MOOREBANK INTERMODAL COMPANY

Moorebank Intermodal Terminal Response to Submissions Report

Volume 3

May 2015

PARSONS BRINCKERHOFF

Contents of the Response to Submissions Report

Appendix E
Traffic and Transport Impact Assessment

Moorebank Intermodal Company

Moorebank Intermodal Terminal – Traffic and Transport Impact Assessment

27 April 2015

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Document information
Client: Moorebank Intermodal Company
Title: Moorebank Intermodal Terminal – Traffic and Transport Impact Assessment
Document No: 2189293I-ITP-RPT-3787-RevC
Date: 27 April 2015

Rev	Date	Details
	27/02/2015	Traffic and Transport Report
A	04/03/2015	Traffic and Transport Report
B	20/04/2015	Traffic and Transport Report
C	27/04/2015	Traffic and Transport Report

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Distribution
Moorebank Intermodal Company, Parsons Brinckerhoff file, Parsons Brinckerhoff Library

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Glossary

AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
AEP	Annual Exceedance Probability
BITRE	(Commonwealth) Bureau of Infrastructure, Transport and Regional Economic
BOOT	Build Own Operate Transfer
BTS	Bureau of Transport Statistics, a division of Transport for NSW
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CCC	Campbelltown City Council
DNSDC	Defence National Storage and Distribution Centre
DoD	Department of Defence
DoE	(Commonwealth) Department of Environment
DP&E	(NSW) Department of Planning and Environment
DoS	Degree of Saturation
DUAP	(NSW) Department of Urban Affairs and Planning
EAR	Environmental Assessment Requirements
EIS	Environmental Impact Statement
EMME/2	Equilibrium Multi Modal Equilibrium
EP&A	Environmental Planning & Assessment
EPBC	Environment Protection & Biodiversity Conservation
FAK	Freight All Kinds
FBTS	Freight Bureau of Transport Statistics
FCL	Full Container Load
FMM	Freight Movement Model
GBE	Government Business Enterprise
GFA	Gross Floor Area

GLFA	Gross Leasable Floor Area
ha	hectare
HV	Heavy vehicle
IMEX	Import/Export
IMT	Intermodal terminal
IS	Inter-state
ITVs	In-terminal vehicles
km	Kilometre
km/h	Kilometre per hour
LCC	Liverpool City Council
LCVM	Light Commercial Vehicle Model
LGA	Local Government Area
LoS	Level of Service
LV	Light vehicle
MIC	Moorebank Intermodal Company
MUR	Moorebank Units Relocation
MT	Empty Container
OTR	over the road vehicles
PCU	Passenger Car Unit
ROL	Road Occupancy Licence
RMS	(NSW) Roads and Maritime Services
SEPP	(NSW) State Environmental Planning Policy
SIDRA	Signalised and unsignalised Intersection Design Research Aid
SIMTA	Sydney Intermodal Terminal Alliance
SME	School of Military Engineering
SSD	Stage significant development
SSFL	Southern Sydney Freight Line
STM	Sydney Strategic Transport Model
SZA	Speed Zone Authorisation

TEU	Twenty-foot equivalent unit containers
TCP	Traffic Control Plan
TDT	Traffic Technical Direction
VHT	Vehicle hours travelled
VKT	Vehicle kilometres travelled
VMS	Variable message sign

1. Introduction

The Moorebank Intermodal Terminal (IMT) Project (the Project) involves the development of approximately 220 hectares (ha) of land at the Project site (refer to Figure 1.1) for the construction and operation of an IMT and associated infrastructure, facilities and warehousing. The Project includes a rail link connecting the Project site to the Southern Sydney Freight Line (SSFL) and a single road access from the Moorebank Avenue and Anzac Road intersection. The Project is proposed on an area of land owned by the Australian Government and currently occupied by the Department of Defence (Defence). The site is adjacent to the SSFL, the East Hills Rail Line and the M5.

The primary function of the IMT is to be a transfer point in the logistics chain for shipping containers and to handle both international IMEX cargo, and domestic interstate and intrastate (regional) cargo. The key aims of the Project are to increase Sydney's rail freight mode share including: promoting the movement of container freight by rail between Port Botany and western and south-western Sydney; and reducing forecast road freight on Sydney's congested road network.

The development of the Project is proposed to be phased, with an initial import export (IMEX) terminal and warehousing facilities planned to commence operations around 2018 (subject to approval). Subsequent 'ramp-up' of IMEX capacity, interstate capacity and warehousing is then expected, with the site fully developed (referred to as the 'full – build' scenario) by about 2030, in line with the expected freight demand. Early Works, consisting mainly of building demolition, are proposed to commence in 2015, followed by the first phase of construction.

The Project proponent is Moorebank Intermodal Company (MIC), a Government Business Enterprise (GBE) set up to facilitate the development of the Project.

The key features/components of the Project are:

- *an IMEX freight terminal* – designed to handle up to 1.05 million TEU per annum (525,000 TEU inbound and 525,000 TEU outbound) of IMEX containerised freight to service 'port shuttle' train services between Port Botany and the Project;
- *an Interstate freight terminal* – designed to handle up to 500,000 TEU per annum (250,000 TEU inbound and 250,000 TEU outbound) of interstate containerised freight to load on and off freight trains travelling to and from regional and interstate destinations; and
- *warehousing facilities* – with capacity for up to 300,000 (square metres) sq. m of warehousing to provide an interface between the IMT and commercial users of its facilities such as freight forwarders, logistics facilities and retail distribution centres.

1.1 Project location and study area

The Project is situated in the Sydney suburb of Moorebank, NSW located approximately 35 km south west from the centre of Sydney and approximately 2 km south of Liverpool CBD. It is located in the Liverpool City Council (LCC) local government area (LGA). The Moorebank IMT is proposed to be located on land currently occupied by the School of Military Engineering (SME). The Project Site is approximately 220 hectares (ha) in area.

The Project site is bounded by Moorebank Avenue to the east, the East Hills Railway Line to the south, the Georges River to the west and the commercial site for ABB Australia (a power and automation technology manufacturer) and the M5 to the north. The M5 provides access to other Sydney motorways, with the M7 Motorway (M7) interchange approximately 5 km by motorway west of the Project site.

The SSFL has been constructed on the western side of the Georges River along the South Line/Bankstown Line and would be used to service the terminal by rail.

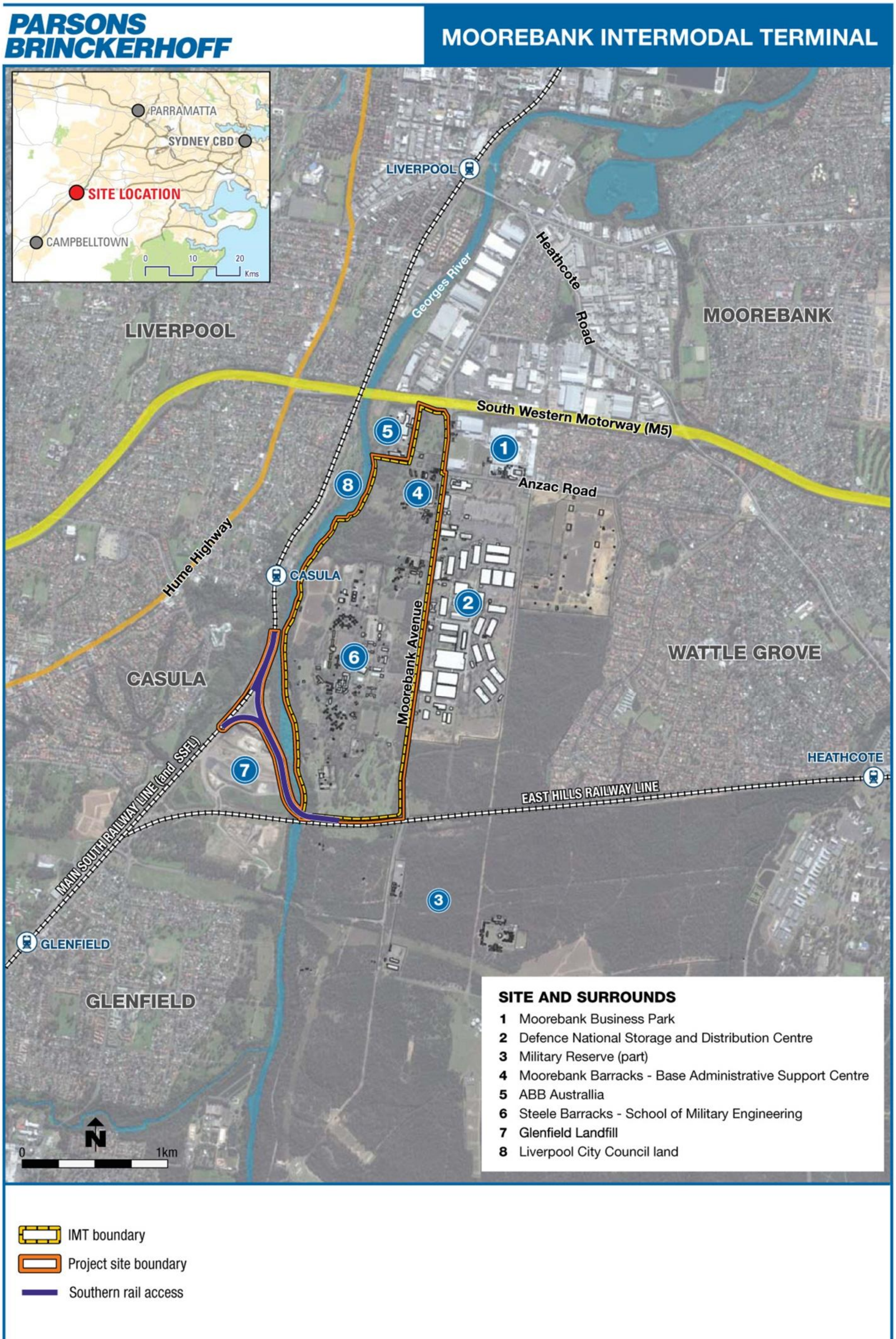

Figure 1.1 Project site and context

1.2 Scope and methodology

This report presents the results of an investigation into the traffic impact of the Moorebank IMT on the surrounding transportation network and assesses the operation of the road upgrades to Moorebank Avenue required to manage the increased demand at acceptable performance levels.

In preparing this report, our analysis follows the principles of the Roads and Maritime Services (RMS) *Guide to Traffic Generating Developments (2002).* Where appropriate, different rates and requirements have been adopted to either make use of more recent and applicable information or to better reflect the local planning environment. Information sources are as follows:

- IMEX and interstate traffic generations were sourced from Deloitte analysis based on a comprehensive analysis of internal warehouse operations.
- Warehouse traffic generation rates sourced from both Deloitte and the RMS *Guide to Traffic Generating Developments Technical Direction TDT 2013/04 Traffic Surveys* (May 2013).

The Moorebank IMT would facilitate the distribution of road freight to western Sydney by transferring the origin of truck hauled containers from Port Botany to Moorebank. These movements would be present on the road network originating from Port Botany if the Moorebank IMT were not developed.

The methodology used for the investigation comprised:

- Consultation with Transport for NSW (TfNSW) and Roads and Maritime Services (RMS) to determine suitable study area extents and those intersections to be surveyed and analysed
- Collection of data including traffic surveys to determine the existing traffic network demands and performance by times of day.
- Determining the expected traffic generation from all developments proposed within the Project site for both operation and construction phases.
- Distributing the expected traffic generated to the network via a number of intersections along Moorebank Avenue and the wider area road network.
- Determining the peak traffic years to be tested depending on peak operational and construction traffic demands and assess the AM peak hour and PM peak hour.
- Determining the future level of background traffic based on yearly traffic growth rates provided by RMS from various years of the EMME/2 model.
- Simulating the proposed future intersection upgrades of Moorebank Avenue and the wider area road network utilising SIDRA 6 intersection analysis software to forecast the operation of the network for the following design years:
  - Early works – 2015: this considers construction only impacts.
  - Scenario 1 – 2016: this considers construction only impacts.
  - Scenario 2a – 2019: this considers a combination of construction and operation impacts.
  - Under this scenario operations on-site would be 24 hours/7 day a week with the exception of the operation of the truck gate which would only be operational 16 hours/5 days a week.
  - Scenario 2b – 2023: this considers a combination of construction and operation impacts.
  - Under this scenario operations on-site would be 24 hours/7 day a week with the exception of the operation of the truck gate which would only be operational 16 hours/5 days a week.
  - Scenario 3 – 2030: this considers operational impacts only.
  - Under this scenario operations on-site would be 24 hours/7 day a week and truck movements would be 24 hours.

- Additional assessment for the years 2025 and 2028 as requested by Transport for NSW.
- Modelling cumulative scenarios.

The Sydney Intermodal Terminal Alliance (SIMTA) is proposing to develop an IMT facility on the site currently occupied by DNSDC on Moorebank Avenue, Moorebank. In light of this, the Secretary's Environmental Assessment Requirements (EARs) require a cumulative assessment of the impacts that would occur in the event that both projects were developed:

- Cumulative scenario A (2030) – which assumes that the SIMTA site would operate as an intensified warehousing development that would support the operation of the Project in 2030. A number of assumptions have been made to define and assess cumulative scenario A including:
  - i) The Moorebank IMT would operate as proposed in the EIS.
  - ii) The SIMTA development would have an indicative warehouse capacity of 300,000 sq. m gross floor area (GFA).
  - iii) Both sites would operate 24 hours a day, seven days a week.
- Cumulative scenario B (2030) – which consists of an IMEX terminal on the SIMTA site only with throughput of 1 million TEU per year, as well as 300,000 sq. m of warehousing. An interstate terminal of 500,000 TEU per year and 300,000 sq. m of warehousing would be located on the Project site in 2030. The following assumptions were made for cumulative scenario B:
  - i) Both sites would operate 24 hours a day, seven days a week.
  - ii) The Moorebank IMT will have 205,000 sq. m of warehousing not directly associated with containerised terminal traffic.
- Cumulative scenario C1 – this is an interim (2020) scenario that would ultimately lead to scenario C2 at 2030 (full build). It consists of an IMEX terminal on the SIMTA site with throughput of 250,000 TEU per year, as well as 200,000 sq. m of warehousing. An IMEX terminal of 250,000 TEU per year, interstate terminal of 250,000 TEU per year and 100,000 sq. m of warehousing would be located on the Project site in 2020. The following assumptions were made for cumulative scenario C1:
  - i) Both sites would operate 24 hours a day, seven days a week.
  - ii) The SIMTA development will have surplus warehousing in the order of 125,000 sq. m.
- Cumulative scenario C2 (2030) – which consists of an IMEX terminal on the SIMTA site with throughput of 500,000 TEU per year, as well as 300,000 sq. m of warehousing. An IMEX terminal of 500,000 TEU per year, interstate terminal of 500,000 TEU per year and 300,000 sq. m of warehousing would be located on the Project site in 2030. The following assumptions were made for cumulative scenario C2:
  - i) Both sites would operate 24 hours a day, seven days a week.
  - ii) The SIMTA development will have will have 150,000 sq. m of warehousing not directly associated with containerised terminal traffic.

- All traffic assessments are based upon the southern rail alignment.
- Reviewing the results and providing recommendations for future intersection and other required upgrades to mitigate traffic impacts from the Project.

1.3 Purpose of this report

This report documents and assesses changes that MIC proposes to make to the Project since the public exhibition of the Environmental Impact Statement (EIS).

The revised Project has been developed as a result of an in-principle agreement between MIC and SIMTA that will result in the development of both the Moorebank IMT site (the subject of the EIS and this Response to Submissions Report) and the SIMTA IMT site to create an intermodal precinct solution. This has meant that since exhibition of the EIS, new site layouts and phasing (as well as the selection of a southern rail access) is proposed that better responds to the likely development under a precinct – wide development. This approach additionally requires consideration of additional cumulative assessment scenarios as described in section 1.2. These changes are described in more detail in section 1.4 below.

1.4 Summary of changes that have been made from the EIS reporting

The following changes have been made relative to the Traffic and Transport Impact Assessment prepared for the Environmental Impact Statement to this document, the Response to Submissions Report:

Project site layout

- Revised site layout which accommodates only one vehicular access via the Moorebank Avenue and Anzac Road intersection from 2016.
- Revised internal road layout including roundabout intersection.
- Bapaume Road is not upgraded and realigned.
- Construction access to the Project site relocated to single intersection (previously the Project had additional accesses on Moorebank Avenue south of Anzac Road).
- Southern rail access option is utilised (the northern and central rail access options presented in the EIS are no longer being considered).

Project phasing

- Revised construction and operational phasing with changes in land use yields at each stage and year.

Cumulative scenario assessment

- Revised cumulative scenario assessment and land use yields.
- Four cumulative scenarios assessed (cumulative scenarios A, B, C1 and C2).

Traffic generation and distribution

- Revised truck loading capacities for the Project which see an increase in pallet loading for rigid trucks from 8 pallets to 20 pallets and for semi-trailers from 20 pallets to 40 pallets, which will reduce the level of truck traffic generation.
- Revised construction traffic generation based upon new Project phasing.
- SIMTA peak hour heavy vehicle percentage of 7.7% in the AM peak and 9.3% in the PM peak applied to the Project.
- SIMTA traffic distribution for light and heavy vehicles applied to proposed development on SIMTA site in the closer area (including Moorebank Avenue, Anzac Road and the M5) and STM distribution for heavy vehicles applied to the wider area (beyond Moorebank Avenue and the M5).

- 2030 STM traffic distribution from the STM model applied to all assessment years.

Intersection traffic assessment

- Additional years of assessment for wider area intersections including 2015, 2016, 2019, 2023, 2025 and 2028 (beyond Moorebank Avenue, the EIS only assessed intersection performance at 2030).
- Additional base year intersection assessment for wider area intersections.
- Additional base plus Moorebank IMT intersection assessment for wider area intersections.

SIMTA site intersection layouts

- Due to the removal of Project site accesses on Moorebank Avenue south of Anzac Road, the layouts of the SIMTA intersections have been reconfigured for the cumulative scenario assessments as T-intersection arrangements.

Mitigation measures for improved intersection performance

- Preparation of mitigation measures to enable intersections to perform at similar levels of service when compared to the base conditions for any assessment year.
- Determining what intersection upgrades are required in what year based on Moorebank IMT traffic increases.

General reporting, figures and tables

- Revised mid-block capacity assessments based on new traffic generation.
- Revised weaving assessment for the M5 in both directions between Moorebank Avenue and the Hume Highway in the 2030 AM and PM peaks based on the latest STM and FMM distributions.
- Revised trip increases (percentages) onto the M5 due to both Moorebank IMT and SIMTA traffic (cumulative scenarios).

1.5 Document structure

This report is structured as follows:

- Section 2 describes the existing situation and Project location.
- Section 3 describes the proposed Project.
- Section 4 details the Project road and intersection upgrades.
- Section 5 describes the future year traffic modelling undertaken.
- Section 6 describes the expected traffic generation and distribution. The input assumptions to derive these values are also provided.
- Section 7 documents the background traffic growth rates on the surround road network as provided from RMS.
- Section 8 describes the strategic modelling and strategic trip distribution.
- Section 9 provides discussion on the intersection analysis for Moorebank Avenue and the wider road network study area and summarises intersection performance between 2015 and 2030 with and without Moorebank IMT. This includes proposed mitigation measures for intersection upgrades and modifications to signal phasing.
- Section 10 assesses mid-block road capacity on the wider area road network in 2030.

- Section 11 documents the weaving assessment undertaken on the M5 between Moorebank Avenue and the Hume Highway in 2030.
- Section 12 describes the volume of Project traffic on the M5 in 2030.
- Section 13 describes mitigation measures during detailed design and operation of the facility.
- Section 14 discusses the construction traffic workforce, haulage routes, construction impacts and mitigation measures.
- Section 15 provides conclusions of the report findings.
- Section 16 lists the study references.

2. Existing situation

Summary of changes from the Environmental Impact Statement Traffic and Transport Assessment: **No change.**

2.1 Existing land use

Currently the Project site is occupied by the SME and other minor Defence units. The Project site contains a number of buildings used for administration, teaching and instructing, tactical operations, storage and accommodation. There are training facilities associated with skills and trade training for the SME located around the Project site. The Project site also has a number of recreational facilities, including playing fields and a golf course. There are a total of 13 Defence units that currently utilise the Project site.

On the western side of Moorebank Avenue, off-street car parks at grade have been provided for the staff of the facility and the neighbouring facility, the Defence National Storage and Distribution Centre (DNSDC). The DNSDC is currently in the process of relocating to a new site at West Wattle Grove. The relocation is expected to be completed by early 2015. The new site will be accessed from Moorebank Avenue and Anzac Road.

2.2 Surrounding road network

This assessment considers the impact on the following roads within the study area as shown in Figure 2.1:

- Moorebank Avenue is a local road owned and maintained by Liverpool City Council (LCC) between the M5 interchange and Anzac Road with a 2010 ADT of 17,581 with 6% heavy vehicles (HV). South of Anzac Road, Moorebank Avenue is a private road on Commonwealth land (2010 ADT 15,777) with 4.2% heavy vehicles. This section of Moorebank Avenue south of the M5 interchange is generally two lane undivided road with one lane in each direction. The posted speed limit along Moorebank Avenue on both these road sections is 60 km/h.
- Anzac Road is a local road owned and maintained by LCC. It is primarily a two-lane undivided road with one lane in each direction. The posted speed limit on this road is 60 km/h. The intersection with Moorebank Avenue at the western end of Anzac Road is a signalised T-intersection. The intersection has designated turn bays, with a left turn slip lane from Moorebank Avenue southbound into Anzac Road.
- Bapaume Road is a local road owned and maintained by LCC that provides access to ABB Australia Pty Ltd. It is a two lane undivided road with one lane in each direction. The intersection with Moorebank Avenue is a T-intersection with right of way given to vehicles on Moorebank Avenue. There are no turning bays at this intersection. However there is ample storage within Bapaume Road to accommodate queuing of exiting vehicles.
- There are a number of private roads located in the subject SME site with some connecting to Moorebank Avenue, including Chatham Avenue. Some of these intersections are controlled gates. The majority of the intersections have dedicated turning lanes along Moorebank Avenue into the Project site. The majority of these internal roads are two lane undivided roads with one lane in each direction. All of these roads will be removed as part of the proposed development.

- Cambridge Avenue to the east of the causeway (low level bridge subject to flooding) is a local road owned and maintained by LCC. It is a two-lane undivided road with one lane in each direction. This road crosses the Georges River to the south of the Project site via a narrow low lying bridge with a limited vehicle loading capacity that is prone to flooding. The posted speed limit on this road is 60 km/h.

The nearby major roads in the area include the Hume Highway, the M5, Newbridge Road, Heathcote Road and the M7.

The Hume Highway is classified as a National Road. It is a six-lane divided road with three-lanes of traffic in each direction. The posted speed limit on the Hume Highway is 70 km/h in this area. The Hume Highway links Sydney to Canberra and provides a local arterial route through this area.

The M5 is classified as a 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. The M5 was built under a Build Own Operate Transfer (BOOT) scheme with Interlink Roads Pty Ltd. They are currently responsible for the operation and maintenance of the motorway. This road opened in 1992 and, following several project variations including the M5 widening, the contract is due to be transferred to State Government ownership in 2026. From 2026 the NSW Government will benefit from road to rail transfer resulting from the Moorebank IMT project and the reduction in truck movements around Port Botany and the airport.

The lane configuration on the M5 depends on the location. To the east of Heathcote Road, the M5 is a six lane divided road with three lanes in each direction. Between Heathcote Road and Moorebank Avenue the M5 widens to a six lane divided road with three lanes in each direction and had a 2010 AADT of 102,766. Between Moorebank Avenue and the Hume Highway the M5 is widened further to an eight lane divided road with four lanes in each direction (2010 AADT 123,780). The additional lanes in this section of road are due to a continuation of entry and exit merge lanes from the two interchanges. To the west of the Hume Highway the M5 reduces to a six lane divided road with three lanes in each direction. The M5 posted speed limit in the vicinity of the Project site is 100 km/h.

The section of the M5 over the Georges River between Moorebank Avenue and the Hume Highway acts as a bottleneck within the motorway network. This is due in part to the substandard distance available for the weaving movement of vehicles joining and leaving the motorway. Congestion from weaving movements is expected to be become worse with the widening of the M5 to the east and west of this location.

A number of 'rat-runs' have developed through the area in order to avoid using the M5. Turning volumes from Cambridge Avenue into Moorebank Avenue indicate it is used as an alternative to the M5 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.

Newbridge Road is classified as a State Road. From Henry Lawson Drive it is a six lane divided road with three lanes of traffic in each direction until Heathcote Road (westbound) where it becomes a four lane divided road with two lanes of traffic in each direction, crossing the Georges River and continuing along Terminus Street to Macquarie Street. The post speed limit on Newbridge Road is 60 km/h from Terminus Street to Bridges Road and 70 km/h between Bridges Road and Henry Lawson Road. Newbridge Road provides a local arterial route between Bankstown Airport, Milperra and the Liverpool CBD.

Heathcote Road is classified as a State Road. It is a four lane road with two lanes of traffic in each direction. Heathcote Road narrows to one lane in each direction between Junction Road and the M5 (north of the interchange). The posted speed limit on Heathcote Road is 60 km/h in this area. Heathcote Road provides access to most of the Moorebank industrial precinct.

The M7 is classified as a motorway and is a privately operated Toll Road with distance-based tolling. The M7 was built under a Build Own Operate Transfer (BOOT) scheme with the Westlink Motorway consortium and opened in 2005. This contract is due to be transferred back to the State Government in 2037. It is consistently a four lane divided road with two lanes of traffic in each direction. The posted speed limit on the M7 is 100 km/h with variable speed limit signs.

2.3 Existing traffic conditions

Intersection surveys of traffic and pedestrians 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 and the Hume Highway
- Moorebank Avenue and the M5
- 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)
- Moorebank Avenue and Chatham Avenue.

The location of these intersections is shown in Figure 2.1.

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

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

Further intersection surveys on the wider road network adjacent to the Project site were undertaken on Tuesday 18 March 2014 during the AM peak (between 6.00 am and 9.00 am) and the PM peak (between 4.00 pm and 7.00 pm) and also included the following intersections:

- 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

- Cambridge Avenue, Canterbury Road, Glenfield Road and Railway Parade.

All counts were conducted outside of school and university holidays. Intersection and tube counts indicated average daily and peak hour traffic, light and heavy vehicle proportions and pedestrian volumes. For this study, traffic growth rates have been obtained by extrapolating changes in traffic volume growth from the Sydney STM EMME/2 model to estimate the traffic volumes for intersections surveyed in 2010.

Intersection diagnostic monitor (IDM) data was obtained from RMS for all signalised intersection to determine traffic signal phasing and cycle times for the weekday AM and PM peak periods. Traffic signal phasing and cycle times were also verified during the site inspection. This data was then utilised into the SIDRA intersection modelling.

The intersection surveys indicate that the majority of the traffic currently using Moorebank Avenue is through traffic travelling between the Glenfield area and the M5/Moorebank Avenue 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. Both the AM and PM peaks have unbalanced traffic flows where the majority of traffic is northbound on Moorebank Avenue in the AM peak and southbound in the PM peak.

Data retrieved from the additional surveys undertaken on March 2014 indicate that the network peaks on the wider road network (beyond Moorebank Avenue) generally occurs between 7.45 am and 8.45 am and between 4.30 pm and 5.30 pm.

Figures 2.2 and 2.3 show the intersection turning movement volumes in vehicles per hour (vph) during the analysed peak AM and PM periods, respectively.

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MOOREBANK INTERMODAL TERMINAL

Figure 2.1 Location of existing key intersections on Moorebank Avenue

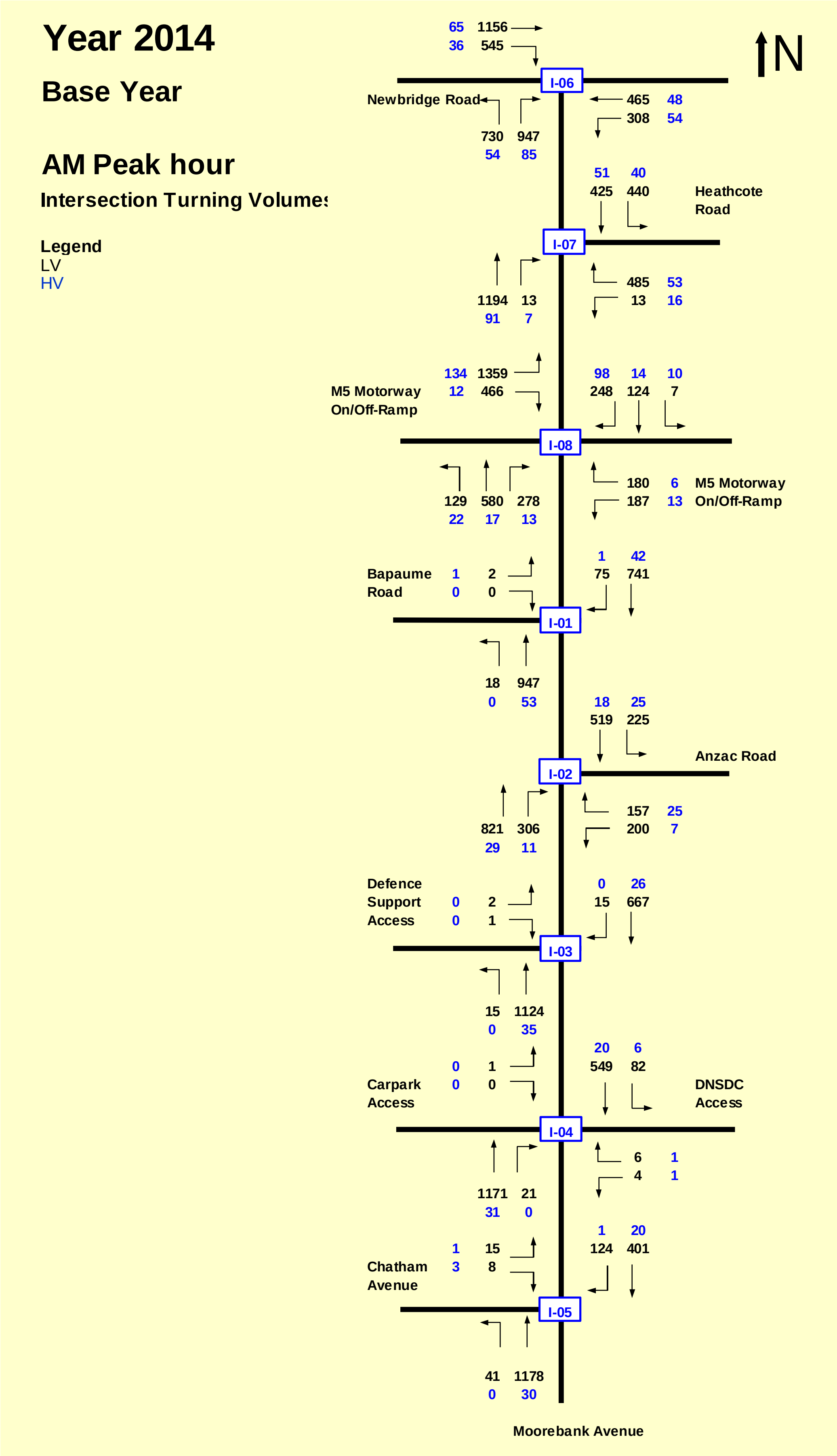

Figure 2.2 Existing AM peak hour intersection turning volumes – Year 2014

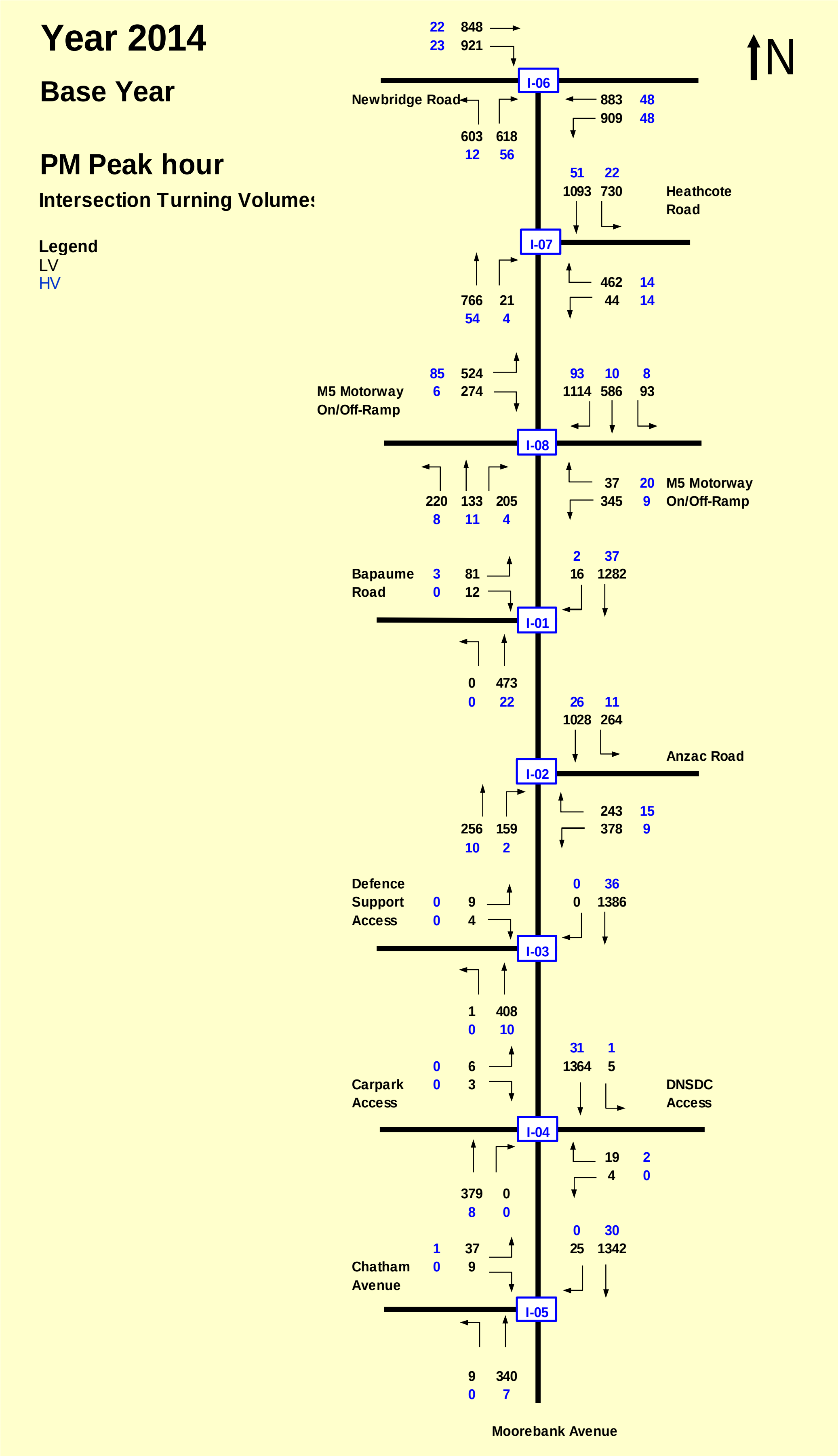

Figure 2.3 Existing PM peak hour intersection turning volumes – Year 2014

Traffic flows on Moorebank Avenue are tidal with high northbound volumes in the AM peak hour (1,024 vehicles per hour), reversing during the PM peak hour to high southbound volumes (1,156 vehicles per hour). As a result sections of the road with one lane are at or near to capacity during the peak periods.

The full traffic survey results can be found in **Appendix A**.

2.3.1 Existing intersection performance

A base case SIDRA Intersection analysis was undertaken to provide an understanding of the current traffic operations along Moorebank Avenue and provide a basis for the qualitative and quantitative assessments of the proposed Moorebank IMT.

SIDRA is a traffic engineering micro-analytical traffic evaluation tool used for intersection design and analysis. It stands for Signalised and unsignalised Intersection Design and Research Aid. It is used for the analysis of intersection capacity, level of service and performance.

This package provides several useful indicators to determine the level of intersection performance. These are known as Level of Service (LoS), Degree of Saturation (DoS), Average Delay (seconds) and Maximum Queue Length (metres). An explanation of these intersection assessment criteria is provided in **Appendix B**. The LoS criteria for intersections are also shown in Table 2.1.

Table 2.1 Level of Service criteria for intersections

Level of Service	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

Table 2.2 shows the SIDRA modelling results of the performance of the intersections along Moorebank Avenue under existing traffic conditions. Refer to Figure 2.1 for the location of the key intersections.

Table 2.2 Existing intersection performance (2014)

Intersection	Intersection control type	Peak hour	Degree of Saturation	Average Delay (sec)	Level of Service	95th percentile 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

The level of service at the intersection of Moorebank Avenue and Bapaume Road reflects the delays experience by vehicles turning right from Bapaume Road into Moorebank Avenue. As those vehicles must give-way to the high volumes of traffic on Moorebank Road, they find few opportunities to exit and experience poor performance of the intersection. The through lanes on Moorebank Avenue have good operation.

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

The high DoS and long queues at the other intersections on Moorebank Avenue are a result of their existing designs and the unbalanced traffic flows of the northern and southern approaches.

The full results of the existing intersection SIDRA analysis can be found in **Appendix C**.

2.4 Southern Sydney Freight Line

The SSFL has been constructed between Birrong and Macarthur and forms a dedicated freight rail corridor between Port Botany and Macarthur. The SSFL was opened in 2013 and improves the efficiency and cost effectiveness of rail freight services by removing current restrictions created due to the sharing of the railway lines operated by RailCorp.

The SSFL provides an additional freight only railway track that allows passenger and freight services to operate separately. This permits freight movements to be transported by rail at any time.

2.5 Public transport

Whilst there is no rail station on or adjacent to the site, bus route 901 runs along Moorebank Avenue during peak traffic periods providing a link to the passenger rail network. Trips to the Project site using existing public transport must therefore be by bus only or by rail and bus. Further discussion on the existing public transport network is provided below.

2.5.1 Train services

The Project site is accessible via four nearby railway stations: Liverpool, Casula, Glenfield and Holsworthy. Travel distance to each station and station accessibility is shown in Table 2.3. The locations of Liverpool, Casula and Holsworthy railway stations are shown in Figure 2.4.

Table 2.3 Travel distance and accessibility to local railway stations

Station/Interchange	Train line	Distance by car (travel time)	Distance by walking (travel time)	Accessible by bus (average trip time)
Casula Station	Cumberland Line (T5) Inner West and South Line (T2)	4.8 km (7 minutes)	7.2 km (1.5 hrs)	No
Liverpool Interchange	Cumberland Line (T5) Inner West and South Line (T2) Bankstown Line (T3)	4.1 km (6 minutes)	3.8 km (50 minutes)	Yes (11 minutes)
Glenfield Interchange	Cumberland Line (T5) Airport, Inner West and South Line (T2)	4.8 km (7 minutes)	5.6 km (1.2 hrs)	No
Holsworthy Station	Airport, Inner West and South Line (T2)	5.9 km (9 minutes)	4.8 km (1 hr)	Yes (19 minutes)

Note: distances and travel times were measured from the centre point of the Moorebank IMT area, or equivalent location on Moorebank Avenue. Distances and travel times may vary slightly, depending on Project site access location.

Table 2.3 shows that while there are four stations within a 10 minute drive from the Moorebank IMT site, only two stations are accessible by bus and would be difficult to access by walking. While Casula station is less than 1 km from the Project site, it is a 1.5 hour walk or 7 minute drive from the site, without a bus connection to Moorebank Avenue. In terms of options for commuting to the Project site, Liverpool and Holsworthy stations are currently the only viable options with bus connections to Moorebank Avenue.

2.5.2 Bus services

Moorebank Avenue is currently serviced by one bus route provided by Transdev (Route 901). The bus route operates between Liverpool and Holsworthy via Wattle Grove (using Anzac Road) with a single AM and PM diverted service which travels further south along Moorebank Avenue to Chatham Avenue. The route map and bus stop locations on Moorebank Avenue are shown in Figure 2.4.

On a weekday, bus services operate between 5.30 am and 9.30 pm at half hourly intervals during the AM and PM peaks. Hourly services run outside peak periods. Weekend and Public Holiday services are provided (7.00 am to 7.00 pm Saturday, 8.30 am to 7.00 pm Sunday and Public holidays) where buses operate hourly with no diverted bus services to Chatham Avenue.

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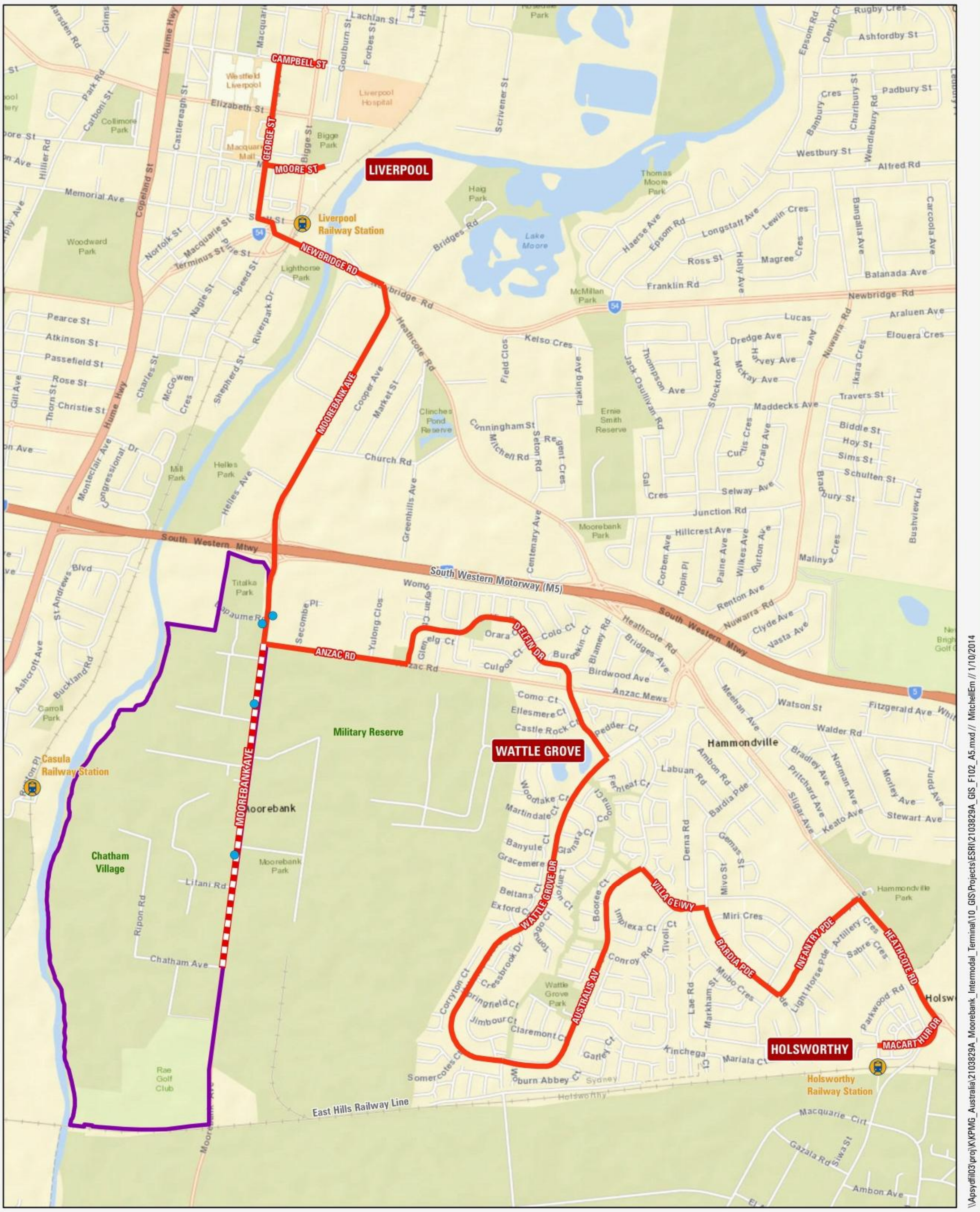
MOOREBANK INTERMODAL TERMINAL



Bus stop
Train station
Bus route 901
Limited bus service
IMT boundary

0 500 1,000
Metres

Figure 2.4 Local bus service route and train station locations

2.6 Pedestrian and cyclist facilities

A shared path is provided on the eastern side of Moorebank Avenue between the M5 and Anzac Road. The shared path then continues on the southern side of Anzac Road to connect to Holsworthy Station. This is the only identified cycleway in the area.

There are limited pedestrian and cyclist facilities on Moorebank Avenue south of Anzac Road. There is no shared path along Moorebank Avenue in front of the Project site. A footpath is provided on the western side of Moorebank Avenue between Anzac Road and Chatham Avenue. There is a wide shoulder (except for the locations of the signalised intersections) along Moorebank Avenue that can accommodate cyclists; however is not a designated cycle lane.

LCC have identified a number of proposed routes in its *Bike Plan 2009* for new on and off road paths in the LGA. These routes would include provision of off-road cycleways from the northern end of the Project site to provide additional options for cycling. As a result this may improve the connection between the Project site, neighbouring destinations and suburbs, and the local train stations.

Figure 2.5 shows the existing footpaths, cycleways and proposed LCC cycleways in proximity to the Project site.

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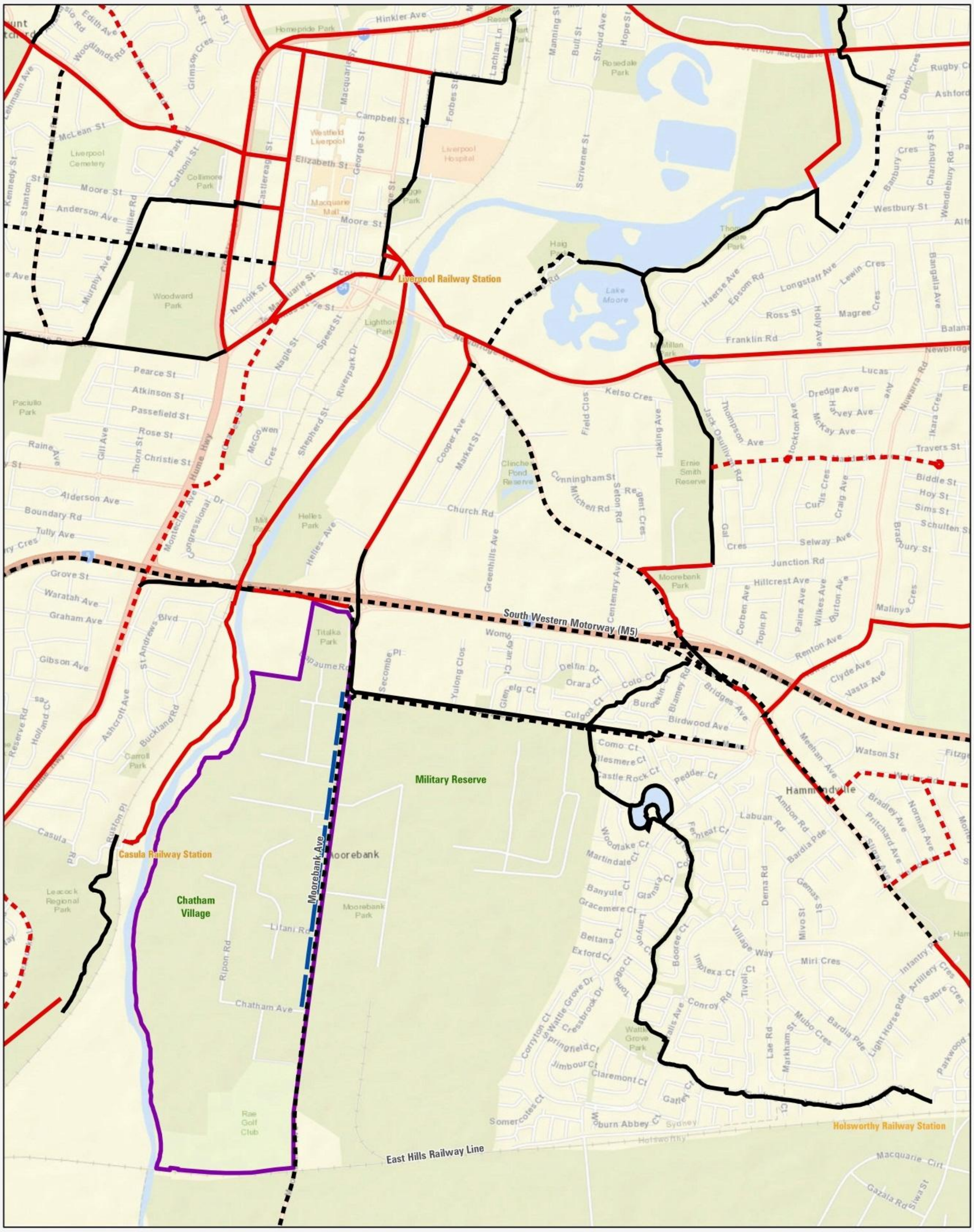
MOOREBANK INTERMODAL TERMINAL



- - - - Existing on road cycleway
—— Existing off road cycleway
- - - - Proposed on road cycleway
—— Proposed off road cycleway
— — Existing footpath
▭ IMT boundary

0 500 1,000
Metres

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Figure 2.5 Existing and proposed footpaths and cycleways

2.7 Crash analysis

2.7.1 Moorebank Avenue crash analysis

Crash data were obtained from RMS for a five year period (2008–2013) for the section of Moorebank Avenue between the East Hills Railway Line and south of the intersection with the M5. The crash locations are shown in Figure 2.6.

An analysis of the accident data is provided below:

- A total of 61 reported accidents occurred on Moorebank Avenue involving a total of 127 vehicles.
- Of the 61 analysed accidents, 33 (54%) were at intersections and 28 (46%) occurred midblock. Out of the 33 recorded accidents at intersections, 15 accidents occurred that the intersection of Moorebank Avenue and the M5 and 18 accidents occurred at the intersection of Moorebank Avenue and Anzac Road.
- On Moorebank Avenue, accidents involving vehicles from opposite directions were the most common accident type with 21 accidents constituting 34% of accidents. A further 18 involved rear end collisions.
- There were no accidents that resulted in a fatality.
- There were no accidents involving pedestrians or cyclists.
- 85% of road users involved in accidents were light vehicles (cars, utilities, vans) and 15% were heavy vehicles.
- 18% of crashes involved three or more vehicles.
- 78% of the accidents occurred during fine conditions.
- 78% of accidents occurred during the day (46% AM, 32% PM), of which the majority occurred during daylight.
- 88% of accidents occurred on weekdays.

2.7.2 M5 crash analysis

Crash data was obtained from RMS for a five year period (2008–2013) for the section of the M5 between the Hume Highway and Heathcote Road intersections.

An analysis of the accident data is provided below:

- A total of 171 reported accidents occurred on the M5, involving a total of 368 vehicles.
- Overall, accidents involving rear end collisions were the most common accident type with 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.
- There was one cyclist crash and no pedestrian crashes.
- 86% of road users involved in accidents were light vehicles (cars, utilities, vans) and 14% were heavy vehicles.
- 80% of crashes involved more than one vehicle.
- 75% of the accidents occurred during fine conditions.
- 69% of accidents occurred during the day (30% AM, 39% PM), of which the majority occurred during daylight.

- 78% of accidents occurred on weekdays.

2.8 Black spot analysis

The following guidelines apply to nominating black spots in NSW under the National Black Spot Programme and sourced from the *NSW Black Spot Program, How to apply for funding* (Roads and Maritime Services).

Black Spot sites

A Black Spot can be up to 3 km in length. The minimum criteria for eligibility is at least two casualty crashes in the most recent 5 years of crash data.

Black Lengths sites

A Black Length is any section of road being treated that is longer than 3 km. The minimum criteria for eligibility are an average 0.13 casualty crashes per kilometre per annum over the last 5 years of crash data.

The above guidelines have been applied to Moorebank Avenue between the East Hills Railway Line and the M5, and the M5 between the Hume Highway and Heathcote Road interchanges.

2.8.1 Moorebank Avenue

The section of Moorebank Avenue between the East Hills Railway Line and the M5 is approximately 2.8 km and is generally two-lane two-way with lane widening to accommodate movements at the M5 intersection.

The crash data as supplied by RMS indicate that 38 casualty crashes have occurred over the last 5 year period between 2008 and 2013.

By converting these crash rates per kilometre per annum, this results in 2.71 casualty crashes per kilometre per annum. This is in excess of the 0.13 casualty crashes per kilometre per annum and therefore considered a black spot.

2.8.2 M5

The section of the M5 between the Hume Highway and Heathcote Road interchanges is approximately 2.7 km and is generally three lanes in either direction at this location.

The crash data as supplied by RMS indicate that 66 casualty crashes have occurred over the last 5 year period between 2008 and 2013.

By converting these crash rates per kilometre per annum, this results in 4.89 casualty crashes per kilometre per annum. This is in excess of the 0.13 casualty crashes per kilometre per annum and therefore considered a black spot.

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MOOREBANK INTERMODAL TERMINAL

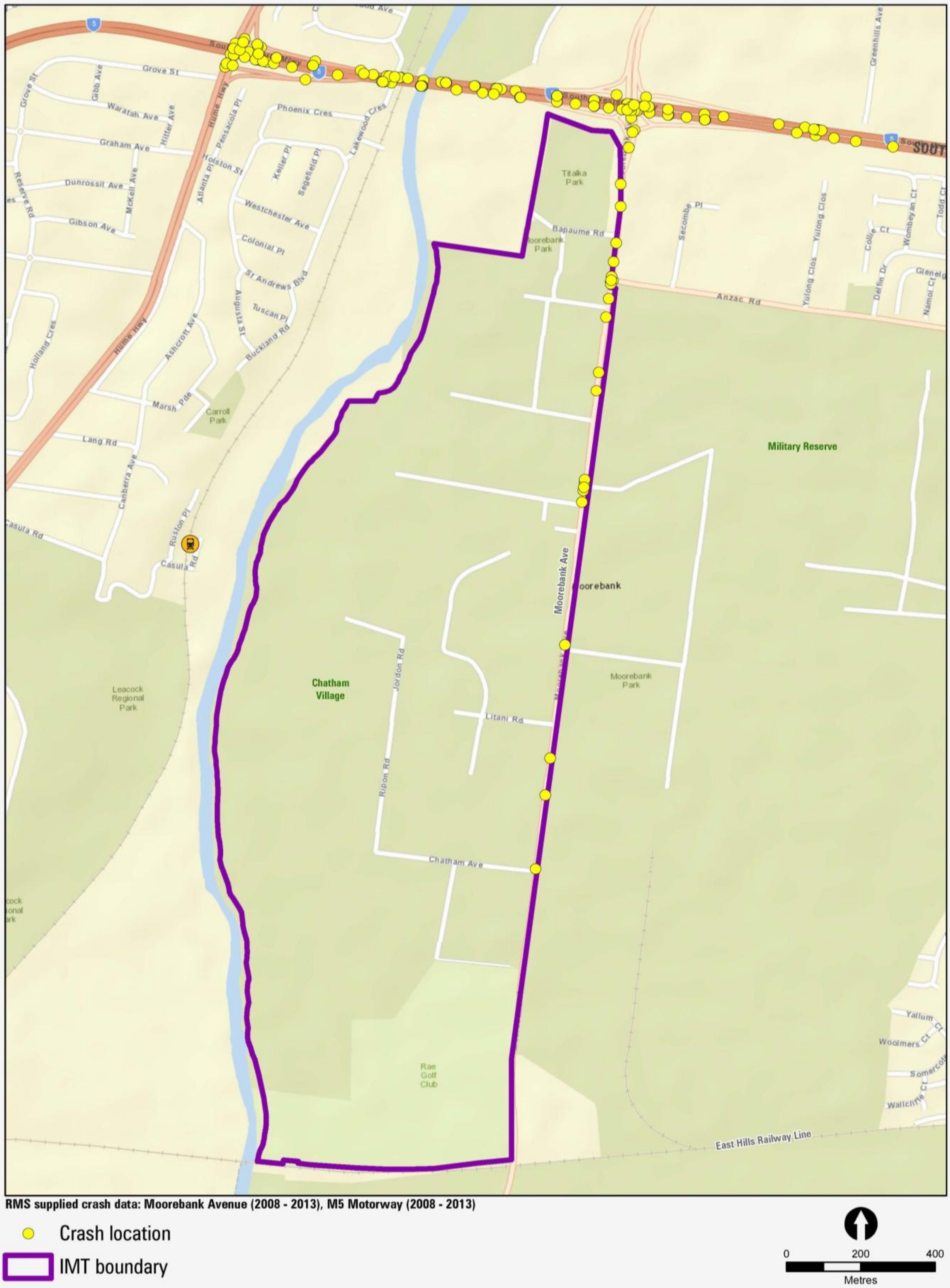


Figure 2.6 Location of crashes on Moorebank Avenue and the M5 Motorway

3. Proposed project

Summary of changes from the Environmental Impact Statement Traffic and Transport Assessment:

– Proposed Project details.
– Project site layouts.
– Access intersection layout for Moorebank Avenue and Anzac Road.
– Consideration of the southern rail access option only.

The Project includes:

- *An IMEX freight terminal* – designed with a maximum capacity of 1.05 million twenty-foot equivalent units (TEU) a year (525,000 TEU inbound and 525,000 TEU outbound) servicing international IMEX freight movement between Port Botany and the Project site.
- *A*n interstate freight terminal – designed to handle up to 500,000 TEU a year (250,000 TEU inbound and 250,000 TEU outbound) of interstate freight, servicing trains travelling to, from and between Sydney and regional and interstate destinations. The interstate terminal would provide for a total of up to 500,000 TEU a year, of which approximately 406,000 TEU would generate truck movements and approximately 94,000 TEU would remain on site as transit movements (between trains only).
- *Warehousing facilities* – with capacity for up to 300,000 square metres (sq. m) of warehousing to provide an interface between the IMEX and interstate terminals and commercial users of the facilities such as freight forwarders, logistics facilities and retail distribution centres.

The following changes have been made to the Project since the EIS (refer to Figure 3.1):

- Changes to the footprint (associated with the removal of the northern and central rail accesses from further consideration), layout and operation of the IMT terminal, including the location of the warehousing, working tracks and storage tracks, IMT freight village precinct, IMEX and Interstate equipment storage and repair area and detention ponds.
- Confirmation that only the southern rail access into the site will be required (the EIS sought flexibility to build either a southern, central or northern rail access into the site from the SSFL).
- Changes to the upgrade of Moorebank Avenue as described in the EIS (changes in the extent and timing of the upgrade works).
- Changes to access and circulation including heavy and light vehicle access to the facility via the Moorebank Avenue and Anzac Road intersection along a dedicated road at the north and along the western boundary of the Project site.
- Changes to the site access and vehicle circulation within the Project site.
- Modification to the locations and footprint of the detention basin and administrative office buildings, employee facilities and parking.
- Increase in the size of the conservation area as a result of the new IMT layout and a reduction of the size of the IMT footprint.

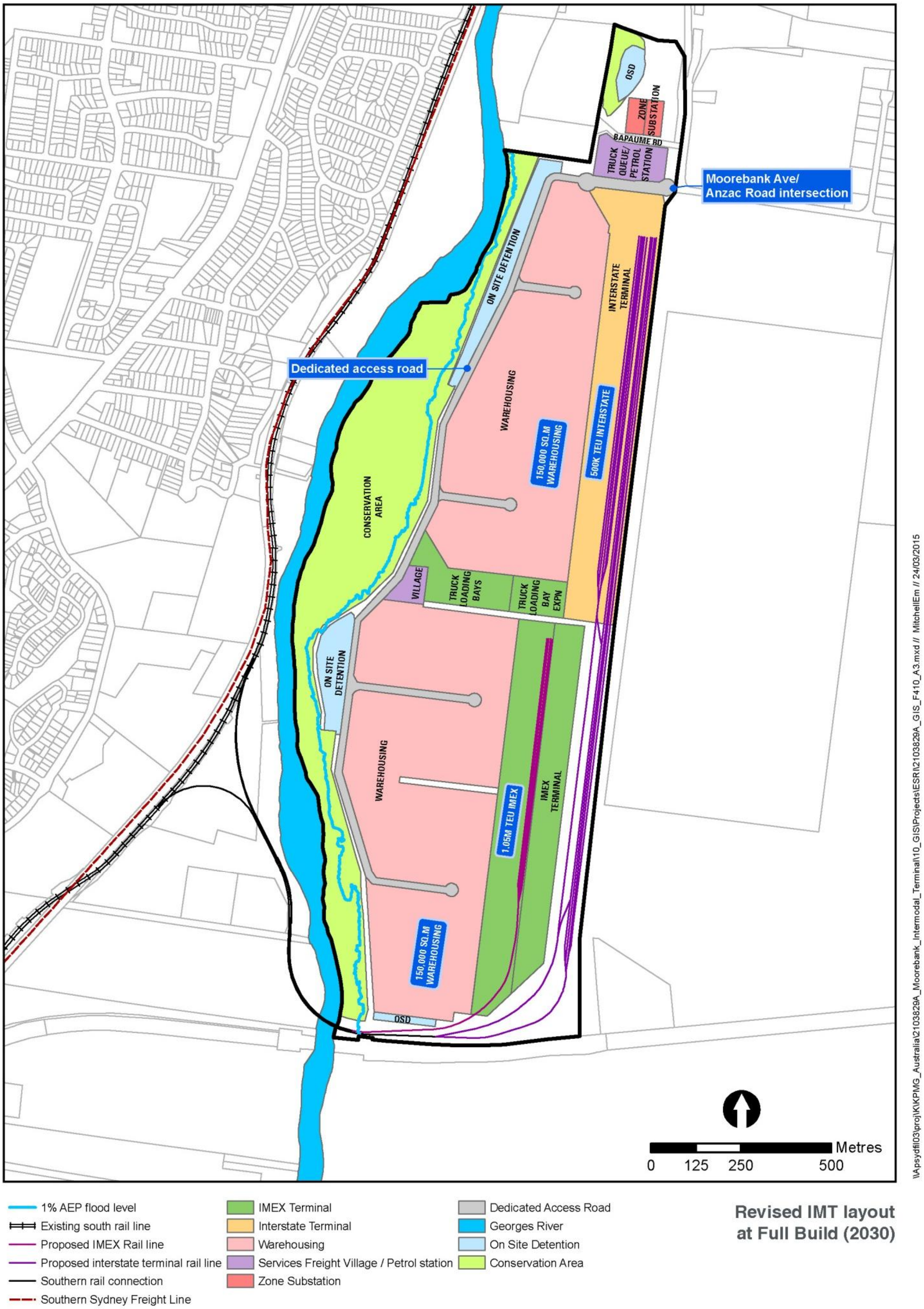


Figure 3.1 **Indicative revised IMT layout associated with the southern rail access option – Full build in 2030**

3.1 Rail access

The project no longer seeks approval to construct a northern or central rail connection. Approval is sought for a southern rail connection only.

The southern rail access location and configuration has not changed since the EIS and remains as per the description presented in Section 7.5.3 and Figure 7.6 of the EIS. However the construction staging of delivery has changed, with the entire rail connection (northbound and southbound rail spur) to be built during Phase A in 2016.

3.2 Rail layout

The revised Project allows for four IMEX terminal tracks (three working tracks and locomotive release) which are arranged in parallel in one group along the eastern boundary of the Project site set back from Moorebank Avenue.

The Interstate rail layout is also located on the eastern boundary to the north of the IMEX terminal tracks and still comprises two groupings of approximately four interstate arrival and departure tracks, one group for 1800 m long trains and the other group for 900 m long trains. The revised proposal however does not include a separate grouping of combined storage and classification tracks.

3.3 Moorebank Avenue upgrades

All traffic entering and exiting the Project site will utilise an upgraded Moorebank Avenue and Anzac Road intersection, with traffic restrictions in place to force all exiting heavy vehicle traffic to turn left onto Moorebank Avenue. Hence redevelopment of Moorebank Avenue north of Anzac Road is proposed and would include:

- Widening of Moorebank Avenue to a four-lane carriageway between the M5 and Anzac Road only.
- An upgrade of the Anzac Road intersection and relocation of and upgrade of Bapaume Road and its intersection with Moorebank Avenue (to be determined as part of the detailed design).
- Only one access point to the IMT Project site.

Design for these upgrades will be undertaken as part of the detailed design phase of the Project.

3.4 Internal road layout and access

The internal road layout and access, as illustrated on Figure 3.2, will include:

- A vehicle entry point (for all vehicles) from Moorebank Avenue at a proposed new intersection at the junction of Moorebank Avenue and Anzac Road.
- Within the site, a dedicated access road for heavy and light vehicles and emergency vehicles (constructed from the Moorebank Avenue and Anzac Road intersection).
- Right-turn lanes at the Moorebank Avenue and Anzac Road intersection will be provided for safe entry for vehicles turning into the Project site and the dedicated access road. The dedicated access road will be a dead end road, also open to the public, located adjacent to the warehouse precinct on the western boundary of the Project site.
- When exiting the Project site from the dedicated access road, all heavy vehicles will be restricted to left turns only at the Moorebank Avenue and Anzac Road intersection for travel towards the M5. There will be no restrictions on light vehicle movements at this intersection.

- Two IMT access gates, one for the Interstate Terminal and one for the IMEX Terminal as follows:
  - The Interstate IMT gate will provide access for heavy vehicles and would be located at the northern end of the Interstate terminal with direct access from the dedicated access road. This gate will be located a sufficient distance from the access road to allow inbound trucks to queue within the IMT boundary without impeding the flow of traffic on the access road, Moorebank Avenue or the functioning of the intersection with Anzac Road or the M5. Outbound traffic will still be able to queue within the IMT boundary along the approach to the Interstate IMT gate.
  - The IMEX gate will provide access for heavy vehicles to a dedicated IMEX truck loading area. This area processes the trucks which then parks in a designated bay and waits for their container to be delivered by a straddle crane or transfer vehicle. The truck then secures the load and leaves the area via the exit gate.
- Internal warehouse access roads that interface the warehouse precinct, on the western side of the Project site, with the terminals, providing direct internal access for the ITVs to the warehouses from the IMEX and Interstate terminal.
- No grade separated crossing over the IMEX and interstate rail track is proposed at the south-western corner of the Project site for the southern rail access option.

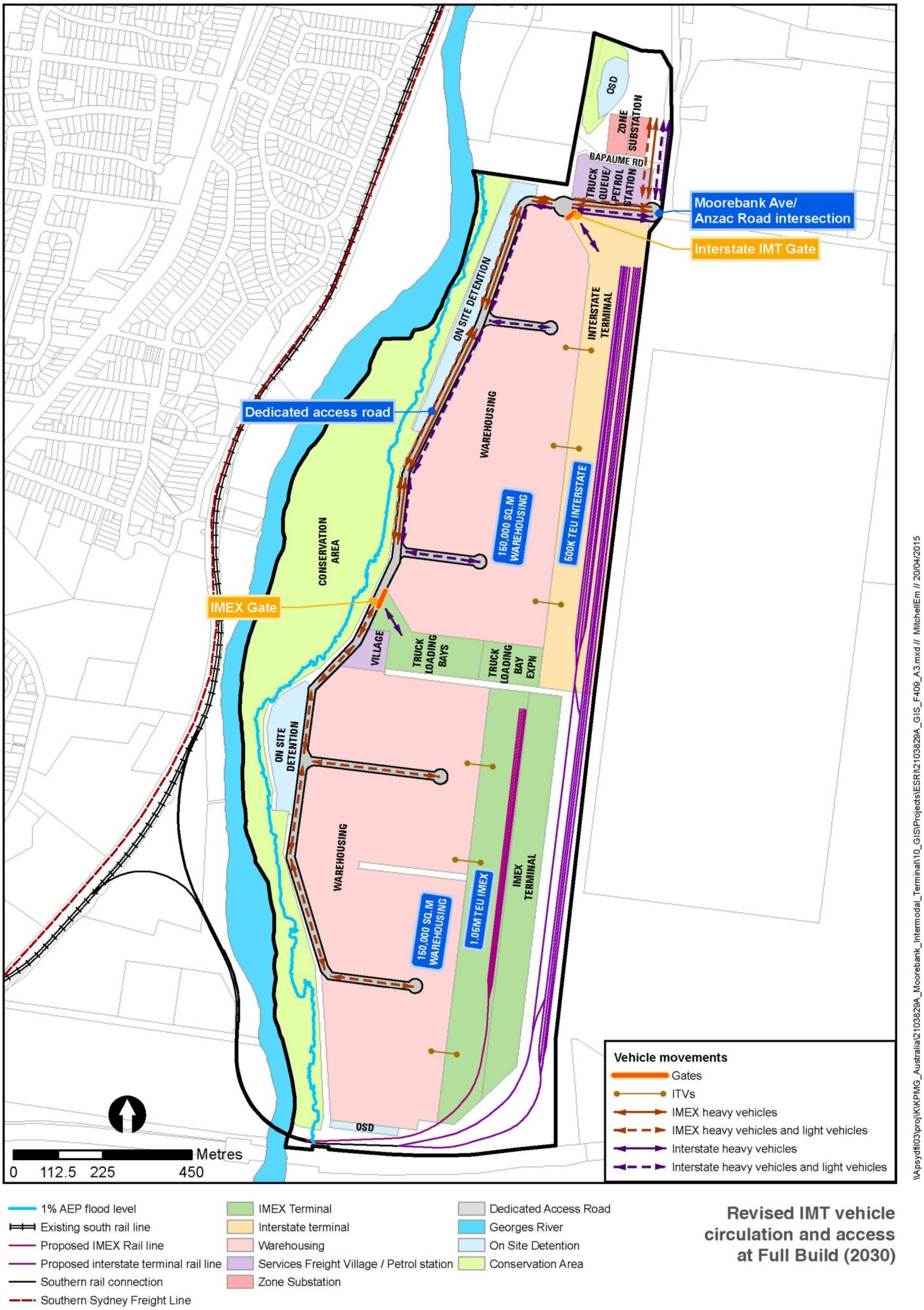


Figure 3.2 **Indicative Moorebank IMT vehicle circulation and access associated with the southern rail access option – Full build in 2030**

3.5 Staff parking

All staff parking for IMEX, interstate and warehouse operations would be provided within the Project site at dedicated parking areas.

3.6 Bus services

The Project site will be designed to accommodate for potential regular bus or shuttle bus services internal to the site. Site access at intersections and adequate turnaround facility will be provided should these services occur. Ideally the provision of bus services and bus stop facilities on Moorebank Avenue adjacent to the Project site would be preferred.

3.7 Pedestrian and cyclist facilities

To accommodate the increase in background traffic and the Moorebank IMT development, 4.3 m borders are included on both sides of Moorebank Avenue in the road reserve cross-section. A border is the distance between the right of way and the property boundary. The width is based on an arterial road standard allowance as per Austroads 2009, *Guide to Road Design Part 3: Geometric Design*. The 4.3 m border would accommodate the proposed footpath/shared use path.

4. Project road and intersection upgrades

Summary of changes from the Environmental Impact Statement Traffic and Transport Assessment:

– Single construction access to the Project site from 2016 onwards.
– Upgrade of Moorebank Avenue between the M5 and Anzac Road.
– Larger Anzac Road and Moorebank Avenue intersection footprint.
– Internal road access to include internal roundabout.
– Discussion on proposed M5/Moorebank Avenue Interchange upgrades by SIMTA.
– Proposed timeframe of road and intersection upgrades by SIMTA.

4.1 Moorebank IMT construction accesses

All Moorebank IMT construction vehicle access would be via the Moorebank Avenue, Anzac Road and Moorebank IMT Access Road intersection from 2016 to 2028 during the construction stages of the Project.

Construction vehicle access during the Early Works Phase of the Project in 2015 would be via existing intersections along Moorebank Avenue including Bapaume Road, Defence Support Access and Chatham Avenue.

Construction accesses have changed due to the removal of new intersections along Moorebank Avenue to the south of Anzac Road.

4.2 Moorebank Avenue upgrades

Existing (2014) intersection performances indicate that intersections along Moorebank Avenue between Cambridge Avenue and the M5 are performing near or at capacity at present. Future year background traffic growth on Moorebank Avenue as discussed further in section 7.1, would lead to increased traffic volumes on Moorebank Avenue and further deteriorating intersection performance. Intersection and roadway capacity will worsen and hence the need for an upgrade of Moorebank Avenue. The Moorebank Avenue upgrade would be required purely on background traffic growth alone based on existing intersection operation and vehicle movements.

As part of the Project, Moorebank Avenue is proposed to be upgraded to a four lane divided roadway from the M5 interchange to Anzac Road in 2016. One new intersection is proposed to provide access to the Moorebank IMT site with the existing intersection at Anzac Road being retained with the implementation of the Moorebank IMT Access Road leg included to create a four way signalised intersection.

4.3 Moorebank Avenue, Anzac Road and Moorebank IMT Access intersection

The SIMTA development is proposing the following intersection layout for the Moorebank Avenue, Anzac Road and Moorebank IMT Access intersection as shown in Figure 4.1 and would be constructed in 2016. This intersection would be traffic signal controlled with indented right and left turn lanes as required. Generally pedestrian footpaths or shared paths are proposed on both sides of the road with signalised pedestrian crossings at the intersection. This intersection layout would also form the basis for future mesoscopic modelling to be undertaken at a later stage.

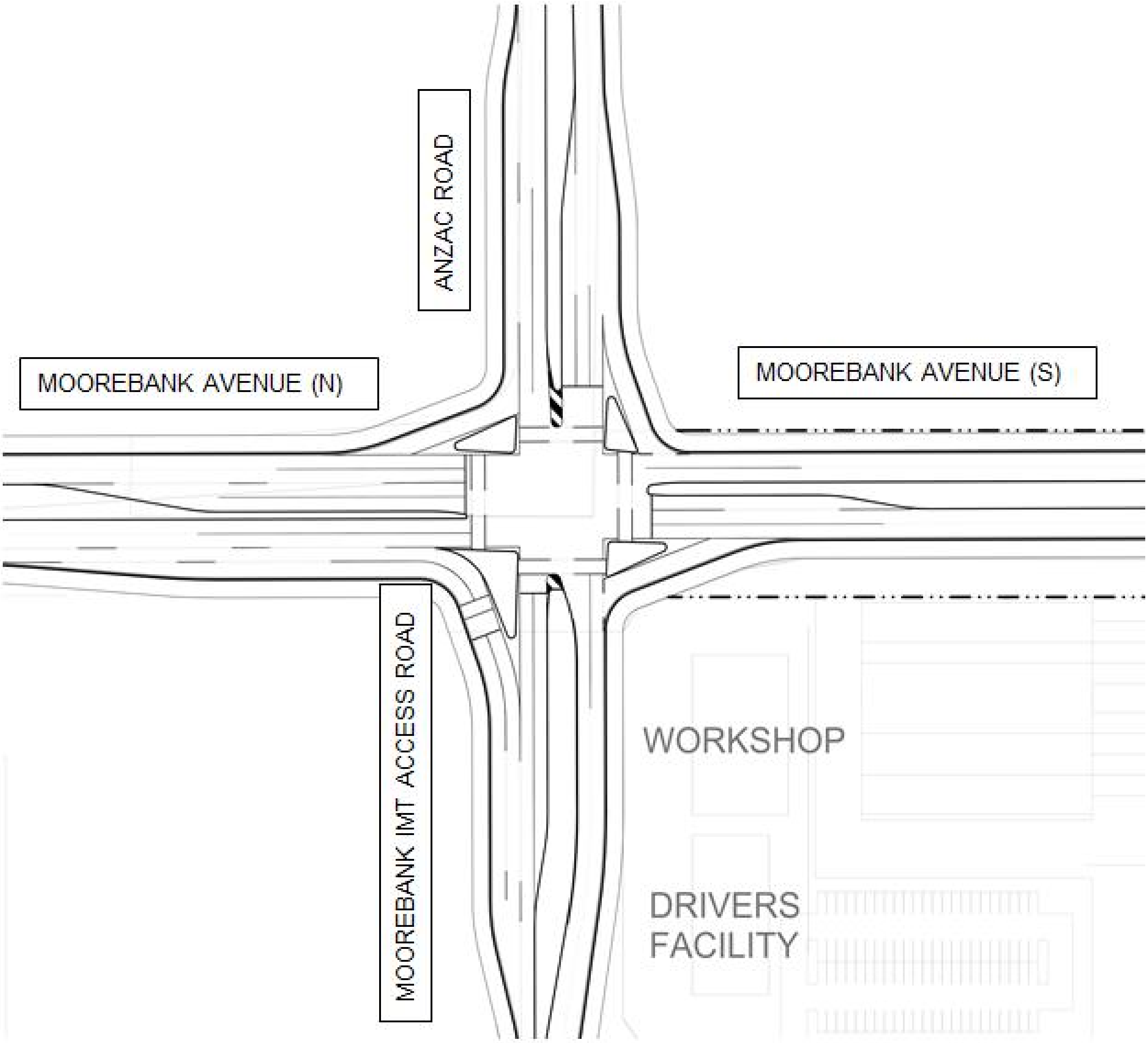


Figure 4.1 Proposed Moorebank Avenue, Anzac Road and Moorebank IMT Access intersection

4.4 Moorebank Avenue intersections

SIMTA proposes to undertake Moorebank Avenue and Moorebank Avenue intersections into the future. These proposed upgrades by SIMTA have been included in this assessment as they form part of the cumulative assessment undertaken. As documented in Table 4 of Section 6 in the *Sydney Intermodal Terminal Alliance (SIMTA) Submissions Report* December 2013 prepared by Urbis, the following upgrades are proposed to intersections along Moorebank Avenue:

- Provide a new traffic signal at SIMTA's Northern access with Moorebank Avenue.
- Provide a new traffic signal approximately 750 metres south of SIMTA Central access.
- Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue grade separated interchange and the southern SIMTA site access. Some localised improvements will be required around central and southern access points (to be addressed within 24 months of operating at 300,000 TEU throughput per annum).
- Potential upgrading works at the M5 Motorway/Moorebank Avenue grade separated interchange (to be addressed within 24 months of operating at 500,000 TEU throughput per annum).

5. Future year traffic modelling

Summary of changes from the Environmental Impact Statement Traffic and Transport Assessment:

The future year traffic scenarios assessment has been revised based on Project land use yields, the timing of construction and operation of the facility, cumulative scenario traffic distribution and generation, and revised peak period heavy vehicle percentages of total daily traffic.

This section discusses the traffic modelling program utilised for the traffic assessment and future assessment years and scenarios.

5.1 Traffic modelling program

SIDRA Intersection version 6 software was used as the modelling tool to undertake the modelling for this project as agreed with RMS. This version of SIDRA allows intersections to be modelled as a network, allowing the interaction of queues between intersections to be modelled. Due to the close spacing of the Moorebank Avenue/Newbridge Road intersection and Moorebank Avenue/Heathcote Road intersection and Moorebank Avenue and Industrial Park Access intersection, these have been grouped into network models in SIDRA.

5.2 Future year assessment

For the Response to Submissions Report, the focus of the assessments is on the *changes to the impact* relative to that predicted in the EIS. Adopting this approach it was identified that a number of impacts remain largely unchanged relative to the EIS assessments and that any minor changes of impact could be addressed during the subsequent stages of the SSD process.

The assessment of the revised Project and development phasing, where remodelling has been undertaken (noise and vibration, transport and access, local air quality and human health), follows the same approach to the EIS, with an assessment of the southern rail access only.

This approach allows for assessment of potential worst case impacts, by considering the cumulative impacts of simultaneous construction and operational activities. As with the EIS, this assessment approach has also been applied to the Response to Submissions Report to provide transparency to the community and approval agencies Department of Environment (DoE) and NSW Department of Planning & Environment (DP&E) in relation to the potential impacts over the course of development of the Project.

For the studies where remodelling has required, the assessment was undertaken for the following four scenarios:

- Scenario 1 – (Phase A) 2016 (construction only)
- Scenario 2a – (Phase B) 2019 (construction and operation)
- Scenario 2b – (Phase C) 2023 (construction and operation)
- Scenario 3 – (Full Build) 2030 (operation only).

Figure 5.1 shows the relationship between the Project development phases and the assessment scenarios. Additional traffic modelling was also undertaken for 2025 and 2028.

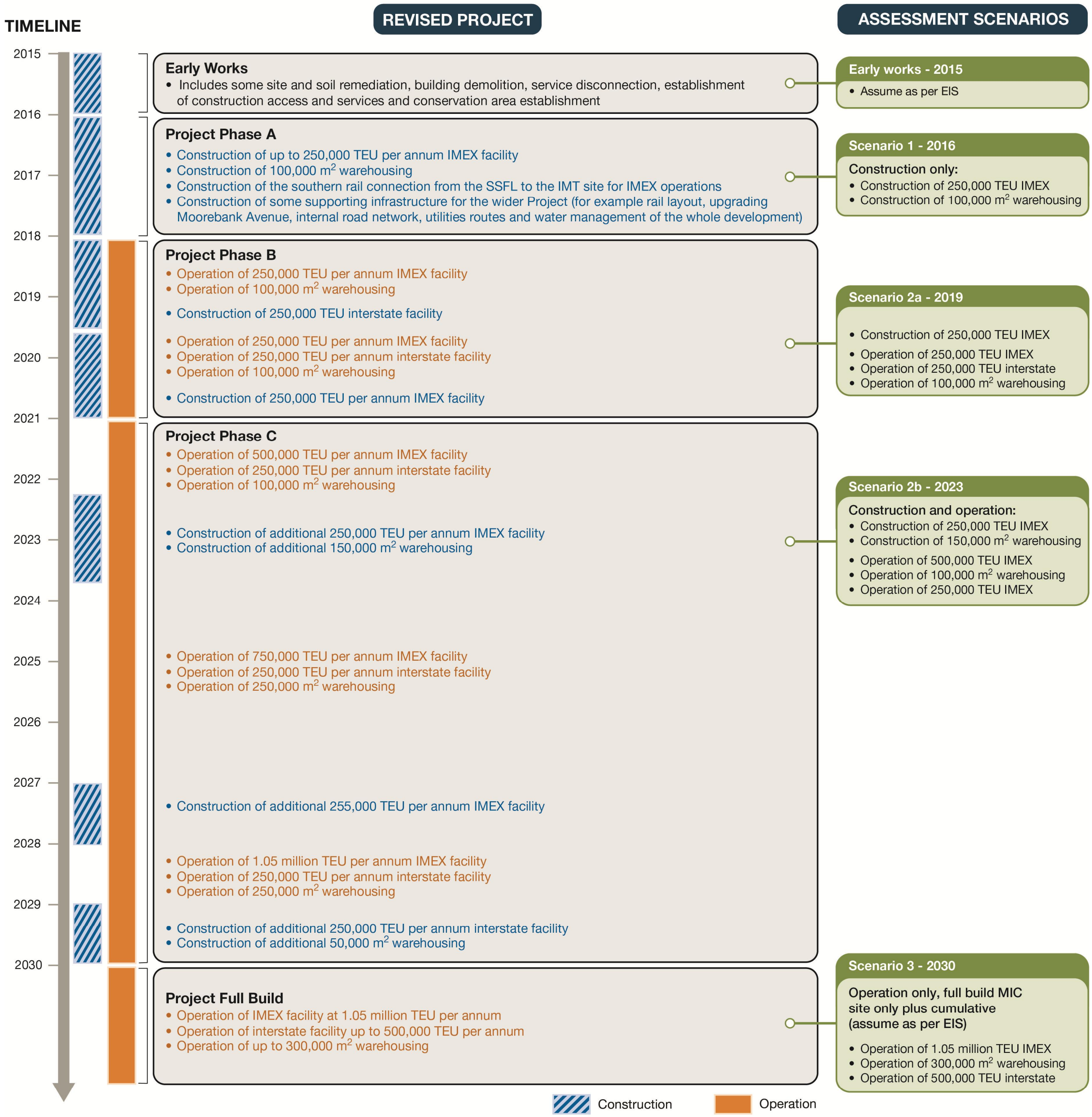


Figure 5.1 Relationship between the Project development phasing and assessment scenarios

5.3 Cumulative scenarios

This sub section provides a description of the approach to the cumulative impact assessment of the Moorebank IMT and the proposed development on the SIMTA site and the potential traffic impacts associated with the development of both sites. The cumulative assessment has been completed based on the Moorebank IMT southern rail access option for Cumulative Scenario's A, B, C and C1.

The SIMTA proposal has been assessed by the NSW Department of Planning and Environment and was subsequently approved by the NSW Planning Assessment Commission (PAC) on 29 September 2014 (albeit for an interim capacity of 250,000 TEU IMEX freight and an eventual 500,000 TEU). The *SIMTA Traffic and Transport Assessment* prepared by Hyder Consulting in 2013 assesses the traffic impacts of the proposed facility based on the development described in the SIMTA EIS, being 1 million TEU IMEX and 300,000 sq. m warehousing. Parsons Brinckerhoff has extracted some of the information from this report in preparation of this cumulative impact assessment including traffic generation, shift operation, warehouse development yields and site access locations onto Moorebank Avenue.

The site for the SIMTA development is to the immediate east of the Project site and the two projects would, if both approved, operate simultaneously.

Four cumulative scenarios were analysed to determine their traffic generating impact on the road network utilising the southern rail access and include:

- Cumulative scenario A – 1.05 million TEU IMEX, 500,000 TEU Interstate, 300,000 sq. m warehouse on Moorebank IMT site and 300,000 sq. m standalone warehouse operation on the SIMTA site in 2030.
- Cumulative scenario B – 500,000 TEU Interstate, 300,000 sq. m warehouse on Moorebank IMT site and 1.0 million TEU IMEX, 300,000 sq. m warehouse operation on the SIMTA site in 2030.
- Cumulative scenario C1 – 250,000 TEU IMEX, 250,000 TEU Interstate, 300,000 sq. m warehouse on Moorebank IMT site and 250,000 TEU IMEX and 200,000 sq. m warehouse on the SIMTA site in 2020.
- Cumulative scenario C2 – 550,000 TEU IMEX, 500,000 TEU Interstate, 300,000 sq. m warehouse on Moorebank IMT site and 500,000 TEU IMEX and 300,000 sq. m warehouse on the SIMTA site in 2030.

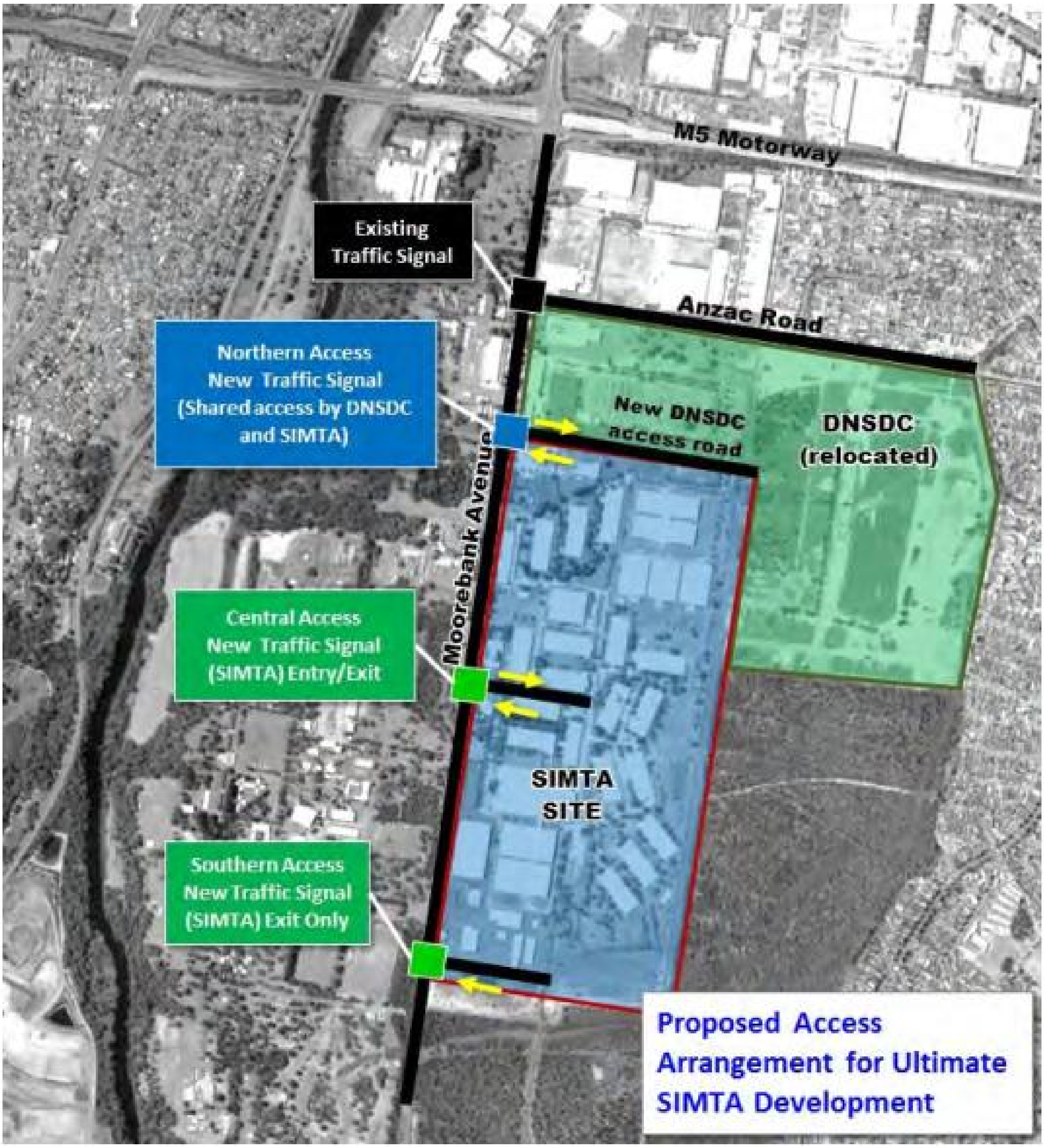
For these cumulative scenarios it is assumed that:

- The traffic generated by warehousing by Moorebank IMT is based upon Deloitte traffic generation rates for heavy vehicles and staffing requirements for light vehicles.
- The traffic generated by standalone warehousing on the SIMTA site or surplus warehousing on the Project site utilises the RMS daily trip generation rate, with 8.7% of daily light vehicle trips occurring during peak hours.
- The SIMTA site would be developed in accordance with the concept layout identified in Figure 5.2 with three access roads connecting with Moorebank Avenue (northern, central and southern accesses).
- The traffic generated by the SIMTA standalone warehouse operation is based upon RMS trip generation rates.
- The heavy vehicle distribution for the Moorebank IMT site is based upon the Freight Movement Model (FMM) distribution.
- The heavy vehicle distribution for the SIMTA site is based upon the Freight Movement Model (FMM) distribution from the M5 and from the SIMTA EIS onto Moorebank Avenue.
- The light vehicle distribution for Moorebank IMT is based upon the Sydney Strategic Travel Model (STM) for Moorebank Avenue and from intersection traffic volume distributions on the wider road network (beyond Moorebank Avenue).

- The light vehicle distribution for SIMTA is based upon the SIMTA EIS for Moorebank Avenue and from intersection traffic volume distributions on the wider road network (beyond Moorebank Avenue).
- Both sites are assumed to be operational 24 hours a day seven days a week.
- The majority of staff would arrive and depart outside the peak periods on the road network and the maximum traffic generation would occur during the shift changeover (at 6.00 am, 2.00 pm and 10.00 pm) for the Project site.
- The majority of staff would arrive and depart within the peak periods on the road network and the maximum traffic generation would occur during the shift changeover (at 8.00 am and 5.00 pm) for the SIMTA site.
- Light vehicle trip generation was assumed to be tidal during peak hours, i.e. all inbound in the AM peak and all outbound in the PM peak, and heavy vehicles were assumed to be evenly distributed between inbound and outbound movements.
- A heavy vehicle peak hour traffic profile of 7.7% for the AM peak and 9.3% for the PM peak utilised for both Moorebank IMT and SIMTA sites.

5.4 SIMTA site access

The proposed access locations for the SIMTA site are shown in Figure 5.2. Based on the SIMTA Traffic and Transport Assessment prepared by Hyder Consulting, the Northern and Central accesses would be utilised by both light and heavy vehicle for ingress and egress and the Southern access for heavy vehicle egress only. These accesses have been utilised in various forms for all four cumulative scenarios.



Source: SIMTA Traffic and Transport Assessment, Hyder Consulting 2013

Figure 5.2 Proposed SIMTA site access locations

6. Traffic generation and distribution

Summary of changes from the Environmental Impact Statement Traffic and Transport Assessment:

– Revised construction staging and construction traffic generation.
– Revised Project traffic generation based upon increased truck capacities to hold increased pallet loads, revised peak period heavy vehicle traffic percentage of daily traffic.
– Revised traffic distribution for facilities on the SIMTA site.
– Revised daily traffic profile on Moorebank Avenue between the M5 and Anzac Road due to revised traffic generations and increased peak hour heavy vehicle percentages.

This section outlines the forecast traffic generation from the Project site. This includes the operation and construction phases for the IMEX, interstate and the warehouse developments. The assumptions behind these calculations are provided in this section.

In general, the traffic generated by the Moorebank IMT development will include:

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

It was assumed there would be no significant commercial vehicle traffic generated by this development as the freight associated with this terminal would be transported to and from the Project site as pallets or containers on trucks.

6.1 Construction

The construction vehicle volumes are based on an indicative construction schedule and the estimated volume of material to be shifted during the various stages of construction. The maximum traffic generator for the Project site is the removal of spoil and delivery of fill. These volumes may differ to the eventual volume experienced by the Project site depending on the capacity of machinery used.

Heavy vehicle movements generated by construction activities were assumed to be consistent throughout the hours of construction during the day, with 25% of the hourly heavy vehicle volume arriving just before and after construction start and finish each day to align with construction working hours.

The number of construction staff onsite was determined according to the indicative construction schedule. It was assumed that 90% of staff would drive to work, where:

- 80% of workers arrive before morning peak hour and leave after the afternoon peak hour
- 20% of workers arrive during the morning peak hour and leave during the afternoon peak hour
- 50% of workers leave the Project site and return in the middle of the day
- Each staff member will generate three light vehicle trips a day on average.

Hours of construction are assumed as follows:

- Monday to Friday – 7.00 am to 6.00 pm.
- Saturday – 8.00 am to 3.00 pm.
- No work will be undertaken on Sundays or public holidays.

Based on the construction schedule and the volume of material, the assumed maximum daily volume of construction vehicle trips calculated for each stage is shown in Table 6.1.

Table 6.1 Construction vehicle volumes

Stage	Daily vehicle movements		Peak hourly vehicle movements	
	Cars	HV	Cars	HV
Early Works (2015)	810	64	54	10
Scenario 1 (2016)	2295	1390	153	152
Scenario 2a (2019)	1485	260	99	28
Scenario 2b (2023)	2080	360	139	40

6.2 Operations

6.2.1 Intermodal terminal traffic generation – IMEX and Interstate facilities

The train and road traffic generation of the Moorebank IMT was sourced from the *Moorebank Intermodal Terminal Demand Estimate Summary – Trip Generation Modelling* (Deloitte January 2015), based on the annual TEU forecast freight movements for the IMEX and interstate facilities.

Train generation

Deloitte demand modelling estimated that IMEX would have a capacity of approximately 1.05 million TEU per annum split between imports and exports (approximately 525,000 TEU in/525,000 TEU out) in 2030. As a result of this demand, IMEX would generate approximately 273 train trips per week with the IMEX facility operating 24 hours 7 days a week. The forecast TEU is comprised of the following:

- 52.3% import, TEU.
- 16.5% export TEU.
- 31.2% empty TEU.

The demand model estimated that interstate would cater for around 500,000 TEU per annum by 2030, (approximately 30 train trips per week with the interstate facility operating 24 hours 7 days a week) where freight is received or handled prior to distribution outside the Sydney metropolitan region. Of this around 406,000 TEU were assumed to be associated with truck movements to and from the Moorebank IMT.

6.2.1.1 Derivation of truck numbers from TEU demand

The forecast train movements and their container loading will result in the generation of truck demand to transport those containers. Deloitte derived the relationship between TEU demand and truck movements in and out of the Moorebank IMT based on the following process:

Approach to estimating daily truck trips generated from Moorebank IMT

In order to estimate the daily heavy vehicles generated from the Moorebank IMT, the forecast container volumes for the terminal at 2030 were derived. These estimates were broken down into three categories for containers both arriving and departing the Project site by rail:

- Full container load (FCL) movements arriving or departing the terminal by rail and moving directly offsite or onsite by road.
- FCLs moving within the Project site between the rail terminal and associated warehousing with all cargo arriving or leaving the warehouses by truck as deconsolidated or palletised cargo.
- Empty (MT) containers.

Warehouse related FCLs were further broken down equally into two segments: Freight of all kinds (FAK) to be deconsolidated (i.e. unpacked from containers and broken up into smaller packages) and delivered; and inventory, which was assumed to be held in the warehouse for a period prior to delivery. It has been assumed that FCLs and MTs would leave the Project site on a combination of semi-trailers and B-doubles whilst FAK and Inventory would leave the Project site on a mix of semi-trailers and rigid trucks.

2030 Traffic – IMEX and Interstate

The terminal is anticipated to handle 500,000 TEU of interstate and close to 1.05 million TEU of IMEX throughput when it reaches full capacity. For the purposes of investigating the full capabilities of the IMEX and Interstate terminals, it is assumed that these terminals and the warehouses will be operating at full capacity in 2030.

The following steps were taken to derive the daily truck movements in and out of Moorebank IMT:

1. Of the 1.55 million TEU expected to be handled through the terminal in 2030, the breakdown between IMEX and interstate is:

   1,546,000 TEU = 1,046,000 IMEX TEU + 500,000 interstate TEU

2. Of the 1.046 million IMEX TEU handled, the breakdown between full imports, full exports and empty containers is:

   1,046,000 TEU = 547,000 full import TEU + 173,000 full export TEU + 326,000 empty TEU

3. Of the 500,000 Interstate TEU handled, the proportion not unloaded from the inbound train and the proportion unloaded from the train, to be transported via the road network are:

   500,000 TEU = 406,000 TEU via the road network + 94,000 TEU not transferred outside the terminal

4. Of the 406,000 Interstate TEU to be transported via the road network, the breakdown between full inbound, full outbound and empty containers is:

   406,000 TEU = 149,000 full inbound TEU + 149,000 full outbound TEU + 108,000 empty TEU

   This leads to a new total of:

   1,452,000 TEU by road = 1,046,000 IMEX TEU + 406,000 Interstate TEU

5. Of the 1.452 million total TEU by road in 2030, the breakdown between containers leaving the Project site by road and containers arriving at the Project site by road are as follows:

   1,452,000 TEU = 702,000 inbound TEU + 750,000 outbound TEU

6. Of the 702,000 TEU containers arriving at the Project site, 627,200 TEU arrive by road and 74,800 by rail, the breakdown between loaded and empty containers is as follows:

   627,200 TEU = 321,500 loaded TEU + 305,700 empty TEU

7. Of the 750,000 TEU containers leaving the Project site by road the breakdown between loaded and empty containers is as follows:

   750,000 TEU = 695,500 loaded TEU + 54,500 empty TEU

8. In 2030, it was assumed that approximately 80% of the loaded combined TEU would move to and from the Project site as containers and 20% of the loaded combined TEU would move through the onsite warehousing. The empty containers were all assumed to move directly to and from the Project site:

   321,500 loaded TEU inbound = (321,500 x 80% direct to the Project site) + (321,500 x 20% to onsite warehousing)

   = 257,200 loaded TEU direct + 64,400 TEU via warehouses

   695,500 loaded TEU outbound = (695,500 x 80% direct from the Project site) + (695,500 x 20% from onsite warehousing)

   = 556,400 loaded TEU direct + 139,200 TEU via warehouses

   360,200 empty TEU inbound and outbound = 305,700 empty TEU inbound + 54,500 empty TEU outbound

9. As outlined above it was assumed that all of the empty containers and approximately 80% of the loaded total TEU would move off the Project site as containers. The 20% going via warehouses was split equally resulting in 10% going to warehousing onsite for deconsolidation (FAK) and direct delivery and 10% going to warehousing for deconsolidation and placement into inventory for later delivery.

   1,173,800 Direct TEU = 435,000 empty TEU -74,800 + 257,200 loaded direct into terminal + 556,400 loaded TEU direct out of terminal

   203,400 TEU via warehouses = 139,200 TEU out of warehouses + 64,400 TEU into warehouses = (139,200 x 50% FAK) + (139,200 x 50% Inventory) + (64,400 x 50% FAK) + (64,400 x 50% Inventory) = (69,600 FAK and 69,600 Inv) leaving the Project site from warehouses + (32,200 FAK and 32,200 Inv) arriving at Project site warehouses
   = 102,000 TEU to and from the warehouses and 102,000 TEU inventory

10. This can be further summarised into the total number of IMEX and Interstate TEU (1.452 million) split into total FCL Direct (1.249 million) and total TEU via the warehousing onsite (0.250 million):

    1,452,000 TEU = 1,249,000 containers direct to/from customers + 102,000 FAK TEU + 102,000 Inventory TEU

Direct FCL and empty container movements by road

1. The demand analysis has determined likely future demand for both IMEX and interstate markets where Sydney is either an origin or a destination. For the purposes of simplification all international and interstate cargo destined for the Sydney market is referred to in the following as imports – all international and interstate cargo leaving the Sydney market is referred to as exports.

   610,900 TEU leaving the Project site by road (imports) = 556,400 full import TEU + 54,400 empty import TEU

   562,900 TEU arriving at the Project site by road (exports) = 257,200 full export TEU + 305,700 empty export TEU

2. It is assumed that the terminal would be operational 52 weeks per year.

   11,748 TEU leaving the IMT by road per week = 610,900 import TEU ÷ 52

   10,825 TEU arriving at the IMT by road per week = 562,900 export TEU ÷ 52

3. It was assumed that trucks moving containers in and out of Moorebank IMT will comprise 80% semi-trailers and 20% B-Doubles based on similar intermodal operations:

   Semi-Trailer TEU (80% of TEU arriving at or leaving the terminal):

   9,398 TEU out on a Semi = 11,748 TEU x 80%

   8,660 TEU in on a Semi = 10,825 TEU x 80%

   B-double TEU (20% of TEU arriving at or leaving the terminal):

   2,350 TEU out on a B-double = 11,748 TEU x 20%

   2,165 TEU in on a B-double = 10,825 TEU x 20%

4. Each Semi-Trailer truck is assumed to have the capacity to carry 2 TEU with an utilisation of 80% on average resulting in an average 1.6 TEU per Semi-Trailer truck. B-double trucks will have the capacity to carry 3 TEU, and with an average utilisation of 80% the resulting average TEU per B-double truck is 2.4. Using these factors, the weekly total loaded truck movements can be derived.

   5,874 Semis out of terminal per week = 9,398 TEU out on a Semi ÷ 1.6 TEU per Semi

   5,412 Semis into terminal per week = 8,660 TEU in on a Semi ÷ 1.6 TEU per Semi

   979 B-doubles out of terminal per week = 2,350 TEU out on B-Double ÷ 2.4 TEU per B-double

   902 B-doubles into terminal per week = 2,165 TEU in on B-Double ÷ 2.4 TEU per B-double

5. In addition, each outbound movement outlined above will also generate an inbound movement. It is assumed that some load matching would occur, i.e. rather than every truck having to do an empty return journey to its origin, a portion of the journeys could be loaded both ways. For example, some outbound full import movements could be matched with full export or empty containers inbound, the remainder of the trucks would arrive empty. It was assumed that this load matching would be limited to only 30% of loaded semi-trailer truck movements (generated off the direction with the more significant volume). The 30% load matching has been advised by freight logistics specialists in Deloitte and the same load matching factor was adopted by the SIMTA Traffic and Transport Assessment prepared by Hyder Consulting. There are currently no intermodal terminals in Australia of the nature and scale proposed at the Project site to use as a reference. However, the load matching being achieved at the Fremantle Ports precinct (incorporating empty container park facilities and warehousing) which was 43% in 2013, an increase from 39% in 2012 (Fremantle Ports, July 2014). It is therefore considered that the 30% load matching is a realistic estimate for the Moorebank IMT. All other movements would generate an empty running leg into or out of the terminal.

   To generate the empty running trips for each truck type:

   Empty running trips in = loaded trips out X (1 – % load matching factor):

   4,112 semis empty into terminal per week = 5,874 loaded semis outbound X (1 - 30% matched loads)

   979 B-doubles empty into terminal per week = 979 loaded B-doubles outbound X (1 - 0% matched loads)

   Empty running trips out = loaded trips in – (loaded trips out – empty running trips in):

   3,650 semis empty out of terminal = 5,412 loaded semis inbound – (5,874 loaded semis outbound – 4,112 empty semis inbound).

902 B-doubles empty out of terminal per week = 902 loaded B-doubles inbound – (979 loaded B-doubles outbound – 979 empty B-doubles inbound).

By adding the total inbound and outbound movements the total truck movements can be estimated. To generate total number of trips for each truck type:

Total trips per week = loaded trips out + empty trips out + loaded trips in + empty trips in

Total B-double movements = 979 loads out + 902 empty out + 902 loads in + 979 empty in

= 1,881 trips out + 1,881 trips in

= 3,762 trips

Total semi movements = 5,874 loads out + 3,650 empty out + 5,412 loads in + 4,112 empty in

= 9,524 trips out + 9,524 trips in

= 19,048 trips

6. It was then assumed that 85% of container truck movements would occur on weekdays and 15% would occur on weekends based on current profiles at Port Botany. The proportion on weekdays was then divided by 5 to reach an average number of truck moves per weekday, assuming two truck movements per truck trip.

   (3,762 B-double trips per week X 85%) ÷ 5 = 639 B-double movements per weekday

   (19,048 semi trips per week X 85%) ÷ 5 = 3,238 Semi movements per weekday

Total inbound and outbound moves per weekday for 2030 is summarised in Table 6.2.

Table 6.2 Moorebank terminal daily traffic movements

Truck status	Direction	Truck type	2030
IMEX			
Loaded	Inbound	B-double	106
		Semi	637
	Outbound	B-double	119
		Semi	715
Empty	Inbound	B-double	119
		Semi	501
	Outbound	B-double	106
		Semi	422
Total	Inbound	B-double	225
		Semi	1138
	Outbound	B-double	225
		Semi	1138
Interstate			
Loaded	Inbound	B-double	47
		Semi	283
	Outbound	B-double	47
		Semi	283

Truck status	Direction	Truck type	2030
Empty	Inbound	B-double	47
		Semi	198
	Outbound	B-double	47
		Semi	198
Total	Inbound	B-double	94
		Semi	481
	Outbound	B-double	94
		Semi	481

Source: *Moorebank Intermodal Terminal Trip Generation Estimate, January 2015 (Deloitte)*

7. Daily truck volumes were multiplied by 7.7% in the AM peak and 9.3% in the PM peak to generate indicative peak hourly truck volumes for each vehicle class, both inbound and outbound.

   Average trucks per weekday in each direction x 7.7% = trucks on and off site per hour in AM peak:

   639 B-double movements per weekday divided by 2 x 7.7% = 25 B-double truck movements in AM peak hour in each direction.

   3,238 Semi movements per weekday divided by 2 x 7.7% = 125 Semi truck movements in AM peak hour in each direction.

   Average trucks per weekday in each direction x 9.3% = trucks on and off site per hour in PM peak:

   639 B-double movements per weekday divided by 2 x 9.3% = 30 B-double truck movements in PM peak hour in each direction.

   3,238 Semi movements per weekday divided by 2 x 9.3% = 151 Semi truck movements in PM peak hour in each direction.

Table 6.3 Moorebank terminal peak hour traffic movements

Facility	Direction	Truck type	2030 AM	2030 PM
IMEX	Inbound	B-double	17	21
		Semi	88	106
	Outbound	B-double	17	21
		Semi	88	106
Interstate	Inbound	B-double	7	9
		Semi	37	45
	Outbound	B-double	7	9
		Semi	37	45
Total	Inbound	B-double	25	30
		Semi	125	151
	Outbound	B-double	25	30
		Semi	125	151

Source: *Moorebank Intermodal Terminal Trip Generation Estimate, January 2015 (Deloitte)*

The arrival of trucks to the terminal would be controlled by a booking system managed by the terminal operators. The proposed booking system is assumed to have a similar operation to that used by Port Botany. This tends to create an even arrival profile of trucks collecting and delivering containers throughout the day. Trucks that arrive early to the terminal may be required to wait on the internal Project site service road. No parking of trucks would be permitted on Moorebank Avenue.

6.2.2 Warehouse traffic generation

The total proposed warehouse GFA as part of the concept plan is approximately 308,000 m^2.

Warehouse generated truck traffic movements were estimated using a similar methodology to the derivation of container truck movements through the IMEX and Interstate operations, with some variation to the underlying assumptions. The most significant changes to the assumptions were:

- the makeup of the fleet
- the proportion of movements occurring during the week
- the level of load matching.

The following steps were taken to derive the daily truck movements in and out of Moorebank IMT for cargo handled through the warehouses:

1. The Moorebank IMT will have enough on-site warehousing capacity to handle approximately 20% of all full TEU. It is assumed that half of these will be held in inventory in onsite warehousing for a period of weeks with the rest being general cargo (FAK) which would be deconsolidated and distributed offsite within a few days or arrive onsite for consolidation and export.

   69,600 TEU FAK for distribution from the Project site = 695,500 full inbound TEU x 10% FAK

   69,600 TEU Inventory for distribution from the Project site = 695,500 full inbound TEU x 10% Inventory

   32,200 TEU FAK arriving at the Project site for consolidation = 321,500 full outbound TEU x 10% FAK

   32,200 TEU Inventory arriving at the Project site for consolidation = 321,500 full outbound TEU x 10% Inventory.

2. It is assumed that the terminal would be operational 52 weeks per year.

   2,675 TEU into warehouse and distributed off site each week = 69,600 FAK + 69,600 Inventory TEU ÷ 52

   1,237 TEU arrive onto the Project site and into warehouse each week = 32,200 FAK + 32,200 Inventory TEU ÷ 52.

3. It is assumed that each TEU, when deconsolidated will generate approximately 25 pallet loads for domestic distribution:

   66,879 equivalent pallet loads into warehouse and distributed off site by road each week = 2,675 TEU x 25 equivalent pallet loads per TEU.

   30,917 equivalent pallet loads into warehouse by road and railed offsite each week = 1,237 x 25 equivalent pallet loads per TEU.

4. The truck fleet profile for palletised cargo would be different to that for direct FCL and MT container movements to and from the Moorebank terminal. It is assumed that trucks moving pallets out of Moorebank IMT warehousing will comprise of 34% semi-trailers and 66% rigid trucks whilst 100% of the palletised cargo arriving at the Project site will be carried by rigid trucks:

   Deliveries from Moorebank warehouses*:*

   22,739 pallets out on semi-trailer trucks = 66,879 pallets per week x 34%

   44,140 pallets out on rigid trucks = 66,879 pallets per week x 66%.

Deliveries to Moorebank warehouses:

30,917 pallets in on rigid trucks = 30,917 pallets per week x 100%.

5. Semi-trailer trucks are likely to carry, on average 40 pallets per truck whilst rigid trucks have been assumed to carry, on average 20 pallets per load. Dividing the number of pallets by each average load determines the average number of loaded truck movements per week into and out of the warehouses.

   Deliveries from Moorebank warehouses:

   568 loaded semi-trailer truck movements out per week = 22,739 pallets in semis per week ÷ 40 pallets per truck

   2,207 loaded rigid truck movements out per week = 44,140 pallets in rigids per week ÷ 20 pallets per truck.

   Deliveries to Moorebank warehouses:

   1,546 loaded rigid truck movements in per week = 30,917 pallets in rigids per week ÷ 20 pallets per truck.

6. It is assumed that there will be no truck load matching for palletised cargo movement to and from the Moorebank IMT warehouses. Therefore all movements would generate an empty running leg into or out of the terminal. By adding the total inbound and outbound movements the total truck movements can be estimated.

   Empty running trips in = loaded trips out X (1 – % load matching factor):

   568 semis empty into terminal per week = 568 loaded semis outbound X (1 - 0% matched loads)

   2,207 empty rigids into terminal per week = 2,207 loaded rigids outbound X (1 - 0% matched loads)

   1,546 empty rigids out of terminal per week = 1,546 loaded rigids inbound X (1 - 0% matched loads).

   By adding the total inbound and outbound movements the total truck movements can be estimated. To generate total number of trips for each truck type:

   Total trips per week = loaded trips out + empty trips out + loaded trips in + empty trips in

   Total semi movements = 568 loads out + 0 empty out + 0 loads in + 568 empty in

   = 568 trips out + 568 trips in

   = 1,137 trips per week

   Total rigid movements = 2,207 loads out + 1,546 empty out + 1,546 loads in + 2,207empty in

   = 3,753 trips out + 3,753 trips in

   =7,506 trips per week.

7. It was then assumed that 95% of container truck movements would occur on weekdays and 5% would occur on weekends. The proportion on weekdays was then divided by 5 to reach an average number of truck moves per weekday:

   216 semi-trailer movements per weekday = (1,137 semi-trailer movements per week X 95%) ÷ 5

   1,426 rigid truck movements per weekday = (7,506 rigid truck movements per week X 95%) ÷ 5.

Total inbound and outbound truck movements per weekday for 2030 is summarised in Table 6.4.

Table 6.4 Moorebank warehouse daily truck movements

Facility	Direction	Truck type	2030
IMEX	Inbound	B-double	0
		Semi	294
	Outbound	B-double	108
		Semi	420
Interstate	Inbound	B-double	108
		Semi	420
	Outbound	B-double	0
		Semi	294
Total	Inbound	B-double	108
		Semi	714
	Outbound	B-double	108
		Semi	714

Source: *Moorebank Intermodal Terminal Trip Generation Estimate, January 2015 (Deloitte)*

8. Daily truck volumes were multiplied by 7.7% in the AM peak and 9.3% in the PM peak to generate indicative peak hourly truck volumes for each vehicle class, both inbound and outbound:

   Trucks on and off site per hour in AM peak in each direction = Average trucks per weekday x 7.7%

   8 semi-trailer movements in AM peak hour in each direction = 108 semi movements per weekday x 7.7%

   55 rigid truck movements in AM peak hour in each direction = 714 rigid movements per weekday x 7.7%

   Trucks on and off site per hour in PM peak in each direction = Average trucks per weekday x 9.3%

   10 semi-trailer movements in PM peak hour in each direction = 108 semi movements per weekday x 9.3%

   66 rigid truck movements in PM peak hour in each direction = 714 rigid movements per weekday x 9.3%

Table 6.5 Moorebank warehouse peak hour truck movements

Facility	Direction	Truck type	2030 AM	2030 PM
Total	Inbound	Semi	8	10
		Rigid	55	66
	Outbound	Semi	8	10
		Rigid	55	66

Source: *Moorebank Intermodal Terminal Trip Generation Estimate, January 2015 (Deloitte)*

The shift pattern of the warehouses is expected to follow the terminal operations with a 24 hour operation from 2030.

6.2.3 Staff traffic generation

Staff traffic generation is based on the number of staff for the IMEX and interstate terminals and Warehouses. The number of staff assumed for each facility is provided in Table 6.6.

Table 6.6 Terminal staff numbers

<table>
<tr><th>Staff type</th><th>IMEX</th><th>Interstate</th><th>Warehouse(1)</th><th>Total daily</th></tr>
<tr><td>Administration</td><td>35</td><td>35</td><td>22</td><td>92</td></tr>
<tr><td>Operations (by shift – 3/day)</td><td>104</td><td>78</td><td rowspan="2">496</td><td rowspan="2">2,082</td></tr>
<tr><td>Maintenance (by shift – 3/day)</td><td>9</td><td>7</td></tr>
</table>

(1) *Warehouse staffing sourced via RMS Guide to Traffic Generating Developments, 2013*

Source: *Staff numbers based on Moorebank IMT Staffing Requirements – Version 4, August 18, 2011 (Deloitte)*

Warehouse staff numbers were estimated using data from the RMS *Guide to Traffic Generating Developments,* 2013 traffic surveys. The total number of staff was calculated using a daily trip rate of 2.1 trips per 100 m^2, assuming approximately 70% of all trips are light vehicle (staff) and an average trip rate of three trips per person per day, assuming 50% of staff would travel offsite and return during the middle of the day:

6,468 vehicle trips per day = 308,000 m^2 GFA x 2.1 trips per 100 m^2

1509 staff (further broken down into 22 administration staff, 496 operations staff per shift) = 6,468 trips x 70% (light vehicles) ÷ 3 trips per staff/

The following assumptions have been made in the calculation of traffic generation for staff vehicles:

- Shift hours would be as follows:
  - administration – 8.30 am to 5.00 pm
  - operations and maintenance:
    - 6.00 am to 2.00 pm
    - 2.00 pm to 10.00 pm
    - 10.00 pm to 6.00 am.
- It is assumed that 90% of the staff for both IMEX and interstate would drive to the Project site. This assumes that 10% of staff may carpool, catch public transport or walk/cycle to the terminal. This is a conservative estimate. There is considerable scope to reduce reliance on car travel further by car share programs and the use of other transport modes such as public transport through the development of work place travel plans/green travel plans.
- All staff would arrive just prior to the start of their shift and depart directly after the shift.
- Traffic generated by IMEX and Warehouse staff in the intermediate years of operation would be based on the proportion of operations active at that time.

Based on the above assumptions, the administration staff would be the only light vehicle generator during both AM (6.45 am to 7.45 am) and PM (5.00 pm to 6.00 pm) peak hours on the road network. This traffic generation is shown in Table 6.7.

Table 6.7 Peak hour staff light vehicle traffic generation in the weekday AM and PM peak hours

	IMEX	Interstate	Warehouse
AM peak (inbound)	32	32	20
PM peak (outbound)	32	32	20

The maximum staff generation period would be during the shift changeover of the operation and maintenance staff. When both IMEX and interstate are in operation (from year 2030 onwards), the shift changeover would generate 625 vehicle trips. However, this is likely to occur outside the peak period (at 6.00 am, 2.00 pm and 10.00 pm) when there would be sufficient capacity on the road network and at intersections, and therefore has not been assessed.

6.2.3.1 Service vehicle generation

Service vehicles would be generated by the operational requirements of the Moorebank IMT. These vehicles are likely to be small or medium rigid vehicles that are used by contractors to service electrical, machinery or other items. This number is anticipated to be relatively low. These movements would probably occur outside peak periods and have been excluded from the assessment.

6.2.4 Truck petrol station/retail facility

A truck petrol station or small retail facility has been considered for the Project IMT site to provide goods and services to staff and visitors of the Project site. Although the proposed facility has not been designed, land within the Project site on the concept plan has been allocated for this land use.

Considering the current availability of fast food outlets elsewhere and the remoteness of this facility, this facility is not expected to attract traffic above that which is already entering the facility. It is therefore assumed that the potential facility would not generate any additional traffic other than catering for vehicles already on the adjacent road network and within the Project site.

6.3 Traffic generation summary

A summary of the total traffic generated by the Moorebank IMT development during the construction and operation phase based on the information contained within section 6 is shown in Table 6.8 for the different years of analysis. Table 6.9 and Table 6.10 show the weekday AM peak and PM peak volumes for these phases for the different years.

While a reduction of 30% due to load matching was applied to semi-trailer movements generated by the IMEX and Interstate terminals, load matching is accounts for 13% of the total vehicle trips generated by the development (including light vehicle movements).

Table 6.8 shows one-way weekday trips. For example 50 trips would involve 25 trips in and 25 trips out.

Table 6.8 Summary of total daily weekday trips generated by Moorebank IMT

	Early Works 2015		Scenario 1 2016		Scenario 2a 2019		Scenario 2b 2023		Scenario 3 2030	
	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV
Construction	810	64	2,295	1,390	1,485	260	2,080	360	0	0
IMEX	0	0	0	0	168	652	337	1,302	674	2,726
Interstate	0	0	0	0	262	710	262	710	522	1,152
Warehouse	0	0	0	0	1,510	580	1,510	852	4,528	1,644
Total trips	**810**	**64**	**2,295**	**1,390**	**3,425**	**2,202**	**4,189**	**3,224**	**5,724**	**5,522**

Table 6.9 Summary of total weekday AM peak hour traffic movements

		Early Works 2015		Scenario 1 2016		Scenario 2a 2019		Scenario 2b 2023		Scenario 3 2030	
		LV	HV	LV	HV	LV	HV	LV	HV	LV	HV
Construction	Inbound	54	5	153	76	99	14	139	20	0	0
	Outbound	0	5	0	76	0	14	0	20	0	0
IMEX	Inbound	0	0	0	0	8	25	16	50	32	105
	Outbound	0	0	0	0	0	25	0	50	0	105
Interstate	Inbound	0	0	0	0	16	27	16	27	32	44
	Outbound	0	0	0	0	0	27	0	27	0	44
Warehouse	Inbound	0	0	0	0	10	22	10	33	20	63
	Outbound	0	0	0	0	0	22	0	33	0	63
Total trips	**Inbound**	**54**	**5**	**153**	**76**	**133**	**88**	**181**	**130**	**84**	**212**
	Outbound	**0**	**5**	**0**	**76**	**0**	**88**	**0**	**130**	**0**	**212**

Table 6.10 Summary of total weekday PM peak hour traffic movements

		Early Works 2015		Scenario 1 2016		Scenario 2a 2019		Scenario 2b 2023		Scenario 3 2030	
		LV	HV	LV	HV	LV	HV	LV	HV	LV	HV
Construction	Inbound	0	5	0	76	0	14	0	20	0	0
	Outbound	54	5	153	76	99	14	139	20	0	0
IMEX	Inbound	0	0	0	0	0	30	0	61	0	127
	Outbound	0	0	0	0	8	30	16	61	32	127
Interstate	Inbound	0	0	0	0	0	33	0	33	0	54
	Outbound	0	0	0	0	16	33	16	33	32	54
Warehouse	Inbound	0	0	0	0	0	27	0	40	0	76
	Outbound	0	0	0	0	10	27	10	40	20	76
Total trips	**Inbound**	**0**	**5**	**0**	**76**	**0**	**104**	**0**	**154**	**0**	**257**
	Outbound	**54**	**5**	**153**	**76**	**133**	**104**	**181**	**154**	**84**	**257**

6.4 Cumulative scenarios

Cumulative scenario A (refer to Figure 6.1) assumes that the SIMTA site would operate as an intensified warehousing development that would support the operation of the Moorebank IMT Project.

A number of assumptions have been made to define and assess cumulative Scenario A including:

- the Moorebank IMT would operate as proposed in the EIS
- the SIMTA development would have indicative warehouse capacity of 300,000 sq. m gross floor area (GFA)
- both sites would operate 24 hours a day, seven days a week.

Cumulative scenario B (refer to Figure 6.2) consists of an IMEX terminal on the SIMTA site only with throughput of 1 million TEU per year, as well as 300,000 sq. m of warehousing. An interstate terminal of 500,000 TEU per year and 300,000 sq. m of warehousing would be located on the Project site. Under cumulative scenario B, there is surplus warehousing in the order of 205,000 sq. m for the Project.

The following assumptions were made for cumulative scenario B:

- Both sites would operate 24 hours a day, seven days a week.

Cumulative scenario C1 (refer to Figure 6.3) consists of an IMEX terminal on the SIMTA site with throughput of 250,000 TEU per year, as well as 200,000 sq. m of warehousing. An IMEX terminal of 250,000 TEU per year, interstate terminal of 250,000 TEU per year and 100,000 sq. m of warehousing would be located on the Project site in 2020. Under cumulative scenario C1, there is surplus warehousing in the order of 125,000 sq. m for the SIMTA site.

The following assumptions were made for cumulative scenario C1:

- Both sites would operate 24 hours a day, seven days a week.

Cumulative scenario C2 (refer to Figure 6.4) consists of an IMEX terminal on the SIMTA site with throughput of 550,000 TEU per year, as well as 300,000 sq. m of warehousing. An IMEX terminal of 500,000 TEU per year, interstate terminal of 500,000 TEU per year and 300,000 sq. m of warehousing would be located on the Project site in 2030. Under cumulative scenario C2, there is surplus warehousing in the order of 150,000 sq. m for the SIMTA site.

The following assumptions were made for cumulative scenario C2:

- Both sites would operate 24 hours a day, seven days a week.

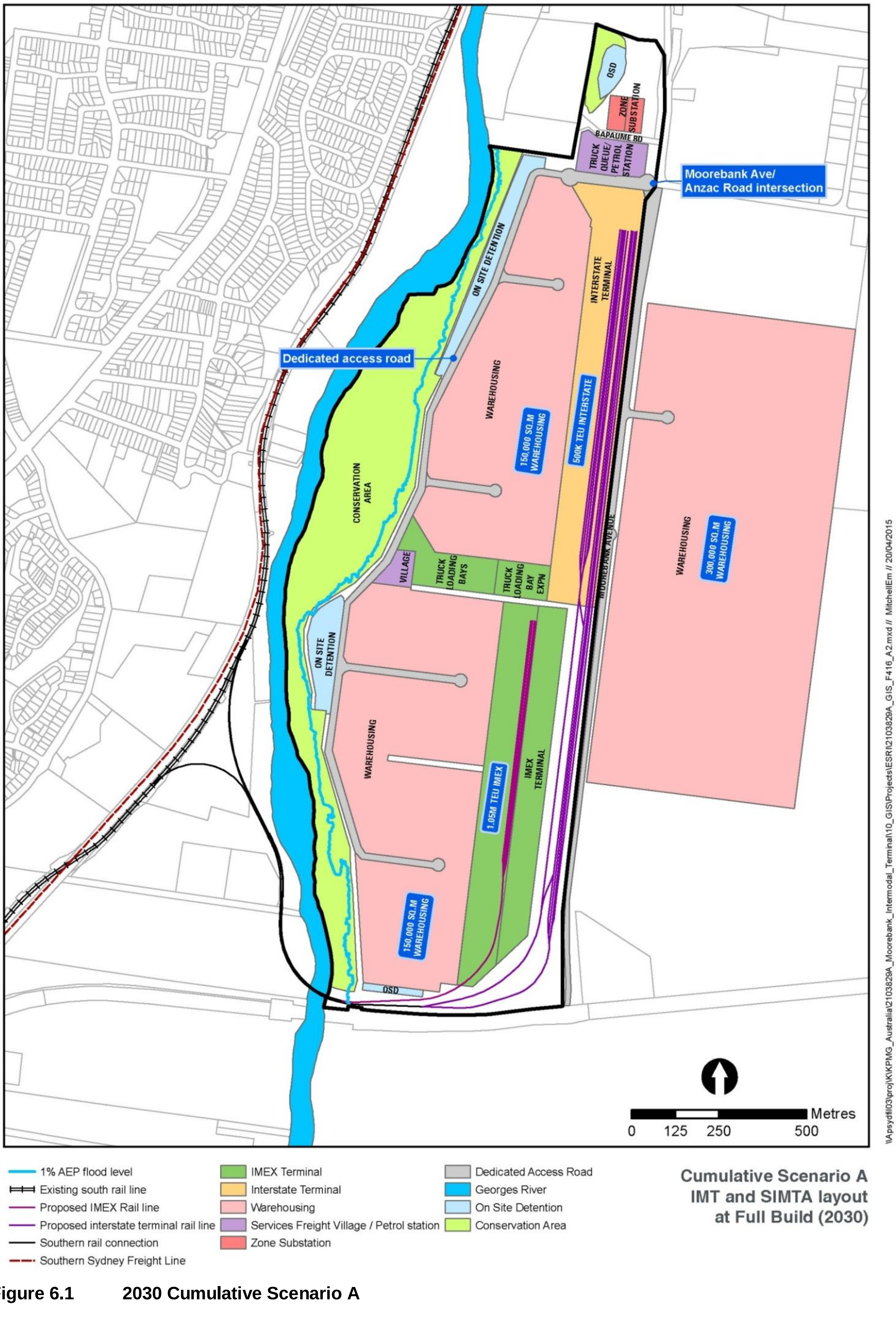


Figure 6.1 2030 Cumulative Scenario A

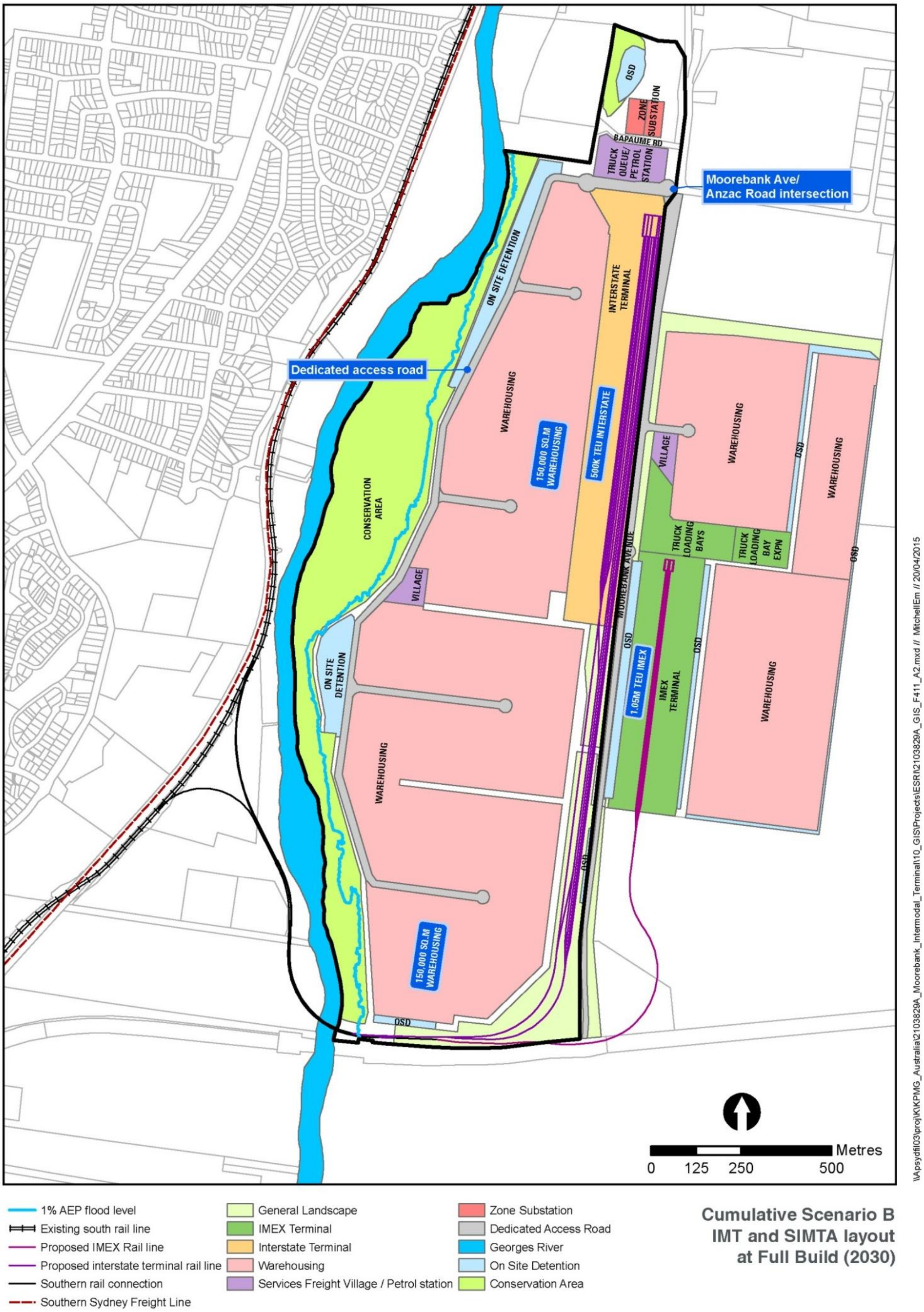


Figure 6.2 2030 Cumulative Scenario B

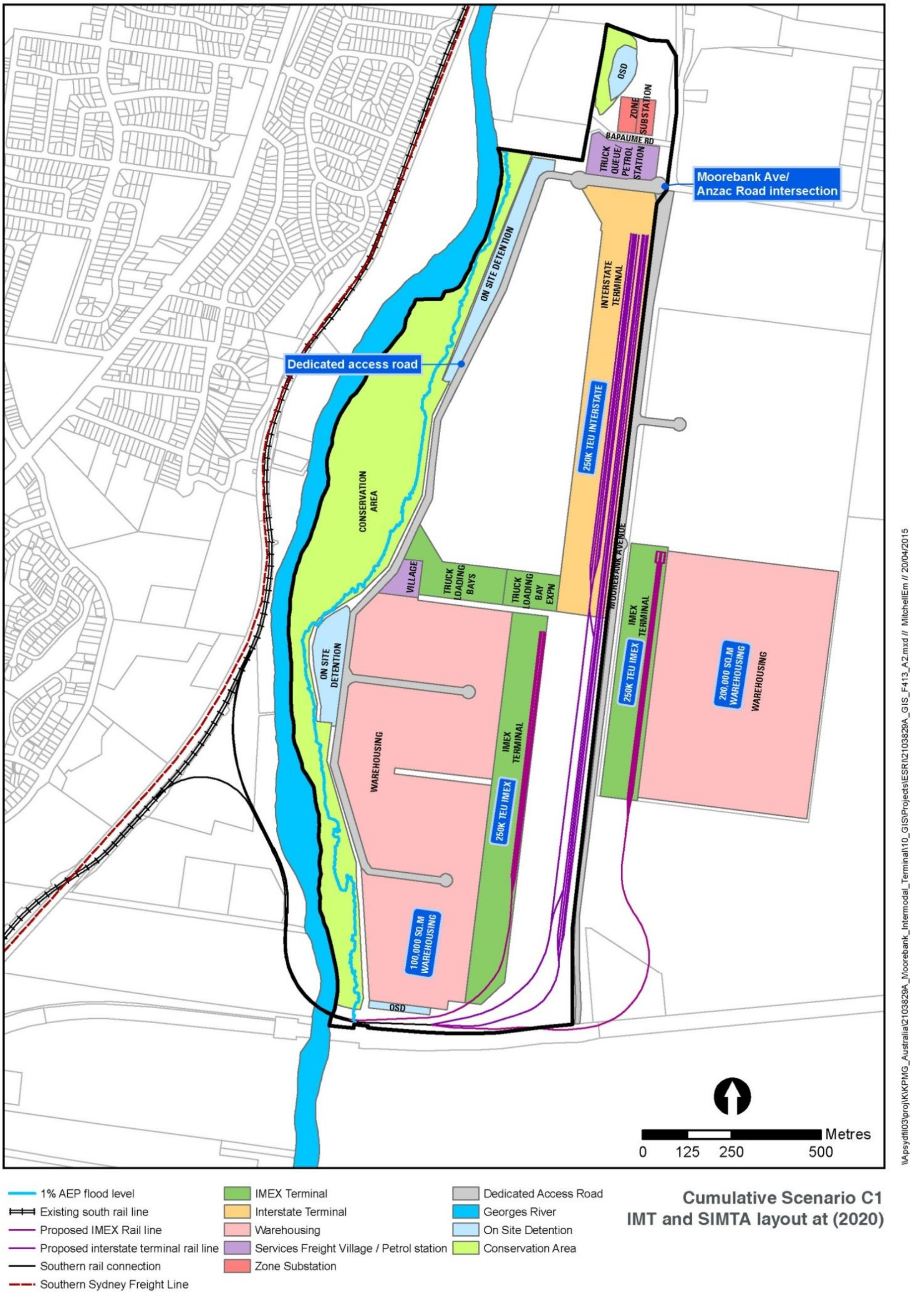


Figure 6.3 2020 Cumulative Scenario C1

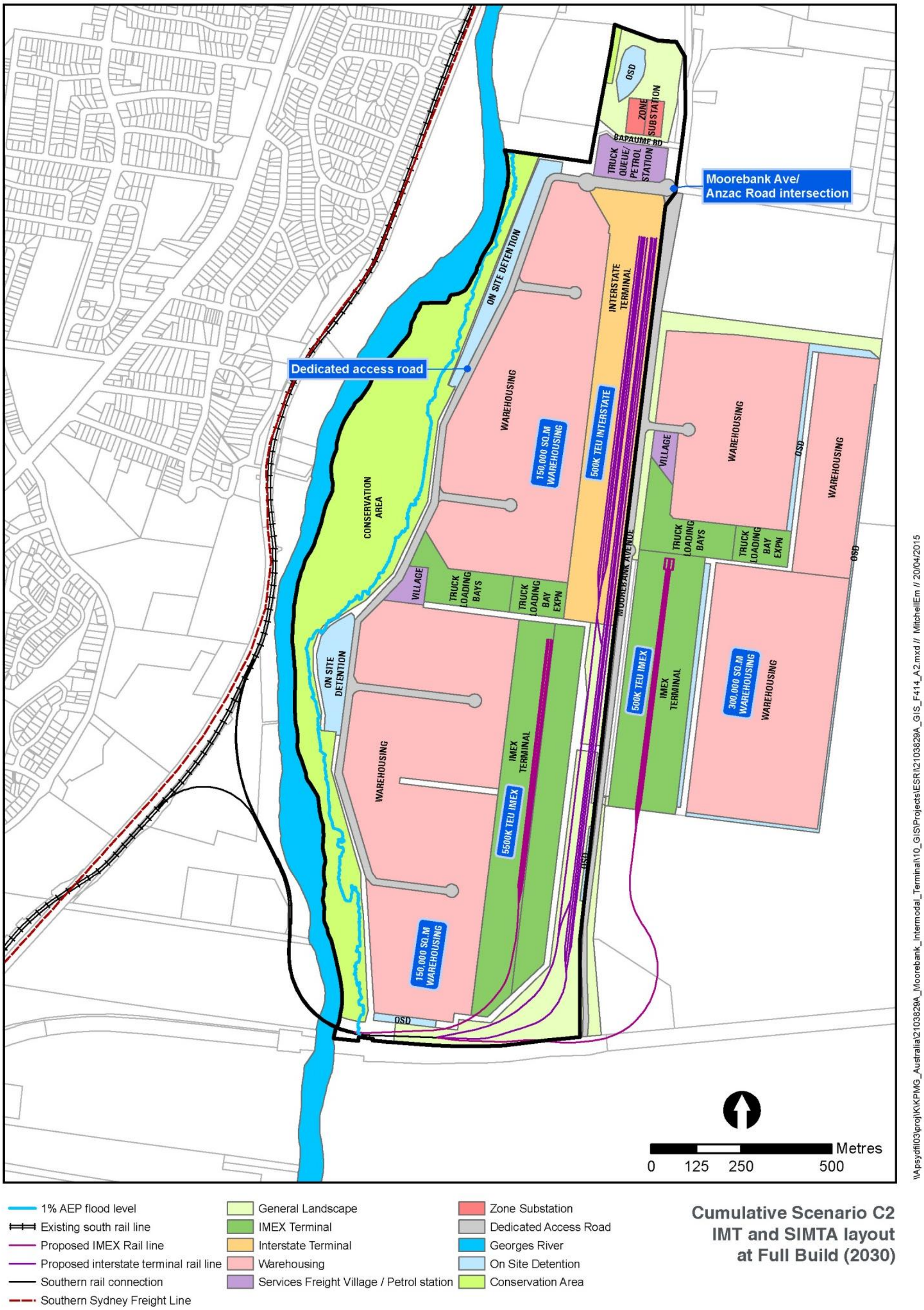


Figure 6.4 **2030 Cumulative Scenario C2**

Traffic generated by standalone or surplus warehousing has been estimated using the RMS *Guide to Traffic Generating Developments (2013) – Appendix A Business Parks and Industrial Estates – Site details and trip generation*, as follows:

- Daily vehicle trips = 2.1 per 100 m^2 GFA.
- Warehouse operations peak hour vehicle trips = 0.1825 per 100 m^2 GFA.
- Trips occurring during the AM and PM peak hour for light vehicles is 8.7%.
- Trips occurring during the peak hour of the adjacent road network for heavy vehicles are 7.7% in the AM peak and 9.3% in the PM peak.
- Heavy vehicle trip proportion of 30% for the warehouse facility.

Daily and warehouse peak hour vehicle trips were taken as an average of two similar warehouse sites from the RMS *Guide to Traffic Generating Developments*, as follows:

- Site 1 Erskine Park Industrial Estate, Erskine Park:
  - 0.163 peak vehicle trips per 100 m^2 GFA
  - warehouse peak hour 2.45–3.45 pm
  - 1.892 total daily trips per 100 m^2 GFA
  - 28.3% heavy vehicle trips
- Site 3 Wonderland Business Park, Eastern Creek:
  - 0.202 peak vehicle trips per 100 m^2 GFA
  - warehouse peak hour 8.00–9:00 am
  - 2.308 total daily trips per 100 m^2 GFA
  - 25.9% heavy vehicle trips.

Traffic generation for the cumulative scenarios is shown in Table 6.11 below.

Table 6.11 Cumulative scenario daily and peak hourly traffic generation

Cumulative traffic			LV	HV
Site	**Scenario A**			
Moorebank IMT	AM peak hour traffic	Inbound	84	212
		Outbound	0	212
	PM peak hour traffic	Inbound	0	257
		Outbound	84	257
	Total daily vehicle trips		**5,724**	**5,522**
SIMTA	AM peak hour traffic	Inbound	399	66
		Outbound	0	66
	PM peak hour traffic	Inbound	0	79
		Outbound	399	79
	Total daily vehicle trips		**4,593**	**1,707**

Cumulative traffic			LV	HV
Combined	AM peak hour traffic	Inbound	482	278
		Outbound	0	278
	PM peak hour traffic	Inbound	0	336
		Outbound	482	336
	Total daily vehicle trips		**10,316**	**7,229**
Site	**Scenario B**			
Moorebank IMT	AM peak hour traffic	Inbound	310	115
		Outbound	0	115
	PM peak hour traffic	Inbound	0	140
		Outbound	310	140
	Total daily vehicle trips		**5,050**	**3,001**
SIMTA	AM peak hour traffic	Inbound	692	102
		Outbound	0	102
	PM peak hour traffic	Inbound	0	78
		Outbound	630	78
	Total daily vehicle trips		**3,614**	**2,638**
Combined	AM peak hour traffic	Inbound	1002	217
		Outbound	0	217
	PM peak hour traffic	Inbound	0	218
		Outbound	940	218
	Total daily vehicle trips		**8,664**	**5,639**
Site	**Scenario C1**			
Moorebank IMT	AM peak hour traffic	Inbound	174	153
		Outbound	0	153
	PM peak hour traffic	Inbound	0	170
		Outbound	174	170
	Total daily vehicle trips		**4,099**	**3,420**
SIMTA	AM peak hour traffic	Inbound	292	54
		Outbound	0	54
	PM peak hour traffic	Inbound	0	52
		Outbound	478	52
	Total daily vehicle trips		**3,632**	**1,365**

Cumulative traffic			LV	HV
Combined	AM peak hour traffic	Inbound	465	207
		Outbound	0	207
	PM peak hour traffic	Inbound	0	222
		Outbound	652	222
	Total daily vehicle trips		**7,731**	**4,785**
Site	**Scenario C2**			
Moorebank IMT	AM peak hour traffic	Inbound	68	157
		Outbound	0	157
	PM peak hour traffic	Inbound	0	191
		Outbound	68	191
	Total daily vehicle trips		**5,386**	**4,098**
SIMTA	AM peak hour traffic	Inbound	494	85
		Outbound	0	85
	PM peak hour traffic	Inbound	0	78
		Outbound	649	78
	Total daily vehicle trips		**4,788**	**2,167**
Combined	AM peak hour traffic	Inbound	562	242
		Outbound	0	242
	PM peak hour traffic	Inbound	0	269
		Outbound	717	269
	Total daily vehicle trips		**10,174**	**6,265**

6.5 Traffic generation from alternate land uses

Parsons Brinckerhoff has undertaken a review of alternate land uses for the Project site. The purpose of this review is to compare traffic generation from the Project site based on various land uses occupying the site on developable land only.

Traffic generation for alternative land uses has been estimated in accordance with the RMS's *Guide to Traffic Generating Developments* (August 2013) which provides guidelines regarding the likely traffic generation potential of various types of development. In most cases, traffic volumes generated by developments are determined by applying multipliers that are either specific to the floor areas or other unit rates specific to the developments. These representative rates were determined through surveys undertaken by the RMS.

The overall area of the Project site is approximately 192 hectares. For this study, it is assumed that the Project site has approximately 166 hectares of developable land which excludes the 1% AEP flood line and confirmed conservation areas. The adopted peak hour vehicle trips for the different land use developments are as follows:

- Residential dwellings – trip generation of 0.95 and 0.99 per dwelling based on RMS rates for low density residential dwellings within the Sydney urban area were adopted for the AM and PM peak hour respectively. It is assumed that 20 dwellings could be constructed per hectare based on Landcom's *Residential Density Guide* (May 2011).
- Business parks and industrial estates – trip generation rate of 5.35 peak hour vehicle trips per hectare was adopted based on RMS rates for the similar size development of business parks in the Sydney area.
- Shopping centres – it is assumed that the Gross Leasable Floor Area (GLFA) for the proposed development site would be approximately 150,000 m^2 (equivalent to the size of the Westfield Parramatta shopping centre). Trip generation of 1.47 and 3.16 peak hour vehicle trips per 100 m^2 GLFA was adopted for the AM and PM peak hour respectively.

Table 6.12 shows the adopted trip generation rate and the inbound/outbound distribution assumed for the AM and PM peak periods.

Table 6.12 Summary of traffic generated by alternate land uses

Development		Distribution	Vehicle trips
Moorebank Intermodal Terminal – Full Build 2030 (IMEX, Interstate and Warehouse)			
AM peak hour	Inbound	-	253
	Outbound	-	169
PM peak hour	Inbound	-	169
	Outbound	-	253
Low density residential dwellings – Approximately 3320 dwellings			
AM peak hour (0.95 per dwelling)	Inbound	20%	631
	Outbound	80%	2523
PM peak hour (0.99 per dwelling)	Inbound	80%	2629
	Outbound	20%	657
Business parks and industrial estates – 166 hectares			
AM peak hour (5.35 per hectare)	Inbound	80%	710
	Outbound	20%	178
PM peak hour (5.35 per hectare)	Inbound	20%	178
	Outbound	80%	710
Shopping centres – Approximately 150,000 m^2 GLFA			
AM peak hour (1.47 per 100m^2 of GLFA)	Inbound	50%	1103
	Outbound	50%	1103
PM peak hour (3.16 per 100m^2 of GLFA)	Inbound	50%	2370
	Outbound	50%	2370

Source: RMS *Guide to Traffic generating Developments* (2013)

Table 6.12 shows that the estimated traffic that generated by the Moorebank IMT development during the peak hours would be significantly lower than the generated traffic by alternative land uses. It indicates that a less significant traffic impact would be expected on the adjacent road network when compared to the alternate land uses.

6.6 Traffic distribution

The distribution of traffic generated by the Moorebank IMT is based on the results of strategic modelling undertaken for the Project. For the purposes of the modelling it is assumed that the origin and destination for vehicles would be similar. This is based on the assumption that vehicles would return to their origin after travelling to the Moorebank IMT. The distribution of traffic may be different for light and heavy vehicles. Heavy vehicles generated by the Project site would travel to and from the M5 interchange where they would be distributed amongst the road network to travel to their destinations throughout the Sydney region.

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 Cambridge Avenue and beyond. B-double vehicles are not permitted to use Anzac Road.

Table 6.13 shows the assumed distribution of traffic generated by the Project site. This same traffic distribution has been applied to all assessment years and is based upon the 2030 traffic distribution. The distribution of light and heavy vehicles is based upon the STM and FMM model which does not distribute freight related heavy vehicle traffic onto Anzac Road.

Wider area traffic distribution is based upon the STM and FMM models and has been applied to both the Moorebank IMT and SIMTA. These distributions are shown in Figures 6.5 to 6.7. Traffic generated by the Project in 2030 is shown in Figures 6.8 and 6.9.

6.6.1 Moorebank IMT traffic distribution

The traffic distribution along Moorebank Avenue for Moorebank IMT is shown in Table 6.13.

Table 6.13 Moorebank IMT traffic distribution

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

Source: STM and FMM models (BTS)

6.6.2 SIMTA traffic distribution

The traffic distribution along Moorebank Avenue for SIMTA is shown in Table 6.14. This is based on the *SIMTA Traffic and Transport Assessment* (Hyder Consulting 2013) report traffic distributions.

Table 6.14 SIMTA traffic distribution

Direction (Moorebank Avenue to)	Distribution (%) weekday AM peak		
	Light vehicles	Container Truck	Rigid Truck
M5 West	18%	41%	35%
Hume Highway North	16%	28%	25%
Moorebank Avenue North	14%	14%	22%
M5 East	29%	3%	3%
Hume Highway South	13%	13%	10%
Anzac Road East	5%	0%	0%
Moorebank Avenue South	5%	0%	5%

Source: SIMTA Traffic and Transport Assessment, Hyder Consulting 2013

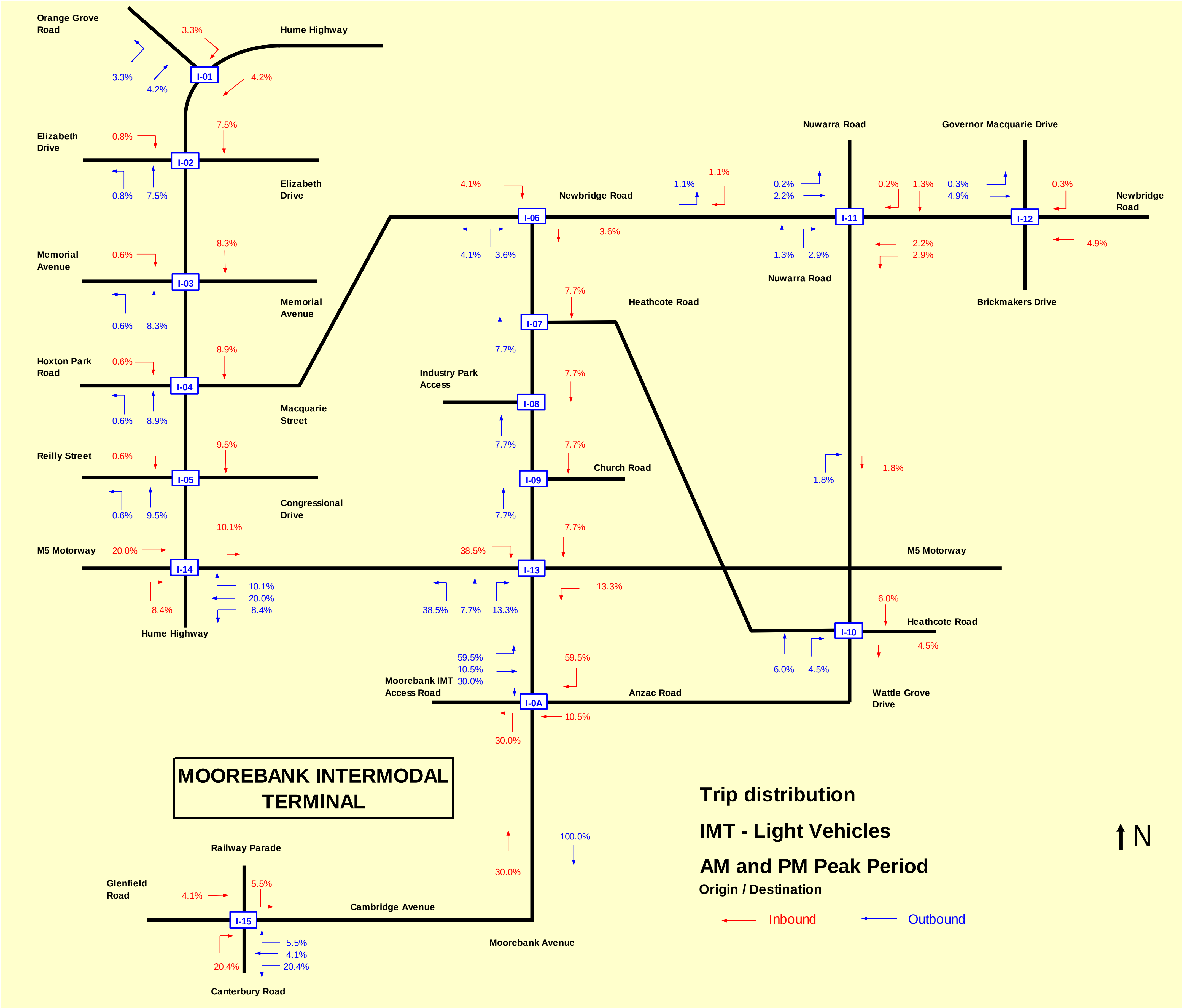


Figure 6.5 2030 weekday AM and PM peak Moorebank IMT light vehicle distribution on the wider area road network

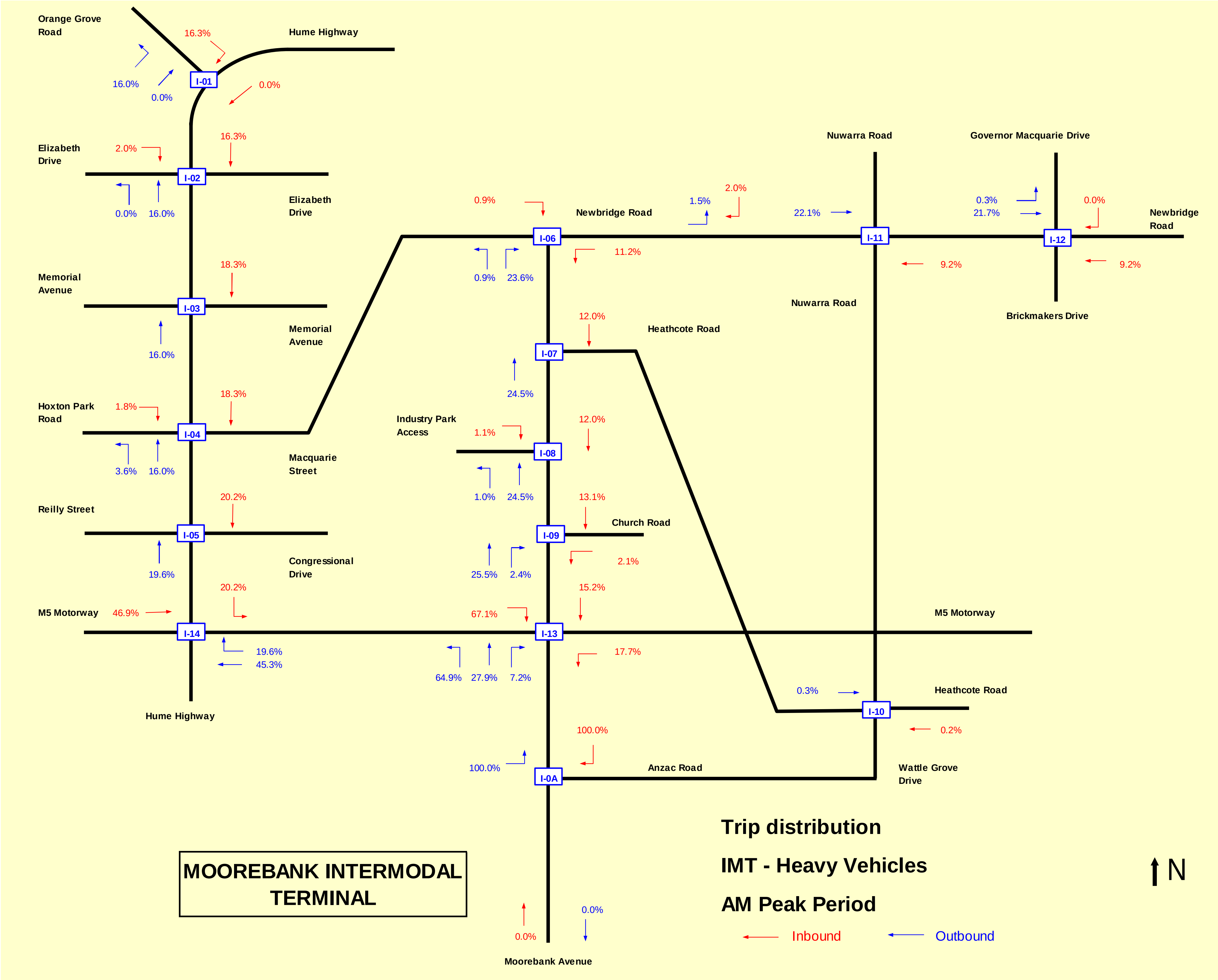


Figure 6.6 2030 weekday AM peak Moorebank IMT heavy vehicle distribution on the wider area road network

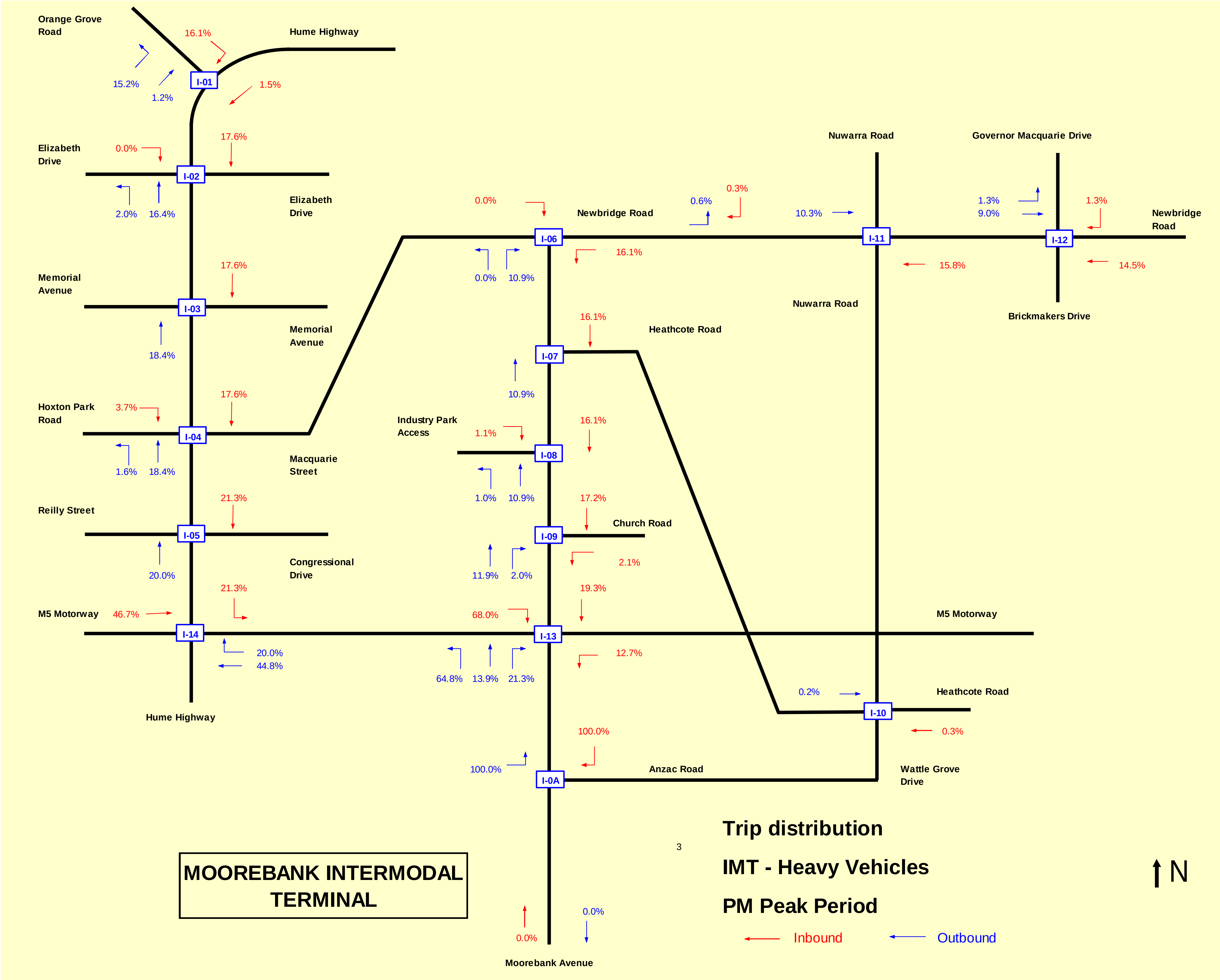


Figure 6.7 2030 weekday PM peak Moorebank IMT heavy vehicle distribution on the wider area road network

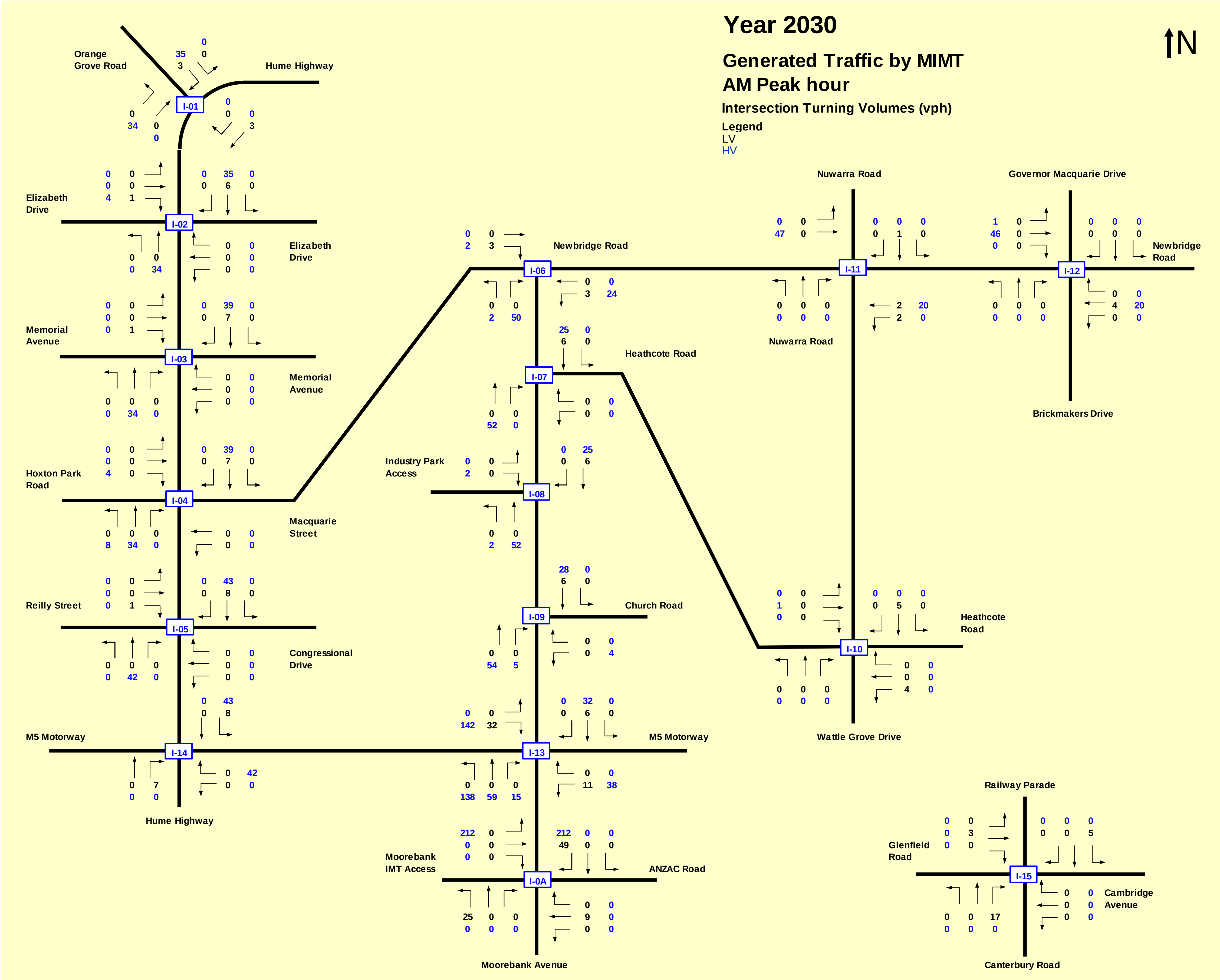


Figure 6.8 2030 Moorebank IMT traffic generated on the wider area road network in the AM peak

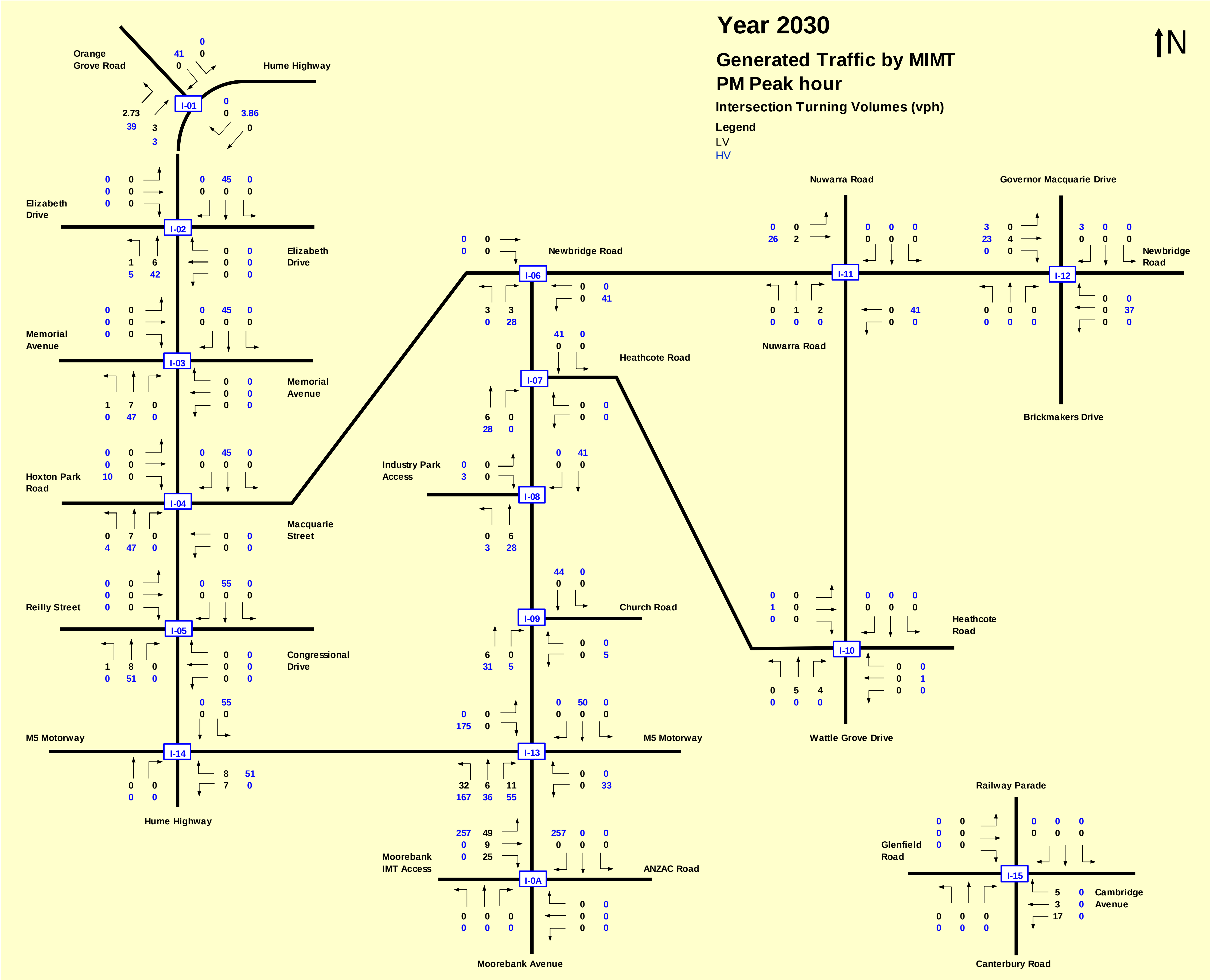


Figure 6.9 2030 Moorebank IMT traffic generated on the wider area road network in the PM peak

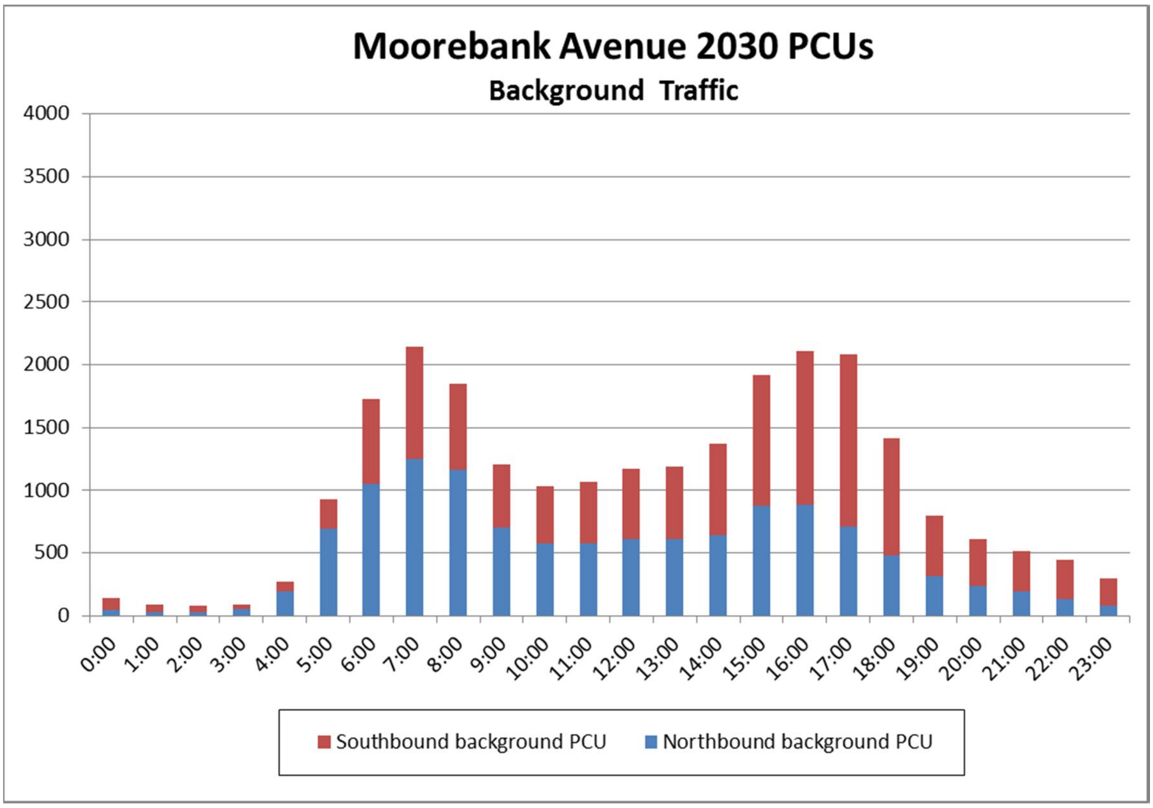
6.7 Moorebank Avenue Daily Traffic Profile

Daily traffic volume profiles for Moorebank Avenue between the M5 and Anzac Road in 2030 with and without the Project are presented in Figure 6.10. 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:

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

Figure 6.10 clearly differentiates the 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. The figure shows that the highest traffic volumes travel on Moorebank Avenue during the AM and PM peak hours and there would be less traffic during the off peak period even with the Moorebank IMT traffic. This daily profile suggests that the off peak traffic conditions still represents a more favourable condition than the peak hours, hence there would be no significant impact on the traffic conditions along Moorebank Avenue during off peak periods.

2030 Background traffic in PCUs



2030 with Moorebank IMT traffic in PCUs

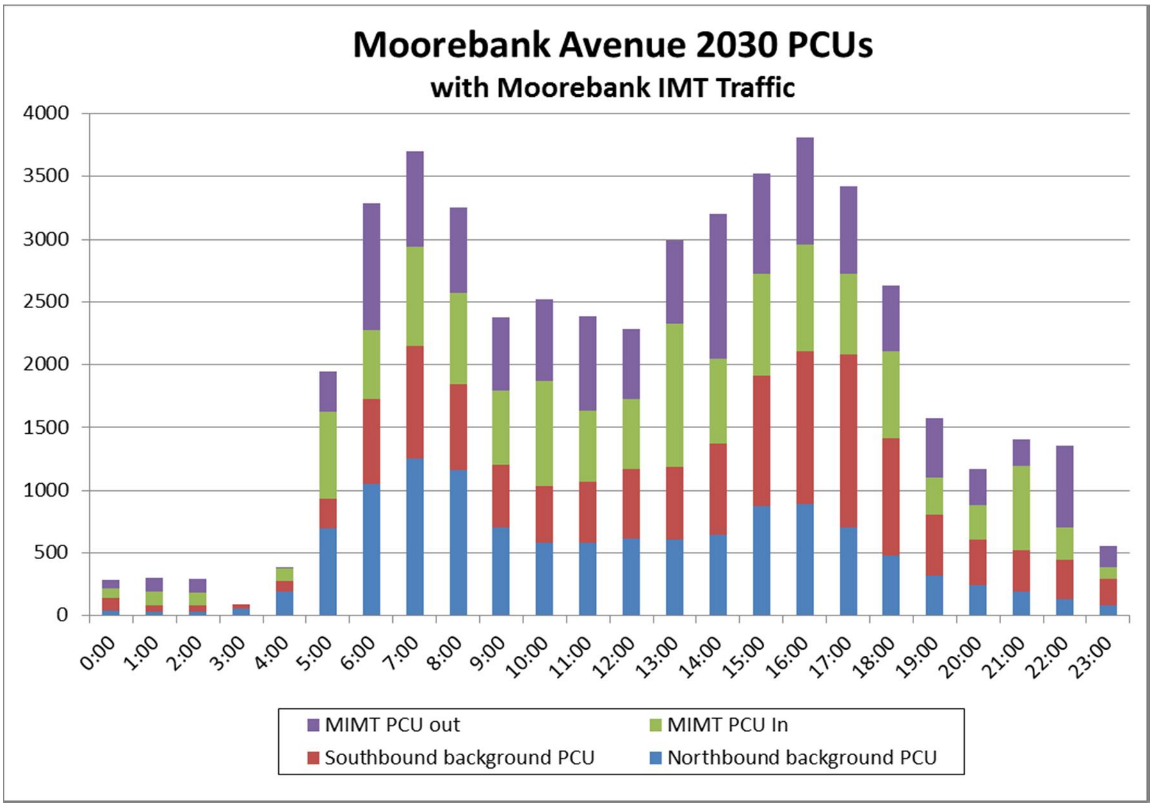


Figure 6.10 Daily traffic volume profiles for Moorebank Avenue between M5 and Anzac Road in 2030 with and without Moorebank IMT in Passenger Car Unit (PCU) equivalents

7. Background traffic growth rates

Summary of changes from the Environmental Impact Statement Traffic and Transport Assessment:

No change.

For the purpose of this study, and in consultation with RMS, traffic growth rates have been obtained by from the RMS road assignment EMME/2 model. Table 7.1 shows the linear traffic growth rates that have been applied to this assessment to estimate future background traffic volumes on the road network (Moorebank Avenue and Anzac Road) adjacent to the Project site. Table 7.2 shows the linear traffic growth rates that have been applied on the wider area road network.

Table 7.1 Annual weekday peak period growth rates on Moorebank Avenue and Anzac Road

Location	Period	Direction	Annual growth rates between		
			2016–2021	2021–2026	2026–2031
Moorebank Avenue, south of Anzac Road	AM (7–9 am)	Northbound	1.8%	1.9%	0.5%
		Southbound	0.8%	0.8%	0.8%
	PM (4–6 pm)	Northbound	0.7%	1.4%	0.5%
		Southbound	1.1%	2.2%	0.6%
Moorebank Avenue, between Anzac Road and the M5	AM (7–9 am)	Northbound	0.8%	1.9%	0.0%
		Southbound	1.7%	1.1%	0.5%
	PM (4–6 pm)	Northbound	1.5%	1.2%	0.4%
		Southbound	0.7%	1.7%	0.8%
Anzac Road, east of Moorebank Avenue	AM (7–9 am)	Eastbound	6.1%	2.5%	4.6%
		Westbound	0.4%	1.4%	1.8%
	PM (4–6 pm)	Eastbound	0.3%	3.4%	2.1%
		Westbound	3.0%	3.6%	1.1%

Source: RMS (2014)

Table 7.2 Annual weekday peak period growth rates on the wider area road network

Location	Period	Direction	Annual growth rates between		
			2016–2021	2021–2026	2026–2031
Hume Highway, north of Elizabeth Drive	AM (7–9 am)	Northbound	0.5%	0.9%	1.3%
		Southbound	0.6%	0.2%	0.9%
	PM (4–6 pm)	Northbound	0.7%	0.0%	0.1%
		Southbound	0.7%	0.5%	0.3%
Orange Grove Road, north of Hume Highway	AM (7–9 am)	Northbound	0.4%	0.8%	1.1%
		Southbound	0.9%	0.6%	1.1%
	PM (4–6 pm)	Northbound	0.4%	0.3%	0.9%
		Southbound	0.2%	0.5%	0.8%
Elizabeth Drive, west of Hume Highway	AM (7–9 am)	Eastbound	0.7%	1.1%	1.5%
		Westbound	1.6%	0.5%	1.6%
	PM (4–6 pm)	Eastbound	0.2%	0.8%	0.6%
		Westbound	0.0%	2.4%	0.7%
Hoxton Park Road, west of Hume Highway	AM (7–9 am)	Eastbound	2.4%	1.3%	1.4%
		Westbound	1.3%	3.9%	0.4%
	PM (4–6 pm)	Eastbound	1.0%	1.3%	0.5%
		Westbound	2.8%	0.6%	0.9%
Moorebank Avenue, north of the M5	AM (7–9 am)	Northbound	1.9%	1.5%	0.1%
		Southbound	1.6%	2.3%	1.6%
	PM (4–6 pm)	Northbound	1.9%	2.4%	0.0%
		Southbound	0.8%	1.7%	0.9%
Moorebank Avenue, south of Newbridge Road	AM (7–9 am)	Northbound	1.8%	2.5%	0.0%
		Southbound	3.2%	3.6%	1.4%
	PM (4–6 pm)	Northbound	2.8%	3.8%	0.6%
		Southbound	0.3%	2.1%	0.7%
Newbridge Road, east of Moorebank Avenue	AM (7–9 am)	Eastbound	2.7%	2.0%	0.5%
		Westbound	3.5%	1.7%	1.5%
	PM (4–6 pm)	Eastbound	2.0%	1.9%	0.9%
		Westbound	1.1%	1.5%	1.1%
Newbridge Road, west of Moorebank Avenue	AM (7–9 am)	Eastbound	2.5%	3.5%	2.1%
		Westbound	1.9%	2.6%	0.6%
	PM (4–6 pm)	Eastbound	0.8%	2.6%	1.1%
		Westbound	2.2%	3.2%	1.3%

Location	Period	Direction	Annual growth rates between		
			2016–2021	2021–2026	2026–2031
Heathcote Road, south of the M5	AM (7–9 am)	Northbound	0.9%	2.9%	0.4%
		Southbound	1.1%	3.9%	1.6%
	PM (4–6 pm)	Northbound	1.2%	2.8%	0.9%
		Southbound	0.7%	2.4%	0.6%
Heathcote Road, south of Nuwarra Road	AM (7–9 am)	Northbound	0.8%	3.0%	0.4%
		Southbound	1.4%	4.4%	1.6%
	PM (4–6 pm)	Northbound	1.3%	3.4%	1.3%
		Southbound	0.5%	2.5%	0.8%
Nuwarra Road, North of Heathcote Road	AM (7–9 am)	Northbound	1.7%	0.3%	1.3%
		Southbound	0.7%	2.7%	1.1%
	PM (4–6 pm)	Northbound	1.2%	0.5%	1.1%
		Southbound	1.3%	0.7%	0.2%
M5 off ramp to Moorebank Avenue	AM (7–9 am)	Eastbound	0.3%	0.4%	0.3%
		Westbound	1.8%	0.7%	0.3%
	PM (4–6 pm)	Eastbound	2.3%	1.9%	0.7%
		Westbound	0.9%	1.3%	0.4%
Hume Highway, north of the M5	AM (7–9 am)	Northbound	0.1%	1.3%	0.6%
		Southbound	0.2%	0.8%	0.2%
	PM (4–6 pm)	Northbound	0.0%	0.1%	0.3%
		Southbound	0.3%	0.8%	0.6%
Hume Highway, south of the M5	AM (7–9 am)	Northbound	0.3%	1.8%	0.9%
		Southbound	1.2%	1.4%	1.2%
	PM (4–6 pm)	Northbound	0.6%	0.7%	0.4%
		Southbound	1.2%	1.2%	0.9%
M5 on and off ramp to Hume Highway	AM (7–9 am)	Eastbound	0.1%	1.7%	1.4%
		Westbound	0.3%	0.5%	3.0%
	PM (4–6 pm)	Eastbound	1.0%	1.1%	0.3%
		Westbound	2.0%	1.3%	0.6%
Cambridge Avenue, east of Canterbury Road	AM (7–9 am)	Eastbound	2.1%	2.1%	0.7%
		Westbound	1.7%	1.5%	1.3%
	PM (4–6 pm)	Eastbound	2.3%	5.1%	0.4%
		Westbound	1.3%	3.1%	0.4%

Location	Period	Direction	Annual growth rates between		
			2016–2021	2021–2026	2026–2031
Canterbury Road, west of Cambridge Avenue	AM (7–9 am)	Northbound	0.4%	2.9%	0.6%
		Southbound	1.7%	2.7%	1.2%
	PM (4–6 pm)	Northbound	0.2%	3.3%	1.3%
		Southbound	0.2%	1.9%	0.8%
Glenfield Road, east of Canterbury Road	AM (7–9 am)	Eastbound	1.8%	4.8%	1.4%
		Westbound	0.5%	3.8%	1.1%
	PM (4–6 pm)	Eastbound	1.1%	4.2%	0.7%
		Westbound	1.7%	6.2%	1.2%
Railway Parade Road, north of Canterbury Road	AM (7–9 am)	Northbound	0.9%	2.8%	1.4%
		Southbound	2.2%	2.2%	1.0%
	PM (4–6 pm)	Northbound	1.5%	2.0%	0.9%
		Southbound	3.2%	3.1%	1.6%

Source: RMS (2014)

8. Strategic traffic modelling and trip distribution

Summary of changes from the Environmental Impact Statement Traffic and Transport Assessment:

No change.

This section outlines the distribution of traffic generated by the Moorebank IMT development based on information extracted from a strategic model developed for the Project.

8.1 Strategic modelling

Strategic modelling has been undertaken to investigate the traffic related changes associated with the Moorebank IMT Project. This analysis has been based on utilising the Transport for New South Wales (TfNSW) strategic models to examine the projected changes on truck volumes resulting from the operations of the 'with Moorebank IMT' as compared to the 'base case' without Moorebank IMT.

The travel demand sources available to the study include:

- Sydney Strategic Travel Model (STM).
- Light Commercial Vehicle Model (LCVM).
- Freight Movement Model (FMM) for rigid and articulated commercial vehicles.

These three components provide the travel demand across the highway network. The supply of highway network has been based on:

- Roads and Maritime Services (RMS) highway network as used in the STM.

These four data sources are outlined in Table 8.1.

Table 8.1 Strategic model components

Demand/Supply	Data	Class of vehicles	Sources
Demand	Background traffic	Car	STM
		Light commercial vehicles	LCVM
		Rigid trucks	FMM
		Articulated trucks (non-Port Botany and Moorebank IMT)	FMM
	Port Botany and Moorebank IMT	Articulated trucks	FMM
Supply	Highway Network	All	RMS networks as used in the STM highway assignment

These data sources have all been developed with the same geographic coverage and modelling zoning system (2006 travel zones) to provide a compatible set of travel demand trip tables.

Details of the strategic modelling are provided in the Strategic Traffic Modelling report in **Appendix J**.

The STM was supplied with a 2011 base year and future networks for 2016 to 2041 in 5 year increments. Table 8.2 lists the changes that the STM road network should contain as per the documentation supplied with the model. It is noted that the form/alignment of some of the projects identified in Table 8.2 may differ from the latest planning documentation and this is because the detailed investigations around these projects are still underway.

Table 8.2 Planned network changes

Year	Road	Detail
2016	Hunter Expressway	Four-lane expressway from the M1 Pacific Motorway to Branxton.
	M2 widening	Widen from Windsor Road to Delhi Road.
	M5 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	There are some changes to the road network around Edmondson Park that are likely to be 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	There are 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 seen in the model as various network changes (i.e. new links, upgraded links, etc.) to the west of the Hume Highway and the M7.

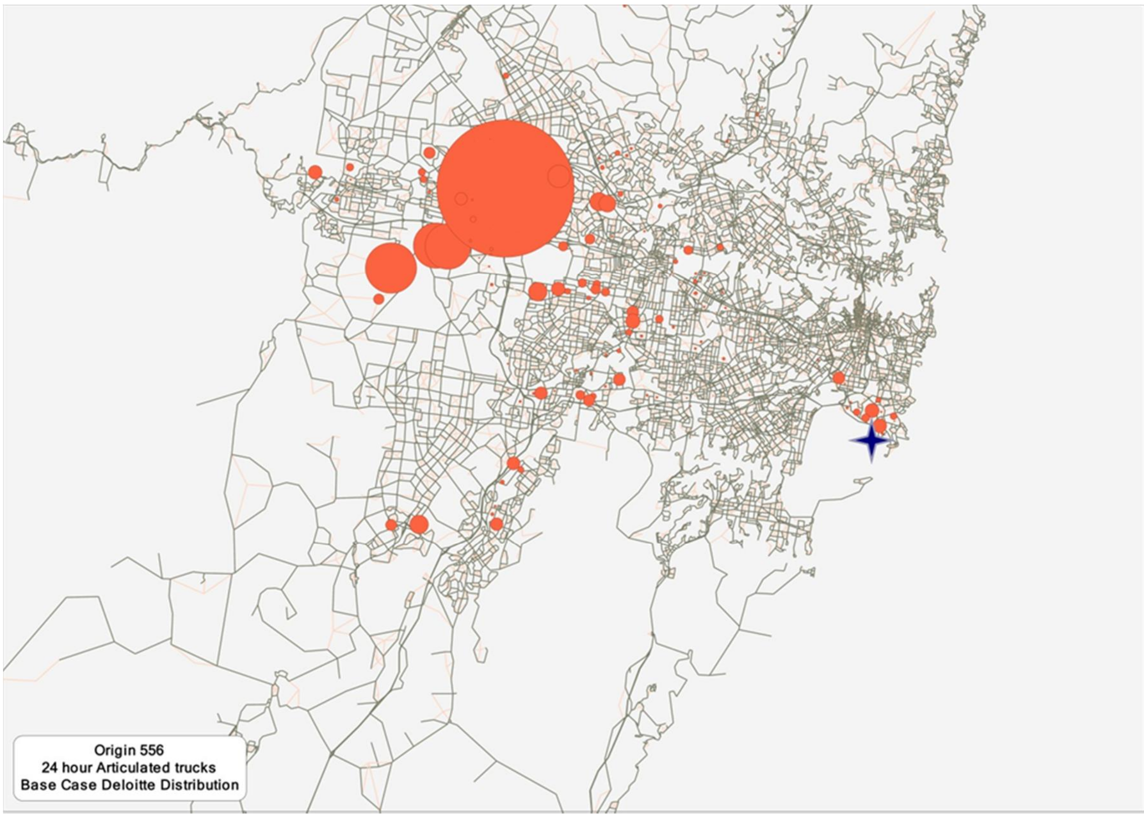
Source: STM network changes (BTS)

The changes between each of the forecast years are shown in the Strategic Traffic Modelling report in **Appendix L**. However there are changes to the road network which are not covered in Table 8.2 (i.e. not discussed in the documentation provided with the model). The most notable of these changes is the extension of Cambridge Avenue to Campbelltown Road which first appears in 2026 and is also present in the 2031 network. This is the only change that is likely to have a significant bearing on the results of the investigations relating to the Moorebank IMT. Discussions with Roads and Maritime Services indicate that this extension is not currently part of the future 2031 network. Therefore the modelling undertaken for this study has removed this extension from the model network.

The future STM road network changes have been included in the strategic modelling undertaken for the Project. The relevant road network upgrades as stated in Table 8.2 have been included in future 2031 strategic modelling to assess the impacts of the Project traffic on the road network in terms of volume change, as well as vehicle kilometres travelled (VKT) and vehicle hours travelled (VHT).

The strategic model was used to compare the demand with and without the Moorebank IMT based on the 2031 daily forecasts of articulated vehicles associated with container freight based on information provided by Deloitte. Plots of the comparisons are shown in Figure 8.1 to Figure 8.3. The red circles represent the relative size of the demand to and from either Port Botany or Moorebank IMT (indicated as blue star).

From Port Botany



To Port Botany

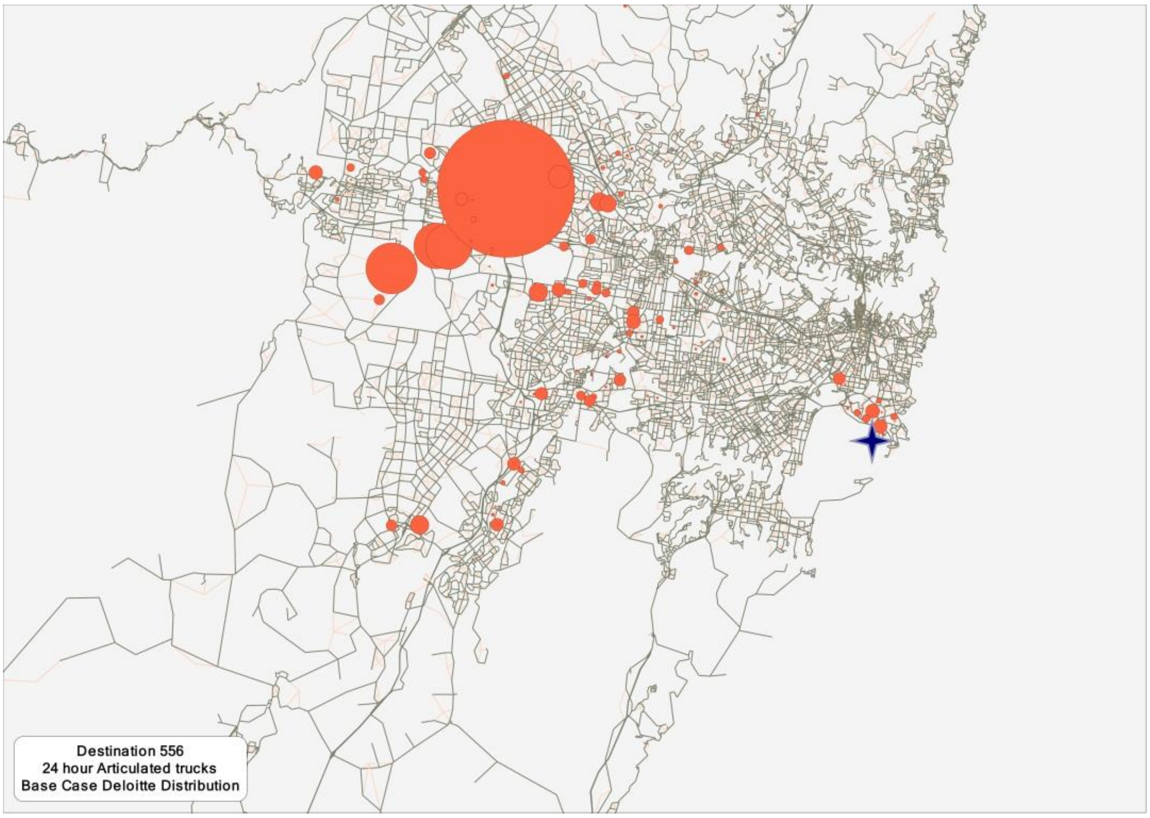
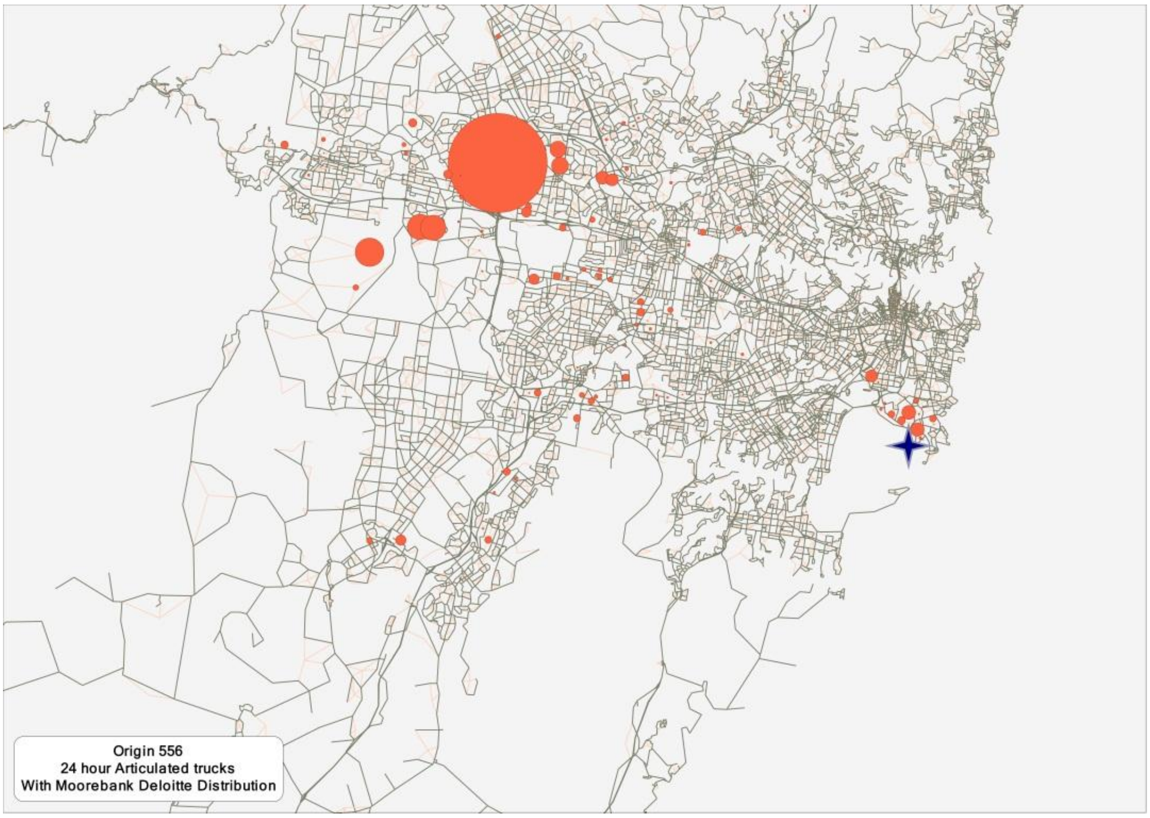


Figure 8.1 Base case articulated truck distributions to/from Port Botany

From Port Botany



To Port Botany

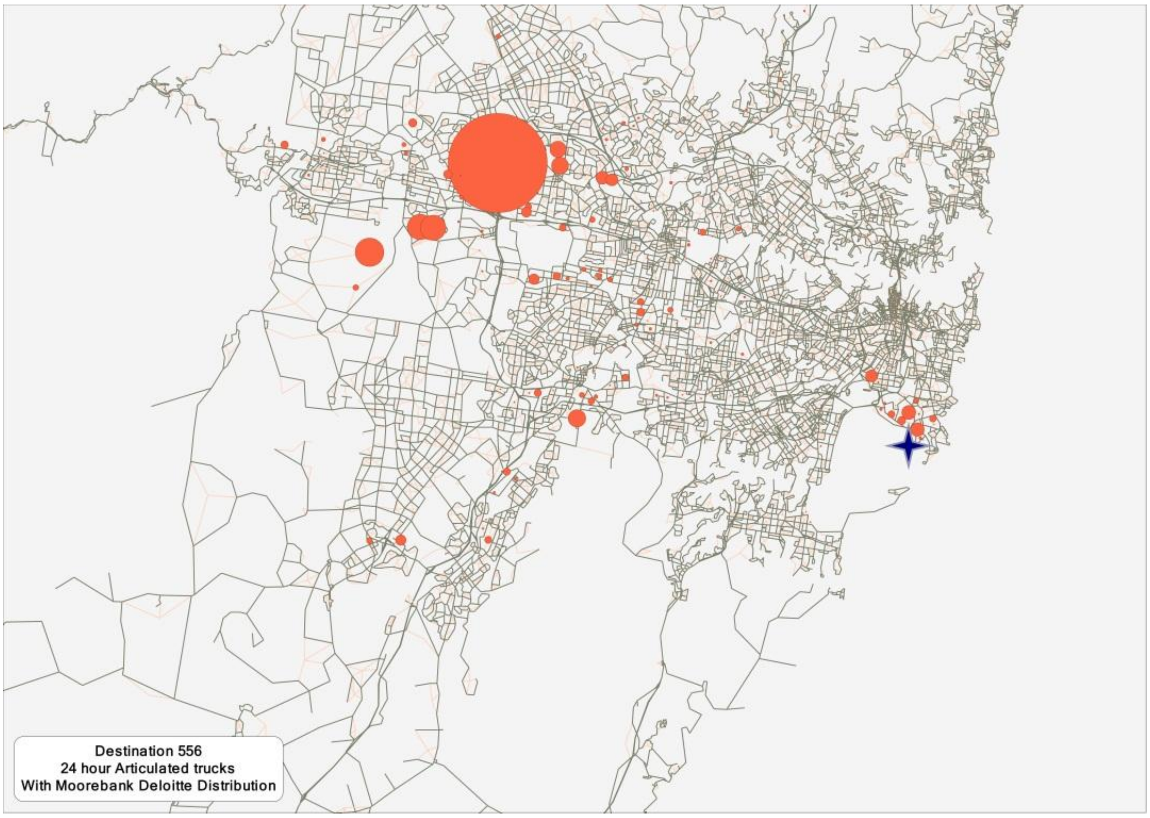
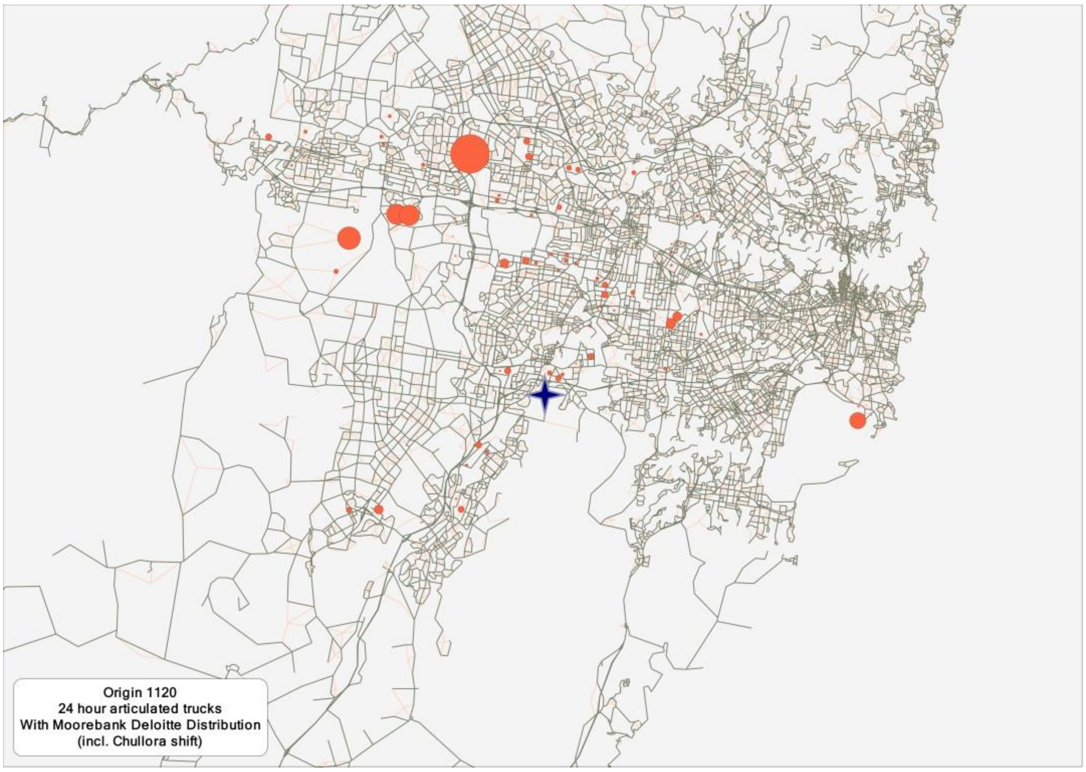


Figure 8.2 Articulated truck distributions to/from Port Botany with Moorebank IMT

From Moorebank



To Moorebank

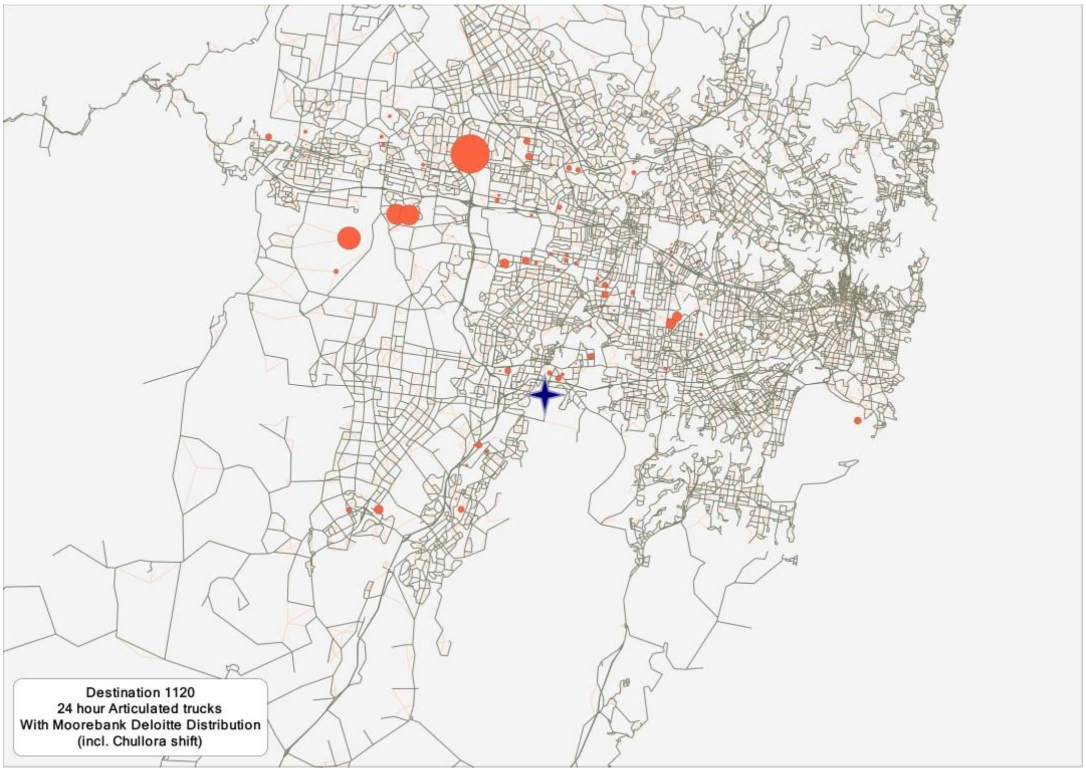


Figure 8.3 Articulated truck distributions to/from Moorebank with Moorebank IMT

8.1.1 Network performance

The performance of the whole network can be assessed by considering the VKT and VHT travelled in each of the assignments by the users of the road network in 2031.

The results indicate that:

- With Moorebank IMT there will be a decrease in both VKT and VHT across the Sydney metropolitan road network as a whole, with most of the reductions seen in articulated truck movements. Although articulated truck trips to and from Port Botany see the greatest reduction in VKT and VHT, other (i.e. background) articulated truck traffic are also expected to see decreases in VKT and VHT under the with Moorebank IMT case.
- On an average weekday the implementation of the Moorebank IMT will result in a reduction of 56,125 vehicle kilometres travelled and 1,265 vehicle hours travelled by trucks across the network.
- At Moorebank and Port Botany, the Moorebank IMT will result in 36,185 fewer vehicle kilometres travelled and 670 fewer vehicle hours travelled by articulated trucks to and from Port Botany and Moorebank per day.

This is accompanied by a daily saving of approximately 2,530 VHT for non-truck traffic across the Sydney road network. The vehicle kilometres for non-truck traffic increased by approximately 10,670 VKT, this is probably caused by traffic migrating from adjacent routes to take advantage of the reduction in congestion along the M5.

Further details of the forecast changes in VKT and VHT for other key roads in the Sydney network are discussed in the Strategic Traffic Modelling Report in **Appendix L**.

8.1.2 Moorebank IMT traffic distribution

The distribution of traffic generated by the Moorebank IMT (as identified in Table 6.8 to 6.10) and associated developments is based on the results of strategic modelling discussed in section 8.1.1. For the purposes of the modelling it is assumed that the origin and destination for vehicles would be similar. This is based on the assumption that vehicles would return to their origin after travelling to the Moorebank IMT. The distribution of traffic may be different for light and heavy vehicles. Heavy vehicles generated by the Project site would travel to and from the M5 interchange where they would be distributed amongst the road network to travel to their destinations throughout the Sydney region.

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 able to cater for the vehicle types generated by the Moorebank IMT. B-Double vehicles are not permitted to use Anzac Road.

Table 8.3 shows the assumed distribution of traffic generated by the Project site in 2030. This distribution of light and heavy vehicles is based upon the STM and FMM model which does not distribute freight related heavy vehicle traffic onto Anzac Road.

Table 8.3 Moorebank IMT traffic distribution in 2030

Direction	Distribution (%) weekday AM peak		Distribution (%) weekday PM peak	
	Light vehicles	Heavy vehicles	Light vehicles	Heavy vehicles
Moorebank Avenue – West (M5)	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)	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: STM and FMM models (BTS)