road	Priority – give way	AM	0.56	>100	F	28
		PM	0.42	>100	F	40
Moorebank Avenue and Anzac Road	Signalised	AM	0.69	18	B	193
		PM	0.94	28	B	219
Moorebank Avenue and Defence support access	Signalised	AM	0.84	8	A	253
		PM	0.96	26	B	409
Moorebank Avenue and DNSDC access	Signalised	AM	0.70	6	A	140
		PM	0.95	24	B	598
Moorebank Avenue and Chatham Avenue	Signalised	AM	0.98	41	C	646
		PM	0.98	39	C	669

Notes: DoS: Degree of Saturation; LoS: Level of Service; Max queue length is usually quoted as the 95th percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It reflects the number of vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

Source: Table 2.2, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Table 11.3 shows a significant delay at the intersection of Moorebank Avenue and Bapaume Road during both the AM and PM peaks, which is the result of vehicles turning right from Bapaume Road into Moorebank Avenue. This intersection operates on a priority (give way) basis and, therefore, the worst possible DoS and delay times are recorded.

The intersection of Moorebank Avenue and Anzac Road has a good LoS with acceptable delay times.

Modelled queue lengths were found to be greatest at the Moorebank Avenue and DNSDC access intersection (PM peak) and the Moorebank Avenue and Chatham Avenue intersection (AM and PM peaks). These are a result of the existing designs of the intersections and the high tidal flows of the northern and southern approaches.

Existing intersection performance in future years

Existing intersection performance was also assessed by modelling future transport scenarios, without development of the Project. The results of this assessment are presented in Table 11.4.

Table 11.4 Existing road network modelled future intersection performance

Intersection	Year	Peak hour	DoS	Average delay (s)	LoS	Maximum queue (m)
Moorebank Avenue and Bapaume Road	2015	AM	0.57	>100	F	29
		PM	0.45	>100	F	42
	2016	AM	0.58	>100	F	30
		PM	0.47	>100	F	43
	2023	AM	0.63	>100	F	30
		PM	0.77	>100	F	54
	2028	AM	0.67	>100	F	26
		PM	1.00	>100	F	66
	2030	AM	0.68	>100	F	25
		PM	1.00	>100	F	68
Moorebank Avenue and Anzac Road	2015	AM	0.73	19	B	188
		PM	0.85	28	B	296
	2016	AM	0.74	19	B	194
		PM	0.85	29	C	302
	2023	AM	0.90	24	B	306
		PM	0.96	35	C	387
	2028	AM	1.04	54	D	732
		PM	1.18	54	D	522
	2030	AM	1.04	56	D	752
		PM	1.21	59	E	577

Intersection	Year	Peak hour	DoS	Average delay (s)	LoS	Maximum queue (m)
Moorebank Avenue and Defence support access	2015	AM	0.84	7	A	255
		PM	0.96	24	B	397
	2016	AM	0.85	9	A	281
		PM	1.04	50	E	796
	2023	AM	0.97	32	C	632
		PM	1.08	76	F	917
	2028	AM	1.04	63	E	932
		PM	1.16	>100	F	1237
	2030	AM	1.05	68	E	972
		PM	1.18	>100	F	1292
Moorebank Avenue and DNSDC access	2015	AM	0.70	5	A	138
		PM	0.95	23	B	595
	2016	AM	0.71	5	A	143
		PM	0.96	26	B	644
	2023	AM	0.89	11	A	250
		PM	1.06	78	F	1161
	2028	AM	1.00	36	C	573
		PM	1.14	>100	F	1580
	2030	AM	1.01	38	C	600
		PM	1.15	>100	F	1647
Moorebank Avenue and Chatham Avenue	2015	AM	0.98	42	C	672
		PM	0.99	44	D	721
	2016	AM	1.00	51	D	784
		PM	1.00	50	D	823
	2023	AM	1.13	>100	F	1305
		PM	1.11	>100	F	1262
	2028	AM	1.21	>100	F	1631
		PM	1.19	>100	F	1676
	2030	AM	1.22	>100	F	1683
		PM	1.21	>100	F	1744

Notes: DoS = Degree of Saturation; LoS = Level of Service; Max queue length is usually quoted as the 95th percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It reflects the number of vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

Source: Table 6.3, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

The above results show that, without the Project and without upgrades to Moorebank Avenue, the performance of the intersections would progressively deteriorate, with long delays and queuing for at least one of the peak hours. In particular:

- The Moorebank Avenue and Bapaume Road intersection is forecast to operate at a LoS of F. This is due to the delay for vehicles exiting Bapaume Road. As traffic increases on Moorebank Avenue between Anzac Road and the M5 Motorway, opportunities for vehicles to leave Bapaume Road would decrease.

- The Moorebank Avenue and Anzac Road intersection is forecast to operate at capacity beyond 2028 with DoS of higher that 1.00. The queuing in Anzac Road would get progressively worse and, by 2030, would block access to neighbouring intersections during both AM and PM peak hours.
- Beyond 2030, the Moorebank Avenue and Defence support access, DNSDC access and Chatham Avenue intersections would operate at an unsatisfactory LoS of F with long queues for at least one of the peak hours.

11.2.5 Crash analysis

This section provides a summary of the analysis of crash data obtained for Moorebank Avenue and the section of the M5 Motorway between the Hume Highway and Heathcote Road intersection.

Moorebank Avenue

For the five-year period between 2008 and 2013, 61 accidents were reported on Moorebank Avenue, between and including the intersection with East Hills Railway Line. These accidents involved a total of 127 vehicles. Of these accidents, 33 (54%) occurred at intersections and 28 (46%) occurred midblock. Out of the 33 recorded accidents at intersections, 15 occurred at the intersection with the M5 Motorway and 18 occurred at the intersection with Anzac Road.

The most common accident type on Moorebank Avenue involved vehicles from opposite directions (21 accidents). A further 18 involved rear end collisions. None of the reported accidents resulted in a fatality or involved pedestrians or cyclists.

The majority of accidents (85%) involved light vehicles (cars, utilities, vans) with the remaining 15% involving heavy vehicles. The majority of accidents occurred on weekdays (88%) and during daylight hours (78%) (46% AM, 32% PM).

M5 Motorway

For the same five-year period, 171 accidents were reported on the M5 Motorway, involving 368 vehicles. Overall, accidents involving rear end collisions were the most common (77 accidents, constituting 45% of all accidents). A further 16% were vehicles leaving the road and colliding with an object and 12% as a result of a lane change. There were no accidents that resulted in a fatality. However there was one reported crash involving a cyclist.

The majority of accidents (86%) involved light vehicles (cars, utilities, vans) with the remaining 14% involving heavy vehicles. The majority of accidents occurred on weekdays (78%) and during daylight hours (69%) (30% AM, 39% PM).

Black spot analysis

An analysis of the crash data was undertaken following guidance on nominating black spots in NSW under the National Black Spot Program and sourced from the RMS website: NSW Black Spot Program, How to apply for funding[6].

A black spot can be up to 3 km in length. The minimum criterion for eligibility is at least two casualty crashes in the most recent 5 years.

[6] http://www.rms.nsw.gov.au/doingbusinesswithus/lgr/downloads/programs/blackspotprogram.html

The section of Moorebank Avenue between the East Hills Railway Line and the M5 Motorway is approximately 2.8 km long and is generally two-lane two-way with lane widening to accommodate movements at the M5 Motorway intersection. The crash data supplied by RMS indicate that 38 casualty crashes have occurred over the last 5-year period between 2008 and 2013. This equates to 2.71 casualty crashes per kilometre a year, which is in excess of the 0.13 casualty crashes per kilometre a year. This section of Moorebank Avenue is therefore considered a black spot.

The section of the M5 Motorway between the Hume Highway and Heathcote Road interchanges is approximately 2.7 km long and is generally three lanes in either direction at this location. The crash data supplied by RMS indicate that 66 casualty crashes have occurred over the last 5-year period between 2008 and 2013. This equates to 4.89 casualty crashes per kilometre a year, which is in excess of the 0.13 casualty crashes per kilometre a year. This section is therefore considered a black spot.

11.3 Moorebank Avenue Upgrade

The Project would involve development of transport infrastructure within the Project site and surrounding areas. A full description of the Project is provided in Chapter 7 – Project built form and operations and Chapter 8 – Project development phasing and construction.

During the construction of Phase A (2016), Moorebank Avenue would be upgraded to a four-lane divided roadway between the East Hills Rail Line and the M5 Motorway. The existing Moorebank Avenue is a two lane two-way road. It is proposed that this would become the ultimate southbound carriageway and that a new northbound carriageway would be constructed on the western side of the existing road. The upgrade of Moorebank Avenue is described in section 7.9 of Chapter 7 - Project built form and operations.

New intersections along Moorebank Avenue are proposed to provide access to the IMT site; the existing intersection at Anzac Road would be retained. The proposed intersections as shown in Figure 11.2 to Figure 11.4 would be at:

- Moorebank Avenue and Anzac Road;
- Moorebank Avenue, DNSDC and Warehouse Access 1 (northern rail access option only);
- Moorebank Avenue, DNSDC and Main Access (central and southern rail access options);
- Moorebank Avenue and Warehouse Access 1;
- Moorebank Avenue and Warehouse Access 2;
- Moorebank Avenue and Main Access (northern rail access option); and
- Moorebank Avenue and Warehouse Access 3.

Traffic would remain on the existing road while the new northbound carriageway is constructed. Upon completion of the northbound carriageway, two-way traffic would be transferred from the existing Moorebank Avenue to the new carriageway. The existing Moorebank Avenue would then be reconstructed (clear of traffic) to form the new southbound carriageway.

All intersections would be traffic signal controlled with indented right and left turn lanes as required. Right-turn lanes would be provided along Moorebank Avenue to provide safe entry for vehicles turning into the Project site. Each of these intersections has been designed to ensure adequate capacity is provided for the traffic volumes likely to be generated by the Project, as well as background traffic growth.

The location of the main IMT access gate for heavy vehicles would differ depending on the IMT internal layout selected. For the IMT layout associated with the northern rail access option, the main IMT access gate would be located at the south of the eastern boundary of the IMT site, while the southern and the central rail access options would result in the main IMT access gate being located towards the north. These layouts are shown in Figure 11.2 to Figure 11.4.

The main IMT access gate would be located a sufficient distance from Moorebank Avenue to allow inbound trucks to queue within the IMT boundary without impeding the flow of traffic on Moorebank Avenue or the functioning of the intersection with the M5 Motorway. Outbound traffic would also be able to queue within the IMT boundary, along the approach to the main IMT access gate.

Staff and visitor entry to the warehouse precinct (light vehicles) would be via direct intersections on Moorebank Avenue (Warehouse Access 1, 2 and 3). The location of these intersections is again dependent on the IMT internal layout.

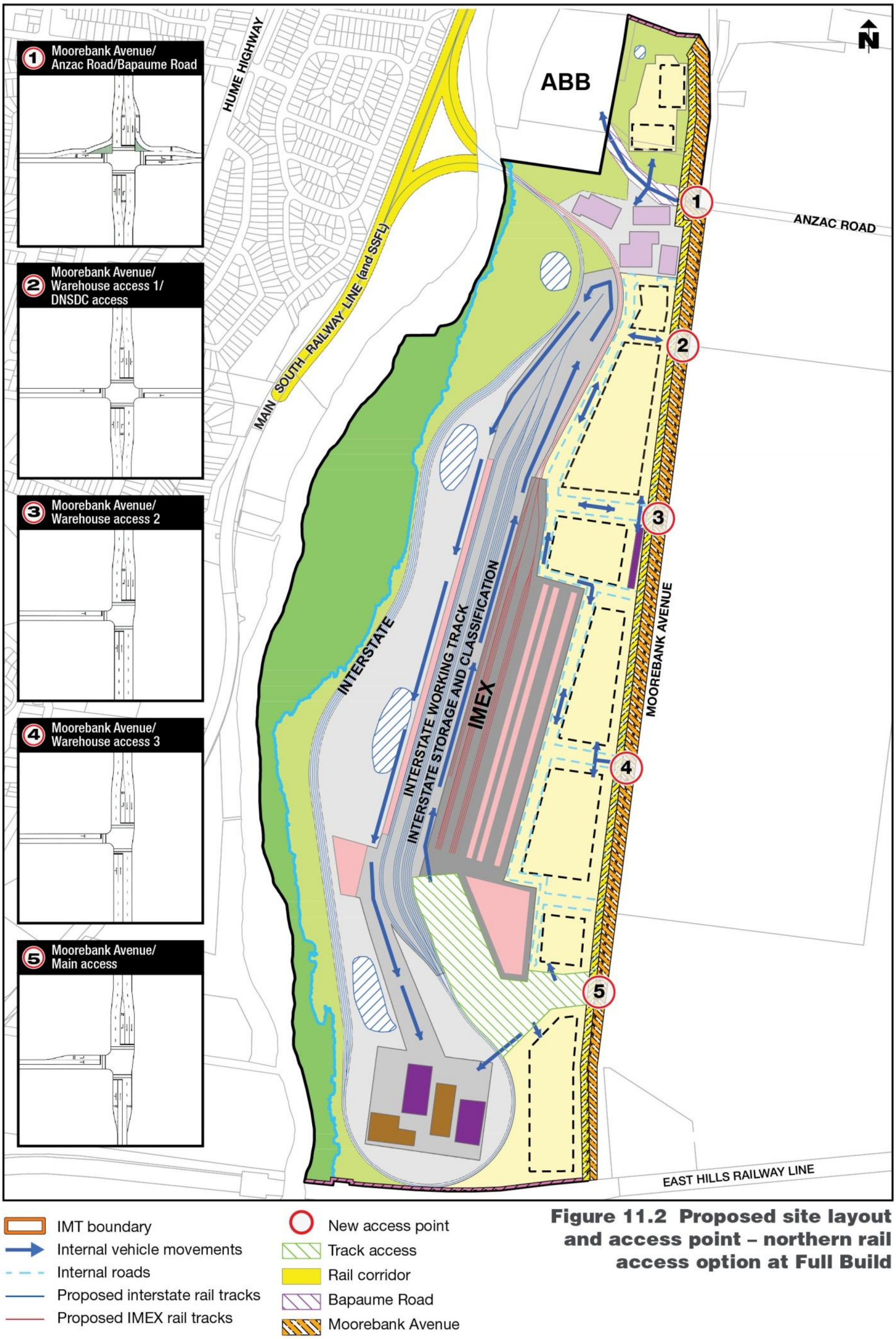
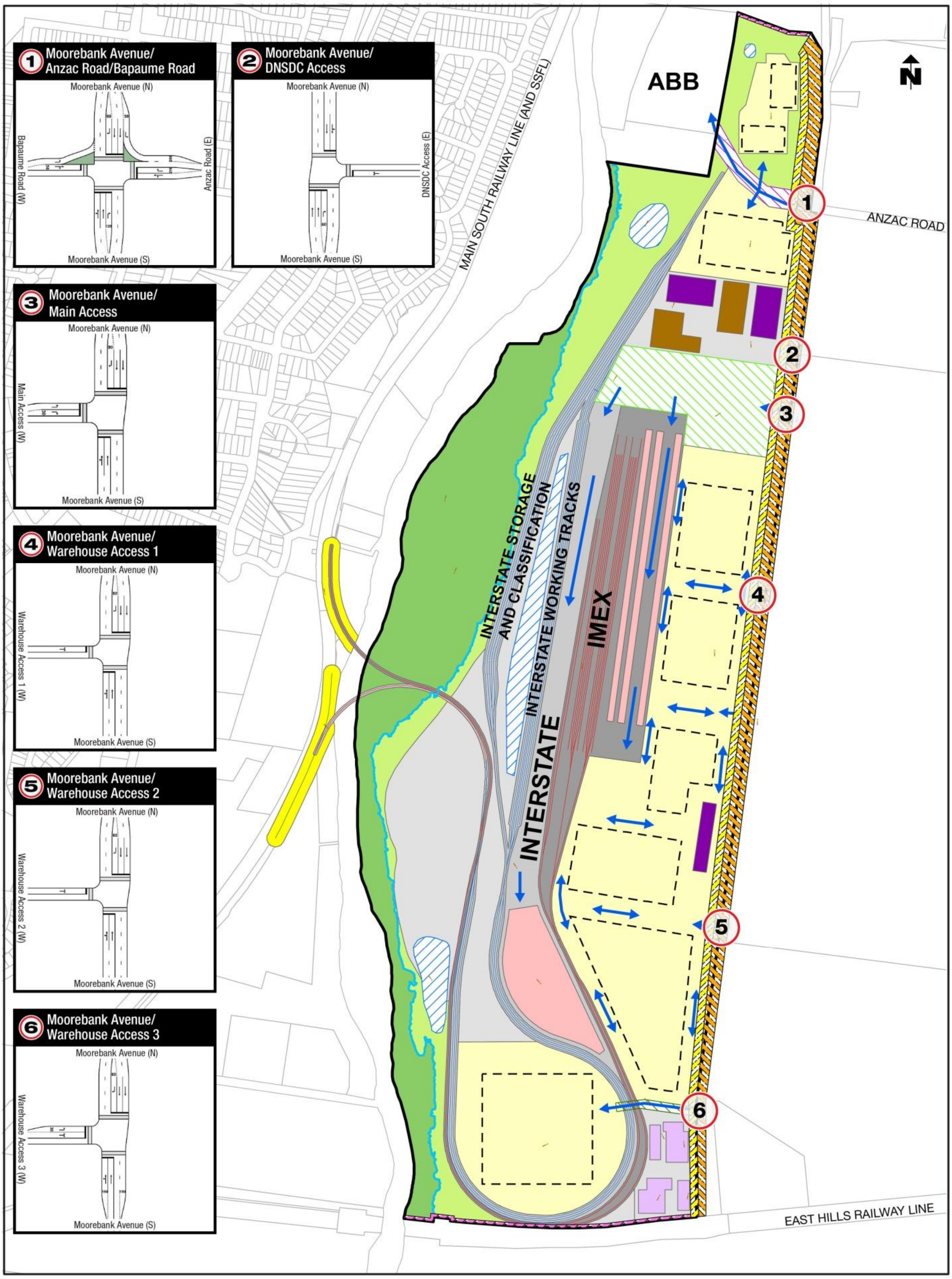


Figure 11.2 Proposed site layout and access point – northern rail access option at Full Build



IMT boundary
Internal vehicle movements
Internal roads
Proposed interstate rail tracks
Proposed IMEX rail tracks
New access point
Track access
Rail corridor
Bapaume Road
Moorebank Avenue

Figure 11.3 Proposed site layout and access point – central rail access option at Full Build

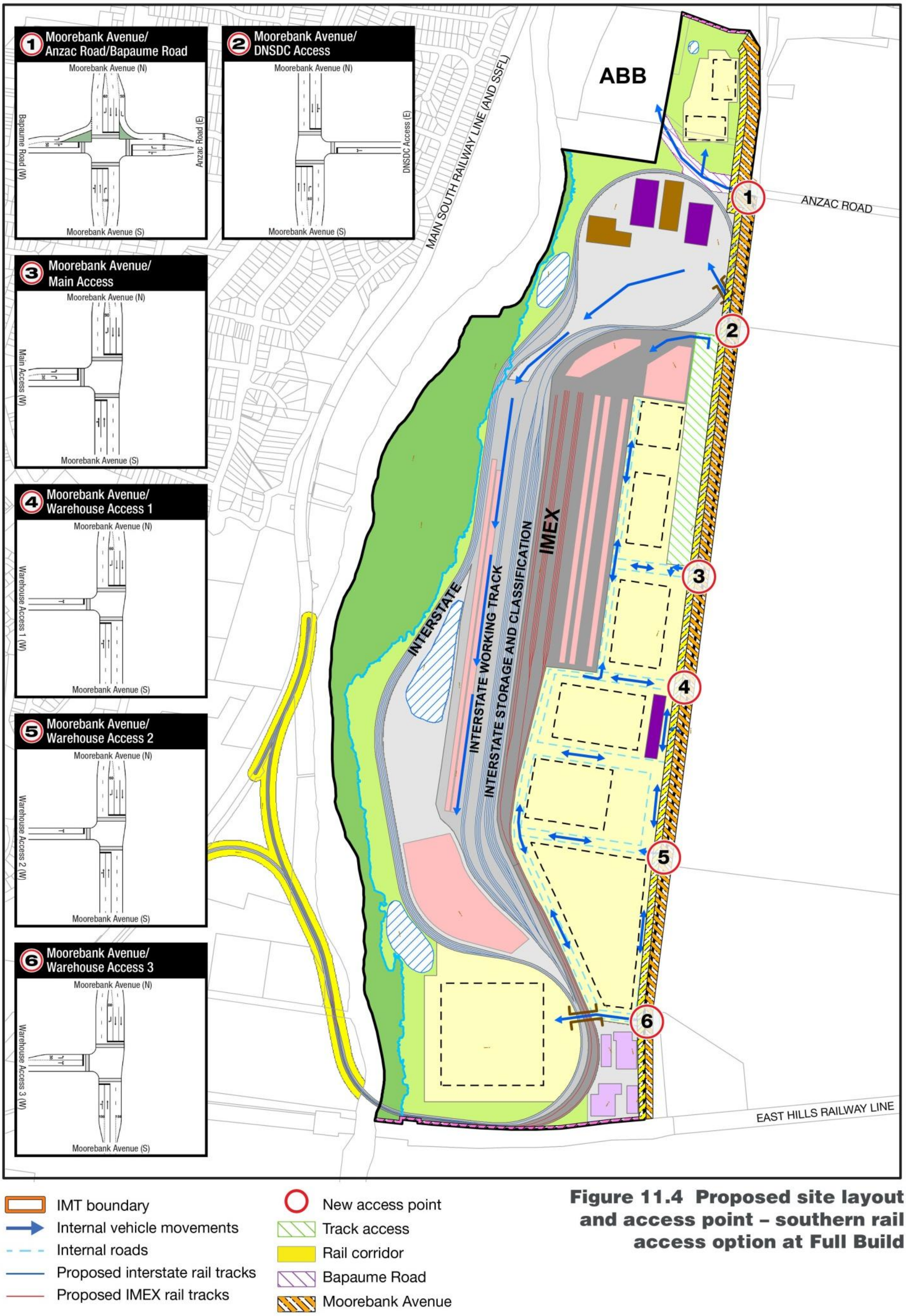


Figure 11.4 Proposed site layout and access point – southern rail access option at Full Build

11.4 Impact assessment

11.4.1 Traffic generation

This section outlines the forecast traffic (road and rail) generated by the development of the Project during construction and operation. In general, traffic generated by the Project will include:

- construction trucks and staff movements;
- IMEX and interstate truck and staff movements; and
- warehousing truck and staff movements.

For the purposes of the assessment, it has been assumed that no significant commercial vehicle traffic would be generated by the Project, since the freight associated with this terminal would be transported to and from the site as pallets on trucks.

While the proposed Moorebank Avenue and Project access intersections were modelled based on the northern rail access option layout (as the worst case scenario), the overall, the traffic impacts would be similar for the central and the southern rail access option layouts.

Construction

Construction vehicle movements would be via the local and regional road networks. Likely haulage routes and access points for construction vehicles have been identified in Figure 8.1 in Chapter 8 – Project development phasing and construction. However, the final location of these access points would be determined during detailed design and would need to consider volumes of traffic, sight distances and impacts on other road users. Access to the Project site would largely be via the M5 Motorway and Moorebank Avenue. Moorebank Avenue south of the East Hills Railway Line would not be used by construction traffic other than light vehicles. This restriction would be detailed as a requirement in the construction environmental management plan (CEMP).

Construction vehicle traffic volumes entering and exiting the Project site would vary over the duration of the Project construction. Indicative maximum daily volumes for the Project phases involving construction (i.e. Early Works, Phase A, Phase B and Phase C) are presented in Table 11.5. The estimates are based on an indicative construction schedule and on the bulk earthworks and materials estimates detailed in Chapter 8 – Project development and construction of this EIS. Traffic would comprise vehicles transporting equipment, materials and spoil, and construction workers accessing the work site.

The following assumptions were used to derive vehicle movements associated with construction workers accessing the site:

- construction hours would be 7.00 am to 6.00 pm Monday to Friday, 8.00 am to 3.00 pm Saturday with no work to be scheduled on Sundays or public holidays;
- 90% of the construction workforce would drive to the Project site. Of these:
  - 80% would arrive before the morning peak hour and leave after the afternoon peak hour;
  - the remaining 20% would arrive and leave during the morning and afternoon peak hours;
- 50% of the construction workforce would leave the site and return in the middle of the day; and

- each construction worker would generate three light vehicle trips a day on average.

Table 11.5 Predicted construction vehicle volumes

Scenario	Daily vehicle movements		Peak hourly vehicle movements	
	Light vehicles (cars)	Heavy vehicles	Light vehicles (cars)	Heavy vehicles
Early works (2015)	810	64	54	10
Phase A (2016)	2,906	1,930	194	210
Phase B (2023)	3,337	1,944	222	212
Phase C (2028)	1,280	394	85	42

Source: Table 4.1, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Table 11.5 illustrates that construction vehicle traffic is expected to be greatest during the main earthworks and civil construction (Phase A) and construction of additional capacity (Phase B).

Operation

Train generation – IMEX

Based on demand modelling provided by Deloitte (2013), the IMEX facility has been designed to have capacity to process approximately 1.05 million twenty-foot equivalent unit (TEU) containers a year, split between imports and exports. As a result of this demand, IMEX would generate approximately 137 trains (or 273 train movements) a week. The forecast TEU comprises:

- 52.3% import TEU containers;
- 16.5% export TEU containers; and
- 31.2% empty TEU containers.

For the purposes of this assessment, imports are considered to generate truck movements from the site, and exports to generate truck movements to the site.

Train generation – interstate terminal

The proposal concept provides capacity for throughput of approximately 500,000 TEU a year at the interstate terminal by 2030. This throughput would equate to approximately 12 interstate trains (or 24 train movements) a week loaded and unloaded at the facility. It is expected that a further three interstate trains (six train movements), coming from or going to Sydney, may also transit through the terminal. The proposed track layouts would allow up to four interstate trains to be processed concurrently, according to the timing of demand for interstate freight.

Table 11.6 below shows the approximate average weekly and annual train movements and subsequent TEU movements for the Full Build operation of the Project.

Table 11.6 Full Build IMEX and interstate rail trips and TEU movements

		Average one way movements		TEU movements	
		Weekly	Annual	Weekly	Annual
IMEX	Exports	130	*6,760	*9,596	499,000
	Imports	143	*7,436	*10,519	547,000
Interstate	Combined (exports and imports)	30	*1,560	*9,616	500,000
Total		*303	*15,756	*29,731	1,546,000

Note * Numbers used are based on 52 week year as per Parsons Brinckerhoff's assessment in Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3). These values are indicative only.

Since the origin and destination of interstate rail movements would depend on market and industry demands at the time of operation, the likely interstate rail freight movements and locations cannot be known at this time.

Vehicle generation

Traffic generated by operation of the Project would include truck movements from the IMEX and interstate terminals and warehouse facilities, and light vehicle movements from administration, operations and maintenance staff. A summary of total daily trips generated by the Project is outlined in Table 11.8.

Staff traffic generation

Traffic generated by staff vehicle movements was based on the number of staff expected to be located at the IMEX and interstate terminals and warehouse facilities, as discussed in sections 7.6, 7.7 and 7.8 of Chapter 7 – Project built form and operations of this EIS. The number of staff assumed for each facility is outlined in Table 11.7.

Table 11.7 Moorebank IMT staff numbers (one way peak hour trips generated)

Staff type	IMEX terminal	Interstate terminal	Warehouse	Total daily
Administrative	35 (32)	35 (32)	22 (20)	92 (84)
Operations (by shift – 3 shifts/day)	104	78	248	1290
Maintenance (by shift – 3 shifts/day)	9	7	248	792
Total				2,174

Source: Table 4.6, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

All facilities would operate 24 hours a day, 7 days a week.

Calculations for traffic generated by staff vehicles were based on the following assumptions:

- shift hours would be:
  - administration – 8.30 am to 5.00 pm; and
  - operations and maintenance – 6.00 am to 2.00 pm; 2.00 pm to 10.00 pm; and 10.00 pm to 6.00 am;

- 90% of staff for both the IMEX and interstate terminals would drive to site. The remaining 10% would carpool, catch public transport or walk/cycle to the terminal;
- all staff would arrive just prior to the start of their shift and depart directly after the shift;
- traffic generated by interstate terminal staff would commence from 2030; and
- traffic generated by IMEX terminal and warehouse staff in the intermediate years of operation would reflect the proportion of operations active at that time.

Based on these assumptions, the administrative staff would be the only generators of light vehicle movements during both the AM (6.45 am to 7.45 am) and PM (5.00 pm to 6.00 pm) peak hours on the road network. The peak period for traffic generation associated with staff would be during the shift change for operation and maintenance staff. From 2030 onwards, this shift change would generate 625 vehicle trips. However, this is likely to occur outside the peak periods (at 6.00 am, 2.00 pm and 10.00 pm).

IMEX and interstate terminals and warehouse traffic generation

Forecast train movements and their container loading would result in the generation of truck movements to transport those containers. The relationship between TEU demand and truck movements in and out of the Project site was derived based on calculations and estimates by Deloitte (2014) and is explained in detail in Chapter 4 of Technical Paper 1 – Traffic, Transport and Access Impact Assessment included in Volume 3 of this EIS.

A summary of the total traffic generated by the Project development during construction and operations over the years of analysis is shown in Table 11.8. These figures reflect one-way trip movements; i.e. 50 trips would involve 25 trips in and 25 trips out. Table 11.9 shows the AM and PM peak volumes for these phases by year.

Table 11.8 Summary of total daily weekday vehicle trips generated by the Project

	Early Works 2015		Phase A 2016		Phase B 2023		Phase C 2028		Full Build 2030	
	Cars	HV	Cars	HV	Cars	HV	Cars	HV	Cars	HV
Construction	810	64	2,906	1,930	3,337	1,944	1,280	394	0	0
IMEX	0	0	0	0	336	1,420	674	3,012	674	3,007
Interstate	0	0	0	0	0	0	0	0	522	1,155
Warehouse	0	0	0	0	1,510	774	3,774	1,644	4,528	3,998
Total trips	810	64	2,906	1,930	5,183	4,138	5,728	5,050	5,724	8,160

Source: Table 4.8, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Table 11.9 Summary of total AM and PM peak hour traffic movements

	Early Works 2015		Phase A 2016		Phase B 2023		Phase C 2028		Full Build 2030	
	Cars	HV	Cars	HV	Cars	HV	Cars	HV	Cars	HV
AM										
Total trips – inbound	54	5	194	105	248	152	135	119	84	169
Total trips – outbound	0	5	0	105	0	152	0	119	0	169
PM										
Total trips – inbound	0	5	0	105	0	152	0	119	0	169
Total trips – outbound	54	5	194	105	248	152	135	119	84	169

Source: Tables 4.9 and 4.10, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

11.4.2 Traffic distribution (operation)

Road network distribution (operation)

This section describes predicted road traffic distribution during operation of the Project (at Full Build in 2030) based on information from the strategic transport model developed for this Project.

Container freight received from Port Botany via the IMEX train freight terminal would be stored in onsite warehousing and then distributed, via the interstate freight rail network or heavy vehicle road haulage, to destinations in the Sydney region and beyond. Trucks used for transfer of IMEX freight would primarily travel along the M5 Motorway en route to their destinations. A number of other key motorways and arterial roads throughout Sydney and NSW would also be used as part of the road haulage network. It is anticipated that heavy vehicle road haulage would follow a similar travel route throughout the regional and interstate road network for both inbound and outbound trips to and from the Project site. The Project is not anticipated to result in a substantial increase in heavy vehicle movements along the regional and interstate road networks, as these are already used by existing road haulage from Port Botany.

As noted in Chapter 3 – Strategic context and need for the Project (section 3.6.2), Transport for NSW (TfNSW) is seeking to provide road network upgrades to support development of the Project. This should assist in minimising the operational traffic and transport impacts of the Project on the surrounding road network.

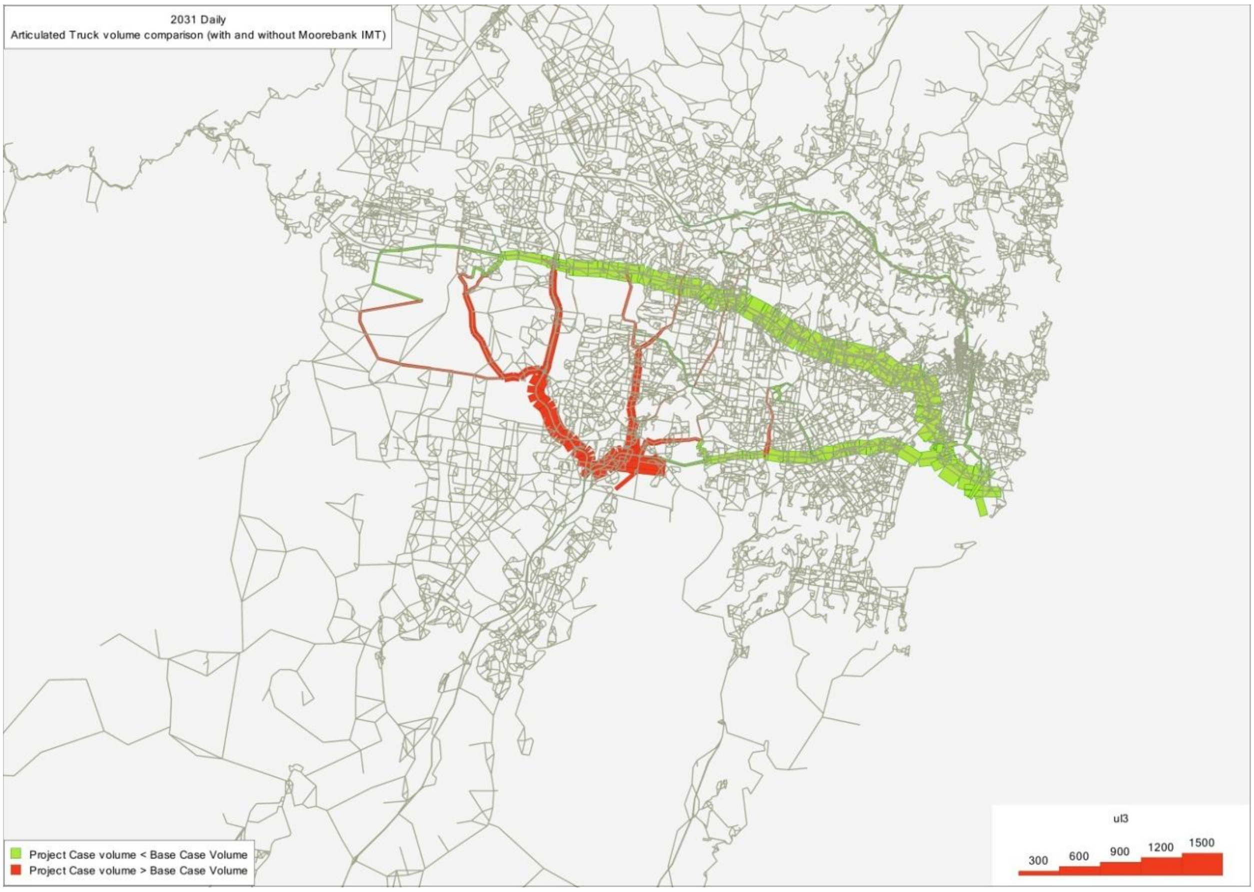
A strategic traffic network model was developed to assess the impact of the Project on the distribution of intermodal-related traffic within the Sydney region. A number of future network upgrades were considered during the development of this strategic network model, which is described in Table 11.10.

Table 11.10 Future network changes

Year	Road	Detail
2016	Hunter Expressway	Four-lane expressway from the M1 Pacific Motorway to Branxton.
	M2 Motorway widening	Widen from Windsor Road to Delhi Road.
	M5 Motorway widening	Widening Camden Valley Way to King Georges Road.
	Western Sydney Employment Hub	Link roads to the M7 Motorway.
	Great Western Highway widening	Widening the highway to four/three lanes between Emu Plains and Mount Victoria.
	South West Rail Link via East Hills	Changes to the road network around Edmondson Park related to this project (i.e. links to rail stations, etc.).
2021	WestConnex Stage 2: M5 East Duplication	Duplication from M5 East to King Georges Road It is noted that the changes included in the 2021 network extend to parts of the WestConnex project beyond the M5 East duplication such as the Sydney Airport Access Link, etc. (as per the WestConnex – Sydney's next motorway priority, October 2012, RMS document).
	North West Rail Link to Rouse Hill	Changes to the 2021 model road network around Kellyville which is likely to be associated with this project.
2026	WestConnex Stage 2: M4 Extension and M4 Widening	M4 widening and extension from Parramatta to Haberfield
	NW Growth Centre	The 2026 model road network includes changes to links in the area to the north west of the M7 which are likely to be related to this project.
2031	M2 to M1 Tunnel (NorthConnex)	Connection between M2 and M1 at Wahroonga
	SW Growth Centre	This is represented in the model as various network changes (i.e. new links, upgraded links) to the west of the Hume Highway and the M7.

Source: STM network changes (BTS)

The future STM road network changes have been included in the strategic modelling undertaken for the Project. The relevant road network upgrades shown in Table 11.10 have been included in strategic modelling for 2031 to assess the impacts of Project traffic on the network, in terms of volume change, as well as vehicle kilometres travelled (VKT) and vehicle hours travelled (VHT).

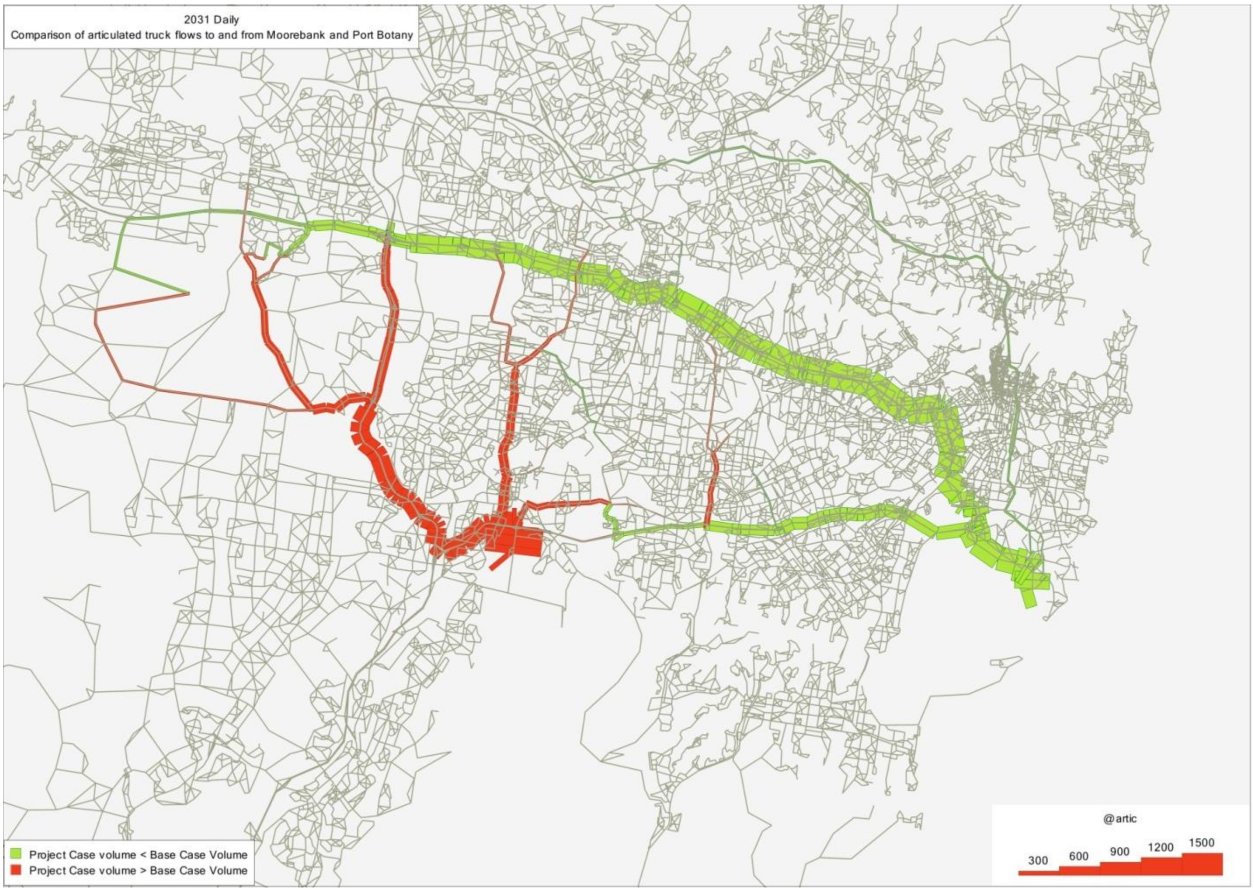


Source: Figure 6.3, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Figure 11.5 Daily comparison of articulated truck volumes (project case versus base case) in 2031

Figure 11.5 shows the change in daily articulated truck volumes on the network between the project case (with Moorebank IMT) and the base case (without Moorebank IMT). This figure shows that the introduction of the Moorebank IMT would result in:

- reductions in articulated truck volumes through the Sydney CBD and inner city suburbs, on the M4 Motorway and the M5 Motorway east of the Moorebank Avenue interchange; and
- an increase in articulated truck flows, particularly on the M7, Hume Highway and Mamre Road south of the M4 Motorway as well as the M5 Motorway between Moorebank Avenue interchange and the M7 Motorway.



Source: Figure 6.4, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Figure 11.6 Daily comparison of articulated truck volumes to/from Port Botany and Moorebank only (project case versus base case) in 2031

Figure 11.6 shows the net difference of articulated truck volumes between Port Botany and Moorebank. Comparing this to Figure 11.5 indicates that the changes in articulated truck volumes on the network would be the result of changes in heavy vehicle movements between Port Botany and Moorebank and that changes to background articulated truck traffic are not significant.

Comparison of Figures 11.5 and 11.6 suggests that development of the Project would help to relieve the regional Sydney road network of articulated vehicular traffic. In 2030 there would be a daily saving of approximately 1500 heavy vehicle movements into Port Botany, and a similar number out of Port Botany, due to the IMEX facility at Moorebank. The operation of the interstate facility would result in a daily reduction of approximately 400 truck movements out of the Chullora area, and a similar number into Chullora.

The strategic network modelling predictions also indicate that the operation of the Project would result in reductions of approximately 56,125 truck VKT per day and 1265 truck VHT per day on the regional network (refer Appendix J of the Traffic, Transport and Accessibility Impact Assessment (Volume 3).

From a regional perspective, the heavy vehicle VKT savings generated by the Project do not reflect a reduction in heavy vehicles on the road network, but instead a reduced travel distance for these heavy vehicles. These savings would be accompanied by a daily saving of approximately 2530 VHT for other traffic across the Sydney road network; however, VKT for light vehicles was found to increase by approximately 10,670 VKT as a result of future road upgrades. This reflects faster speed but longer distance trips (refer Section 5 of Technical Paper 1 – Traffic and transport impact assessment).

Figures 11.7 and 11.8 present the background traffic with additional Project traffic volumes at locations surrounding the M5 Motorway and Moorebank Avenue interchange and south of the Project site near Cambridge Avenue. As discussed above, these figures demonstrate that the Project would result in a small increase in traffic volumes at some locations on the M5 Motorway close to the Project site; however, the Project's overall impact on traffic on the M5 Motorway would be positive.

As one of the main outcomes of the Project would be the transfer of road haulage between Port Botany and Western Sydney to rail freight for redistribution, the impacts and benefits resulting from the Project in terms of vehicle speed were also modelled. Figure 11.9 shows the predicted impact of ongoing operation of the Project on road speed within the Sydney region, during a weekday AM peak period in 2031.

As the M5 Motorway is located between Port Botany and the Project site, it has greater potential to be affected by the Project than the other road corridors. Figure 11.9 shows that development of the Project is likely to have a small impact on vehicle speeds on the M7 Motorway and other roads surrounding the Project site. However, as a whole, the Sydney road network would experience road speed benefits associated with reduced traffic congestion, particularly on the M5 Motorway (east of Moorebank Avenue), the M2 Motorway and in the inner western suburbs.

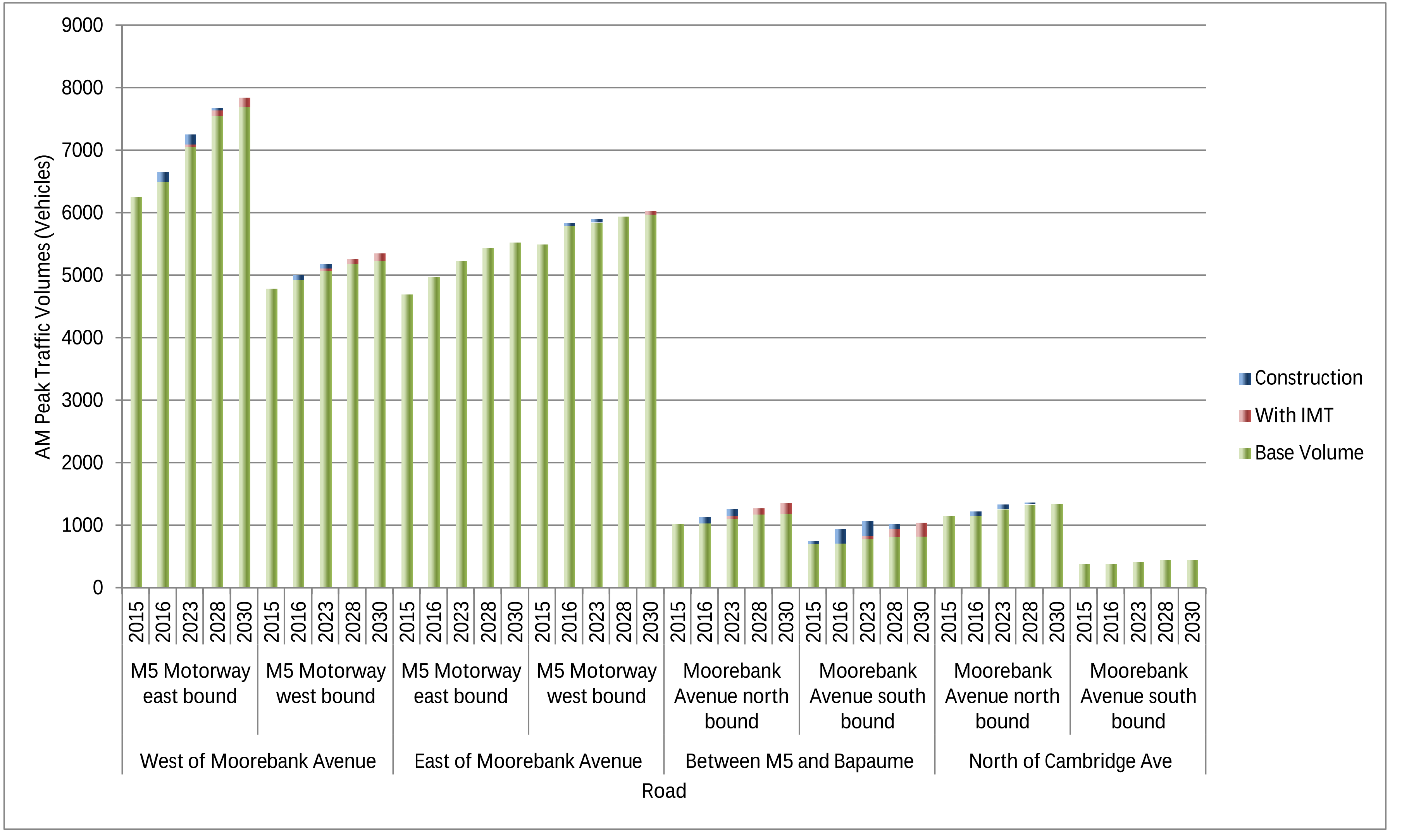


Figure 11.7 Modelled additional road network traffic volumes generated by the Project operation, AM peak

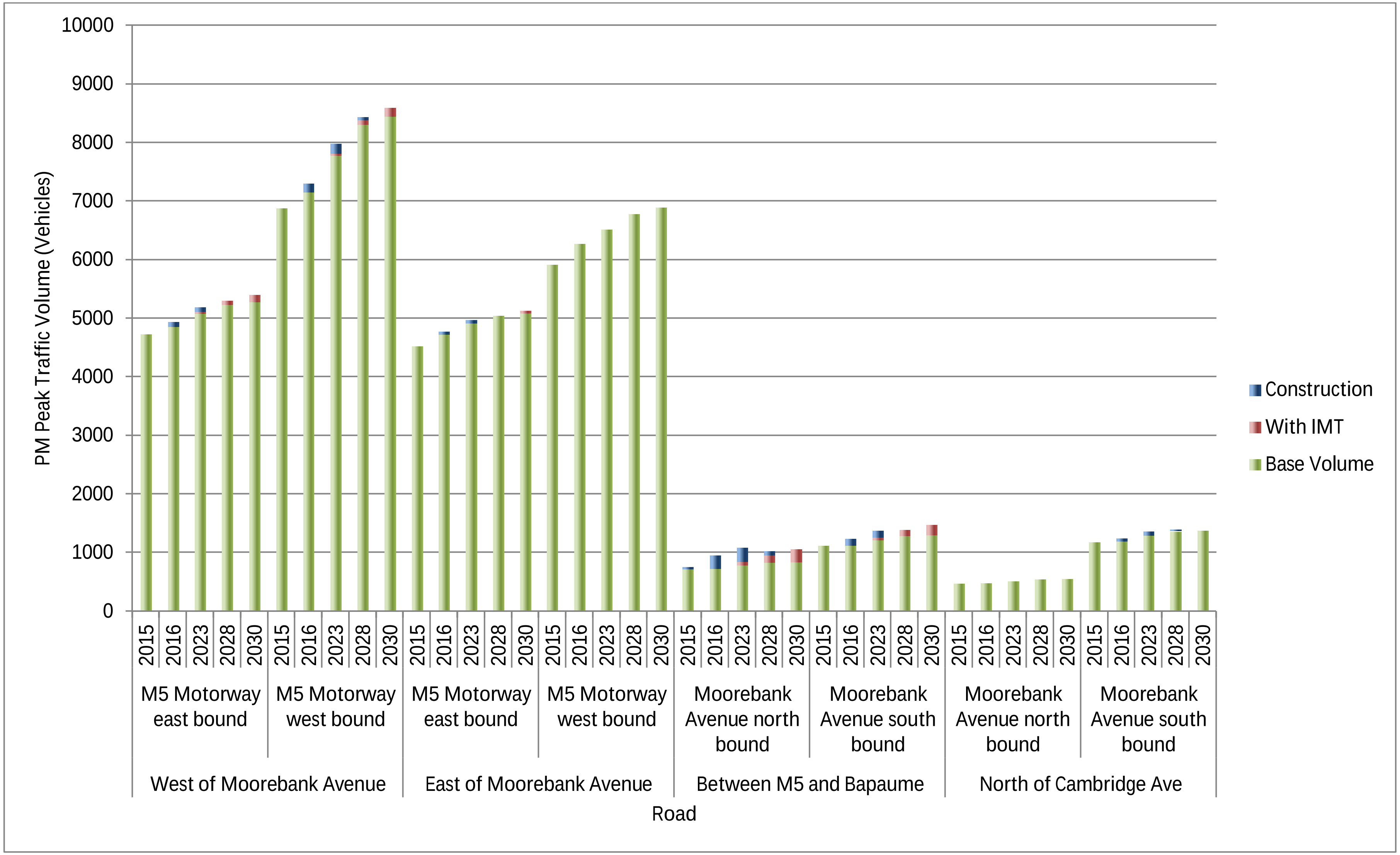


Figure 11.8 Modelled additional road network traffic volumes generated by the Project operation, PM peak

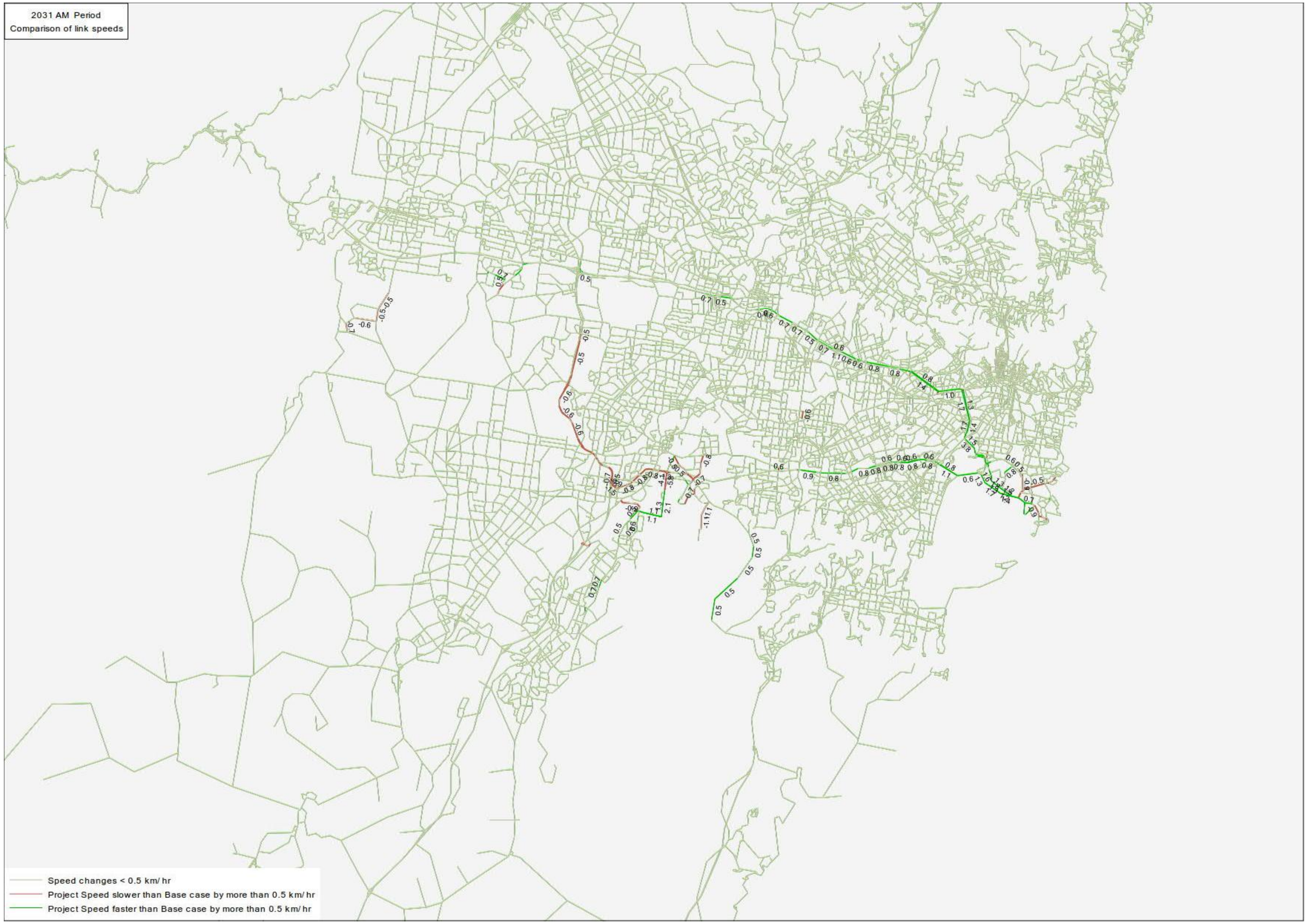


Figure 11.9 Speed change in the AM peak as a result of the Project in 2031

Table 11.11 shows the assumed traffic distribution of both light and heavy vehicles generated from the Project site. The figures in Table 11.11 are based upon the STM model which does not distribute freight related heavy vehicle traffic onto Anzac Road. Existing load or vehicle size limits mean that B-double vehicles are not permitted to use Anzac Road. Light vehicles would be evenly distributed in all directions on a number of roads throughout the area.

The design of the Moorebank IMT proposed truck access does not allow for southbound heavy vehicle movements. This is to prevent heavy vehicles generated by the Moorebank IMT travelling south along Moorebank Avenue to areas of the road network (Cambridge Avenue) which may not be able to cater for these vehicle types. As a result, heavy vehicles would be restricted from travelling south on Moorebank Avenue past the Project site. Heavy vehicles generated by the Project site would travel to and from the M5 Motorway and Moorebank Avenue interchange, where they would be distributed across the road network to travel to destinations throughout the region. The majority of heavy vehicles (70%) are expected to travel further west of the Project site, as shown in Table 11.11.

Table 11.11 Weekday peak traffic distribution in 2030

Direction	Distribution (%) Morning peak		Distribution (%) Afternoon peak	
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Moorebank Avenue – West (M5 Motorway)	20.0%	45.3%	20.0%	44.8%
Moorebank Avenue – West (Hume Highway)	18.5%	19.6%	18.5%	20.0%
Moorebank Avenue – North (Moorebank Avenue)	7.7%	27.9%	7.7%	13.9%
Moorebank Avenue – East (M5 Motorway)	13.3%	7.2%	13.3%	21.3%
Moorebank Avenue – East (Anzac Road)	10.5%	0.0%	10.5%	0.0%
Moorebank Avenue – South (Moorebank Avenue)	30.0%	0.0%	30.0%	0.0%

Source: Table 5.3, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Figures 11.10 and 11.11 present a breakdown of the Project generated traffic by functional purpose, for both the AM and PM peaks for all years between 2015 (Early Works) and 2030 (Full Build). These figures demonstrate the transition in Project related traffic movements throughout construction and operation.

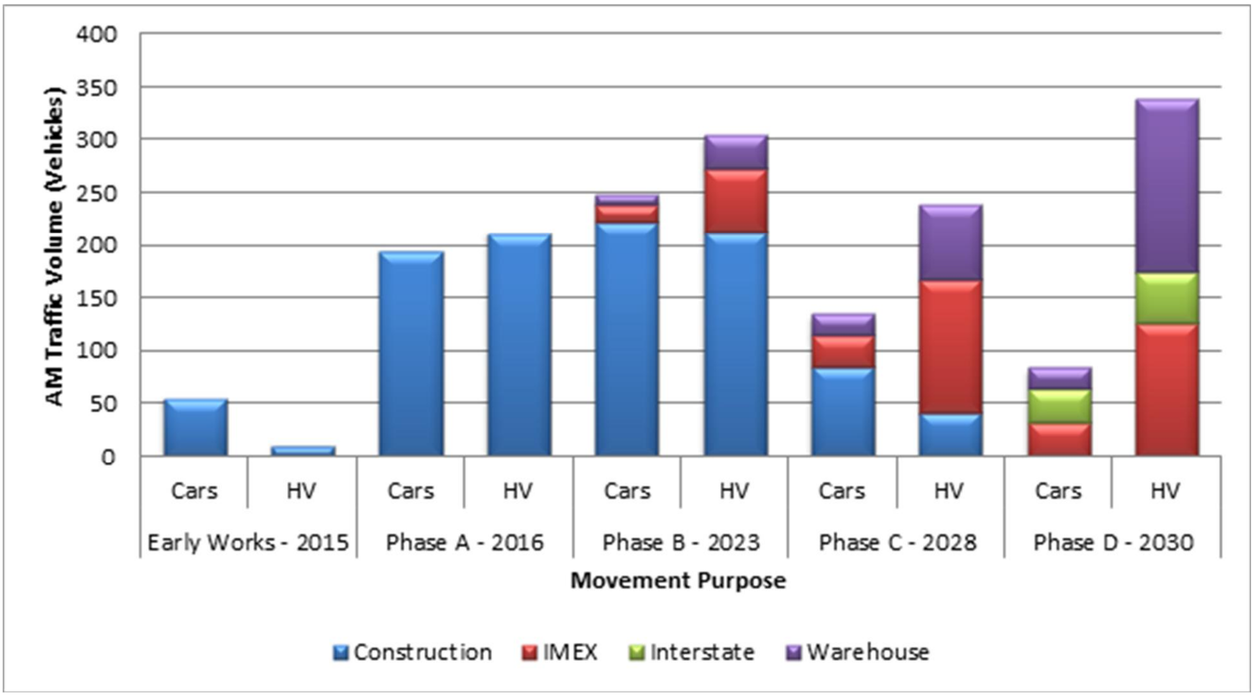


Figure 11.10 Modelled traffic volumes associated with the Project by journey purpose, AM peak

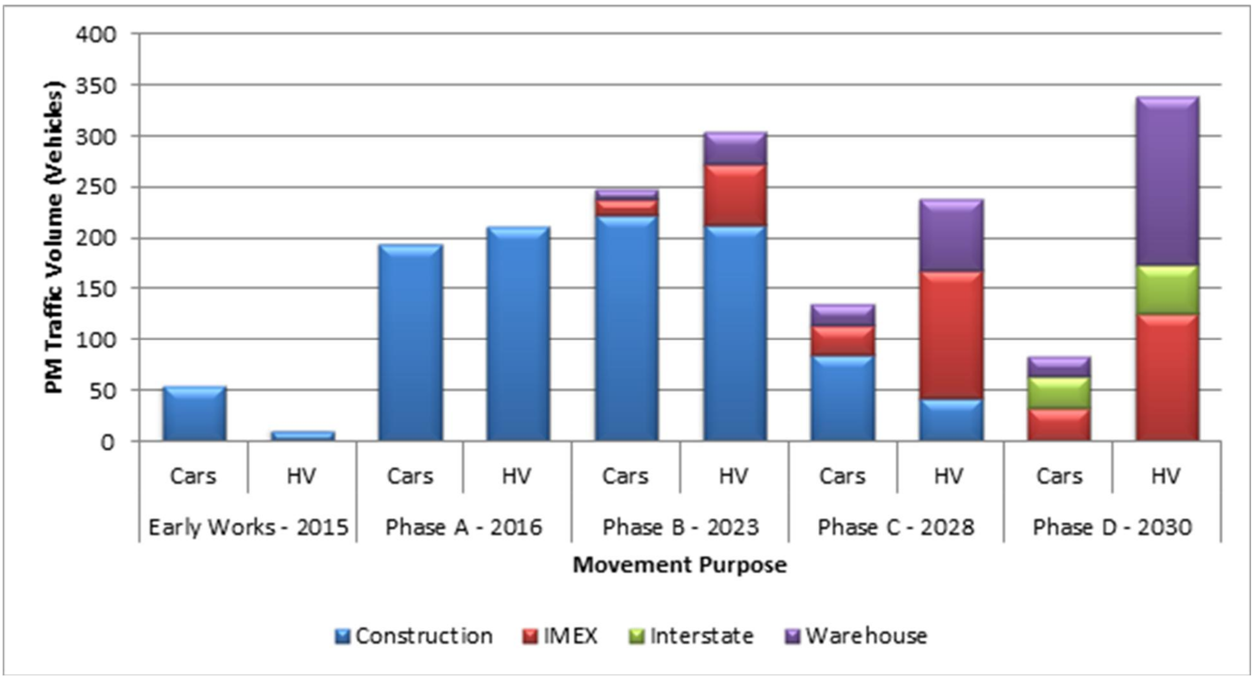


Figure 11.11 Modelled traffic volumes associated with the Project by journey purpose, PM peak

Rail network distribution (operation)

The IMEX operation would consist of freight trains travelling between the Project site and Port Botany via the SSFL and the Port Botany Rail Link.

The interstate freight transport to and from the Project site would involve a number of major rail lines, including freight rail lines such as the Northern Sydney Freight Corridor (under construction) and major arterial roads.

The following sections describe the key connecting road and rail routes that would be used by Project interstate freight. The Commonwealth Department of Infrastructure and Transport's factsheet Addressing Sydney's Freight Rail Bottleneck 2013, the ARTC website www.artc.com.au and the Sydney Ports website www.sydneyports.com.au were used in the analysis of these routes.

11.4.3 Traffic and access impacts (road network)

This section describes traffic and access impacts on the road network during construction and operation of the Project. The assessments of traffic generation (section 11.4.1) and traffic distribution (section 11.4.2) described above were used to assess the potential traffic impacts on Moorebank Avenue and the wider regional road network. To enable this assessment, two potential future scenarios were considered:

- the existing Moorebank Avenue without the Project ('do nothing' scenario), described in section 11.2.4; and
- an upgraded Moorebank Avenue with the development of the Project, described below.

Moorebank Avenue analysis

Moorebank Avenue would be upgraded as part of the Project (as described in section 11.3), with the majority of works assumed to occur around 2016. Therefore, the assessment of impacts on Moorebank Avenue under the three traffic assessment scenarios can be separated into:

- the scenario prior to the Moorebank Avenue upgrades (Early Works in 2015); and
- scenarios after the upgrades (Phase A in 2016, Phase B in 2023, Phase C in 2028 and Full Build in 2030).

The scenario for Phase A assumes Moorebank Avenue is fully upgraded in 2016. Before this, and during the early development of the Project, the points of access to the Project site would vary with the changing requirements of the Project. However, it is likely that the current intersections between Moorebank Avenue and Bapaume Road, Anzac Road and the DNSDC access would be the last intersections to be upgraded. To assess the traffic impacts on Moorebank Avenue before its complete upgrade, these intersections were analysed in their current (2014) state and in their projected state during the Early Works phase in 2015.

It was also assumed that all construction vehicles would travel on Moorebank Avenue through the intersections with Bapaume Road and Anzac Road, with half the construction vehicles accessing the site north of the DNSDC access and the remainder accessing the site south of the DNSDC access. Table 11.12 shows the results of the SIDRA analysis on these intersections prior to the full upgrade of Moorebank Avenue.

Table 11.12 Construction phase intersection performance (Early Works 2015)

Intersection	Peak hour	DoS	Average delay (seconds)	LoS	Max queue (m)
Moorebank Avenue and Bapaume Road	AM	0.58	>100	F	23
	PM	0.62	>100	F	44
Moorebank Avenue and Anzac Road	AM	0.71	18	B	204
	PM	0.97	29	C	219
Moorebank Avenue and Defence Support Access	AM	0.87	11	A	309
	PM	0.97	28	B	425
Moorebank Avenue and DNSDC Access	AM	0.71	6	A	142
	PM	0.97	30	C	693
Moorebank Avenue and Chatham Avenue	AM	0.97	36	C	657
	PM	0.99	44	D	780

Notes: DoS = Degree of Saturation; LoS = Level of Service; Max queue length is usually quoted as the 95th percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It reflects the number of vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

Source: Table 6.4, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Table 11.12 shows that the increased volumes from construction activities would reduce the performance of the existing intersections. There would potentially be extensive queuing on Moorebank Avenue in the northern approach during the PM peak, with queuing potentially impacting on the operation of the adjacent intersection along Moorebank Avenue. The CEMP would need to consider this possibility and implement measures to prevent its occurrence.

In addition, during the construction of the Project and upgrade of Moorebank Avenue, traffic and access impacts may affect users of the ABB site to the north of the Project site. As discussed in section 11.5, traffic management and control measures would be established as part of the Project CEMP to limit traffic congestion impacts and ensure that access to the ABB site is maintained at all times.

The proposed upgrade to Moorebank Avenue and new intersection configurations would be fully completed before the start of IMEX operations. The intersection performance results for the Project in the years assessed are shown in Table 11.13.

Table 11.13 Proposed network with Moorebank Avenue upgrade future intersection performance

Intersection	Year	Peak hour	DoS	Average delay (seconds)	LoS	95th percentile queue (m)
Moorebank Avenue and Anzac Road	2016	AM	0.64	19	B	117
		PM	0.91	23	B	154
	2023	AM	0.77	22	B	173
		PM	0.90	26	B	196
	2028	AM	0.78	24	B	191
		PM	0.93	33	C	270
	2030	AM	0.84	24	B	200
		PM	0.97	37	C	312

Intersection	Year	Peak hour	DoS	Average delay (seconds)	LoS	95th percentile queue (m)
Moorebank Avenue, Warehouse Access 1 and DNSDC Access	2016	AM	0.56	7	A	70
		PM	0.56	6	A	115
	2023	AM	0.66	8	A	86
		PM	0.65	6	A	149
	2028	AM	0.69	7	A	94
		PM	0.68	6	A	163
	2030	AM	0.74	8	A	112
		PM	0.71	6	A	185
Moorebank Avenue and Warehouse Access 2	2016	AM	0.60	8	A	136
		PM	0.57	4	A	45
	2023	AM	0.71	9	A	179
		PM	0.66	4	A	54
	2028	AM	0.74	9	A	194
		PM	0.69	4	A	53
	2030	AM	0.77	10	A	214
		PM	0.72	4	A	56
Moorebank Avenue and Warehouse Access 3	2016	AM	0.59	9	A	132
		PM	0.56	7	A	108
	2023	AM	0.69	10	A	174
		PM	0.65	7	A	141
	2028	AM	0.73	10	A	190
		PM	0.69	7	A	159
	2030	AM	0.76	11	A	204
		PM	0.72	7	A	176
Moorebank Avenue and Main Access	2016	AM	0.59	11	A	132
		PM	0.52	9	A	131
	2023	AM	0.75	15	B	177
		PM	0.71	11	A	149
	2028	AM	0.74	13	A	176
		PM	0.77	11	A	166
	2030	AM	0.75	15	B	191
		PM	0.82	13	A	190

Notes: Results assume that Moorebank Avenue is fully upgraded in 2016.

DoS = Degree of Saturation; LoS = Level of Service; Max queue length is usually quoted as the 95th percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It reflects the number of vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

Source: Table 6.5, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3).

The results from the SIDRA analysis indicate that overall, the upgraded intersections would operate better than the existing road network (refer 11.2.4), with a satisfactory LoS (C or better) and acceptable delay times during both the AM and PM peak periods for all years assessed. The results indicate that overall, the upgraded intersections would operate better than the existing road network.

Moorebank Avenue daily traffic profile values

Daily traffic volume profiles for Moorebank Avenue between the M5 Motorway and Bapaume Road in 2030 with and without the Project are presented in Figure 6.2. Light and heavy vehicles were converted to Passenger Car Unit (PCU) equivalents to compare the difference between with and without Project traffic profiles. The following conversion factors were applied to generate PCU equivalents:

- PCUs for cars
- 1.2 PCUs for light commercial vehicles (LCV)
- PCUs for rigid trucks
- PCUs for articulated trucks.

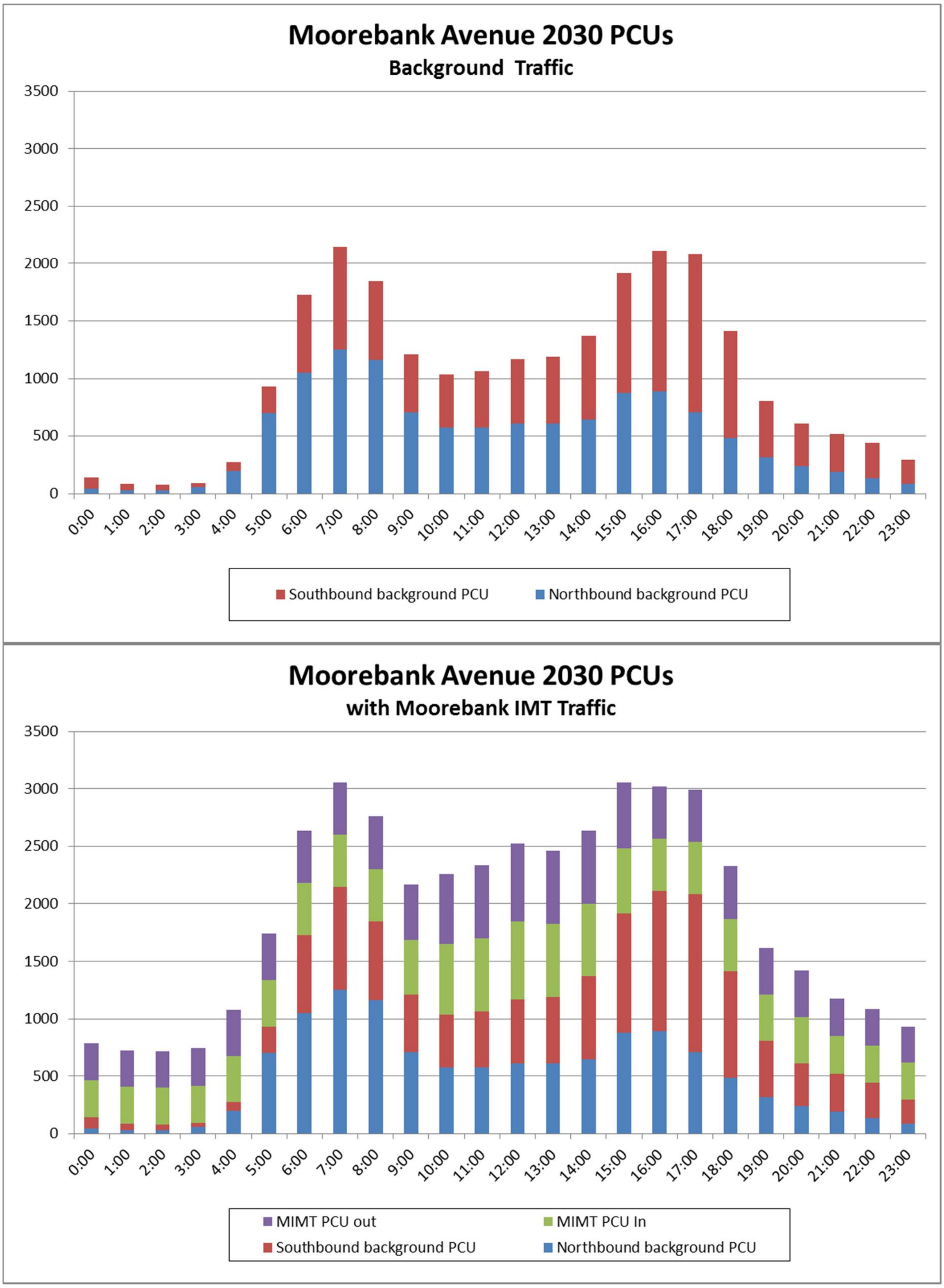


Figure 11.12 Daily traffic volume profiles for Moorebank Avenue between the M5 Motorway and Bapaume Road in 2030 with and without Moorebank IMT in Passenger Car Unit (PCU) equivalents

Figure 11.12 shows clearly defined road traffic peak hours with and without the Project. The weekday road background traffic peak occurs between 7.00 am and 8.00 am and 5.00 pm and 6.00 pm. With the inclusion of Project traffic, it can be seen that the road traffic peak continues to occur at these times.

Rail access construction

During the construction of the rail bridge over the Georges River, it is likely that a series of construction works would be undertaken from the west side of the river in the vicinity of residences in Casula. The construction vehicle haulage route for rail bridge works on the western side of the river would be via Charles Street, Mill Road, Speed Street, Shepherd Street and Powerhouse Road. It is expected that up to 25 trucks would use this route each day. During this time, residences may experience traffic and access impacts such as congestion from the movement of heavy vehicles and construction machinery. This low daily truck volume would have only a minor impact on intersection performance along the haulage route. As the location of the rail bridge, along with the construction works program, are yet to be finalised, specific construction impacts cannot be described in further detail at this stage. As discussed in section 11.5.2, the CEMP would include detailed traffic management measures to prevent and control traffic and access impacts on residences in this area. It is unlikely that there would be any traffic impacts on residents or businesses on the western side of the Georges River outside the construction of the rail bridge.

Impact on the M5 Motorway

As shown in Table 11.11, 86% of heavy vehicles from the Project (IMEX and interstate facilities in particular) would travel along the M5 Motorway, en route to their destination.

Table 11.14 shows that the percentage increase from the traffic generated by Moorebank IMT on the M5 is under 3% of total M5 traffic during the 2030 AM and PM peak hours. In Phase B there is a temporary increase due to construction traffic, but the extra traffic still represents less than 3% of the forecast M5 traffic volume. Similar increases are shown in Phase C. The increase in the heavy vehicle proportion is an overestimate as no allowance has been made for heavy vehicles that would have been on the network anyway. The impact of this increase in heavy vehicles is reflected in the intersection analysis.

The impact on the operation of the network and traffic conditions on the strategic road network would be examined in greater detail at the next stage of development approval. With greater certainty of the warehouse operations and layout it is likely that micro or mesoscopic models would be used to assess the impact on the road network from the proposed development for the Stage 2 SSD approval.

Table 11.14 Increase in M5 Motorway traffic volumes (between Heathcote Road and the Hume Highway) as a result of the Project (construction and operation)

		Phase B			Phase C			Full Build		
		2023			2028			2030		
AM peak hour		LV	HV	ALL	LV	HV	ALL	LV	HV	ALL
M5 west of Moorebank Avenue	EB	1.52%	12.81%	2.79%	0.79%	9.76%	1.76%	0.47%	13.60%	1.88%
	WB	0.00%	18.86%	1.95%	0.00%	14.15%	1.48%	0.00%	19.64%	2.10%
M5 east of Moorebank Avenue	EB	0.00%	1.67%	0.21%	0.00%	1.35%	0.17%	0.00%	1.78%	0.22%
	WB	0.62%	4.85%	1.03%	0.33%	3.69%	0.66%	0.20%	5.14%	0.68%
PM peak hour		LV	LV	HV	ALL	LV	HV	ALL	LV	HV
M5 west of Moorebank Avenue	EB	0.00%	35.45%	2.02%	0.00%	27.17%	1.55%	0.00%	37.93%	2.18%
	WB	1.35%	13.39%	2.48%	0.70%	10.30%	1.56%	0.42%	14.37%	1.68%
M5 east of Moorebank Avenue	EB	0.72%	9.66%	1.32%	0.38%	7.42%	0.85%	0.23%	10.60%	0.92%
	WB	0.00%	5.66%	0.29%	0.00%	4.51%	0.22%	0.00%	6.23%	0.30%

Source: Table 6.6, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3)

Analysis of local road intersections in the vicinity of the Project site

The performance of the road intersections in the vicinity of the Project site has been assessed for the Full Build scenario (2030) with and without the Project. These intersections are at:

- Moorebank Avenue and Newbridge Road;
- Moorebank Avenue and Heathcote Road;
- Moorebank Avenue and M5 Motorway interchange; and
- Hume Highway and M5 Motorway interchange.

Table 11.15 shows that, with the Project fully operational in 2030, there would be minimal changes to the AM and PM performance of the intersections. This table also shows that in order to accommodate the future traffic (with or without the Project), additional capacity would be required at all of the intersections in the vicinity of the proposed development, excluding the Moorebank Avenue–M5 Motorway interchange. The results indicate that the intersections would operate with long delays for at least one of the peak periods.

Table 11.15 2030 AM and PM peak comparison

Scenario	AM peak				PM peak			
	DoS	Delay	LoS	Queue	DoS	Delay	LoS	Queue
I-06 Newbridge Road and Moorebank Avenue								
2014 Existing Year	0.90	26	B	186	0.90	31	C	196
2030 Future Background	1.58	134	F	650	1.19	99	F	520
2030 with Moorebank IMT	1.67	147	F	733	1.20	115	F	606
I-07 Moorebank Avenue and Heathcote Road								
2014 Existing Year	0.93	27	B	239	0.89	16	B	176
2030 Future Background	1.39	207	F	706	1.42	107	F	690
2030 with Moorebank IMT	1.44	209	F	769	1.42	111	F	692
I-13 M5 Motorway and Moorebank Avenue								
2014 Existing Year	0.83	19	B	73	0.88	28	B	212
2030 Future Background	0.99	21	B	90	0.93	32	C	264
2030 with Moorebank IMT	0.98	22	B	122	0.92	34	C	255
I-14 M5 Motorway and Hume Highway								
2014 Existing Year	1.03	30	C	276	0.89	29	C	295
2030 Future Background	1.21	81	F	1101	1.15	79	F	641
2030 with Moorebank IMT	1.29	91	F	1109	1.24	89	F	646

Source: Table 6.9, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment

Wider network analysis

The assessment also considered the above intersections in the context of the wider road network. The distribution of light vehicle and heavy vehicle traffic expected to be generated by the Project was applied to the wider area road network in 2030 based on the results of the strategic modelling. Further detail on the distributions at each intersection in given in Section 6 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3). Comparisons of the performance at each modelled intersection with and without the Project are shown in Table 11.16.

Table 11.16 Intersection performance on the wider road network with and without Moorebank IMT

Scenario	AM peak				PM peak			
	DoS	Delay	LoS	Queue	DoS	Delay	LoS	Queue
I-01 Hume Highway and Orange Grove Road								
2014 Existing Year	0.88	31	C	220	0.96	44	D	269
2030 Future Background	0.94	35	C	288	1.04	63	E	372
2030 with Moorebank IMT	1.05	43	D	353	1.09	70	E	440
I-02 Hume Highway and Elizabeth Drive								
2014 Existing Year	1.10	58	E	313	0.99	47	D	235
2030 Future Background	1.17	93	F	474	1.07	57	E	307
2030 with Moorebank IMT	1.17	97	F	535	1.07	60	E	327
I-03 Hume Highway and Memorial Avenue								
2014 Existing Year	1.00	51	D	314	1.18	45	D	258
2030 Future Background	1.18	92	F	504	1.24	57	E	422
2030 with Moorebank IMT	1.26	101	F	559	1.23	58	E	475
I-04 Hume Highway and Hoxton Park Drive								
2014 Existing Year	0.94	48	D	268	1.16	45	D	298
2030 Future Background	1.27	110	F	485	1.41	81	F	507
2030 with Moorebank IMT	1.26	115	F	503	1.41	84	F	574
I-05 Hume Highway and Reilly Street								
2014 Existing Year	0.89	17	B	273	0.93	16	B	280
2030 Future Background	1.03	26	B	464	1.13	28	B	439
2030 with Moorebank IMT	1.03	29	C	539	1.12	37	C	729
I-06 Newbridge Road and Moorebank Avenue								
2014 Existing Year	0.90	26	B	186	0.90	31	C	196
2030 Future Background	1.58	134	F	650	1.19	99	F	520
2030 with Moorebank IMT	1.67	147	F	733	1.20	115	F	606
I-07 Moorebank Avenue and Heathcote Road								
2014 Existing Year	0.93	27	B	239	0.89	16	B	176
2030 Future Background	1.39	207	F	706	1.42	107	F	690
2030 with Moorebank IMT	1.44	209	F	769	1.42	111	F	692

Scenario	AM peak				PM peak			
	DoS	Delay	LoS	Queue	DoS	Delay	LoS	Queue
I-08 Moorebank Avenue and Industry Park Access								
2014 Existing Year	0.53	6	A	105	0.49	7	A	68
2030 Future Background	1.22	187	F	1144	0.52	7	A	75
2030 with Moorebank IMT	1.26	213	F	1274	0.52	7	A	76
I-09 Moorebank Avenue and Church Road								
2014 Existing Year	0.69	67	E	60	0.91	92	F	183
2030 Future Background	0.95	845	F	83	1.29	374	F	567
2030 with Moorebank IMT	0.98	878	F	92	1.38	565	F	661
I-10 Heathcote Road and Nuwarra Road								
2014 Existing Year	1.04	50	D	260	0.97	54	D	327
2030 Future Background	1.44	178	F	1182	1.32	144	F	854
2030 with Moorebank IMT	1.44	178	F	1183	1.34	146	F	855
I-11 Newbridge Road and Nuwarra Road								
2014 Existing Year	0.99	48	D	320	0.96	27	B	178
2030 Future Background	1.25	168	F	1038	1.08	38	C	298
2030 with Moorebank IMT	1.24	175	F	1105	1.09	39	C	304
I-12 Newbridge Road and Governor Macquarie Drive								
2014 Existing Year	0.98	49	D	400	1.02	40	C	264
2030 Future Background	1.24	161	F	1180	1.15	62	E	389
2030 with Moorebank IMT	1.24	166	F	1241	1.60	79	F	646
I-13 M5 Motorway and Moorebank Avenue								
2014 Existing Year	0.83	19	B	73	0.88	28	B	212
2030 Future Background	0.99	21	B	90	0.93	32	C	264
2030 with Moorebank IMT	0.98	22	B	122	0.92	34	C	255
I-14 M5 Motorway and Hume Highway								
2014 Existing Year	1.03	30	C	276	0.89	29	C	295
2030 Future Background	1.21	81	F	1101	1.15	79	F	641
2030 with Moorebank IMT	1.29	91	F	1109	1.24	89	F	646
I-15 Cambridge Avenue and Canterbury Road								
2014 Existing Year	0.62	17	B	34	0.48	11	A	15
2030 Future Background	1.14	114	F	287	0.59	14	A	28
2030 with Moorebank IMT	1.19	135	F	336	0.60	14	A	28

Source: Table 6.9, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3).

Table 11.16 shows that additional capacity would be required at all intersections in the vicinity of the proposed development, except the Hume Highway and Reilly Street intersection and Moorebank Avenue and M5 Motorway interchange, accommodate future background traffic growth.

Analysis of the results indicates that intersections with the Hume Highway and Newbridge Road would operate at unsatisfactory level of service (LoS E or worse) in at least one of the peak hours. Furthermore these intersections would experience exceptionally long delays and queues as result of the heavy background traffic growth in this region.

Intersections along Moorebank Avenue (north of the M5 Motorway) would operate unsatisfactorily during both the AM and PM peak hours without the Moorebank IMT traffic. In addition, the Moorebank Avenue and Newbridge Road intersection would operate unsatisfactorily in 2030 even without the generated traffic by Moorebank IMT. The amount of Moorebank IMT generated traffic that is expected to use this intersection is very low (6 light vehicles and up to 63 heavy vehicles for the am and pm peak hours).

The interchange of Moorebank Avenue and the M5 Motorway would perform satisfactorily, maintaining a LoS C or better performance during the AM and PM peak hours in 2030. However, the DoS of 0.99 during the AM peak hour indicate that the interchange would be operating at capacity. The Hume Highway and M5 Motorway interchange would operate at an unsatisfactory level of service (LoS F) for the PM peak hours with or without the generated traffic by Moorebank IMT.

The intersection of Cambridge Avenue and Canterbury Road would operate at an unsatisfactory level of service (LoS F) during the AM peak hour in 2030 as result of the heavy growth of right turning traffic from Canterbury Road onto Cambridge Avenue.

While a minor contribution to congestion is predicted on the wider road network due to traffic generated by the Project, there are no significant intersection performance changes between the ‘with’ and ‘without’ Moorebank IMT scenarios. This is because the network in 2030 is generally predicted to be congested based on background traffic growth predictions.

Wider road network volumes

Table 11.17 shows that traffic generated by the Moorebank IMT is expected to increase total intersection traffic volumes by less than 2.5% for the majority of intersections compared to 2030 base traffic volumes. This indicates that the generated traffic is not likely to have a substantial impact on the operation of intersections on the wider road network.

At the intersection of Moorebank Avenue and the M5 Motorway, an additional 388 vehicles equates to approximately 9% of total intersection traffic in the peak hours compared to the 2030 base traffic volumes. As shown in Table 11.16 above, the intersection of Moorebank Avenue and the M5 Motorway is predicted to achieve a satisfactory level of service during the AM and PM peak hours in 2030. At the intersection of M5 Motorway and Hume Highway, an additional 85 vehicles equates to approximately 1% of total intersection traffic in the peak hours when compared to the 2030 base traffic volumes. The modelling result indicates that the intersection of the Hume Highway and M5 Motorway would operate at an unsatisfactory level of service even without the Moorebank IMT generated traffic. This shows that the additional Moorebank IMT traffic at this intersection is not the determining factor for the poor intersection operation.

This conclusion is further supported by mid-block capacity analysis undertaken on the wider road network based on Austroads Guide to Traffic Management part 3: Traffic Studies and Analysis, Table 5.1. This analysis also reflects that the forecast network will be running at or near capacity at 2030 without the Project (refer to section 6.3.5.3 of Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3) for more detail).

Table 11.17 The impact of Moorebank IMT traffic on the wider road network (Moorebank IMT traffic as a percentage of total intersection traffic in 2030)

Intersection	Peak	2030 base total intersection traffic		2030 traffic generated by MIMT at each intersection		Percentage of Total Intersection Traffic
		LV	HV	LV	HV	
Hume Highway/ Orange Grove Road	AM	5,922	436	6	55	0.96%
	PM	6,131	225	6	57	1.00%
Hume Highway/ Elizabeth Drive	AM	6,735	452	7	58	0.90%
	PM	7,187	253	7	61	0.91%
Hume Highway/ Memorial Avenue	AM	4,870	394	7	58	1.24%
	PM	5,646	189	7	61	1.17%
Hume Highway/ Hoxton Park Road	AM	7,441	499	8	67	0.95%
	PM	7,557	262	8	70	0.99%
Hume Highway/Reilly Street	AM	5,193	249	8	67	1.39%
	PM	6,133	171	8	70	1.24%
Moorebank Avenue/ Newbridge Road	AM	6,153	488	6	62	1.03%
	PM	6,154	313	6	46	0.81%
Moorebank Avenue/ Heathcote Road	AM	3,915	350	6	62	1.60%
	PM	3,977	235	6	46	1.24%
Moorebank Avenue/ Industrial Park Access	AM	2,416	269	6	65	2.67%
	PM	2,594	172	6	49	2.01%
Moorebank Avenue/ Church Road	AM	2,857	311	6	73	2.50%
	PM	3,004	224	6	56	1.94%
Heathcote Road/ Wattle Grove Road	AM	6,369	392	9	1	0.14%
	PM	6,772	233	9	1	0.14%
Newbridge Road/ Nuwarra Road	AM	5,009	437	6	53	1.07%
	PM	5,449	294	6	44	0.87%
Newbridge Road/ Governor Macquarie Drive	AM	6,574	554	4	53	0.80%
	PM	7,130	469	4	44	0.64%
Moorebank Avenue/ M5 Motorway interchange	AM	3,917	378	50	338	9.03%
	PM	4,039	280	50	338	8.98%
M5 Motorway/ Hume Highway interchange	AM	7,515	385	16	67	1.05%
	PM	8,546	268	16	70	0.97%
Cambridge Avenue/ Canterbury Road	AM	3,060	124	25	0	0.79%
	PM	3,256	109	25	0	0.75%
SUM (AVERAGE %)		161,521	9,415	345	2,090	1.42%

Source: Table 6.12, Technical Paper 1 – Traffic, Transport and Accessibility Impact Assessment (Volume 3).

As mentioned in section 11.4.2, it is the change in truck volumes (indicated in Figure 11.10 and Figure 11.11) that leads to the overall benefit for the Sydney road network, delivering reductions of approximately 56,125 truck vehicle kilometres travelled (VKT) per day and 1,265 truck vehicle hours travelled (VHT) per day. This change is due to the transition to moving containers to Moorebank by rail. The reduction in truck volumes and kilometres travelled would reduce congestion along the M5 Motorway. However, the vehicle kilometres for non-truck traffic may increase by 10,670 VKT, as other traffic migrates from adjacent routes to take advantage of the reduced congestion along the M5 Motorway.

The M5 Motorway in the vicinity of Moorebank Avenue is an existing congestion point within the motorway network. Congestion is forecast to increase with the widening of the M5 Motorway, as there are no plans to mitigate the congestion caused by the weaving movement between Moorebank Avenue and the Hume Highway. This may mean that the full benefits of the M5 Motorway widening scheme are not realised. Should congestion on the adjacent motorway network continue to be an issue, then the operator of the Project could consider scheduling more movements to occur outside peak periods when congestion is less likely to occur on the M5 Motorway. This will be further assessed as a part of future project approval stages.

11.4.4 Road safety and emergency response

This section describes the potential impacts of the Project on road safety and emergency response.

The proposed upgrade of Moorebank Avenue as part of the development of the Project (including the establishment of the five key intersections discussed in section 11.3) would have a positive impact on overall road safety and should reduce the likelihood of vehicle accidents on this road.

The proposed upgrade includes a number of road safety treatments that would improve safety on Moorebank Avenue in the vicinity of the Project. These include intersection treatments such as fully controlled right-turn lanes, upgraded signal displays, dedicated right and left turn lanes, and midblock treatments like street lighting, non-skid surfacing and raised reflective pavement markers. Some of these intersection treatments are shown on the intersection design layouts in Figures 11.2, 11.3 and 11.4. The benefits of implementing intersection and midblock treatments such as these are detailed in the RMS Accident Reduction Guide, Version 1.1. Some examples of these benefits include an 80% reduction in accidents involving vehicles travelling in opposing directions, when fully controlled right-turn lanes are established at intersections, and a 25% reduction in off-path accidents when street lighting is installed. Where possible, these safety treatments have been incorporated into the Project concept layouts and would be further considered during the development of the detailed design.

The proposed road upgrade includes shared use paths, which would also provide an improved and safer environment for pedestrian and cyclists travelling to, from and past the Project site.

From a regional road safety perspective, the Project would reduce the VKT by trucks on the Sydney road network, leading to a potential reduction in heavy vehicle-related crashes.

During the upgrade works to Moorebank Avenue, there may be times of restricted access through Moorebank Avenue to the Project site and to other areas further south. To ensure that all emergency vehicles have access to the Project site at all times and are able to access areas south of the Project site, an emergency response plan would be prepared for the upgrade of Moorebank Avenue during Phase A. During this phase, consideration would be given to emergency vehicles that currently use Moorebank Avenue as a transport route. Emergency access to adjoining properties would also be considered, to avoid any impediment to access.

11.4.5 Parking, pedestrian and cyclist impacts

During the construction stages of the Project (including Early Works), a substantial proportion of the construction work force is expected to travel to the Project site by light vehicle. Parking for construction staff would be provided on site. It is anticipated that there would be a number of safe access points along Moorebank Avenue that would allow light vehicles to enter and leave the site compound at safe locations. It is anticipated that these parking locations would change over the course of construction. Depending on the stage of construction, formal access may be provided from either the existing or proposed intersections.

Due to the current low number of pedestrians and cyclists using Moorebank Avenue, pedestrian and cyclist access to the site via Moorebank Avenue is unlikely to be significantly affected during construction. Pedestrians using public bus services that stop along Moorebank Avenue would be catered for during the construction of the Project through negotiations with bus operators and with consideration of safety issues.

Given the proposed upgrades to Moorebank Avenue, including the future bus routes and cycle paths shown in Figure 11.1, it is anticipated that approximately 10% of the IMEX and interstate IMT workers would travel to work by public transport or would use pedestrian and cyclist facilities during Phases B, C and Full Build. Bus services would also operate along Moorebank Avenue to service the Project site. Opportunities to increase bus services and stops along Moorebank Avenue to cater for the service demand would be considered and negotiated with bus operators (refer to section 11.5.1).

During the operation of the Project, sufficient staff parking would be provided within the Project site, and accessed via Moorebank Avenue. The number of parking spaces proposed has been based on LCC Development Control Plan 2008 Part 1.2 Additional General Controls for Development (LCC 2008) for industry land use.

During the operation of the Project, the upgraded Moorebank Avenue would have a 4.3 m border, between the right-of-way and the property boundary, which would accommodate a shared cyclist and pedestrian path. This would provide substantial benefits for pedestrian and cyclist access along Moorebank Avenue and to/from the Project site. Thus, the general principles of the DUAP Land Use and Transport Package guideline have been considered such that the Project would be accessible by walking, cycling and public transport.

During both the construction and operation of the Project, staff and Project vehicles would be parked on site or at designated set-down areas to ensure that access to local businesses and private property is unaffected by parked vehicles.

11.4.6 Impacts on rail infrastructure and operations

Construction of the proposed northbound rail connection (Phase A) and southbound rail connection (Phase C) from the operating SSFL (for any of the northern, southern or central rail access options) would cause some disruption to the operation of this freight rail corridor. Some rail closedown periods would be required to facilitate this connection. As noted in sections 11.4.2 and 11.5, the detailed staging and timing of these works would be further developed in consultation with the ARTC, and staged to ensure that impacts on regular rail operations are minimised. It is unlikely that the establishment of the Project's rail connection would result in any impacts on the operation of the Main South Rail Line.

Once the Project is fully operational, the rail link connecting the Project to the SSFL would accommodate approximately 317 train trips per week, or 45 train trips per day, in and out of the Project site combined. In its current configuration, the SSFL has capacity constraints that may impact on the projected IMEX and interstate train movements for the Project. The Project Team will continue to liaise with ARTC, TfNSW and other stakeholders on the rail freight network regarding the capacity of the network for the SSFL and beyond (including for interstate rail transport). As part of the Stage 2 SSD approval process, further analysis would be undertaken to determine likely demand distribution and capacity across the rail freight network.

The operation of the Project and movement of Project-related freight trains would not affect the public passenger train system, because freight and passenger trains would operate on separate rail lines.

11.5 Management and mitigation

11.5.1 Moorebank Avenue upgrade

Existing (2014) intersection performances indicate that intersections along Moorebank Avenue between Cambridge Avenue and the M5 are near or at capacity. As a consequence, future year background traffic growth on Moorebank Avenue resulting in increased traffic volumes on Moorebank Avenue would also result in deterioration in intersection performance. Given the anticipated constraints along Moorebank Avenue and the increased demands that would be placed on the route as a direct result of the Project, an upgrade to Moorebank Avenue is included as part of the Project concept.

11.5.2 Detailed design and further assessment

The proposed Project concept has effectively assessed and addressed the key traffic and transport impacts that may result from the Project. However, a number of additional mitigation measures are recommended for consideration during the development of the detailed design. These include:

- installing a variable message signage system within the Project site to direct heavy vehicles and facilitate safe and efficient access and navigation;
- installing a permanent variable message system on Moorebank Avenue to manage traffic movements to and from the various areas of the Moorebank IMT;
- using the southernmost access off Moorebank Avenue (Access 5) as the main back-up access route for heavy vehicles, for the central and southern rail access options, if the main truck access becomes blocked;
- considering the provision of pedestrian and cyclist connections from Moorebank Avenue into the Project site for the warehouse developments and Moorebank IMT staff;
- providing staff storage and shower areas to promote cycling, jogging and walking as modes of transport;
- negotiating with bus operators for the provision of additional bus stops and for increased bus services between the Project site and nearby public transport interchange hubs to reduce the volume of light vehicles generated by staff; and
- facilitating discussions with Transdev and Transport for New South Wales future bus servicing for the Project site.

During the respective detailed design and subsequent approvals and assessment processes for the development phasing, further traffic, transport and access impact assessment would be undertaken to confirm impacts and the required mitigation measures on the local road network and for the vehicle distributional impacts on the wider road network.

The following measures are also recommended to minimise impacts associated with the operation of the SSFL:

- undertaking detailed design and staging of the Project rail link construction works to ensure:
  - connection with the SSFL is designed to minimise construction impacts on SSFL operations
  - connection with the SSFL would allow trains to leave and enter the SSFL at a maximum design speed of 45 km/h
  - trains entering and leaving the Project site have an appropriate staging area (i.e. arrival and departure roads) to enable smooth interface and minimum disruption to other operations on the SSFL
  - the Project's internal train control system and signalling integrates with the SSFL system; and
- ensuring consultation with the ARTC and appropriate rail operators is undertaken throughout the detailed design and construction of the proposed rail link to the SSFL to minimise disturbance to SSFL operations.

The Project Team will continue to liaise with ARTC, TfNSW and other stakeholders on the rail freight network regarding the capacity of the network beyond the SSFL (including for interstate rail transport). As part of the Project approval process, further analysis would be undertaken to determine likely demand distribution and capacity across the rail freight network.

11.5.3 Construction traffic management – Early Works and construction phases

The greatest traffic impacts created by the Project would occur during Phases A and B, when existing high volumes of heavy vehicles would combine with the disruptions to traffic from the upgrade of Moorebank Avenue (Phase A).

Construction Traffic Management Plans (TMPs) would be developed for each phase, including Early Works, to provide additional information for the construction planning of the Project including the upgrade to Moorebank Avenue. Numerous Construction Traffic Management Plans may be required to address the traffic impacts of individual components of each phase. The following mitigation measures would be considered during development of these Construction Traffic Management Plans:

- Modify access locations in response to the development of the Moorebank Avenue upgrade. During this stage numerous access locations may be required for the transportation of spoil and material.
- Minimise heavy vehicle movements through Casula residential roads by using the Project site east of the Georges River as a construction area for the Georges River rail bridge where possible.
- Minimise construction vehicle movements during peak periods, where possible, to minimise impacts to Moorebank Avenue and other local roads. In particular, Moorebank Avenue south of the East Hills Railway Line would not be used by construction heavy vehicles.
- Ensure access to neighbouring properties is maintained, including the ABB site.

- Develop a communications plan to provide information regarding traffic impacts and road upgrades to the relevant authorities, bus operators and the local community. Ensure the communications plan includes a contact list with appropriate chains of command.
- Implement Traffic Control Plans (TCPs) to inform drivers of the construction activities and locations of heavy vehicle access locations.
- Obtain Road Occupancy Licences (ROLs) as necessary, including for the upgrade of Moorebank Avenue.
- Develop an emergency response plan for the upgrade of Moorebank Avenue during Phase A. During this stage, emergency vehicles using Moorebank Avenue as a transport route would need to be considered, as well as emergency access to adjoining properties.

11.5.4 Monitoring of impacts and management and mitigation strategies

During Early Works and construction, traffic on Moorebank Avenue would be monitored in peak periods to ensure that queuing at intersections did not impact on other road users.

No operational monitoring is considered necessary after the upgrade of Moorebank Avenue as the proposed intersections would operate at a better LoS than the existing intersections, and would be capable of handling the estimated demand. Also, the truck movements associated with the IMT would be controlled by a scheduling system. This system would provide truck arrival and departure data to facilitate monitoring during operation.

11.6 Summary of key findings

The key findings of the Traffic, Transport and Access Assessment are summarised below:

- Traffic generated by the Project would include construction traffic (during Early Works and parts of Phases A to C), and operational traffic (during Phases B and C and Full Build). Operational traffic would include truck movements from the IMEX and interstate terminals and warehouse facilities, and light vehicle movements associated with administration, operations and maintenance staff.
- During the construction of Phase A (in approximately 2016), Moorebank Avenue would be upgraded from a two lane, two-way road to a four-lane divided roadway between the East Hills Rail Line and the M5 Motorway. New intersections along Moorebank Avenue are proposed to provide access to the IMT site.
- The IMEX operation would consist of freight trains travelling between the Project site and Port Botany via the SSFL and the Port Botany Rail Link. The interstate freight transport to and from the Project site would involve a number of major rail lines, including freight rail lines such as the Northern Sydney Freight Corridor (under construction).
- Overall, only minor contribution to congestion is predicted on road network due to the traffic generated by the Project. Furthermore, there are no significant intersection performance changes between the ‘with’ and ‘without’ Moorebank IMT scenarios. This is because the network in 2030 is generally predicted to be congested based on general background traffic growth predictions.

- In regard to construction, traffic transport and access impacts of the Project:
  - > Construction vehicle traffic is expected to be greatest during the main earthworks and civil construction in Phase A (in approximately 2016) due to an increase in vehicle movements and the physical disruption to the road network required to increase the capacity of Moorebank Avenue.
  - > Construction access to the main IMT site would be via Moorebank Avenue (north of the East Hills Railway Line) and the M5 Motorway.
  - > Increased traffic volumes from construction activities would temporarily increase congestion at existing intersections along Moorebank Avenue. However, once Moorebank Avenue is upgraded as part of the Project in Phase A, SIDRA intersection modelling has confirmed that the upgraded intersections would operate better than the existing road network.
  - > Some partial and full road closures may be required during construction (most likely at night).
  - > The impact of the Project construction traffic on the operation of the M5 Motorway is expected to be negligible.
  - > During construction, existing accesses, public transport and pedestrian facilities would be retained.
  - > During construction of the rail access connection from the SSFL for the northern and central rail access options, it is likely that a proportion of construction traffic (around 25 heavy vehicles a day) would need to access the bridge construction area through Casula on the western bank of the Georges River. For the southern rail access option, haulage routes would be via Moorebank Avenue or Glenfield Road.
  - > Construction of the rail access connection to the operating SSFL would cause some temporary disruption to the operation of this freight corridor during rail closedown (possession) periods.
- In regard to operational traffic transport and access impacts of the Project:
  - > In the 2030 AM peak hour, approximately 84 cars and 169 trucks would travel into the IMT and 169 trucks would travel from the IMT.
  - > Importantly, truck movements from the IMEX and interstate operations are not new trips. Without the Project, these movements would be associated with trips taken to and from Port Botany and, therefore, would already be on the highway network.
  - > During operation, the Project would save on road-based freight trips. By transferring freight movements to the Project site by rail for distribution, the regional network would experience reductions of approximately 56,125 truck VKT a day and 1265 truck vehicle hours travelled a day. This is also expected to contribute to reducing heavy vehicle-related crashes.
  - > Some additional heavy and light vehicle trips would be generated by the Project, primarily along Moorebank Avenue, the M5 Motorway and local road intersections in the vicinity of the Project site. This could slightly intensify any existing congestion along the M5 Motorway during peak hours; however, given the Project would contribute less than 3% of the total M5 Motorway traffic volume during the 2030 AM and PM peak hours, this impact is predicted to be negligible.
  - > The upgrade of Moorebank Avenue between the M5 Motorway and the southernmost IMT access would significantly improve intersection performance on this section of road and hence improve traffic congestion when compared with the existing network (no upgrade).

> In 2030, at the highest forecast levels of activity on site, operational traffic is not predicted to have a significant impact on most of the intersections in the vicinity of Moorebank. Any increase in congestion at these intersections is expected to be offset by the significant wider network benefits, especially around the Sydney Airport/Port Botany area, resulting from the diversion of container traffic from the roads in this area.

> There would be no need for heavy vehicle parking on Moorebank Avenue associated with the Project.

> Once the Project is fully operational, the rail link connecting the site to the SSFL would transport approximately 317 train trips per week, or 45 train trips per day, in and out of the Project site. In its current configuration, the SSFL has capacity constraints that may impact on the projected IMEX and interstate train movements. As part of the Stage 2 SSD approval process, further analysis would be undertaken to determine likely demand distribution and capacity across the rail freight network.

Table 11.18 provides a summary of the operational traffic, transport and access impacts of the Project at Full Build.

Table 11.18 Summary of traffic, transport and access impacts at Full Build, without mitigation, for each rail access option

Impact	IMT layout and associated rail access connection option		
	Northern	Central	Southern
Reduction in VKT on the Sydney regional road network leading to potential reduction in heavy vehicle-related crashes	•	•	•
Reduced traffic congestion on the M5 Motorway (east of Moorebank Avenue), M2 Motorway and in the inner western suburbs	•	•	•
Potential to intensify existing congestion at some locations along the M5 Motorway during peak periods[1]	•	•	•
Improved intersection performance along Moorebank Avenue, resulting in reduced traffic congestion	•	•	•

Key: • = impact, - = no impact

Notes: [1] - The impact is predicted to be negligible and the Project's overall impact is expected to be positive)

Key design and mitigation measures proposed to manage traffic, transport and access impacts of the Project include:

- ongoing community consultation;
- upgrade of Moorebank Avenue as part of the Project during Phase A;
- preparation of detailed construction traffic management plans for each construction phase (including Early Works) as part of the construction environmental management plans;
- minimising construction vehicle movements during peak periods;
- monitoring traffic in peak periods on Moorebank Avenue during Early Works and construction, to ensure queuing at intersections does not impact on other road users;
- detailed staging and timing of any rail closedown works to be further developed in consultation with the ARTC, and staged to ensure that impacts to regular rail operations are minimised;

- installing a permanent variable message system on Moorebank Avenue to manage operational traffic movement to and from the various areas of the IMT;
- provision of car parking on site to avoid the need for parking on local streets; and
- liaising with ARTC, TfNSW and other stakeholders regarding the capacity of the network for the SSFL and beyond (including for interstate rail transport).