MEMO

Date	12/12/2018
To	Dominic Crinnion (DP&E)
From	Westley Owers (Arcadis)
Copy to	Steve Ryan (Tactical Group), Richard Johnson (Aspect), Ketan Patel (Arcadis), Nathan Cairney (Tactical Group)
Subject	MPE Stage 2 – Consolidated traffic clarification response

This technical memorandum has been prepared to provide consolidated information in relation to the traffic impact assessment for the MPW Stage 2 Proposal (SSD 7709) as requested by the Department of Planning and Environment (DP&E) in the email[1] dated 12 December 2018. This technical memorandum specifically refers to potential traffic impacts for the upgrade of the Moorebank Avenue / Anzac Road / MPW Stage 2 proposed access intersection.

Table 1 provides references to the information, which includes exerts from the MPW Stage 2 Proposal assessment documentation, requested by DP&E. A complete copy of the Operational Traffic Impact Assessment prepared as part of the EIS (Appendix M of the EIS) and the Operational Traffic Impact Assessment Addendum prepared as part of the RtS (Appendix C of the RtS) are provided at *Attachment E* and *Attachment F* of this technical memorandum.

Table 1 Summary traffic information provided

Number	DP&E request	Reference within this document	Source document
Moorebank Avenue / Anzac Avenue / MPW access			
1.	The assumed background traffic (base year traffic and assumed growth MPE, Anzac Avenue background traffic growth etc)	• Traffic volumes with and without the Proposal (operation 2019) - Table 5-2 • Traffic volumes with and without the Proposal (10 year horizon – 2029) – Table 5-3. Refer to *Attachment A*.	Operational Traffic and Transport Impact Assessment (OTTIA) (Appendix M of the EIS)
2.	The forecast traffic generation from the proposed MPW development (light vehicles and trucks during the AM and PM design peak hours)	• Forecast traffic generation – Table 5-1 (2nd row) Refer to *Attachment B*.	OTTIA (Appendix M of the EIS)
3.	The assumed distribution of MPW generated traffic	• Traffic distribution – Section 5.2 and Figures 5-5 and 5-6. Refer to *Attachment C*.	OTTIA (Appendix M of the EIS)
4.	SIDRA analyses of the intersection performance	• For the purpose of the OTTIA modelling for the Proposal, Arcadis	OTTIA Addendum (Appendix C of the RtS)

[1] Email from Dominic Crinnion (DP&E) to Richard Johnson (Aspect) and Nathan Cairney (Tactical Group).

Number	DP&E request	Reference within this document	Source document
	under the current, and proposed arrangements (both design peak hours), including identification and justification of all non-default values.	used the AIMSUN traffic model provided by Roads and Maritime dated 4 March 2016. Arcadis supplemented this assessment with SIDRA Network version 7[2]. • AIMSUN results with and without the Proposal, with the existing and upgraded intersection (2019 and 2029) – Tables 2-2 and 2-3. • The impacts are considered acceptable and accommodated through the upgrade of the Moorebank Avenue / Anzac Avenue / MPW access intersection. Refer to *Attachment D*.	
5.	SIDRA outputs showing Degree of Saturation, delays and 95 percentile queuing for each scenario.	• As discussed above AIMSUN was used for the OTTIA, as requested by Roads and Maritime. • Results with and without the Proposal (indicating delays for each scenario (2019 and 2029)) – Tables 2-2 and 2-3. Refer to *Attachment D*.	OTTIA Addendum (Appendix C of the RtS)

[2] SIDRA was used for the base year (2016) and AIMSUN for future years (2019 and 2029) as discussed with Roads and Maritime Services.

ATTACHMENT A: BACKGROUND TRAFFIC

Table 5-2 Daily Traffic Volumes and Heavy Vehicle Volumes in 2019 (Opening Year)

ID	Road Locations	2019 without the Proposal		2019 with the Proposal		Traffic Increase Contributed by the Proposal in 2019 Opening Year (% of Background Traffic)
		All vehicle	Heavy Vehicles (%)	All vehicle	Heavy Vehicles (%)	
M-1	Moorebank Avenue, north of Anzac Road	23,200	1,200 (5%)	27,040	2,700 (10%)	3,840 (16.6%)
M-2	Moorebank Avenue, south of Anzac Road	19,000	980 (5%)	19,080	980 (5%)	80 (0.4%)
M-3	Anzac Road, east of Moorebank Avenue	11,100	510 (5%)	11,310	510 (5%)	210 (1.9%)
M-4	Moorebank Avenue, north of Cambridge Avenue	19,000	1,050 (6%)	19,080	1,050 (6%)	80 (0.4%)
M-5	Cambridge Avenue, west of Moorebank Avenue	17,900	630 (4%)	17,980	630 (4%)	80 (0.4%)

Note: Traffic increase contributed by the Proposal equals to Proposal traffic generation divided by background traffic.

Table 5-3 Daily Traffic Volumes and Heavy Vehicle Volumes in 2029 (10-Year Horizon)

ID	Road Locations	2029 without the Proposal		2029 with the Proposal		Traffic Increase Contributed by the Proposal in 2029 Opening Year (% of Background Traffic)
		All vehicle	Heavy Vehicles (%)	All vehicle	Heavy Vehicles (%)	
M-1	Moorebank Avenue, north of Anzac Road	28,000	1,450 (5%)	31,840	2,910 (9%)	3,840 (13.7%)
M-2	Moorebank Avenue, south of Anzac Road	23,500	1,220 (5%)	23,580	1,220 (5%)	80 (0.3%)
M-3	Anzac Road, east of Moorebank Avenue	12,800	590 (5%)	13,010	590 (5%)	210 (1.6%)
M-4	Moorebank Avenue, north of Cambridge Avenue	23,600	1,310 (6%)	23,680	1,310 (6%)	80 (0.3%)
M-5	Cambridge Avenue, west of Moorebank Avenue	22,300	780 (3%)	22,380	780 (3%)	80 (0.4%)

Note: Traffic increase contributed by the Proposal equals to Proposal traffic generation divided by background traffic.

In the opening year (2019), the highest traffic increase attributable to the Proposal is forecast on Moorebank Avenue (north of Anzac Road) with an increase of 17%. The Proposal traffic would also increase traffic on Anzac Road (east of Moorebank Avenue) by approximately 1.9%. The analysis indicates minor traffic increase (less

ATTACHMENT B: FORECAST TRAFFIC GENERATION

5 IMPACT ASSESSMENT WITH THE PROPOSAL

5.1 Trip Generation from the Proposal

The trip generation assumptions for the Proposal were sourced from the following:

- *Moorebank Intermodal Terminal Precinct – Traffic Generation and Underlying Assumptions, Memorandum, Parsons Brinckerhoff, 1 September 2016.* (Provided in Appendix C of this report)
- *MPE Stage 2 Proposal / MPW Stage 2 Proposal – Container Handling Movements, Neil Matthews Consulting Pty Ltd, 4 August 2016.* (Provided in Appendix D of this report)

The following assumptions, which have previously been provided to Roads and Maritime (refer to Section 1.9 of this report), have been made to estimate trip generation for the Proposal:

Components	Assumptions
Intermodal Terminal	• The intermodal terminal facility would operate 52 weeks per year, 7 days a week and 24 hours a day. • Containers will arrive every day of the year. In a typical week, 85% of containers will be processed on weekdays (Monday – Friday), with the remaining 15% being processed on Saturday and Sunday. • The containers arriving by rail will be transferred on to trucks for transport on-site and off-site. In some instances containers will be unloaded from trains into the container storage area (i.e. stacked) and then transferred onto trucks. • Containers are loaded onto either B-doubles or semi-trailers. On average a semi-trailer is equivalent to 1.6 TEUs and a B-double equivalent to 2.4 TEUs • About 80% of container deliveries will be made by semi-trailers and 20% by B-doubles.
Warehouse	• The warehouse facility would operate 52 weeks of year, 7 days a week and 24 hours a day. • Containers will arrive every day of the year. In a typical week 95% of containers will be processed on weekdays (Monday – Friday), with the remaining 5% being processed on Saturday and Sunday. • Containers are loaded onto either B-doubles, semi-trailers or rigid trucks. On average a semi-trailer is equivalent to 1.6 TEUs, a B-double equivalent to 2.4 TEUs, and a rigid truck is equivalent to 0.8 TEUs • About 65% of deliveries will be made by semi-trailers, 30% will be made by rigid trucks and 5% will be made by B-doubles.
Staff shift work	• Two shifts per day transitioning to three shifts per day

Table 5-1 summarises trip generation assumptions for the Proposal. The Proposal is expected to generate approximately 1,458 truck trips (2-way) and 2,670 car trips (2-way) to and from the precinct each week day. In the cumulative development scenario with the addition of traffic from MPE Stage 1, approximately 2,778 truck trips (2-way) and 2,815 car trips (2-way) are estimated to and from the precinct each week day.

Table 5-1 Development Parameters

Trip Generation Assumptions	Development Scenarios	
	Proposal Only	Cumulative Development = Proposal and MPE Stage 1
Development Parameters		
Total Intermodal Terminal Capacity	500,000 TEU per annum	750,000 TEU per annum (Additional 250,000 TEU throughput is attributed to MPE Stage 1)
Total Warehousing GFA	215,000 sq.m	215,000 sq.m (The MPE Stage 1 Proposal does not include warehouse facilities)
Trip Generation		
Daily Truck Trips (to and from, 24 hours)	1,458 truck trips/day	2,778 truck trips/day
Daily Car Trips (to and from, 24 hours)	2,670 car trips/day	2,815 car trips/day

5.1.1 Terminal Truck Generation Profile

Although, the terminal is planned to operate 24 hours per day, 7 days a week. About 95% of trucks are expected to arrive and depart the terminal between 6:00 AM and 10:00 PM.

Figure 5-1 shows the temporal profile for the terminal truck generation assumed for the Proposal. It is envisaged that the peak deliveries to/from the terminal will occur in the morning and evening periods.

ATTACHMENT C: TRAFFIC DISTRIBUTION

5.2 Traffic Distribution

The distribution of additional traffic generated by the Proposal is a key factor in determining its impact on the study area road network. Figure 5-5 shows the estimated truck (including semi-trailers, B-doubles and rigid trucks) distribution on the study area road network in the AM peak.

About 56% of trucks generated by the Proposal would travel to the Proposal site via the M5 Motorway from the west. About 17% is forecast to travel to the Proposal site via the Hume Highway. About 25% is forecast to travel to the Proposal site via Moorebank Avenue on the north side of the M5 Motorway. Of this 25%, 12% would originate from Newbridge Road East and 5% from Newbridge Road West.

In general, all trucks would travel via Moorebank Avenue north of the Proposal site. No container trucks would travel to the Proposal site via Anzac Road (east of Yulong Close) and Cambridge Avenue.

Figure 5-6 shows the trip distribution for employee cars in the AM peak. The majority of employee car traffic associated with the Proposal are forecast to travel to the Proposal site via Moorebank Avenue. About 22% and 31% of car traffic related to the Proposal are forecast to travel to the Proposal site via the M5 Motorway from the east and west, respectively. About 18% is forecast to travel to the Proposal site via the Hume Highway from the west and Moorebank Avenue from the north. Minor employee car traffic is expected to travel to Proposal site via Anzac Road (8%) and Cambridge Avenue (3%).

The traffic distribution in the PM peak (outbound trips) is assumed to be similar to AM peak inbound trip distribution showed in Figure 5-5 and Figure 5-6.

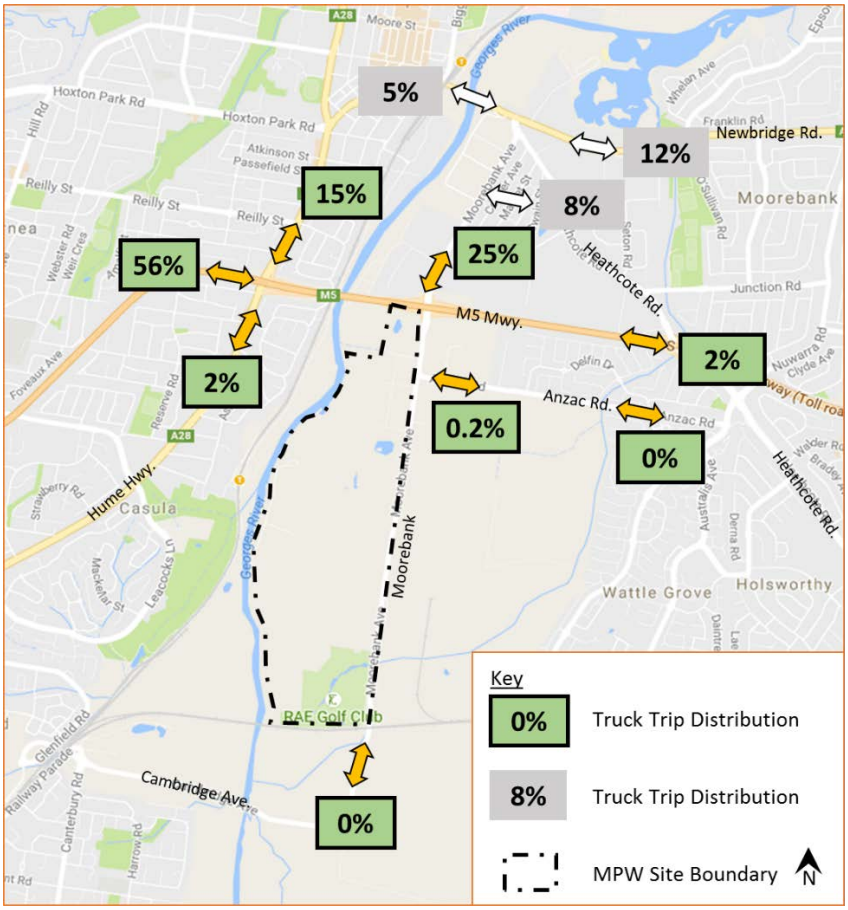

Figure 5-5 Truck Traffic Distribution to Precinct in the AM Peak

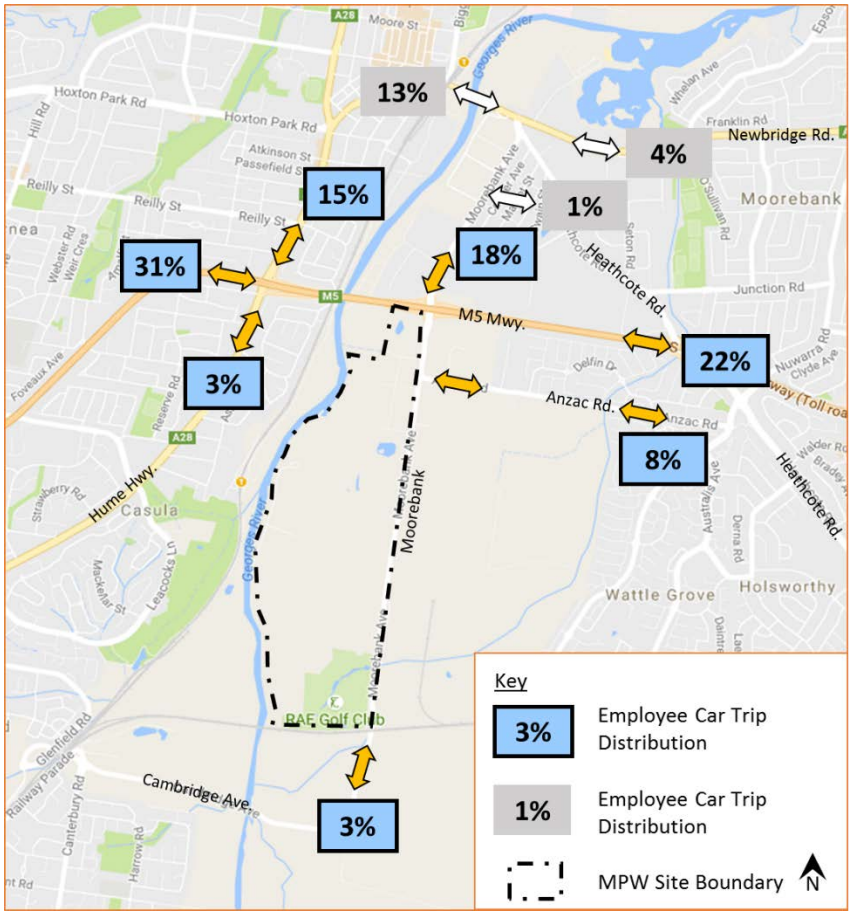

Figure 5-6 Employee Car Traffic Distribution to Precinct in the AM Peak

5.3 Regional Benefits of the Proposal

From a strategic perspective, the Moorebank Intermodal Terminal Project Environmental Impact Statement (EIS), 2014, identified that the introduction of the Proposal would result in wider regional benefits including:

- *Transfer of road haulage between Port Botany and Western Sydney to rail freight for redistribution thereby helping to reduce traffic congestion and providing speed benefits for the Sydney road network*
- *Easing the Port Botany bottleneck to enable the Port to cope with future growth and provide largescale freight capacity*
- *Reductions in articulated truck volumes through the Sydney CBD and inner city suburbs, on the M4 Motorway and the M5 Motorway east of the Moorebank Avenue interchange. The changes in articulated truck volumes on the regional Sydney road network would be reductions in heavy vehicle movements between Port Botany and Moorebank, thereby relieving the regional Sydney road network of articulated vehicular traffic.*
- *An increase in articulated truck flows, particularly on the M7, Hume Highway and Mamre Road south of the M4 Motorway as well as the M5 Motorway between Moorebank Avenue interchange and the M7 Motorway.*
- *Reductions in vehicle operating costs for heavy vehicles (i.e. vehicle-kilometres-travelled (VKT) and vehicle –hours travelled (VHT)) on the regional road network*

ATTACHMENT D: AIMSUN RESULTS

2.2.2 Results

Container wash-down facilities and de-gassing areas

It is envisaged that there would be vehicle movements through the MPW site for access and egress into the wash-down and de-gassing facility as part of standard site operations. The alteration in vehicle circulation within the Proposal site would not change traffic impacts, rather it would be a deviation in the way traffic moves within the site and would be managed through the Operational Traffic Management Plan for the Proposal, where necessary.

Upgraded layout for the Moorebank Avenue / Anzac Road intersection

The predicted intersection performance (i.e. delay (in seconds) and level of service (LoS)) of the eight key intersections in the core traffic study area with the Amended Proposal under Scenario 1 and Scenario 2 for the 2019 and 2029 AM and PM peak periods, both with and without the Proposal, based on the revised traffic modelling to include the upgraded Moorebank Avenue/ Anzac Road intersection layout, are described in Table 2-2 to Table 2-5 below.

The proposed upgraded layout for the Moorebank Avenue / Anzac Road intersection is predicted to increase intersection capacity and either improve or maintain the intersection performance when compared to the intersection layout adopted in the EIS.

In 2019 and 2029 under Scenario 2, the intersection performance of a number of intersections is reduced. As the only modification to the operational traffic model was the inclusion of the upgraded Moorebank Avenue/ Anzac Road intersection layout, worsening in the LoS at these intersections is a result of variability in the operational traffic model in the 2029 under both Scenario 1 and Scenario 2. Variability in the traffic modelling analysis for 2029 is indicative of a heavily congested road network and insufficient network-wide capacity, where there is any capacity changes in one part of the network, re-distribution occurs across the network resulting in inconsistent results at intersections that have otherwise would not experience any actual changes in performance, as described in the EIS.

The following key findings have been identified from the revised traffic modelling and analysis:

Scenario 1 (operation of the Proposal only, with the amendments)

- In 2019 under Scenario 1, all intersections would continue to operate at an acceptable LoS in the AM and PM peak, consistent with the operational traffic and transport impact assessment prepared for the EIS.
- In 2029 under Scenario 1, all intersections would continue to operate at an acceptable LoS in the AM and PM peak, consistent with the operational traffic and transport impact assessment prepared for the EIS, with the exception of the following two intersections, where intersection performance would improve from a LoS F to a LoS E:
  - The M5 Motorway/ Hume Highway in the AM peak
  - The M5 Motorway/ Heathcote Road in the PM peak.

Table 2-2 2019 with and Without Proposal Development (Existing Layout, EIS Layout and Upgraded Intersection Layout) – Scenario 1

ID	Intersection	2019 without Proposal Development (Existing Layout at Moorebank Avenue / Anzac Road intersection)				2019 with Proposal Development (EIS Layout at Moorebank Avenue / Anzac Road intersection)				2019 with Proposal Development (Upgraded Layout at Moorebank Avenue / Anzac Road intersection)			
		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
		Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	24	B	16	B	41	C	42	C	39	C	31	C
I-2	M5 Motorway / Moorebank Avenue	49	D	28	B	20	B	20	B	20	B	20	B
I-3	M5 Motorway / Hume Highway	134	F	32	C	56	E	28	B	59	E	28	B
I-4	Moorebank Avenue / Newbridge Road	44	D	31	C	47	D	37	C	55	D	33	C
I-5	Moorebank Avenue / Heathcote Road	53	D	44	D	75	F	34	C	74	F	31	C
I-6	M5 Motorway / Heathcote Road	78	F	69	E	31	C	36	C	37	C	35	C
I-7	Cambridge Avenue / Glenfield Road	8	A	12	A	8	A	12	A	8	A	10	A
I-8	Cambridge Avenue / Canterbury Road	10	A	7	A	8	A	7	A	9	A	6	A

Table 2-3 - 2029 with and Without Proposal Development (Existing Layout, EIS Layout and Upgraded Intersection Layout) – Scenario 1

ID	Intersection	2029 without Proposal Development (Existing Layout at Moorebank Avenue / Anzac Road intersection)				2029 with Proposal Development (MPW Stage 2 Proposal EIS Layout at Moorebank Avenue / Anzac Road intersection)				2029 with Proposal Development (Upgrade Layout at Moorebank Avenue / Anzac Road intersection)			
		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
		Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	52	D	95	F	53	D	45	D	47	D	33	C
I-2	M5 Motorway / Moorebank Avenue	74	F	125	F	30	C	38	C	33	C	37	C
I-3	M5 Motorway / Hume Highway	155	F	129	F	73	F	38	C	68	E	39	C
I-4	Moorebank Avenue / Newbridge Road	48	D	94	F	50	D	42	C	46	D	47	D
I-5	Moorebank Avenue / Heathcote Road	66	E	153	F	70	E	78	F	68	E	80	F
I-6	M5 Motorway / Heathcote Road	46	D	336	F	38	C	77	F	40	C	70	E
I-7	Cambridge Avenue / Glenfield Road	10	A	7	A	9	A	8	A	8	A	8	A
I-8	Cambridge Avenue / Canterbury Road	14	B	10	A	20	B	7	A	18	B	8	A

ATTACHMENT E: OTTIA (EIS – COMPLETE DOCUMENT)

ARCADIS Design & Consultancy for natural and built assets

Moorebank Precinct West (MPW) – Stage 2 Proposal

Operational Traffic and Transport Impact Assessment

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant Development

October 2016

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MOOREBANK PRECINCT WEST STAGE 2 PROPOSAL

Moorebank Precinct West – Stage 2

Operational Traffic & Transport Impact Assessment

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REVISIONS

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A to D	Aug 2016	Draft Final Including Rebranding	KN, LG, JX, LM	WO
E	Sept 2016	First Internal Review	MY	WO
F	Oct 2016	Second Internal Review	MY	WO

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- Traffic Presentation

APPENDIX B Traffic Data and Assumptions used in Traffic and Accessibility Impact Assessment

APPENDIX C Traffic Generation and Underlying Assumptions (WSP | Parsons Brinkerhoff)

APPENDIX D MPE Stage 2 / MPW Stage 2 – Container Handling Movements, Neil Matthews Consulting Pty Ltd

GLOSSARY

Abbreviation	Description
AEP	Annual Exceedance Probability
AADT	Annual Average Daily Traffic
ADT	Average Daily Traffic
CoA	Conditions of Approval
DP	Deposited Plan
EIS	Environmental Impact Statement
EOW	Explosive ordnance waste
EP&A Act	Environment Planning and Assessment Act
GFA	Gross Floor Area
IMT	Intermodal Terminal
LOS	Level of Service
LMARI	Liverpool Moorebank Arterial Road Investigations
MIC	Moorebank Intermodal Company
MPE	Moorebank Precinct East
MPW	Moorebank Precinct West
Precinct Model	Whole of precinct traffic modelling for the ultimate “full-build” scenario
Proposal Model	Traffic modelling for MPW Stage 2
RAE	Royal Australian Engineers
REMM	Revised Environmental Mitigation Measures
RMS	Roads and Maritime Service of NSW
RtS	Response to Submissions
SEARS	Secretary’s Environmental Assessment Requirements
SIMTA	Sydney Intermodal Terminal Alliance
SSD	State Significant Development
SSFL	Southern Sydney Freight Line
SRtS	Supplementary Response to Submissions

Abbreviation	Description
SME	School of Military Engineering
TEU	Twenty-foot Equivalent Unit
The PROPOSAL	MPW Stage 2
TfNSW	Transport for New South Wales
Trip	A movement with an origin and a destination
USTs	Underground storage tanks
UXO	Unexploded ordnance
VHT	Vehicle-hours travelled
VKT	Vehicle-kilometres-travelled
VPA	Voluntary Planning Agreement
WSP – PB	Parsons Brinkerhoff

EXECUTIVE SUMMARY

The Proposal

MPW Stage 2 (the Proposal) involves the development of an intermodal freight terminal facilities (IMT), linked to Port Botany, the interstate and intrastate freight rail network. It includes associated commercial infrastructure (i.e. warehousing), a rail link connecting the Proposal site to the Southern Sydney Freight Line (SSFL), and a road entry and exit point from Moorebank Avenue.

The IMT facility would have the necessary infrastructure to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum. It would also contain approximately 215,000 m^2 GFA of warehousing, with warehouses ranging in size from 4,000 m^2 to 71,000 m^2. Included within the warehousing area would be ancillary offices, freight village, truck and light vehicle parking, and associated warehouse access roads.

The Proposal site is generally bounded by the Georges River to the west, Moorebank Avenue to the east, the East Hills Railway Line to the south and the M5 Motorway to the north. It is located on Moorebank Avenue, Moorebank, southwest of Sydney.

Planning and Statutory Framework

This Operational Traffic and Transport Impact Assessment Report has been prepared to support the Environmental Impact Statement (EIS) for approval of the Proposal. It has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act. This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (ref: SSD 16-7709 and dated 14 July 2016) and revised environmental mitigation measures (REMMs) identified in the MPW Concept Plan Approval (SSD_5066).

Under the Concept Plan Approval, the MPW Project is to be developed in four phases, being:

- Early Works development phase
- Development of the intermodal terminal (IMT) facility and initial warehousing facilities
- 'Ramp up' of the IMT capacity and warehousing
- Development of further warehousing

On 5 December 2014, Moorebank Intermodal Company (MIC) and Sydney Intermodal Terminal Alliance (SIMTA) announced their in-principle agreement to develop the Moorebank IMT Precinct on a whole of precinct basis. This agreement is subject to satisfying several conditions which both parties are currently working towards. SIMTA is therefore seeking approval to build and operate the IMT facility and warehousing under the MPW Project Concept Approval, known as the MPW Stage 2 Proposal (the Proposal).

Assessment Approach

This report examines the traffic impact of the traffic generated by the Proposal (including the cumulative development impacts of the Proposal with MPE Stage 1) on the road network and assessed the intersection and road network impacts using evidence based traffic modelling, and identifies appropriate mitigation measures to address these impacts.

In determining the required intersection improvements to mitigate the impact of Proposal traffic on the road network, a "no-worsening of the without Proposal intersection performance" approach has been adopted as this identifies improvements directly attributable to the Proposal i.e. not due to growth in background traffic.

The study area comprises a wider area and a core area of investigation. The wider investigation area includes the road network in the Liverpool local government area (LGA) and the Moorebank area. Detailed analysis has been conducted for the key intersections and road links in the core area and includes:

- I-1 Moorebank Avenue / Anzac Road
- I-2 M5 Motorway / Moorebank Avenue
- I-3 M5 Motorway / Hume Highway
- I-4 Moorebank Avenue / Newbridge Road
- I-5 Moorebank Avenue / Heathcote Road
- I-6 M5 Motorway / Heathcote Road
- I-7 Cambridge Avenue / Glenfield Road
- I-8 Cambridge Avenue / Canterbury Road.

The above eight key intersections were identified for assessment based on the SEARs for MPE Stage 1 and have been discussed/agreed through consultation with key stakeholders including Roads and Maritime.

Stakeholder Consultation

Through-out the traffic study, key stakeholders were consulted through a series of meetings which were held individually and then a joint meeting was undertaken with the key stakeholders to present the scope of the study, impact assessment methodology and preliminary findings of the traffic study.

Numerous meetings, emails and telephone conversations have been undertaken to ensure that the modelling undertaken for the Proposal utilises the appropriate AIMSUN (LMARI) model and assessment approach

Findings of the Impact Assessment

Traffic Generation from the Proposal

The Proposal is expected to generate approximately 1,458 truck trips (2-way) and 2,670 car trips (2-way) to and from the precinct each week day. In the cumulative development scenario with the addition of traffic from MPE Stage 1, approximately 2,778 truck trips (2-way) and 2,815 car trips (2-way) are estimated to and from the precinct each week day.

Proposal Site Access

Two access points are proposed for access to the Proposal site. Access to the Proposal site will be via an upgraded Moorebank Avenue/Anzac Road signalised intersection and Moorebank Avenue/Bapaume Road.

Trucks would enter the Proposal site via the main entrance at the upgraded Moorebank Avenue/Anzac Road intersection and continue along the internal road on the western perimeter of the Proposal site.

Once in the warehouse, trucks would be loaded/unloaded via manual handling equipment. Once loaded the trucks would then head to intended markets via the nearby major road network, or transported to the adjacent terminal on the MPE Stage 1 site, or transported directly to the IMT facility for dispatch to interstate, intrastate or port shuttle via rail.

Impact at Key Road Sections

In the opening year (2019), the highest traffic increase attributable to the Proposal is forecast on Moorebank Avenue (north of Anzac Road) with an increase of 17%. The Proposal traffic would also increase traffic on Anzac Road (east of Moorebank Avenue) by approximately 1.9%. The analysis indicates minor traffic increase (less

than 0.5%) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the Proposal.

In the 10-year design horizon (2029), the traffic increase attributable to the Proposal is expected to be reduced to 14% on Moorebank Avenue (north of Anzac Road) and 1.6% on Anzac Road (east of Moorebank Avenue). This is due to the growth in background traffic between 2019 and 2029. The analysis indicates minor traffic increase (less than 0.5 %) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the Proposal by 2029.

Impact at Key Intersections

The highest traffic increase attributable to the Proposal is predicted at Moorebank Avenue / Anzac Road intersection which provides vehicular access to the Proposal site. In 2019, the Proposal would increase traffic at Moorebank Avenue / Anzac Road intersection by 20% to 26 % during the peak hour. The increase is expected to reduce to between 6% and 7% by 2029 as a result of the background traffic increasing and operational traffic remaining consistent (from the opening year).

It is also predicted to increase traffic at M5 Motorway / Moorebank Avenue intersection by 11% to 14% in 2019 and reducing to 3.5% to 4.0% by 2029. Increases in traffic due to the Proposal at the M5 Motorway / Hume Highway are less than 2%.

To the north, the analysis found that likely traffic increase attributable to the Proposal at Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road intersections would be minor (less than 3%). To the east, likely traffic increases at the M5 Motorway / Heathcote Road would be marginal (less than 0.5%). Similarly, to the south on Cambridge Avenue, likely traffic increase at two assessed roundabouts would be marginal (less than 1%).

It should be noted that the predicted increase in traffic generated by the Proposal which are less than 5% of the observed are within the limits of the variations in day to day traffic volumes. As such, their impacts are considered marginal.

Moorebank Avenue / Anzac Road

- The existing intersection is currently operating satisfactorily at LoS B in the peak periods and is expected to operate satisfactorily at LoS B in the opening year 2019 without the Proposal. No upgrading of the existing intersection is required to cater for background traffic demand in 2019
- However, in 2029, the model predicted that the existing Moorebank Avenue/ Anzac Road intersection would operate at unacceptable LoS F without the Proposal. The modelling indicated that the performance of the intersection in its current form will be impacted by the M5 Motorway / Moorebank Ave due to spill back of vehicular queues from the M5 Motorway. Upgrading of the M5 Motorway / Moorebank Avenue intersection is considered to be required to improve the current performance of the Moorebank Avenue / Anzac Road intersection.
- An upgraded Moorebank Avenue/ Anzac Road intersection is proposed to provide access to the Proposal site and to cater for traffic generated by the Proposal. The upgraded intersection is expected to perform at LoS C in 2019 and LoS D in 2029 with the Proposal, which is considered satisfactory.
- The analysis of the cumulative development impacts indicate that the upgraded Moorebank Avenue/ Anzac Road intersection is expected to perform at LoS D in 2019 and LoS E in 2029, which is no-worse than the without Proposal scenario.

M5 Motorway / Moorebank Avenue

- The existing intersection is currently operating satisfactorily at LoS C in the peak periods and is expected to operate satisfactorily at LoS D in the opening year 2019 without the Proposal. No upgrading of the existing intersection is required to cater for background traffic demand in 2019

- In 2029, the model predicted that the existing M5 Motorway / Moorebank Avenue intersection would operate at unacceptable LoS F. Upgrading of the current intersection is required without the addition of the traffic generated by the Proposal as additional capacity is needed to cater for the growth in background traffic in 2029.
- An upgraded M5 Motorway / Moorebank Avenue intersection is proposed to cater for Proposal traffic and is expected to perform at LoS B in 2019 and LoS C in 2029, which is considered acceptable performance.
- The analysis of the cumulative development impacts indicate that the upgraded M5 Motorway / Moorebank Avenue intersection is expected to perform at LoS C in 2019 and LoS D in 2029, which is considered acceptable performance.

M5 Motorway / Hume Highway

- The intersection currently operates with LoS D in the AM and LoS C in the PM peak. The intersection is operating close to capacity in the AM peak.
- In 2019 and 2029 (without the Proposal), the intersection is expected to operate at unacceptable LoS F in the peak periods
- Upgrading of the existing intersection is required to cater for background traffic demand in 2019 and 2029
- With the Proposal and the proposed upgrades, the intersection is expected to operate at LoS E in 2019 and LoS F in 2029, which is no-worse than the without Proposal scenario.
- The analysis of the cumulative development impacts indicate that the upgraded M5 Motorway / Hume Highway intersection is expected to perform at LoS D in 2019 and LoS F in 2029 which is better than/comparable to the without Proposal scenario.

Moorebank Avenue / Newbridge Road

- The existing Moorebank Avenue / Newbridge Road intersection is operating at capacity at LoS E in the AM and PM peaks. Upgrades are needed at this intersection to cater for existing peak demand.
- In 2019 and 2029 (without the Proposal), the intersection is expected to worsen with unacceptable LoS E/F in the peak periods
- With the Proposal and the proposed upgrades, the intersection is expected to operate at LoS D in 2019 and 2029 which is better than without the Proposal
- With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS D in 2019 and 2029 which is better than without the Proposal

Moorebank Avenue / Heathcote Road

- The existing Moorebank Avenue / Heathcote Road intersection is operating at capacity at LoS E in the AM and PM peaks. Upgrades are needed at this intersection to cater for existing peak demand.
- In 2019 and 2029 (without the Proposal), the intersection is expected to operate at unacceptable LoS E/F in the peak periods
- Upgrading of the existing intersection is required to cater for background traffic demand in 2019 and 2029
- With the Proposal and proposed upgrades, the modelling predicted a LoS E/F in 2019 and 2029 which is comparable to without the Proposal
- With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS E/F in 2019 and 2029 which is better than/comparable to without the Proposal

M5 Motorway / Heathcote Road

- The intersection currently operates with LoS B in the AM and LoS D (near capacity) in the PM peak
- In 2019 and 2029 (without the Proposal), the intersection is expected to operate at unacceptable LoS E/F in the peak periods
- Upgrading of the existing intersection is required to cater for background traffic demand in 2019 and 2029
- With the Proposal and proposed upgrades, the modelling predicted a LoS C in 2019 and LoS F in 2029 which is better than/comparable to without the Proposal
- With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS C in 2019 and LoS E in 2029 which is better than without the Proposal

Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road

- The model indicated satisfactory roundabout operations at both locations with LoS A/B in the AM and PM peak in 2019 and 2029 (without and with the Proposal). No upgrading of the existing intersection is required as only a small volume of Proposal traffic uses these intersections in the south.

Car Parking Provision

Based on the Roads and Maritime parking standards and the proposed warehouse, and office gross floor areas for the Proposal, a total of 983 car parking spaces are proposed to be provided.

Bicycle Facilities Provision

Based on the proposed warehouse and office GFAs for the Proposal, an indicative total of 127 bicycle parking spaces, 127 lockers and 15 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*.

Public Transport and Active Transport Provision

In terms of the public transport and active transport provision that is required to cater for the Proposal, that the following mitigation measures are considered suitable:

- SIMTA to undertake consultation with relevant bus provider(s) be conducted regarding the potential to extend the 901 bus service and additional bus stops to ensure adequate accessibility to and within the Proposal site

Consultation with TfNSW will be conducted regarding the provision for active transport to/from the Proposal site and along the internal perimeter road, as part of detailed design for the Proposal.

Regional Network Impacts

The Proposal would partly help to reduce the potential increase in regional freight movements along the M5 Motorway between Port Botany and Moorebank Avenue. From a strategic perspective, as identified in the Moorebank Intermodal Terminal Project Environmental Impact Statement (PB, 2014), the introduction of the Precinct (and the Proposal) would result in wider regional benefits including:

- *Transfer of road haulage between Port Botany and Western Sydney to rail freight for redistribution thereby helping to reduce traffic congestion and providing speed benefits for the Sydney road network*
- *Easing the Port Botany bottleneck to enable the Port to cope with future growth and provide largescale freight capacity*

- *Reductions in articulated truck volumes through the Sydney CBD and inner city suburbs, on the M4 Motorway and the M5 Motorway east of the Moorebank Avenue interchange. The changes in articulated truck volumes on the regional Sydney road network would be reductions in heavy vehicle movements between Port Botany and Moorebank, thereby relieving the regional Sydney road network of articulated vehicular traffic.*
- *An increase in articulated truck flows, particularly on the M7, Hume Highway and Mamre Road south of the M4 Motorway as well as the M5 Motorway between Moorebank Avenue interchange and the M7 Motorway.*
- *Reductions in vehicle operating costs for heavy vehicles (i.e. vehicle-kilometres-travelled (VKT) and vehicle –hours travelled (VHT)) on the regional road network*

Network Improvements and potential solutions

The road network will need to be improved to cater for the forecast increase in traffic volumes which will result from both the general growth in background traffic and operational vehicles from the Proposal passing through the study area.

The study identified the following road network improvements to ensure that satisfactory intersection performance could be achieved based on no-worsening of the performance of the eight key intersections without the Proposal.

In addition to the recommended improvements at the eight key intersections, improvements are also recommended for the wider road network to provide sufficient capacity to meet the anticipated demand from the Proposal.

As discussed above, a number of key intersections are currently operating at an unsatisfactory level of service as a result of background traffic and anticipated background traffic growth, i.e. without the Proposal. These intersections would need to be upgraded by Roads and Maritime to ensure that the network operates sufficiently and that local traffic in the area does not continue to decline in performance.

It is noted that some intersections are directly impacted by the Proposal and therefore upgrades, either in full or part, are to be undertaken as part of the Proposal subject to further negotiations with Roads and Maritime and the Precinct Modelling (refer to Section 1.8 of this report).

Mitigation measures for the Proposal

A summary of the intersection which is to be upgraded (in part of full) as part of the Proposal, subject to negotiations with Roads and Maritime, is discussed in Table E1.

Table E1- Mitigation measures for the Proposal

ID	Intersection	Recommended Network Improvements to Mitigate Proposal Traffic	Indicative Timing
I-1	Moorebank Avenue / Anzac Road	1. Upgrade Moorebank Avenue/Anzac Road signalised intersection to include lane capacity improvements on the northern and southern approaches, and the construction of a new access road into the Proposal site (new western approach). The current configuration on Anzac Road (eastern approach) will be retained. 2. Implement vehicle actuated signals 3. Upgraded intersection to comply with relevant Roads and Maritime design standards	2019

Potential network solutions

A summary of the intersections which would operate at a level of service which is unsatisfactory without the Proposal are provided below. We would recommend that Roads and Maritime consider these solutions to improve the existing and future operation of the local road network. These are presented as potential road network solutions however are not nominated for delivery for the Proposal.

Table E2- Recommendations for Network Improvements due to Background Traffic

ID	Intersection	Recommended Network Improvements due to Background Traffic	Indicative Timing
I-2	M5 Motorway / Moorebank Avenue	1. Provide additional capacity on M5 westbound on-ramp. 2. Provide additional capacity on M5 eastbound off-ramp 3. Increase the storage lengths of the existing (two-lane) right turn bay on Moorebank Avenue northern approach 4. Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue intersection and Moorebank Avenue/Anzac Road intersection 5. Change the signal to vehicle actuated to improve west and north approaches 6. Upgraded intersection to comply with relevant RMS design standards	Staged upgrading starting from 2019
I-3	M5 Motorway / Hume Highway	Change the signal to vehicle actuation in the PM peak to improve traffic signal operations	2019
I-4	Moorebank Avenue / Newbridge Road	1. Add an additional right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations.	2019

ID	Intersection	Recommended Network Improvements due to Background Traffic	Indicative Timing
		2. Upgraded intersection to comply with relevant Roads and Maritime design standards	
I-5	Moorebank Avenue / Heathcote Road	1. Extend right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant Roads and Maritime design standards	2019
I-6	M5 Motorway / Heathcote Road	Change the signal to vehicle actuated in PM peak to improve traffic signal operations.	2019
I-7	Cambridge Avenue / Glenfield Road	No improvements required	N/A
I-8	Cambridge Avenue / Canterbury Road	No improvements required	N/A

Developer contributions

The analysis has identified an intersection which are in part impacted by the Proposal and require upgrade (refer to Table E1). It is considered acceptable that developer contributions, from SIMTA, would be provided to assist with the development of this intersection however this would need to be confirmed through discussions with Roads and Maritime.

Notwithstanding this, the Precinct Model is currently envisaged to provide a whole of precinct based approach which will provide Roads and Maritime with further information on upgrades to be undertaken for each stage of the Moorebank Intermodal Precinct. It is understood, from discussions with Roads and Maritime that the Precinct Model, although part of a separate process to the EIS for the Proposal, would be used to guide developer contributions for the Precinct. Therefore, it is likely that a decision on developer contributions for the Proposal would be deferred until the Precinct Model is available.

1 INTRODUCTION

This Operational Traffic and Transport Impact Assessment Report has been prepared by Arcadis Asia Pacific Pty Ltd (Arcadis) to accompany an Environmental Impact Statement (EIS) for Stage 2 of the Moorebank Precinct West Project (MPW Project). The MPW Stage 2 Proposal (the Proposal) represents the construction and operation of an Intermodal Terminal Facility (IMT Facility) with a rail link to the state's freight rail network and associated container storage / warehouse facilities located on the western side of Moorebank Avenue, Moorebank, in south-western Sydney (the Proposal site).

1.1 Background

1.1.1 Moorebank Precinct West (MPW) Project – Concept Plan Approval

On the 3 June 2016 Concept Plan Approval (SSD 5066) was granted, under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to develop the Moorebank Precinct West Project (MPW Project) on the western side of Moorebank Avenue, Moorebank, in south-western Sydney (the Proposal site).

The MPW Project involves the development of intermodal freight terminal facilities (IMT), linked to Port Botany, the interstate and intrastate freight rail network. The MPW Project includes associated commercial infrastructure (i.e. warehousing), a rail link connecting the Proposal site to the Southern Sydney Freight Line (SSFL), and a road entry and exit point from Moorebank Avenue.

Under the Concept Plan Approval, the MPW Project is to be developed in four phases, being:

- Early Works development phase, comprising:
    - The demolition of existing buildings and structures
    - Service utility terminations and diversion/relocation
    - Removal of existing hardstand/roads/pavements and infrastructure associated with existing buildings
    - Rehabilitation of the excavation/earthmoving training area (i.e. 'dust bowl')
    - Remediation of contaminated land and hotspots, including areas known to contain asbestos, and the removal of:
        - Underground storage tanks (USTs)
        - Unexploded ordnance (UXO) and explosive ordnance waste (EOW) if found
        - Asbestos contaminated buildings
    - Archaeological salvage of Aboriginal and European sites
    - Establishment of a conservation area along the Georges River
    - Establishment of construction facilities (which may include a construction laydown area, site offices, hygiene units, kitchen facilities, wheel wash and staff parking) and access, including site security
    - Vegetation removal, including the relocation of hollow-bearing trees, as required for remediation and demolition purposes
- Development of the intermodal terminal (IMT) facility and initial warehousing facilities
- 'Ramp up' of the IMT capacity and warehousing
- Development of further warehousing

Approval for the Early Works phase (MPW Concept Plan Approval) was granted as the first stage of the MPW Project within the Concept Plan Approval. Works approved as part of this stage are anticipated to commence in the third quarter of 2016.

Commonwealth Approval (No. 2011/6086), under the *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act), was also granted in mid-2016 for the MPW Project. In addition to this, the Planning Proposal (PP_2012_LPOOL_004_00) which provided a rezoning of part of the Proposal site, and surrounds, was gazetted on 24 June 2016 into the *Liverpool Local Environmental Plan 2008* (Amendment No. 62).

On 5 December 2014, Moorebank Intermodal Company (MIC) and Sydney Intermodal Terminal Alliance (SIMTA) announced their in-principle agreement to develop the Moorebank IMT Precinct on a whole of precinct basis. This agreement is subject to satisfying several conditions which both parties are currently working towards. SIMTA is therefore seeking approval to build and operate the IMT facility and warehousing under the MPW Project Concept Approval, known as the MPW Stage 2 Proposal (the Proposal).

1.2 Report purpose

This report has been prepared to support the Environmental Impact Statement (EIS) for approval of the Proposal. A summary of the works included in the Proposal is provided below.

This report has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act. This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (ref: SSD 16-7709 and dated 14 July 2016) and revised environmental mitigation measures (REMMs) identified in the MPW Concept Plan Approval (SSD_5066).

Table 1-1 provides a summary of the SEARs and REMMs from the MPW Concept Plan Approval, which are relevant to this report and the section where they have been addressed in this report.

The report includes an overview of traffic impact assessment that assesses intersection and road network impacts using evidence based traffic modelling, and identifies appropriate mitigation measures to address these impacts.

Table 1-1 SEARs (SSD 5066) and REMMs Compliance Table

Ref No. / SEARs	Where addressed	
4. Traffic and Transport		
A Traffic Impact Assessment that assesses intersection and road network impacts, including impacts on Cambridge Avenue. The traffic assessment shall;		
a) use the background growth models developed by RMS for the Liverpool/Moorebank area;	Operational Traffic & Transport Impact Assessment	Section 1.8 Section 1.9 Section 4.1
b) provide details of the current daily and peak hour light and heavy vehicle, public transport, pedestrian and bicycle movements and existing traffic and transport facilities provided on the	Operational Traffic & Transport Impact Assessment	Section 2.2 Section 2.7

Ref No. / SEARs		Where addressed	
	road network located adjacent to the proposed development		Section 3.1 Section 3.2
c)	undertake a realistic and justified range of daily peak hour generation scenarios (to be determined in consultation with TfNSW, RMS and Liverpool City Council) including assumptions about light and heavy vehicle movements and the proportion of deliveries by railway and road;	Operational Traffic & Transport Impact Assessment	Section 1.9 Section 5.1
d)	undertake detailed modelling analysis to assess network operation in consultation with RMS and identify intersection upgrade requirements. The modelling package is to be determined by RMS;	Operational Traffic & Transport Impact Assessment	Section 1.9 Section 3.3 Section 4.2 Section 5.4 Section 5.6 Section 5.7 Section 5.8
e)	consider the constructability constraints of proposed upgrade(s) at key intersections, such as vehicle swept paths, geometry and sight lines;	Operational Traffic & Transport Impact Assessment	Section 5.4 Section 6.1
f)	provide details of the number of parking spaces, and justification of proposed parking against relevant guidelines / standards and Australian Standards;	Operational Traffic & Transport Impact Assessment	Section 5.9
g)	provide details of proposed staff and heavy vehicle accesses (including intersection location, design and site distance) and layout of the internal road network;	Operational Traffic & Transport Impact Assessment	Section 1.5 Section5.4 Section 5.12
h)	demonstrate appropriate provision, design and location of on-site bicycle parking, and how bicycle provision will be integrated with the existing bicycle network;	Operational Traffic & Transport Impact Assessment	Section 5.9
i)	provide details of service vehicle movements and site access arrangements (including vehicle type and likely arrival and departure times of service vehicles);	Operational Traffic & Transport Impact Assessment	Section 1.5 Section 1.6 Section 1.7 Section 5.1

Ref No. / SEARs		Where addressed	
j)	provide details of sustainable travel initiatives for workers and visitors, particularly for the provision of end-of-trip facilities, pedestrian and cyclist facilities in secure, convenient, accessible areas close to main entrances, incorporating lighting and passive surveillance	Operational Traffic & Transport Impact Assessment	Section 5.9 Section 5.12
k)	assess construction traffic impacts, which may include a draft Construction Traffic Management Plan including:		
	i. the identification of haulage routes and the details of existing traffic situation on these routes;		
	ii. an assessment of construction traffic volumes (including spoil haulage/delivery of materials and equipment to the road corridor and ancillary facilities);		
	iii. an assessment of potential impacts to the regional and local road network (including safety and level of service) and potential disruption to existing public transport services, pedestrians and cyclist movements and access to properties and businesses;		
	iv. an assessment of cumulative impacts associated with other construction activities (if any);	Construction Traffic Impact Assessment	
	v. details of peak hour and daily truck movements, hours of operation, access arrangements at all stages of construction and traffic control measures for all demolition / construction activities;		
	vi. an assessment of construction road safety at key intersections and locations subject to pedestrian / vehicle / bicycle conflicts;		
	vii. details of any required temporary cycling and pedestrian access during construction;		
	viii. details of access arrangements for workers to / from the site, including pedestrian and public transport linkages, emergency vehicles and service vehicle movements; and		
	ix. details of mitigation measures for the identified impacts (if any).		
l)	assess operational traffic and transport impacts to the local and regional road network, including:		

Ref No. / SEARs	Where addressed	
i. changes to local road connectivity and impacts on local traffic arrangements including Cambridge Avenue, road capacity/safety;	Operational Traffic & Transport Impact Assessment	Section 5.7 Section 5.10
ii. an assessment of the cumulative impacts associated with other planned and approved developments in the Moorebank precinct;	Operational Traffic & Transport Impact Assessment	Section 5.8
iii. traffic capacity of the road network and its ability to cater for predicted future growth; and	Operational Traffic & Transport Impact Assessment	Section 5.4 Section 5.5 Section 5.6 Section 5.7
iv. details of mitigation measures for the identified impacts (if any) including how heavy vehicles would be prevented from using Moorebank Avenue south.	Operational Traffic & Transport Impact Assessment	Section 5.2
m) consider the use of heavy vehicles able to move two 40 foot containers;	Operational Traffic & Transport Impact Assessment	Section 5.4 Section 6.1
n) consider the need for a bus stop on Moorebank Avenue; and	Operational Traffic & Transport Impact Assessment	Section 5.11
o) provide an updated Traffic Management and Accessibility Plan for the operation of the facility including: i. measures to prevent heavy vehicles accessing residential streets to maintain the residential amenity of the local community ii. details of public transport services and facilities; iii. details of cyclist facilities; and iv. details of driver code of conduct.	Preliminary Operational Traffic Management Plan	
7. Infrastructure Upgrades/Contributions		
a) an assessment of the impacts of the project on local infrastructure, demonstrating that satisfactory arrangements are in place to support and mitigate any impacts of Stage 2 of the Concept Proposal including applicable costs,	Operational Traffic & Transport Impact Assessment	Section 6.1

Ref No. / SEARs	Where addressed	
timing, TEU thresholds and approval pathways for such measures		
b) Consideration of any relevant Council's Developer Contributions Plan (or equivalent document requiring developer contributions), including the contributions plan for Prestons Industrial Area	Operational Traffic & Transport Impact Assessment EIS	Section 6.1 Section 20.3 of the EIS
c) consideration of the need to extend the Route 901 bus service.	Operational Traffic & Transport Impact Assessment	Section 5.11

Ref No. / REMM	Where addressed	
4C) Install a variable message signage system within the Project site to direct heavy vehicles and facilitate safe and efficient access and navigation.	Preliminary Operational Traffic Management Plan	
4D) Consider the provision of pedestrian and cyclist connections from Moorebank Avenue into the Project site	Operational Traffic & Transport Impact Assessment	Section 2.7 Section 5.12
4E) Consider the provision of staff storage and shower areas to promote cycling, jogging and walking as modes of transport	Operational Traffic & Transport Impact Assessment	Section 5.9
4F) Negotiate with bus operators for the provision of additional bus stops and increased bus services between the Project site and nearby public transport interchange hubs to reduce the volume of light vehicles generated by staff. This would be determined based on staff numbers and likely patronage numbers	Operational Traffic & Transport Impact Assessment	Section 5.11
4H) Prior to all future development application stages, in consultation with Transport for NSW and other relevant agencies of NSW Government, ensure that adequate arrangements are in place to ensure that: • The impacts of additional traffic associated with the future development application stages will minimise Project related traffic impacts and consider the capacity of the road network, taking account of background traffic growth and planned road network improvements. • Arrangements are in place (irrespective of funding source) for the on-time delivery of the necessary	Operational Traffic & Transport Impact Assessment	Section 5.4.3 Section 5.6 Section 5.7 Section 5.8 Section 6.1

Ref No. / REMM	Where addressed
road network improvements referred to in point 1 above. The contribution of MIC towards road network improvements as envisaged by this mitigation measure would be subject to the following conditions: • That certain throughput levels at the terminal had been achieved. These throughputs are outlined in column 1 of Table 7.20 of the Response to Submissions report. • That it can be further demonstrated (as part of any subsequent planning approval stage) that the intersection performance would have deteriorated to a Level of Service E or worse (where previously operating at a LoS D or above) were it not for the implementation of the upgrades outlined in Table 7.20 of the Response to Submissions report.	
4I) Reducing the volumes of construction vehicles travelling during peak periods, especially if the increase in traffic generated by construction activities impedes on the operation of Moorebank Avenue.	Preliminary Construction Traffic Management Plan
4J) Maintain access to neighbouring properties. It is particularly important that the ABB site has access throughout the construction stages.	Preliminary Construction Traffic Management Plan
4K) In addition to the Community Engagement Plan (or equivalent) (Refer to 2A), a communication plan will be developed to provide information to the relevant authorities and bus operators in addition to the local community. The communication plan will need to incorporate a contact list with the chain of command.	Preliminary Construction Traffic Management Plan (also Preliminary Construction Environmental Management Plan)
4L) Implement relevant traffic control measures to inform drivers of the construction activities and locations of heavy vehicle access locations.	Preliminary Construction Traffic Management Plan
4M) Obtain Road Occupancy Licences (ROLs) as necessary.	Preliminary Construction Traffic Management Plan
4N) Develop an emergency response plan for the modification of Moorebank Avenue. During this phase, emergency vehicles using Moorebank Avenue as a transport route would need to be considered, as well as emergency access to adjoining properties.	Preliminary Construction Traffic Management Plan
4O) Traffic on Moorebank Avenue would be monitored during peak periods to ensure that queuing at intersections does not impact on other road users.	Construction Traffic Impact Assessment

Ref No. / REMM	Where addressed
4P) Modify access locations in response to the development of the Moorebank Avenue modification.	Construction Traffic Impact Assessment
4Q) Provision of alternate suitable pedestrian and cycle and facilities during the construction of Moorebank Avenue modifications retaining well defined and well signed routes and paths.	Construction Traffic Impact Assessment

In addition to the above the relevant Conditions of Approval (CoA) from the MPW Concept Plan Approval have been considered and addressed within the report.

1.3 Secretary environmental assessment requirements (SEARs)

The diagram below illustrates the document structure established for Traffic and Transport related reporting for the Proposal. Four standalone reports have been prepared to inform and support the required responses to the SEARs, REMMs and CoA as identified in Figure 1-1. They are:

1. Construction Traffic Impact Assessment
2. Preliminary Construction Traffic Management Plan
3. Operational Traffic and Transport Impact Assessment
4. Preliminary Operational Traffic Management Plan

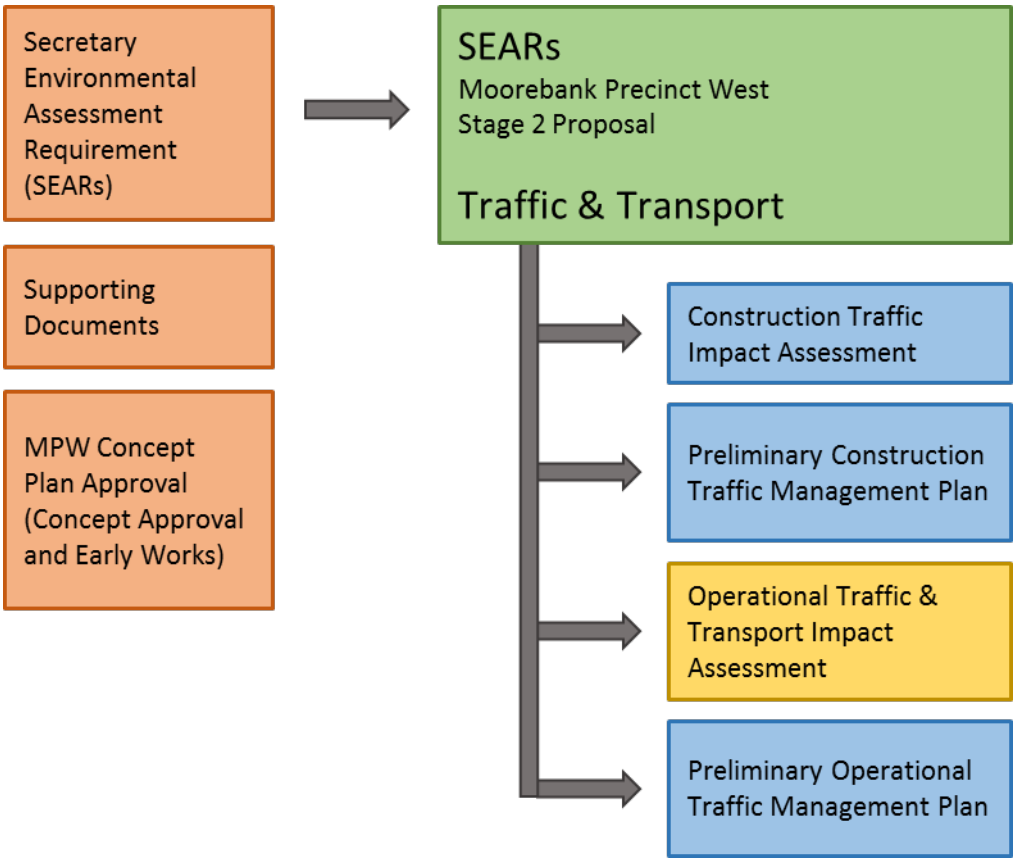

Figure 1-1 Document structure for Traffic and Transport related reporting for the Proposal

This report forms the Operational Traffic and Transport Impact Assessment prepared to address potential traffic impacts associated with operation of the Proposal.

This Operational Traffic and Transport Impact Assessment Report should be read in conjunction with three other standalone traffic reports prepared for the Proposal, including:

- Construction Traffic Impact Assessment
- Preliminary Construction Traffic Management Plan
- Preliminary Operational Traffic Management Plan.

1.4 Key terms

Table 1-2 provides a summary of key terms which are included within this report.

Table 1-2 Key terms

Term	Definition
Moorebank Precinct West (MPW) Concept Plan Approval (Concept approval and Early Works)	MPW Concept Plan and Stage 1 Approval (SSD 5066) granted on 3 June 2016 for the development of the MPW Intermodal terminal facility at Moorebank and the undertaking of the Early Works. Granted under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979*. This reference also includes associated Conditions of Approval and Revised Environmental Management Measures, which form part of the documentation for the approval. N.B. Previously the MIC Concept Plan Approval
Moorebank Precinct West (MPW) EPBC Approval	Commonwealth Approval (No. 2011/6086), granted in mid-2016 under the *Environmental Biodiversity Protection Conservation Act 1999*, for the impact of the MPW Project on listed threatened species and communities and impacts on the environment by a Commonwealth agency.
Moorebank Precinct West (MPW) Concept Plan EIS	The Environmental Impact Statement prepared to support the application for approval of the MPW Concept Plan and Early Works (Stage 1) under the *Environment Protection and Biodiversity Conservation Act 1999* and the *Environmental Planning and Assessment Act 1979*. N.B. Previously the MIC Concept Plan EIS
Moorebank Precinct West (MPW) Planning Proposal	Planning Proposal (PP_2012_LPOOL_004_00) to rezone the MPW site from 'SP2- Defence to 'IN1- Light Industrial' and 'E3- Management', as part of an amendment to the Liverpool Local Environmental Plan 2008 (as amended) gazetted on 24 June 2016.
Moorebank Precinct West (MPW) Project	The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval and the MPW EPBC Approval (2011/6086). N.B. Previously the MIC Project
Moorebank Precinct West (MPW) site	The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Proposal and MPW Planning Proposal (comprising Lot 1 DP1197707 and Lots 100, 101 DP1049508 and Lot 2 DP 1197707). The MPW site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval. N.B. Previously the MIC site
MPW RtS	*MIC Response to Submissions Report* (PB, May 2015)

Term	Definition
MPW SRtS	*MIC Supplementary Response to Submissions Report* (PB, August 2015)
Early Works	Works approved under Stage 1 of the MPW Concept Plan Approval (SSD 5066), within the MPW site, including: establishment of construction compounds, building demolition, remediation, heritage impact mitigation works and establishment of the conservation area.
Early Works Approval	Approval for the Early Works (Stage 1) component of the MPW Project under the MPW Concept Plan Approval (SSD 5066) and the MPW EPBC Approval. Largely contained in Schedule 3 of the MPW Concept Plan Approval.
Early Works area	Includes the area of the MPW site subject to the Early works approved under the MPW Concept Plan Approval (SSD 5066).
Moorebank Precinct West (MPW) Stage 2 Proposal/the Proposal	MPW Stage 2 Proposal (the subject of this EIS), namely Stage 2 of the MPW Concept Plan Approval (SSD 5066) (the subject of this EIS) including construction and operation of an IMT facility, warehouses, a Rail link connection and Moorebank Avenue/Anzac Road intersection works.
Moorebank Precinct West (MPW) Stage 2 site/Proposal site	The subject of this PEA, the part of the MPW site which includes all areas to be disturbed by the MPW Stage 2 Proposal (including the operational area and construction area).
Moorebank Precinct West (MPW) Intermodal Terminal Facility/IMT facility	The Intermodal terminal facility on the Proposal site, including truck processing, holding and loading areas, rail loading and container storage areas, nine rail sidings, loco shifter and an administration facility and workshop.
internal road	Main internal road through the Proposal site which generally travels along the western perimeter of the site. Provides access between Moorebank Avenue and the IMT and warehouses.
Rail link connection	Rail connection located within the Proposal site which connects to the Rail link included in the MPE Stage 1 Proposal (SSD 14-6766).
Proposal operational rail line	The section of the Rail link connection and Rail link between the SSFL and the Rail link connection (included in the MPE Stage 1 Proposal) to be utilised for the operation of the Proposal. and the Rail link connection
construction area	Extent of construction works, namely areas to be disturbed during the construction of the Proposal.
operational area	Extent of operational activities for the operation of the Proposal.

Term	Definition
Moorebank conservation area/conservation area	Vegetated area to remain to the west of the Georges River, to be subject to biodiversity offset, as part of the MPW Project.
Moorebank Precinct	Refers to the whole Moorebank intermodal precinct, i.e. the MPE site and the MPW site.
Moorebank Precinct East (MPE) Project	The Intermodal terminal facility on the MPE site as approved by the MPE Concept Plan Approval (MP 10_0913) and including the MPE Stage 1 Proposal (14-6766). N.B. Previously the SIMTA Concept Plan Approval
Moorebank Precinct East (MPE) site	The site which is the subject of the MPE Concept Plan Approval, and includes the site which is the subject of the MPE Stage 1 Approval. N.B. Previously the SIMTA site
Moorebank Precinct East (MPE) Stage 1 Proposal	MPE Stage 1 Proposal (14-6766) for the development of the Intermodal terminal facility at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval. N.B. Previously known as the SIMTA Stage 1 Proposal
Rail link	Part of the MPE Stage 1 Proposal (14-6766), connecting the MPE site to the SSFL. The Rail link (as discussed above) is to be utilised for the operation of the Proposal.
Revised Environmental Management Measures (REMMs)	The environmental management measures for the MPW Concept Plan Approval as presented within the MIC Supplementary Response to Submissions (SRtS) (PB, 2015) and approved under the MPW Concept Plan Approval.

1.5 Site description

The Proposal site is generally bounded by the Georges River to the west, Moorebank Avenue to the east, the East Hills Railway Line to the south and the M5 Motorway to the north. It is located on Moorebank Avenue, Moorebank and forms Lot 1 in Deposited Plan (DP) 1197707[1]. The Proposal site also contains Lots 100 and 101 DP1049508, which are located north of Bapaume Road and west of Moorebank Avenue. The Proposal site is located wholly within Commonwealth Land.

The Proposal would also require works to upgrade the intersection of the Proposal site with Moorebank Avenue and would therefore be undertaken on the following parcels of land:

- Moorebank Avenue, owned by the Commonwealth Government, south of Anzac Road Lot 2, DP 1197707 (formerly part of Lot 3001, DP 1125930)
- Moorebank Avenue, owned by Liverpool City Council, north of Anzac Road to the M5 Motorway
- A portion of Bapaume Road, a public road that is the responsibility of Liverpool City Council
- A portion of Anzac Road, owned by Liverpool City Council, to the east of Moorebank Avenue

The key existing features of the site are:

- Relatively flat topography, with the western edge flowing down towards the Georges River, which forms the western boundary to the Proposal site
- A number of linked ponds in the south-west corner of the Proposal site, within the existing golf course, that link to Anzac Creek, which is an ephemeral tributary of the Georges River
- An existing stormwater system comprising pits, pipes and open channels
- Direct frontage to Moorebank Avenue, which is a publicly used private road, south of Anzac Road and a publicly owned and used road north of Anzac Road
- The majority of the site has been developed and comprises low-rise buildings (including warehouses, administrative offices, operative buildings and residential buildings), access roads, open areas and landscaped fields for the former School of Military Engineering (SME) and the Royal Australian Engineers (RAE) Golf Course and Club. Defence has since vacated and all buildings on the site are currently unoccupied and will be removed during the Early Works
- Native and exotic vegetation is scattered across the Proposal site
- The riparian area of the Georges River lies to the west of the Proposal site and contains a substantial corridor of native and introduced vegetation. The riparian vegetation corridor provides a wildlife corridor and a buffer for the protection of soil stability, water quality and aquatic habitats. This area has been defined as a conservation area as part of the MPW Concept Plan Approval
- As stated above, the majority of the Proposal site has been developed, however heritage and biodiversity values still remain on the site
- A strip of land (up to approximately 250 metres wide) along the western edge of the Proposal site lies below the 1% annual exceedance probability (AEP) flood level
- The site is privately owned by the Commonwealth and leased by SIMTA.

A number of residential suburbs are located in proximity to the Proposal site, including:

[1] Previously legally described as “Lot 3001, DP 1125930” in the MPW Concept Plan Approval (SSD 5066), however has since been subdivided.

- Wattle Grove, located approximately 1,000 m from the Proposal site and 1,000 m from the Rail link connection to the east. The Rail link, which will be used during operation of the Proposal is 1,260 m to the west of Wattle Grove at its closest point
- Moorebank, located approximately 630 m from the Proposal site and more than 1,400 m from the Rail link connection to the north. The Rail link is 2,500 m to the south of Moorebank at its closest point
- Casula, located approximately 330 m from the Proposal site and 1,200 m from the Rail link connection to the west. The Rail link is approximately 290 m to the east of Casula at the closest point
- Glenfield, located approximately 820 metres from the Proposal site and 1,100 metres from the Rail link connection to the south-west. The Rail link is approximately 750 m to the east of Glenfield at its closest point.

1.6 Proposal overview

MPW Stage 2 (the Proposal) involves the construction and operation of an Intermodal terminal (IMT) facility and associated warehousing, as shown in Figure 1-2.

The IMT facility would have the necessary infrastructure to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum. Specifically, the IMT facility within the Proposal site would include the following key components:

- Truck processing, holding and loading areas – with entrance and exit from Moorebank Avenue via an upgraded intersection and a round-about to distribute traffic between the warehousing precinct and the IMT
- Rail loading and container storage areas – installation of nine rail sidings, with an adjacent container storage area serviced by manual handling equipment
- Administration facility – office building with associated car parking and light vehicle access from Moorebank Avenue
- The Rail link connection – rail sidings within the IMT facility, which would be linked (to the south) to the Rail link (constructed as part of the MPE Project (SSD 14-6766)).

Also included within the Proposal are the following key components:

- Warehousing area – construction and operation of approximately 215,000 m2 GFA of warehousing, with warehouses ranging in size from 4,000 m2 to 71,000 m2. Included within the warehousing area would be ancillary offices, truck and light vehicle parking, associated warehouse access roads.
- Freight village – construction and operation of approximately 800 m2 of retail premises, with access from the internal road.
- Upgraded intersection on Moorebank Avenue and internal road – including works to Moorebank Avenue, Anzac Road to accommodate the proposed site entrance to Moorebank Avenue, and construction of an internal road.
- Ancillary works – including vegetation clearing, earth works, drainage and on-site detention, utilities installation/connection, signage and landscaping.

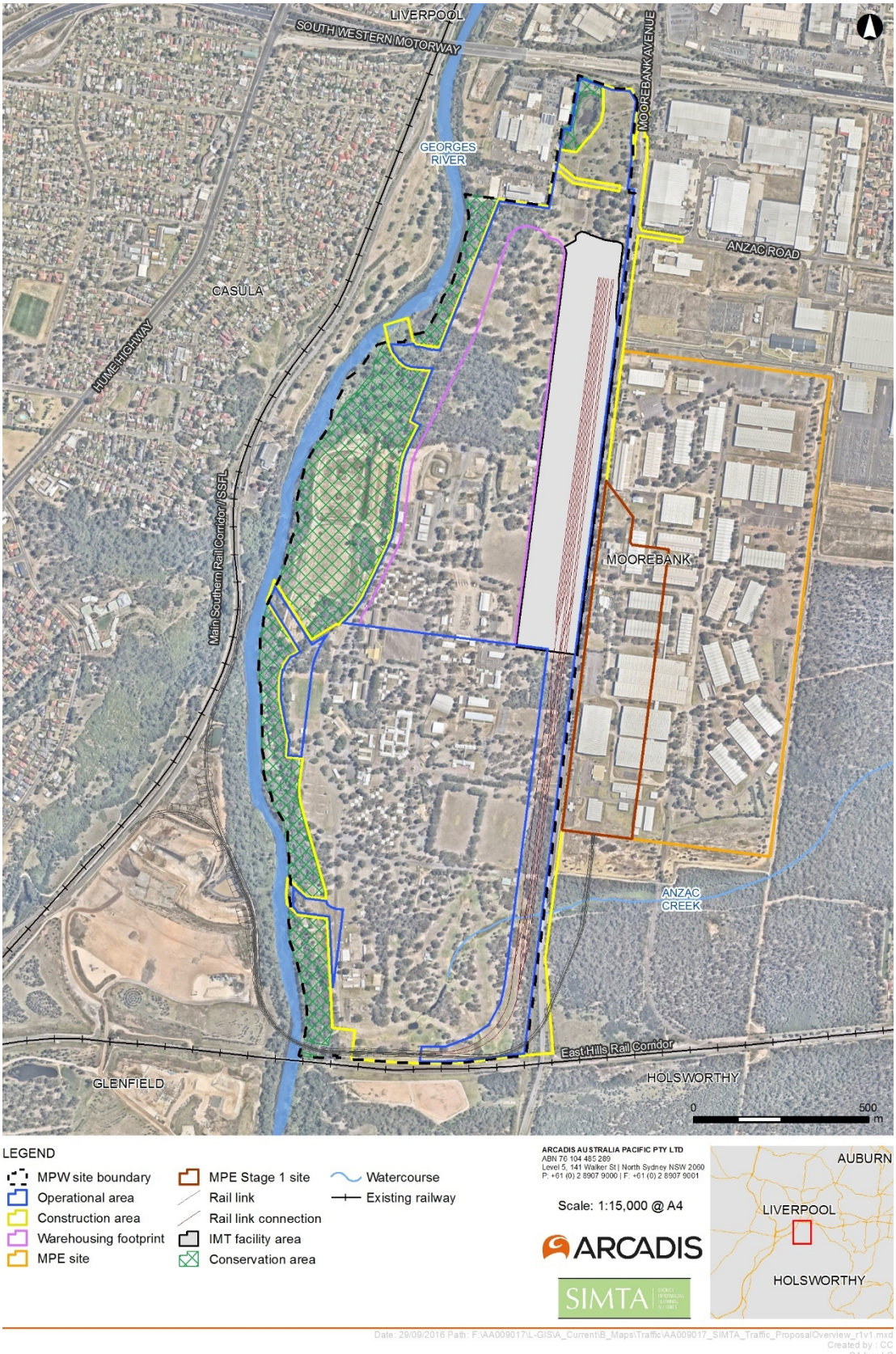

Figure 1-2 Proposal Overview

1.7 Operations Overview

The Proposal would involve the operation of the IMT facility, Rail link connection and warehousing. The Proposal would provide a freight transport facility to support the transport of freight by rail between Victoria, Queensland, regional NSW and NSW Ports, with freight distributed through one of the following container flows:

- Transferred directly between trains within the Proposal site
- Temporarily stored in the IMT facility
- Transferred directly to warehousing within the Proposal site
- Transferred directly by truck to the MPE site
- Loaded directly on to heavy vehicles for distribution to markets via the nearby major road network.

Once operational, the IMT facility would handle an annual container freight volume of 500,000 TEU.

Access (entrance and exit) to the Proposal site for heavy and light vehicles would be via the proposed site access off Moorebank Avenue. Trucks accessing the warehousing area of the Proposal site would continue to the internal road on the western perimeter of the Proposal site and onto the warehouse access roads to the warehousing.

1.8 Reference Traffic Study, Data and Modelling

For the purpose of the study, future traffic growth and modelling data was sourced from Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) model built in AIMSUN modelling software version 8.0.9 (R35843). The LMARI AIMSUN traffic model been developed, calibrated and validated by Jacobs[2] and subsequently updated by GTA consultants[3] (GTA). Roads and Maritime provided the 2026 future based model (Do Nothing) on 4 March 2016. For the purpose of traffic modelling for the Proposal, Arcadis used the AIMSUN traffic model provided by Roads and Maritime dated 4 March 2016. Arcadis supplemented this assessment with SIDRA Network version 7.

Arcadis also used appropriate data from traffic reports previously prepared for the Moorebank Precinct including the following:

- Moorebank Precinct West (MPW) Concept Plan Approval - MPW Concept Plan and Early Works Approval (SSD 5066) granted on 3 June 2016 for the development of the MPW intermodal terminal facility at Moorebank and the undertaking of the Early Works. This report references previous Traffic and Transport Impact Assessment traffic reports (2015, WSP | Parsons Brinkerhoff previously known as Parsons Brinkerhoff) prepared for both the Concept Plan Approval and Stage 1 Proposals where required.
- Moorebank Precinct East Project (MPE) Project – The Intermodal terminal facility on the MPE site as approved by the MPE Concept Plan Approval (MP 10_0913) and including the MPE Stage 1 Proposal (14-6766). This report references previous Transport and Accessibility Impact Assessment reports (2013, 2015 Arcadis previously known as Hyder Consulting) prepared for both Concept Plan Approval and Stage 1 Proposals where required.

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[2] Liverpool Moorebank Arterial Road Investigations, MITRA Base Model Calibration and Validation Report, Final Revision B.0, Jacobs, 12 October 2015.
[3] Moorebank Intermodal Terminal AIMSUN Existing Conditions Model – Modelling Review Summary, Memorandum, GTA Consultants, 26 November 2015.

- Moorebank Intermodal Terminal Precinct – Traffic Generation and Underlying Assumptions, Memorandum, Parsons Brinckerhoff, 1 September 2016.

In addition to the above, MIC (and WSP – PB) is currently undertaking traffic modelling which utilises the June 2016 "Do Minimum" AIMSUN (LMARI) model provided by Roads and Maritime. The intent of the PB modelling is to verify upgrades identified to reduce traffic impacts on the surrounding road network (i.e. at 13 key intersections) arising as a result of the ultimate full-build scenario (i.e. 1.55 m TEUs IMT terminal capacity and 850,000 m^2 Warehouse GFA) for the entire Moorebank Intermodal Precinct (Precinct Model). It is understood that this reporting would be available in November 2016, and that at this time it would be provided to the relevant agencies for review and discussion.

Arcadis has actively coordinated with MIC (and WSP – PB) in relation to the modelling inputs for the Proposal into the Precinct Modelling to ensure consistency between the two modelling exercises. This traffic report recommend upgrades which are considered relevant to addressing the traffic impacts of the Proposal, as is required by the SEARs. The Precinct Modelling would seek to verify the upgrades for the Proposal, and also indicate other upgrades for all future stages of the Moorebank Intermodal Precinct.

1.9 Consultation with Key Stakeholders

In the preparation of this traffic assessment and to fulfil the requirements of the SEARs, REMMs and CoA (in particular condition 12 of the MPW Concept Plan Approval), consultation was undertaken with the key stakeholders including Roads and Maritime, Transport for New South Wales, Liverpool City Council and Campbelltown City Council. Through-out the traffic study, key stakeholders were consulted through a series of meetings which were held individually and then a joint meeting was undertaken with the key stakeholders to present the scope of the study, impact assessment methodology and preliminary findings of the traffic study.

Roads and Maritime have been consulted on a number of occasions since the last quarter of 2015. In particular, consultation has been based on establishing and agreeing on a suitable approach to the operational traffic modelling to be undertaken for the Proposal, especially in the context of the separate overall precinct modelling.

A number of meetings, emails and telephone conversations have been undertaken to ensure that the modelling undertaken for the Proposal utilises the appropriate AIMSUN (LMARI) model and assessment approach.

Key meetings and presentations to key stakeholders were held on:

- Meetings with RMS to discuss RMS AIMSUN modelling and assessment methodology – 10 Feb 2016 and 9 June 2016
- Presentation on Traffic Methodology and Preliminary Findings to Roads and Maritime (RMS) and Transport for New South Wales (TfNSW) – 31 August 2016
- Presentation on Traffic Methodology and Preliminary Findings to Liverpool City Council (LCC) – 1 September 2016
- Presentation on Traffic Methodology and Preliminary Findings to Campbelltown City Council (CCC) – 2 September 2016
- Presentation on Traffic Methodology and Preliminary Findings to Joint Agency (Roads and Maritime, TfNSW, LCC and CCC) – 7 September 2016. Stakeholder feedback and responses from the joint agency meeting (undertaken on 7 September 2016) are attached in Appendix A of this report.

Technical notes were also sent to RMS/TfNSW describing the proposed modelling and assessment methodology. The MPW Stage 2 Technical Note 4 – Proposed

Traffic Modelling Methodology discussing the assumptions and approach to the modelling was provided to RMS and TfNSW for information and comment on 31 August 2016.

1.10 Report structure

This Traffic and Transport Impact Assessment contains the following six chapters providing an assessment of the traffic issues relating to the proposed construction of Proposal.

- Section 1 provides an overview of the Proposal, background information, report purpose and SEARs/REMMs/CoA requirements.
- Section 2 provides the existing traffic and transport environment within which the assessment has taken place. This section provides an overview of existing travel patterns in the study area as well as existing public transport, pedestrian and cycle provisions.
- Section 3 describes the existing road network performance and level of service results. An assessment of existing network capacity has been undertaken, summarising network deficiency at key roads and intersections.
- Section 4 reports on traffic impacts without the Proposal, taking into consideration background traffic growth.
- Section 5 details traffic impacts associated with the Proposal. In particular this section documents proposed accesses to the Proposal site, trip generation, level of service, traffic impacts to the road network, including Cambridge Avenue and public transport.
- Section 6 summarises the key findings and recommendations of the assessment.

2 EXISTING TRAFFIC AND TRANSPORT ENVIRONMENT

The existing traffic and transport conditions in the study area are described within this chapter. The chapter provides the regional and local transport context within which the assessment has been undertaken.

2.1 Study Area

The traffic study area comprises the wider traffic study area (delineated below in blue in Figure 2-1) and the core traffic study area (delineated below in red in Figure 2-1). These areas are derived from investigations based on previous modelling undertaken for the MPW Concept Plan and the Roads and Maritime LMARI traffic model. The wider traffic study area includes the surrounding road network in the Liverpool local government area (LGA) which has been delineated by the Roads and Maritime LMARI traffic model. The core traffic study area selected for the Proposal includes eight key intersections, which have the most potential to be impacted by the Proposal and have been confirmed through consultation with Roads and Maritime. Detailed analysis has been conducted for the key intersections and road links in the core area (as shown in Figure 2-2) and includes:

- I-1 Moorebank Avenue / Anzac Road
- I-2 M5 Motorway / Moorebank Avenue
- I-3 M5 Motorway / Hume Highway
- I-4 Moorebank Avenue / Newbridge Road
- I-5 Moorebank Avenue / Heathcote Road
- I-6 M5 Motorway / Heathcote Road
- I-7 Cambridge Avenue / Glenfield Road
- I-8 Cambridge Avenue / Canterbury Road.

The above eight key intersections were identified as key intersections for assessment based on consultation with Roads and Maritime. Further, the impact assessment of these intersections (only) was provided to Roads and Maritime as part of the consultation undertaken in August 2016, prior to completing the modelling (refer to Section 1.9 of this report for consultation undertaken to confirm proposed scope of the assessment and the eight key intersections).

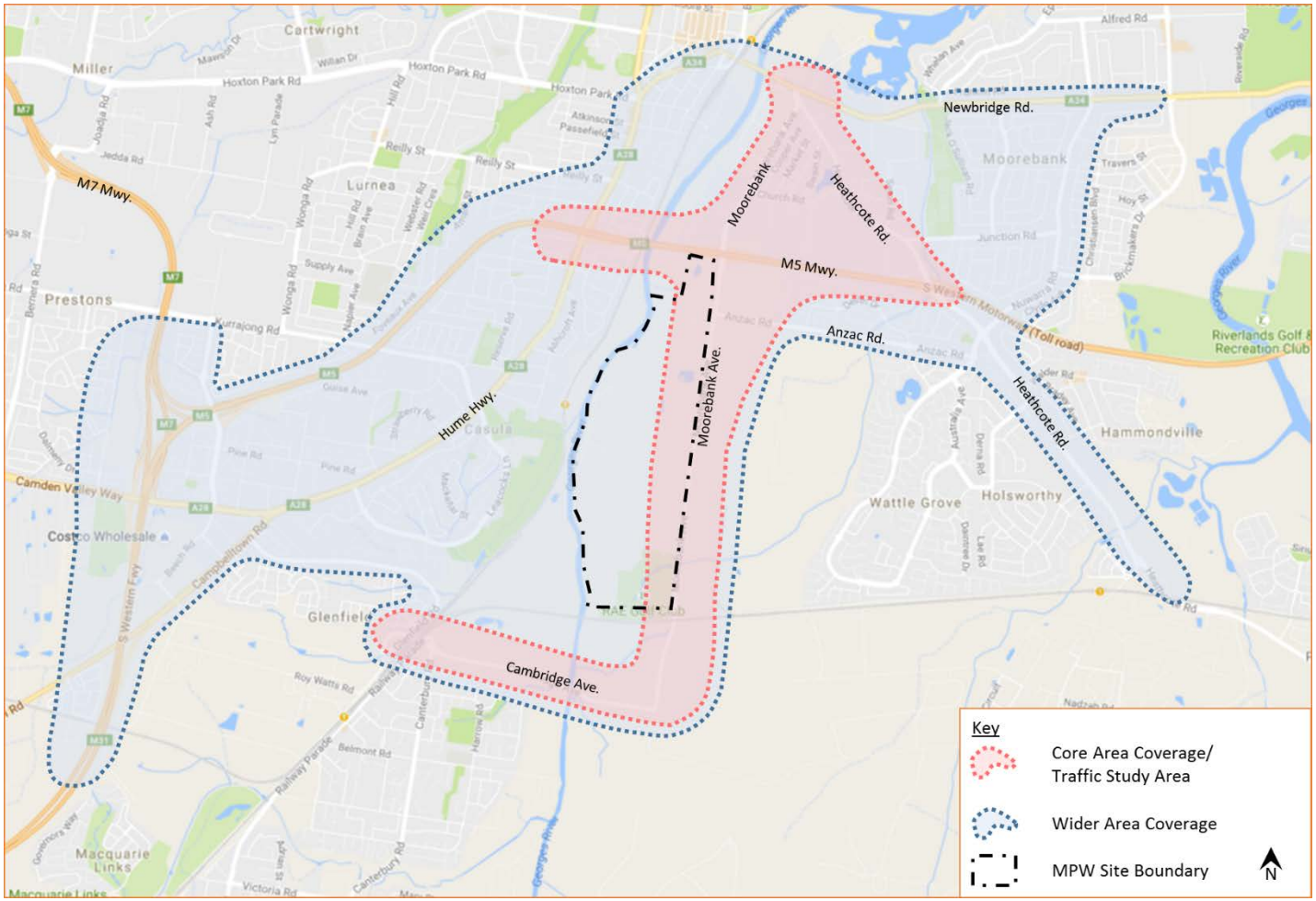


Figure 2-1 Study Area Coverage

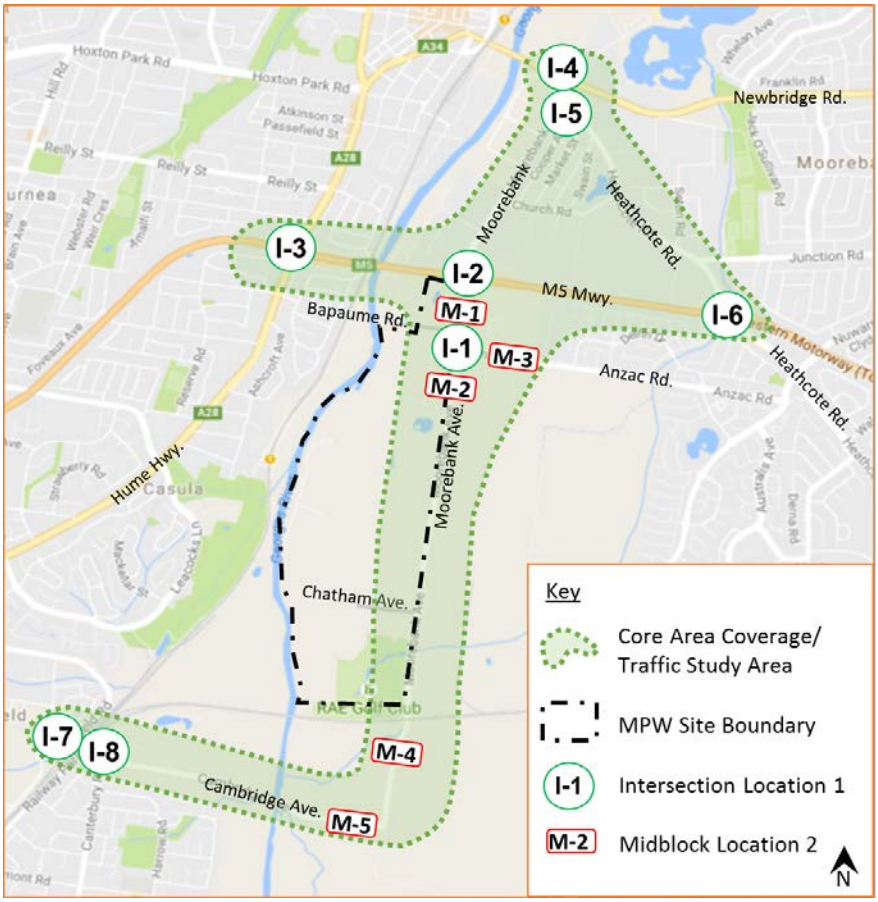


Figure 2-2 Key Intersections and Road Links in the Core Area

2.2 Road hierarchy

The Roads and Maritime Services (RMS) defines the functional road hierarchy in an urban area to establish a consistent basis for traffic management and planning. There are three key road categories and their functions are stated as below.

- State Roads: Freeways/motorways and primary arterials.
- Regional Roads: secondary or sub-arterials.
- Local Roads: Collector and local access roads.

A generic road hierarchy comprises freeways, primary arterial roads, secondary or sub-arterial roads, collector roads and local access roads. The State road network comprises the primary network of principal traffic carrying and linking routes for the movement of people and goods within the urban centres of Sydney, Newcastle, Wollongong and Central Coast, and throughout the State. Regional roads comprise the secondary network, which together with State roads, provide for travel between smaller towns and districts and perform a sub-arterial function within major urban centres.

A hierarchy of state (motorway), local and private roads surrounds the Proposal site. Table 2-1 and Figure 2-3 describes the current road hierarchy that provides access to/from the Proposal site.

It is expected that more than half of the traffic associated with the construction and operation of the Proposal would travel to the Proposal site from the west along the M5 Motorway then south down Moorebank Avenue to the Proposal site. Similarly, the majority of the traffic will travel north from the site to the M5 then travel west along the M5 Motorway.

Table 2-1 Existing key roads on the road network adjacent to the Proposal site

Road Names	Road Hierarchy	Characteristics
M5 South West Motorway	Motorway	The M5 South West Motorway (M5 Motorway) is a 22km tolled road with generally three lanes in each direction between Camden Valley Way, Prestons and King Georges Road, Beverly Hills. It is operated by Interlink Roads. It forms part of the M5 transport corridor, the main passenger, commercial and freight route between Sydney Airport, Port Botany and south west Sydney. It is also a key part of the Sydney Orbital Network, a series of interconnected roads that link key areas of the Greater Sydney Metropolitan Region.
Moorebank Avenue	Local Road / Private Road	Moorebank Avenue is currently a two lane undivided road (one lane on each direction) between Cambridge Avenue and M5 South West Motorway (adjacent to the site) and four lane undivided road (two lanes in each direction) north of the M5 South West Motorway. This road provides a north-south link between Liverpool and Glenfield. It also forms a grade separated interchange with the M5 South West Motorway. North of the M5, Moorebank Avenue is a State Road. Moorebank Avenue between M5 and Anzac Road is owned and maintained by Liverpool City Council. Moorebank Avenue between Anzac Road and Cambridge Avenue is a private road on Commonwealth land however is publicly accessible.
Anzac Road	Local Road	Anzac Road is an east-west local road that connects Moorebank Avenue and Heathcote Road. It provides access to Moorebank Business Park and the residential area of Wattle Grove. This is generally a two-lane undivided road.
Bapaume Road	Local Road	Bapaume Road is an east-west local road that connects Moorebank Avenue to the industrial complex (ABB site). This is generally a two-lane undivided road. The road is owned and maintained by Liverpool City Council.
Cambridge Avenue	Local Road	Cambridge Avenue is a local road which connects Moorebank Avenue from the south to Macquarie Fields through to Campbelltown. It is generally a two lane road (one lane each direction). Cambridge Avenue is owned and maintained by Campbelltown City Council. Cambridge Avenue crosses the Georges River via a low level narrow bridge (subject to flooding).

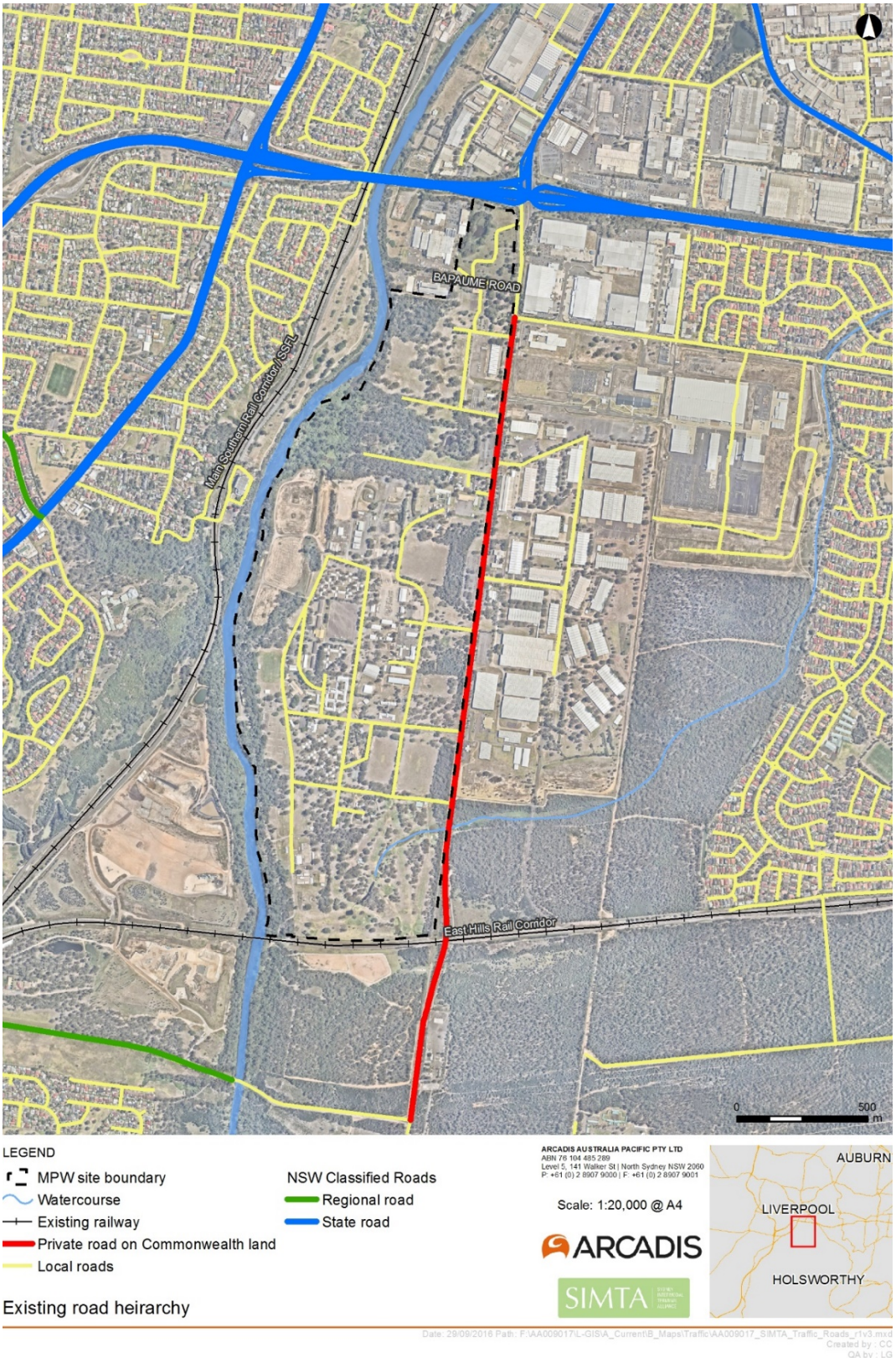


Figure 2-3 Existing Road Hierarchy

2.3 Historical Traffic Volume

The historical traffic data in this section presents annual average daily traffic (AADT) and average daily traffic (ADT) for key roads proximate the project site. The ADT data for 2010 and 2014 were sourced from traffic surveys undertaken for the MPE project[4][5]. The daily traffic data for 2015 were estimated from actual 2014 ADT counts and traffic count data sourced from the Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) traffic model.

Table 2-2 show historical traffic data reported at key roads including the M5 Motorway, Moorebank Avenue and Anzac Road. The data in Table 2-2 provides an understanding of the background traffic volumes on the M5 Motorway, Moorebank Avenue and Anzac Road between 2002 and 2015, over a 13 year period.

Table 2-2 Historical Traffic Volumes on Key Roads between 2002 and 2015

Roads/ Locations	(AADT)						ADT (All Vehicles)	
	Unit	2002(1)	2005(1)	2009(1)	2012(2)	2010(3)	2014(4)	2015(5)
M5 Motorway, at bridge over Georges River	All Vehicles	91,849	98,194	113,759	119,800	128,500	n.a	n.a
Moorebank Avenue, north of Cambridge Avenue	All Vehicles	14,348	15,903	14,098	n.a	16,500	16,460	16,760
Moorebank Avenue, south of Anzac Road	All Vehicles	n.a	n.a	n.a	n.a	17,500	16,900	17,200
Anzac Road, east of Moorebank Avenue	All Vehicles	n.a	n.a	n.a	n.a	9,500	10,230	10,410

Note: n.a= Data is not available.
Source: RMS count data, 2010 and 2014 traffic survey data
(1) AADT obtained from RMS.
(2) AADT obtained from RMS http://www.rms.nsw.gov.au/about/corporate-publications/statistics/traffic-volumes/map/index.html. The M5 West Widening project commenced in August 2012.
(3) ADT obtained from 2010/10 traffic survey for MPE Concept Approval.
(4) 2014 ADT obtained from 2014 November traffic survey for MPE Stage 1 Proposal traffic assessment.
(5) 2015 ADT traffic volumes have been estimated from 2014 actual ADT traffic counts and traffic count data sourced from the Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) traffic model.

[4] MPE Concept Plan, Traffic and Accessibility Impact Assessment, Hyder Consulting, 2013.
[5] MPE Intermodal Terminal Facility – Stage 1, Traffic and Accessibility Impact Assessment, Hyder Consulting, 2015.

The historical traffic data analysis suggests that:

- Traffic on the M5 Motorway over Georges River has grown consistently. The future traffic on the M5 Motorway will continue to grow due to additional capacity provided from the recent M5 West Widening upgrade.
- Since 2010, traffic volumes on Moorebank Avenue and Anzac Road did not change substantially. Between 2010 and 2015, traffic on this section of Moorebank Avenue was found to be consistent between 16,700 and 17,200 vehicles per day.
- Traffic volumes on Anzac Road have increased slightly from 9,500 vehicles per day in 2010 to 10,400 vehicles per day in 2015.

The following section documents historical traffic growth analysis undertaken for key roads and intersections based on recent available data.

2.4 Historical Traffic Growth

Table 2-3 below shows historical traffic growth observed on the study area road network. The growth is estimated based on available data reported as AADT and ADT.

Table 2-3 Historical Traffic Growth between 2002 and 2015

Roads/Locations	Annual Average Growth Rate (%)		
	Between 2002-2009	Between 2002-2010	Between 2010-2015
M5 Motorway, at bridge over Georges River		▲4.3%	
Moorebank Avenue, north of Cambridge Avenue	▼0.3%		▲0.3%
Moorebank Avenue, south of Anzac Road			▼0.3%
Anzac Road, east of Moorebank Avenue			▲1.8%
Average for all roads (last 13 years)	▲1.3%		

The historical traffic data indicates the following plausible trends:

- Consistent traffic growth was observed on the M5 Motorway of about 4.3% per annum (2002 – 2010).
- The data suggest that the historical traffic volumes on Moorebank Avenue (between the M5 Motorway and Cambridge Avenue) has been relatively stable which fluctuations of 0.3%. This could be attributed to numerous factors including increases in traffic due new residential developments in Glenfield and Macquarie Fields, reductions in traffic due the relocation of the DSNDC and the M5 West Widening (less 'rat-running" of traffic on Moorebank Avenue due to increased motorway capacity).
- The last five years of data (between 2010 and 2015) suggests traffic increases on the Anzac Road of about 1.8% per annum which may have been attributed to the development of the nearby industrial estates at Yulong Close, however this the specific result of this is unclear at this time.

On average, the last 13 years of data suggests traffic growth of approximately 1.3% per annum to 2015. This growth rate appears to be consistent with regional growth rate between 1% and 2% per annum observed on the adjacent State Road network.

2.5 Crash data

This assessment is based on recent crash data supplied by Roads and Maritime for the five-year period from 1st July 2010 to 30th June 2015 inclusive. The crash data has been reported for a wider road network including the M5 Motorway (and its three interchanges with Moorebank Avenue, Hume Highway and Heathcote Road), Moorebank Avenue (north and south of M5 Motorway), Anzac Road, Cambridge Avenue, Moorebank Avenue/Newbridge Road intersection, and Moorebank Avenue/Heathcote Road intersection (refer to Figure 2-4 below).

A total of 444 crashes were recorded in the five year period. Of these, 210 (47%) crashes resulted in injuries, 232 (52%) crashes resulted in non-casualty and two crashes (1%) were recoded as fatalities. Figure 2-4 shows injury, non-casualty and fatal crashes occurred across a wider road network in the last five year. The crash data appears to be more concentrated at State Roads and the M5 Motorway including its associated interchanges with Moorebank Avenue, Hume Highway and Heathcote Road. Some crash prone locations include:

- M5 Motorway between Hume Highway and Heathcote Road
- M5 Motorway / Heathcote Road Interchange
- M5 Motorway / Moorebank Avenue Interchange
- M5 Motorway / Hume Highway Interchange
- Moorebank Avenue / Newbridge Road intersection.

From the analysis of the crash data between 2010 and 2015, the following points are noted:

- The majority of crashes were rear-end (45.7%) and are concentrated on the M5 Motorway between Hume Highway and Heathcote Road. Table 2-4 shows crashes by crash type.
- There were 27 crashes (6.1%) involving articulate vehicles with the majority occurring on the M5 Motorway.
- A low number of crashes occurred on Moorebank Avenue (south of the M5 Motorway), Anzac Road and Cambridge Avenue compared to State Roads crash sites.

Table 2-4 Crashes by Type

Crash Type	Crashes	%
Rear-end	203	45.7%
Intersection, adjacent approaches	55	12.4%
Lane change	38	8.6%
Opposing vehicles; turning	33	7.4%
Off road on straight, hit object	32	7.2%
Parallel lanes, turning	15	3.4%
Head-on (not over-taking)	12	2.7%
Other crash type	56	12.6%
Total crash	444	100%

Source: RMS Crash Data 2010-2015

Figure 2-4 Distribution of Crashes on Key Roads between 2010 and 2015 (5 Years)

Source: RMS Crash Data 2010-2015

2.6 Transport mode share

The Bureau of Transport Statistics (BTS) provided journey to work (JTW) data for the Sydney General Metropolitan Area (GMA) which provided a comprehensive sample of commuter travel, collected during the 2011 Census. Work trip origin and destinations are coded to the 2011 travel zones.

Table 2-5 summarises some of the key transport indicators for the Liverpool LGA and the Sydney Statistical Division sourced from the BTS Household Travel Survey. Generally, Liverpool's residents' exhibit higher trip making and car based mode shares than the average for Sydney. Total travel per person (km) and VKT's per person are both above the Sydney average. Mode choice in Liverpool is dominated by the car which is more than 10 percentage points higher than the Sydney Average (86% vs. 69%).

Table 2-5 Existing Model Share Liverpool LGA

Indicator	Sydney	Liverpool
Population	4,551,000	168,000
Households	1,689,000	54,000
Trips per person	2.7	3.3
Total travel per person (km)	31.9	38.3
Model of travel (%):		
- Car Driver	47%	59%
- Car passenger	22%	27%
Car combined	69%	86%
- Train	5%	10%
- Bus	6%	2%
- Walk	18%	2%
Vehicles per Household	1.6	1.8
Ave. trip length [km]	8.7	11.7
VKT per person	18.5	22.6
Ave. work trips (mins)	35	37
Daily travel time (per person)	81	83

Source: BTS HTS 2012/13 Sydney Greater Metropolitan Area (GMA)

2.6.1 Transport mode share (Moorebank catchment area)

Transport mode share data was further investigated for the Moorebank catchment area in the vicinity to the Proposal. The 2011 JTW data relates to trips to places of employment within travel zone 3824 in Moorebank. The travel zone boundary is shown in Figure 2-5.

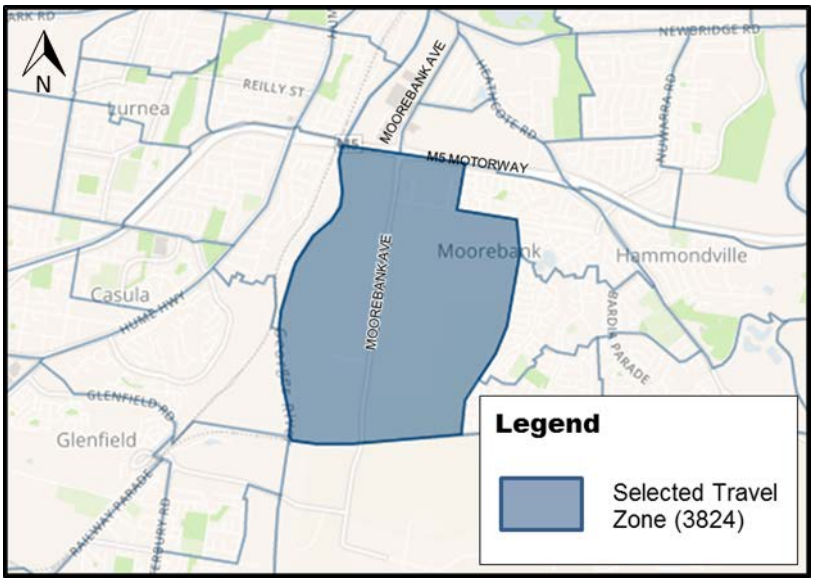


Figure 2-5 Travel Zone as per JTW2011

In 2011, as per JTW data, about 2,100 employees travelled to the catchment area for work. Table 2-6 shows existing mode share within Moorebank catchment area. The 2011 JTW indicates that around 80% of people surveyed travelled to work by private vehicle (driver and passenger), while 2% of workers travelled by public transport. The remainder were walk/cycle trips (6%), indicating that a proportion of employees live locally. The remainder worked from home, did not travel, or not stated (6%).

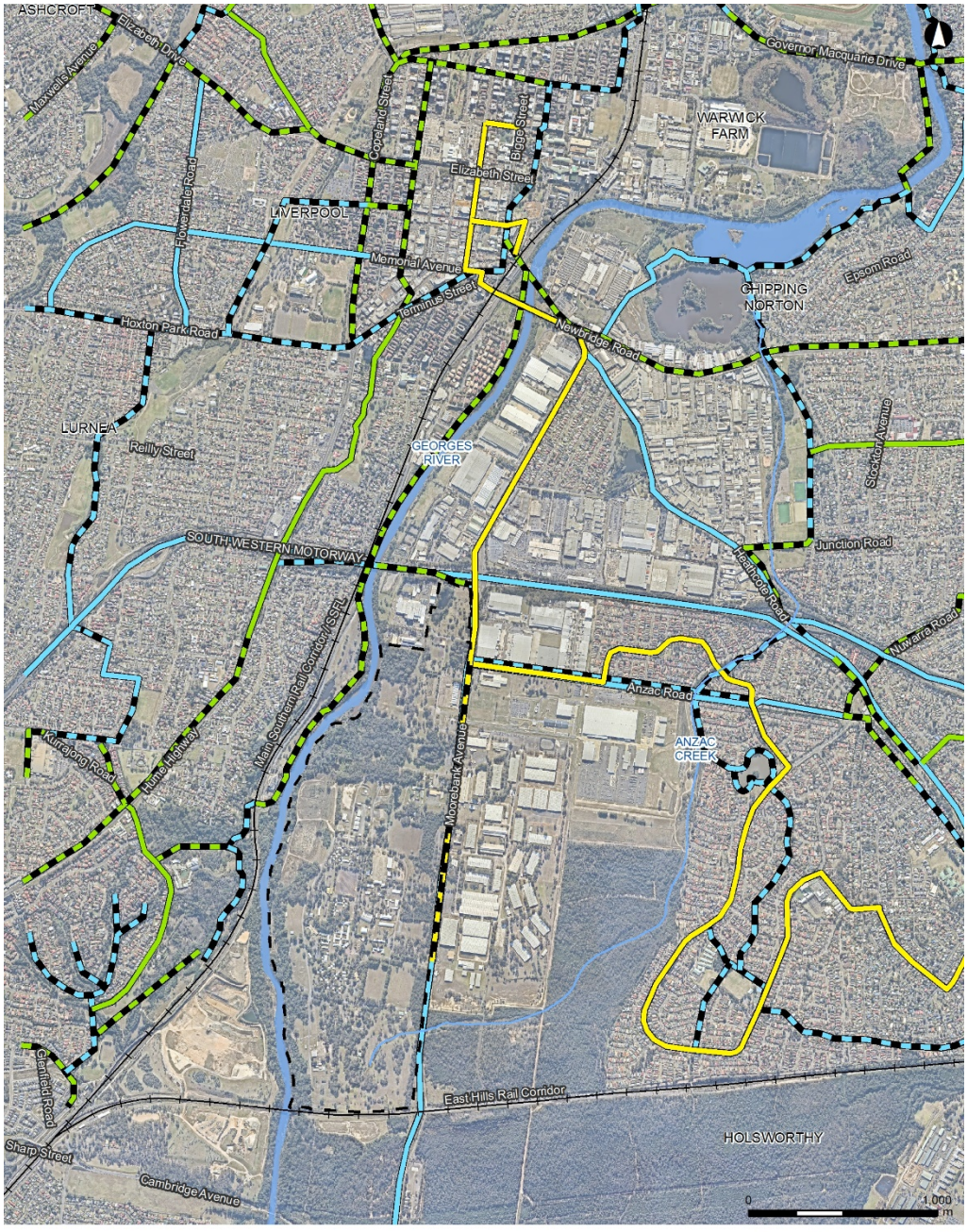
Table 2-6 Daily Work Trips and Model Share for Moorebank Catchment Area

Travel Mode	Study Area as Workplace (Inbound trips)	% Study Area as Workplace
Car Driver	1,695	80%
Car Passenger	118	6%
Public Transport	40	2%
Others (walk, cycle, etc.)	127	6%
Work at home, did not travel, or not stated	128	6%
Total	2,108	100%

The current low public transport usage (2%) is due to the fact that the Proposal site is poorly serviced by public transport. The public transport currently servicing the Proposal site is further discussed in the following section.

2.7 Public and Active Transport

Figure 2-6 shows the public (bus) and active transport services and routes within the general vicinity of the Proposal site.



LEGEND

- MPW site boundary
- Watercourse
- Existing railway
- Bus route 901
- Limited service bus route

Liverpool Bike Plan (2009)

- Existing off road cycleway
- Existing on road cycleway
- Proposed off road cycleway
- Proposed on road cycleway

Local public transport and pedestrian/cycleway network

ARCADIS AUSTRALIA PACIFIC PTY LTD
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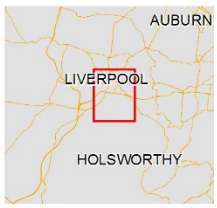
Scale: 1:30,000 @ A4

ARCADIS

SIMTA



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Created by : CC
QA by : LG

Figure 2-6 Local public transport and pedestrian/cycleway network

2.7.1 Public Transport

As shown in Figure 2-6, the Proposal site is serviced by a single bus service (i.e. route 901) which operates within close proximity of the site. Three train stations are also located approximately four to seven kilometres from the Proposal site (i.e. Liverpool, Holsworthy or Casula railway stations).

Whilst bus stops are located on Moorebank Avenue, including at the Proposal site frontage, these are serviced on a limited basis with a single bus service during the AM and PM peak periods only. Full-time bus services are accessed by the bus stops located at the Moorebank Ave/Anzac Road intersection.

A summary of the service details for each public transport service operating in the general vicinity of the Proposal site (both bus and train) is provided in Table 2-7.

Table 2-7 Public Transport Services

Mode	Stop/station	Route Description	Significant destinations on route	Service Frequency
Bus	Moorebank Ave / Anzac Rd junc.	Route 901 (standard route) Liverpool to Holsworthy	Liverpool train station, Liverpool Westfield shopping centre, Wattle Grove shops, Holsworthy train station	30 mins (peak) 60 mins (off-peak)
	Moorebank Ave (site frontage)	Route 901 (via Proposal site) Liverpool to Holsworthy		One service during AM and PM peaks
Train	Liverpool train station	T2 Inner West & South Line	Strathfield, Sydney CBD	8 mins (peak) 30 mins (off-peak)
		T3 Bankstown Line	Bankstown, Sydney CBD	15 mins (peak) 30 mins (off-peak)
		T5 Cumberland Line	Parramatta, Blacktown, Glenfield, Campbelltown	30 mins (peak) 30 mins (off-peak)
	Holsworthy train station	T2 Airport & South Line	Airport, Sydney CBD, Glenfield, Campbelltown	8 mins (peak) 20 mins (off-peak)

Overall, the 901 bus service operates as a feeder bus service to the Liverpool and Holsworthy train stations. The train services provide good transit connectivity to major destinations in the South West Sydney area and the wider Sydney metropolitan region. However, poor frequencies for the feeder bus services in peak times (i.e. only one service operating during the AM and PM peak periods adjacent to the Proposal site) reduces the connectivity to the Liverpool and Holsworthy train stations from the Proposal site.

Additionally, access from the Proposal site to the feeder bus stops is constrained. The ‘full-time’ bus stops are located approximately 750 metres north of the Proposal site, which is considered the upper limit of what is an acceptable walking distance. It is also noted that the stops are poorly identified with signage that is not consistent with current Sydney bus branding, as shown in Figure 2-7.

Figure 2-7 Photo of ‘full-time’ bus stop located on north-east boundary of Proposal site

2.7.2 Active Transport

2.7.2.1 Cycle infrastructure

On-street cycling is permitted on Moorebank Avenue, with sealed and lane-marked shoulders of varying width provided on both sides of the road (approximately 1.5-2.5 metre width). However, the sealed shoulders are not marked as on-street cycle lanes. The posted speed limit on Moorebank Avenue is 60 km/h which is amenable for cyclist.

Figure 2-8 Sealed & marked road shoulders on Moorebank Ave – permitted for on-street cycling

Moorebank Avenue connects to a series of cycle routes in the surrounding area, as shown in Figure 2-6, in the form of either on-street cycle lanes, shared pedestrian-cycle paths or along local roads. As an example, a cycle route from the Proposal to Holsworthy train station is possible via a connection of shared-paths and local streets in the Wattle Grove residential area (cycling distance of approximately 5.6 km).

In addition to the above:

- The NSW Bike Plan (June 2010) has identified bike routes (to be constructed) around Liverpool on Moorebank Avenue, Heathcote Road and Newbridge Road
- Sydney's Cycling Future (Transport for NSW, 2013) commits to completing missing links in the existing bicycle network to the Liverpool CBD. This would include improving bicycle access to the Liverpool City Centre from the south by completing the missing sections of the off-road walking and cycling corridor along Glenfield Creek, between Casula and Liverpool. This improved access would integrate with the cycling routes proposed in the Liverpool Bike Plan (Liverpool Council, 2009). Moorebank Avenue is also considered a strategic bicycle corridor.

2.7.2.2 Pedestrian infrastructure

A sealed footpath is provided on one side of Moorebank Avenue (the western side) with pedestrian crossing facilities located at signalised T-intersections along Moorebank Avenue which are spaced approximately 250 metres to 600 metres, as shown in Figure 2-9. Sightlines along Moorebank Avenue are generally clear, providing motorists suitable opportunity to see pedestrians.

Overall pedestrian connectivity is considered good for the area, given the relatively low pedestrians volumes.

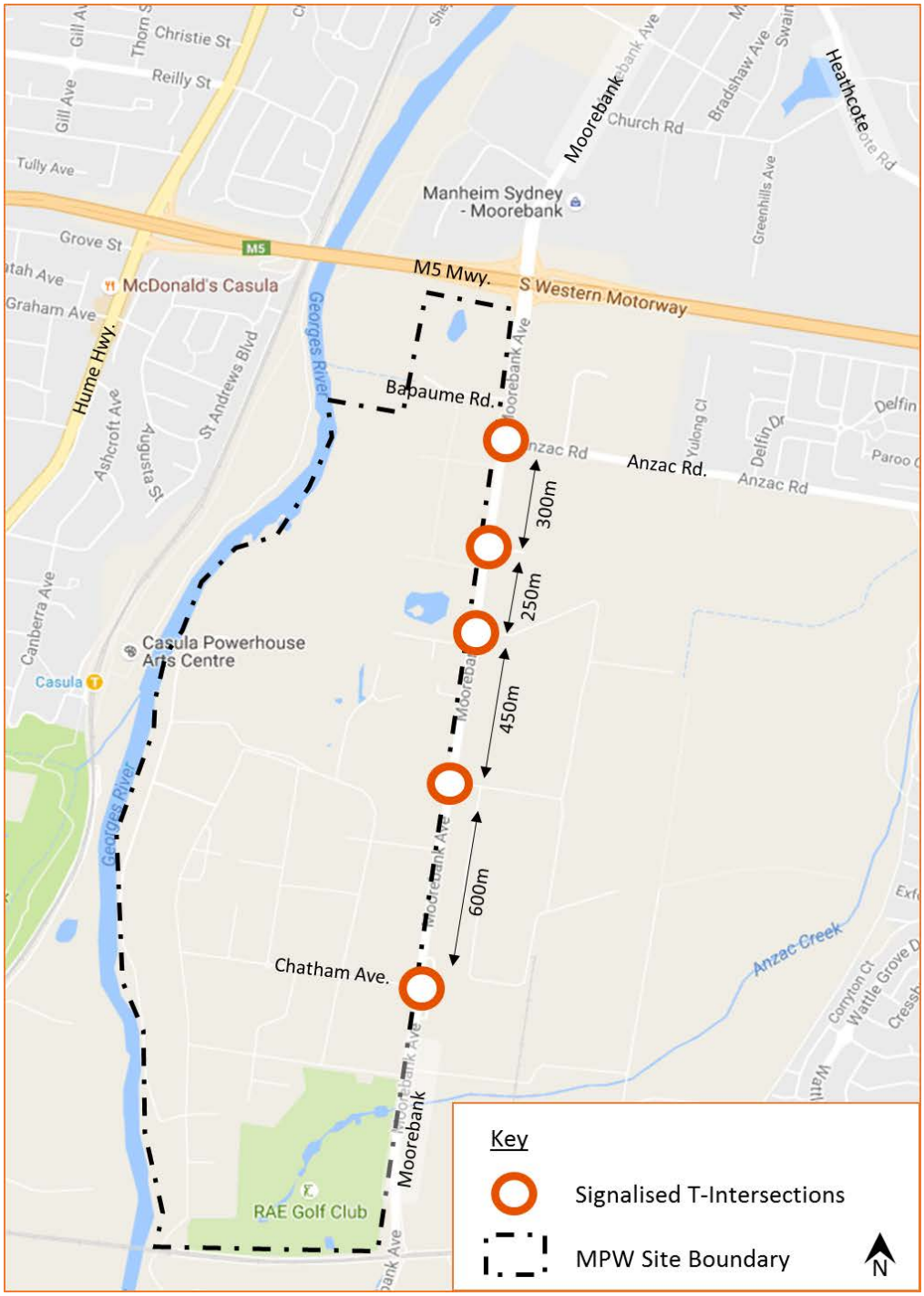


Figure 2-9 Locations of existing pedestrian crossing facilities on Moorebank Avenue

3 EXISTING ROAD NETWORK PERFORMANCE

This section establishes the existing traffic capacity and operational performance of intersections and the road network at key sites including:

- I-1 Moorebank Avenue / Anzac Road
- I-2 M5 Motorway / Moorebank Avenue
- I-3 M5 Motorway / Hume Highway
- I-4 Moorebank Avenue / Newbridge Road
- I-5 Moorebank Avenue / Heathcote Road
- I-6 M5 Motorway / Heathcote Road
- I-7 Cambridge Avenue / Glenfield Road
- I-8 Cambridge Avenue / Canterbury Road.

As discussed in Section 2.1, a detailed traffic assessment was undertaken for the eight key intersections including relevant road sections of Moorebank Avenue, Anzac Road and Cambridge Avenue.

Traffic count surveys undertaken for the Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) traffic model in 2015 supplemented by 2014 traffic surveyed carried out for the MPE Stage 1 Proposal have been used to form the basis of existing base traffic count data and capacity assessment at key roads, and intersections analysed within this section.

3.1 Daily traffic volumes

Table 3-1 summarises the 2015 daily traffic volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue.

Table 3-1 Daily Traffic Volumes and Heavy Vehicle Volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue - 2015

ID	Roads/Locations	Locations	Daily Volumes (all vehicles)	Heavy Vehicle Volume (%)
M-1	Moorebank Avenue	North of Anzac Road	21,300	1,100 (5%)
M-2	Moorebank Avenue	South of Anzac Road	17,200	890 (5%)
M-3	Anzac Road	East of Moorebank Avenue	10,410	480 (5%)
M-4	Moorebank Avenue	North of Cambridge Avenue	16,760	930 (6%)
M-5	Cambridge Avenue	West of Moorebank Avenue	15,700	550 (4%)

The 2015 data shows that Moorebank Avenue (south of the M5 Motorway) carried between 21,300 and 16,800 vehicles per day. The heavy vehicle proportion was found to be approximately 5% of total traffic. Anzac Road (east of Moorebank Avenue) carried approximately 10,400 vehicles per day. The heavy vehicle proportion on Anzac Road was found to be 5% of total traffic. Cambridge Avenue (west of Moorebank Avenue) carried approximately 15,700 vehicles per day. The heavy vehicle proportion was found to be approximately 4% of total traffic. The majority of the heavy vehicles on these roads are small trucks (Austroads Classes 3-5) which contributed around 90% of the total heavy vehicle volumes.

3.2 Peak hour volumes

Table 3-2 below shows existing peak hour traffic volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue. In the AM peak, traffic volumes on Moorebank Avenue (south of Anzac Road) were approximately 950 vehicles per hour in the northbound direction. The traffic volumes on Moorebank Avenue were substantially lower in the southbound direction in the AM peak, approximately 430 vehicles per hour. In the PM peak, the highest traffic volume was observed in the southbound direction, approximately 840 vehicles. Similarly, in the PM peak, about 450 vehicles per hour were observed in the northbound direction.

The peak flows on Anzac Road (east of Moorebank Avenue) were between 490 and 720 vehicles in one hour.

The peak traffic flows on Cambridge Avenue (east of Canterbury Road) were found to be similar to Moorebank Avenue. In the AM peak, approximately 960 vehicles per hour were observed in the eastbound direction. The westbound direction traffic in the AM peak was approximately 330 vehicles per hour. In the PM peak, the highest traffic volume was observed in the westbound direction, approximately 930 vehicles in one hour.

Table 3-2 Peak hour traffic volumes on key roads in 2015

ID	Roads/Locations	AM Peak		PM Peak	
		NB/EB(1)	SB/WB(1)	NB/EB(1)	SB/WB(1)
M-1	Moorebank Avenue, north of Anzac Road	910	780	680	940
M-2	Moorebank Avenue, south of Anzac Road	950	430	450	840
M-3	Anzac Road, east of Moorebank Avenue	720	490	510	520
M-4	Moorebank Avenue, north of Cambridge Avenue	920	360	350	920
M-5	Cambridge Avenue, west of Moorebank Avenue	960	330	340	930

Note: (1) Northbound (NB), Eastbound (EB), Southbound (SB), Westbound (WB)

3.3 Existing Network Performance

The existing operational performance of the eight key intersections was assessed using the LMARI AIMSUN traffic model provided by Roads and Maritime. Arcadis has further locally updated the LMARI AIMSUN traffic model at the eight key intersections for this assessment. Arcadis supplemented the traffic analysis with SIDRA Network modelling.

The following section provides existing level of service results for the eight key intersections assessed as part of the Proposal.

3.3.1 Level of service (LoS)

Intersection Levels of Service (LoS) was assessed using the standard NSW Level of Service criteria for intersection performance (see Table 3-3 below).

Table 3-3 LoS Criteria for intersection capacity analysis

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & 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	>70	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

Source: RMS Guide to Traffic Generating Development

Table 3-4 shows the existing 2015 AM and PM peak LoS results for the eight key intersections. Existing (2015) AM and PM peak hour turning volumes at the key study intersections are included in Appendix B of this report.

Table 3-4 Existing 2015 Level of Service for AM and PM Peak Traffic Condition

ID	Intersection	Layout	2015 Existing			
			AM Peak (8-9 am)		PM Peak (5-6 pm)	
			Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road	Existing Layout	18	B	17	B
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	31	C	31	C
I-3	M5 Motorway / Hume Highway	Existing Layout	48	D	36	C
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	61	E	60	E
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	66	E	63	E
I-6	M5 Motorway / Heathcote Road	Existing Layout	24	B	53	D
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	14	B	15	B
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	15	B	12	A

The existing level of service results are reported for the AM peak hour between 8-9 am and PM peak hour between 5-6 pm for all eight intersections.

The signalised intersections of Moorebank Avenue/ Anzac Road and M5 Motorway /Moorebank Avenue are currently operating satisfactorily at LoS B and LoS C, respectively.

The M5 Motorway/ Hume Highway intersection currently operates with LoS D in the AM and LoS C in the PM peak. The intersection is operating close to capacity in the AM peak.

The modelling results indicate that the existing Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road intersections are operating at capacity at LoS E in the AM and PM peaks. Upgrades are needed at these intersections to cater for existing peak demand.

For M5 Motorway/ Heathcote Road intersection, the intersection currently operates with LoS B in the AM and LoS D (near capacity) in the PM peak

The existing level of service on Cambridge Avenue has been assessed for two key roundabouts with Glenfield Road and Canterbury Road. The modelling indicates satisfactory roundabout operations at both locations with LoS A/B in the AM and PM peak periods.

4 IMPACT ASSESSMENT WITHOUT THE PROPOSAL

The Proposal represents the second stage of the MPW Project, which includes the construction and operation of an intermodal terminal facility with a capacity of 500,000 TEU (twenty-foot equivalent units) throughput per annum and 215,000 sq. m GFA warehousing and a Rail link connection. The traffic assessment has assumed that the Proposal will be open to traffic in 2019. The following section presents the impact of future background traffic volumes at the eight key intersections for opening year in 2019 and ten years after opening in 2029 i.e. without the Proposal.

4.1 Future background traffic growth

The road network in and around the Proposal site including the M5 Motorway, Moorebank Avenue, Cambridge Avenue, Newbridge Road and Hume Highway carry a significant volume of regional and local traffic. The population and employment growth projected in Liverpool LGA and the Southwest Sub-region will increase traffic volumes on these roads and associated intersections.

For the purpose of this assessment, future background traffic growth at the eight key intersections was sourced from the Roads and Maritime's wider Liverpool Moorebank Arterial Road Investigations (LMARI) AIMSUN traffic model. At the time of undertaking the assessment, Arcadis were provided with the AIMSUN traffic model for 2015 and 2026 AM and PM peak. The average peak hour background traffic growth between 2015 and 2026 at the eight key intersections was found to be between 1.0% and 1.9% per annum (compound growth). Table 4-1 shows average peak hour background traffic growth between 2015 and 2026 at the study intersections.

Table 4-1 Average Peak Hour Traffic Growth (2015-2026)

ID	Intersection	Average Peak Hour Traffic Growth Per Annum (2015-2026)
I-1	Moorebank Avenue / Anzac Road	1.9%
I-2	M5 Motorway / Moorebank Avenue	1.2%
I-3	M5 Motorway / Hume Highway	0.9%
I-4	Moorebank Avenue / Newbridge Road	1.4%
I-5	Moorebank Avenue / Heathcote Road	1.5%
I-6	M5 Motorway / Heathcote Road	1.2%
I-7	Cambridge Avenue / Glenfield Road	1.8%
I-8	Cambridge Avenue / Canterbury Road	1.8%

4.2 Impact on network operation without the Proposal

The traffic impact from background traffic growth on the operation of the road network has been undertaken for the eight key intersections for opening year in 2019 and ten years after opening in 2029 in both the AM and PM peak. In the event the predicted background traffic growth is realised at the study intersections in 2019 and 2029, the model predicts worsening of the level of service of those intersections currently identified to be problematic i.e. near or at capacity (see Section 3.3.1).

Table 4-2 shows predicted intersection level of service (LoS) results without the Proposal for the 2019 AM and PM peaks. Table 4-3 shows predicted intersection level of service (LoS) results without the Proposal for the 2029 AM and PM peaks.

Table 4-2 Intersection Level of Service without the Proposal - 2019

ID	Intersection	Layout	2019 without the Proposal			
			AM Peak (8-9 am)		PM Peak (5-6 pm)	
			Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road	Existing Layout	24	B	16	B
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	49	D	27	B
I-3	M5 Motorway / Hume Highway	Existing Layout	134	F	32	C
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	61	E	60	E
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	66	E	63	E
I-6	M5 Motorway / Heathcote Road	Existing Layout	78	F	69	E
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	8	A	12	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	10	A	7	A

Table 4-3 Intersection Level of Service without the Proposal - 2029

ID	Intersection	Layout	2029 without the Proposal			
			AM Peak (8-9 am)		PM Peak (5-6 pm)	
			Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road	Existing Layout	52	D	95	F
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	74	F	125	F
I-3	M5 Motorway / Hume Highway	Existing Layout	155	F	129	F
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	78	F	94	F
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	78	F	153	F
I-6	M5 Motorway / Heathcote Road	Existing Layout	78	F	336	F
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	10	A	7	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	14	B	10	A

The following results are identified by theses tables:

Moorebank Avenue / Anzac Road

- In the opening year 2019 (without the Proposal), the intersection is expected to operate at LoS B in the peak periods, which is considered acceptable intersection performance against a threshold of LoS D. No upgrading of the existing intersection is required to cater for background traffic demand in 2019.
- In 2029, the model predicted that the existing Moorebank Avenue/ Anzac Road intersection would operate at unacceptable LoS F. The modelling indicated that the performance of the intersection in its current form will be impacted by the M5 Motorway / Moorebank Ave due to spill back of vehicular queues from the M5 Motorway. Upgrading of the M5 Motorway / Moorebank Avenue intersection is considered to be required to improve the current performance of the Moorebank Avenue / Anzac Road intersection.

M5 Motorway / Moorebank Avenue

- In the opening year 2019 (without the Proposal), the intersection in its current form is expected to operate at LoS D in the AM and LoS B in the PM peaks, which is considered acceptable intersection performance. No upgrading of the existing intersection is required to cater for background traffic demand in 2019.
- In 2029, the model predicted that the existing M5 Motorway / Moorebank Avenue intersection would operate at unacceptable LoS F. Upgrading of the current intersection is required without the addition of the traffic generated by the Proposal as additional capacity is needed to cater for the growth in background traffic in 2029.

M5 Motorway / Hume Highway

- In 2019 and 2029 (without the Proposal), the intersection is expected to operate at unacceptable LoS F in the peak periods
- Upgrading of the existing intersection is required to cater for background traffic demand in 2019 and 2029

Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road / M5 Motorway / Heathcote Road

- In 2019 and 2029 (without the Proposal), the intersection is expected to operate at unacceptable LoS E/F in the peak periods
- Upgrading of the existing intersection is required to cater for background traffic demand in 2019 and 2029

Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road

- The model indicated satisfactory roundabout operations at both locations with level of service A/B in the AM and PM peak in 2019 and 2029 (without the Proposal). No upgrading of the existing intersection is required to cater for background traffic demand in 2019 and 2029.

5 IMPACT ASSESSMENT WITH THE PROPOSAL

5.1 Trip Generation from the Proposal

The trip generation assumptions for the Proposal were sourced from the following:

- *Moorebank Intermodal Terminal Precinct – Traffic Generation and Underlying Assumptions, Memorandum, Parsons Brinckerhoff, 1 September 2016.* (Provided in Appendix C of this report)
- *MPE Stage 2 Proposal / MPW Stage 2 Proposal – Container Handling Movements, Neil Matthews Consulting Pty Ltd, 4 August 2016.* (Provided in Appendix D of this report)

The following assumptions, which have previously been provided to Roads and Maritime (refer to Section 1.9 of this report), have been made to estimate trip generation for the Proposal:

Components	Assumptions
Intermodal Terminal	• The intermodal terminal facility would operate 52 weeks per year, 7 days a week and 24 hours a day. • Containers will arrive every day of the year. In a typical week, 85% of containers will be processed on weekdays (Monday – Friday), with the remaining 15% being processed on Saturday and Sunday. • The containers arriving by rail will be transferred on to trucks for transport on-site and off-site. In some instances containers will be unloaded from trains into the container storage area (i.e. stacked) and then transferred onto trucks. • Containers are loaded onto either B-doubles or semi-trailers. On average a semi-trailer is equivalent to 1.6 TEUs and a B-double equivalent to 2.4 TEUs • About 80% of container deliveries will be made by semi-trailers and 20% by B-doubles.
Warehouse	• The warehouse facility would operate 52 weeks of year, 7 days a week and 24 hours a day. • Containers will arrive every day of the year. In a typical week 95% of containers will be processed on weekdays (Monday – Friday), with the remaining 5% being processed on Saturday and Sunday. • Containers are loaded onto either B-doubles, semi-trailers or rigid trucks. On average a semi-trailer is equivalent to 1.6 TEUs, a B-double equivalent to 2.4 TEUs, and a rigid truck is equivalent to 0.8 TEUs • About 65% of deliveries will be made by semi-trailers, 30% will be made by rigid trucks and 5% will be made by B-doubles.
Staff shift work	• Two shifts per day transitioning to three shifts per day

Table 5-1 summarises trip generation assumptions for the Proposal. The Proposal is expected to generate approximately 1,458 truck trips (2-way) and 2,670 car trips (2-way) to and from the precinct each week day. In the cumulative development scenario with the addition of traffic from MPE Stage 1, approximately 2,778 truck trips (2-way) and 2,815 car trips (2-way) are estimated to and from the precinct each week day.

Table 5-1 Development Parameters

Trip Generation Assumptions	Development Scenarios	
	Proposal Only	Cumulative Development = Proposal and MPE Stage 1
Development Parameters		
Total Intermodal Terminal Capacity	500,000 TEU per annum	750,000 TEU per annum (Additional 250,000 TEU throughput is attributed to MPE Stage 1)
Total Warehousing GFA	215,000 sq.m	215,000 sq.m (The MPE Stage 1 Proposal does not include warehouse facilities)
Trip Generation		
Daily Truck Trips (to and from, 24 hours)	1,458 truck trips/day	2,778 truck trips/day
Daily Car Trips (to and from, 24 hours)	2,670 car trips/day	2,815 car trips/day

5.1.1 Terminal Truck Generation Profile

Although, the terminal is planned to operate 24 hours per day, 7 days a week. About 95% of trucks are expected to arrive and depart the terminal between 6:00 AM and 10:00 PM.

Figure 5-1 shows the temporal profile for the terminal truck generation assumed for the Proposal. It is envisaged that the peak deliveries to/from the terminal will occur in the morning and evening periods.

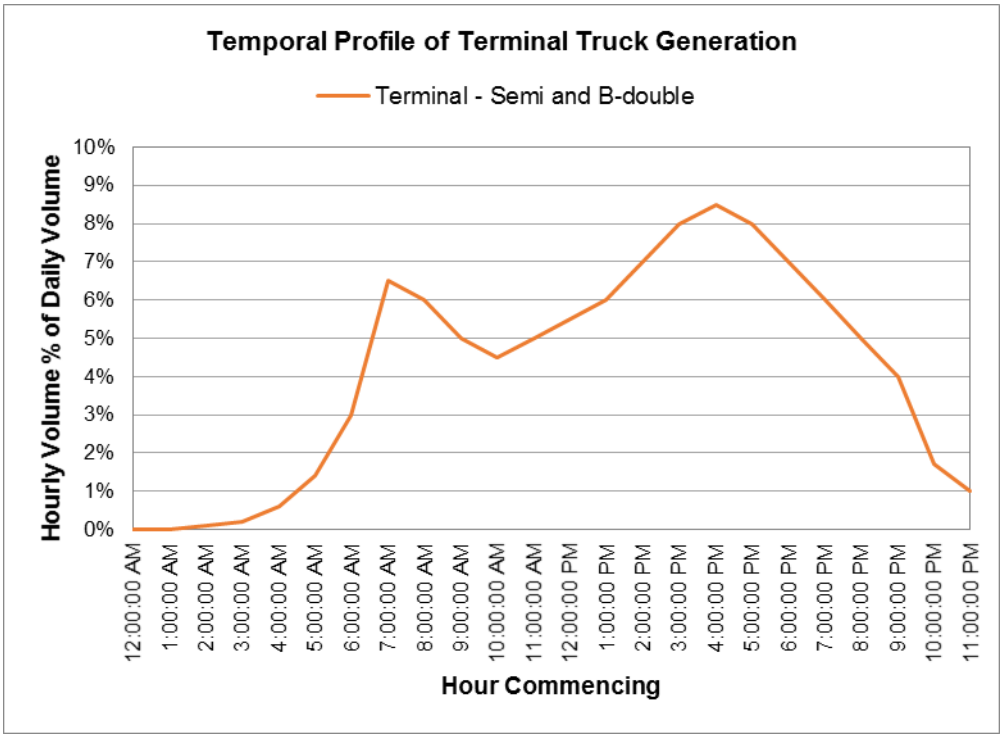


Figure 5-1 Temporal Distribution for Terminal Trucks

5.1.2 Warehouse Truck Generation Profile

Similar to the terminal facility, the warehouse facility is planned to operate 24 hours per day, 7 days a week. Figure 5-2 shows the temporal profile for the warehouse truck generation assumed for the Proposal.

Deliveries to and from warehouse will be made by B-doubles, semi-trailers and rigid trucks. The majority of deliveries will be made by semi-trailers and rigid truck are anticipated during the middle of the day. However, the majority of deliveries made by B-doubles are anticipated outside the AM and PM peak hours.

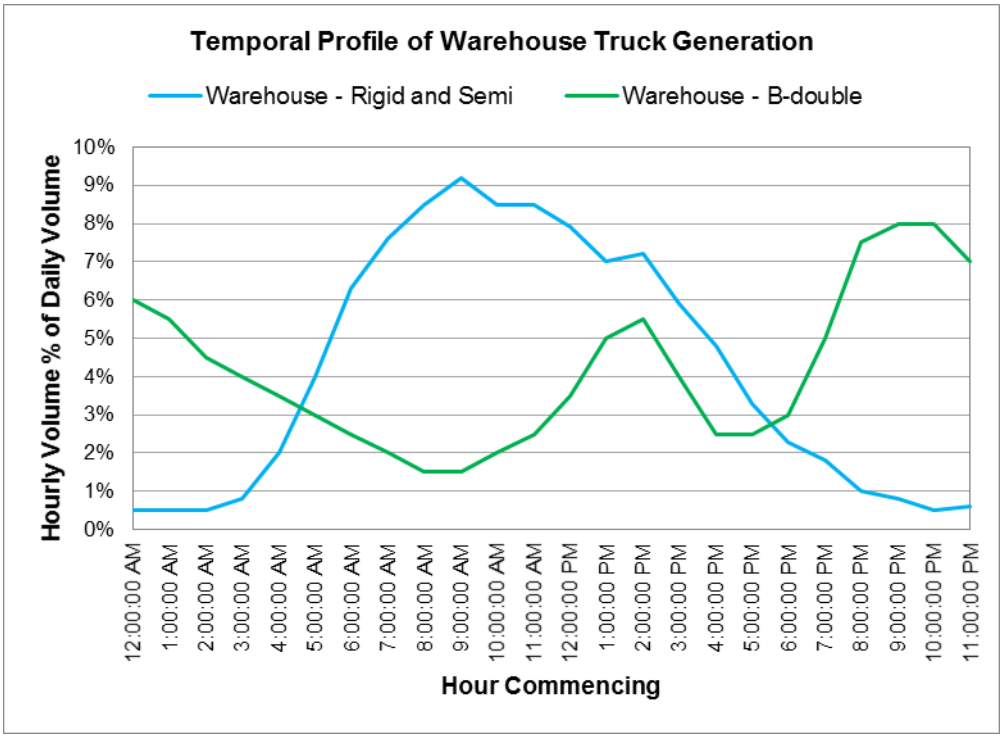


Figure 5-2 Temporal Distribution for Warehouse Trucks

5.1.3 Employee Traffic Generation Profile

At opening, it is envisaged that the facility will operate two shifts per day and then transitioning to three shifts[6] per day as the later stages of the development. For the purpose of this assessment, it is assumed that at opening year in 2019, the Proposal will operate with two shifts per day. At ten years after the opening in 2029, the Proposal will operate with three shifts per day.

Figure 5-3 shows hourly car generation profile for the Proposal with two shifts per day. The hourly data shows that the AM and PM peak hour for car movements will occur at 7-8 am and 4-5 pm. The AM and PM peak hour car movements represent about 19% and 17% of total daily car movements, respectively.

Figure 5-4 shows the hourly car generation profile for the Proposal with three shifts per day. The hourly data shows that the AM and PM peak hour for car movements will occur at 5-6 am and 9-10 pm with an inter-peak period occurring at 1-2 pm. During the AM and PM peak hour, car movements represent about 9% and 10% of total daily car movements, respectively.

[6] The three shift scenario is based on a transition to efficient supply chain operations in the future and that there are a number of existing examples which utilise a 3-shift operation. It is understood that both Yennora Distribution Centre and Enfield Intermodal Terminal operate with the utilisation of 3-shifts.

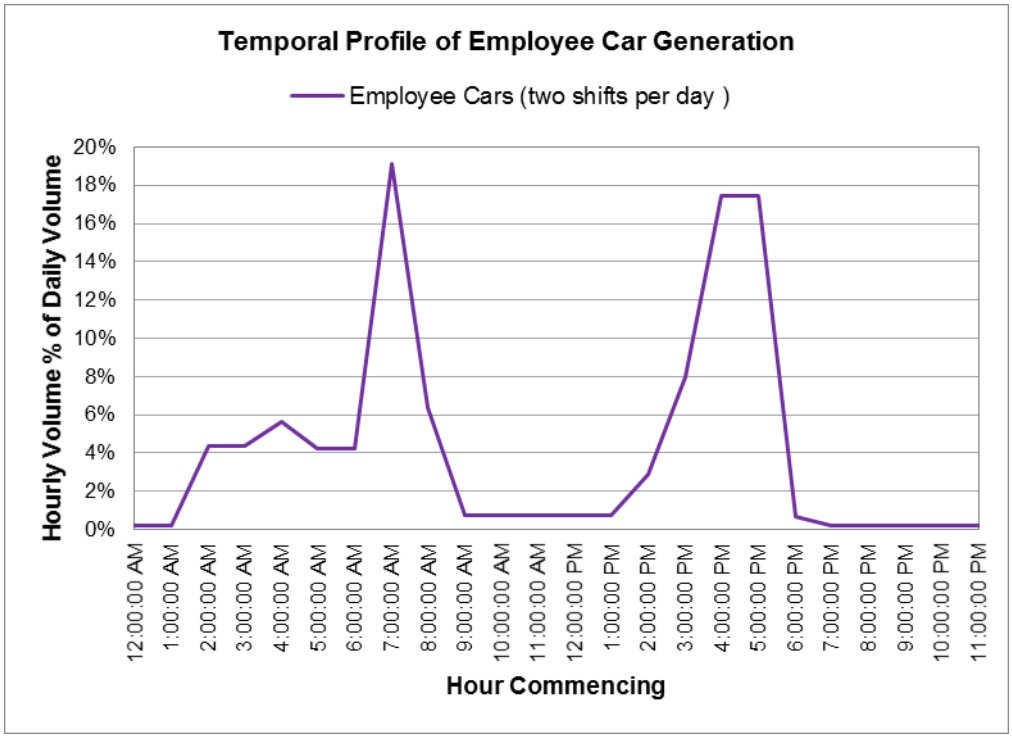


Figure 5-3 Weekday Temporal Distribution of Employee Car Trips – Two Shifts per Day

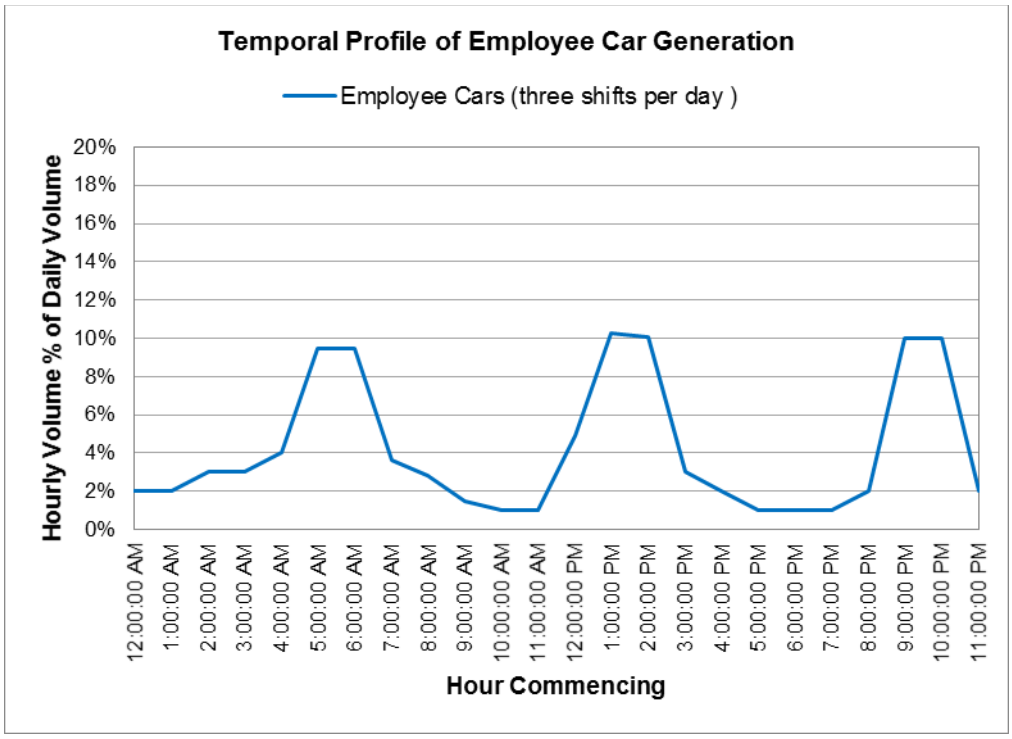


Figure 5-4 Weekday Temporal Distribution of Employee Car Trips – Three Shifts per Day

5.2 Traffic Distribution

The distribution of additional traffic generated by the Proposal is a key factor in determining its impact on the study area road network. Figure 5-5 shows the estimated truck (including semi-trailers, B-doubles and rigid trucks) distribution on the study area road network in the AM peak.

About 56% of trucks generated by the Proposal would travel to the Proposal site via the M5 Motorway from the west. About 17% is forecast to travel to the Proposal site via the Hume Highway. About 25% is forecast to travel to the Proposal site via Moorebank Avenue on the north side of the M5 Motorway. Of this 25%, 12% would originate from Newbridge Road East and 5% from Newbridge Road West.

In general, all trucks would travel via Moorebank Avenue north of the Proposal site. No container trucks would travel to the Proposal site via Anzac Road (east of Yulong Close) and Cambridge Avenue.

Figure 5-6 shows the trip distribution for employee cars in the AM peak. The majority of employee car traffic associated with the Proposal are forecast to travel to the Proposal site via Moorebank Avenue. About 22% and 31% of car traffic related to the Proposal are forecast to travel to the Proposal site via the M5 Motorway from the east and west, respectively. About 18% is forecast to travel to the Proposal site via the Hume Highway from the west and Moorebank Avenue from the north. Minor employee car traffic is expected to travel to Proposal site via Anzac Road (8%) and Cambridge Avenue (3%).

The traffic distribution in the PM peak (outbound trips) is assumed to be similar to AM peak inbound trip distribution showed in Figure 5-5 and Figure 5-6.

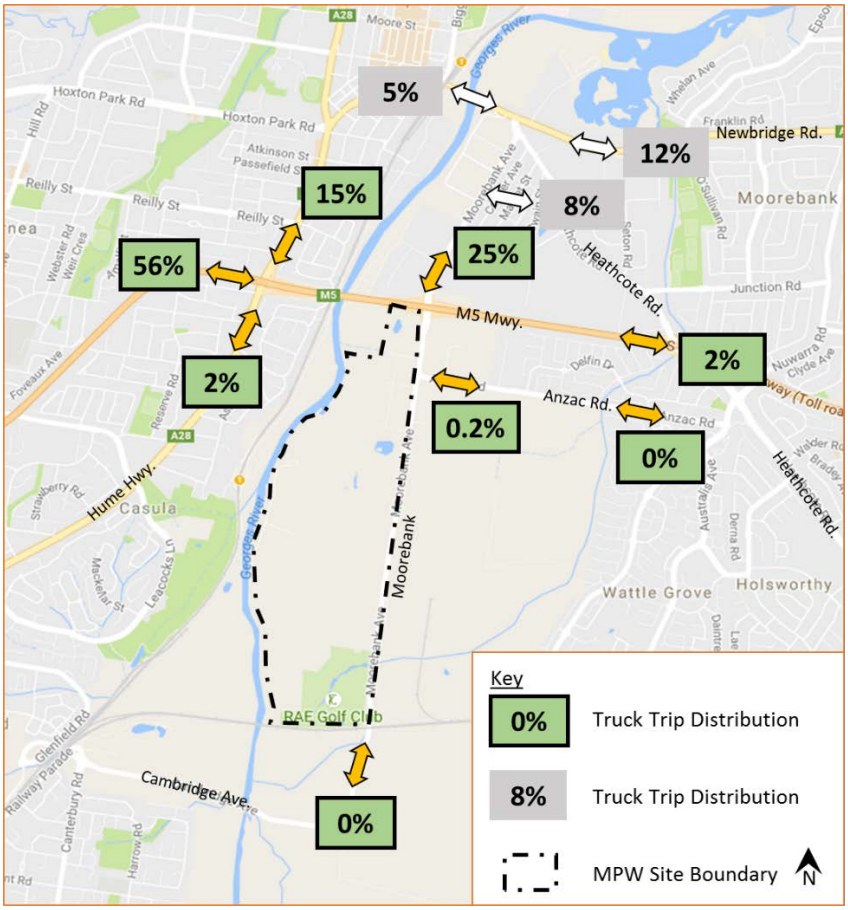


Figure 5-5 Truck Traffic Distribution to Precinct in the AM Peak

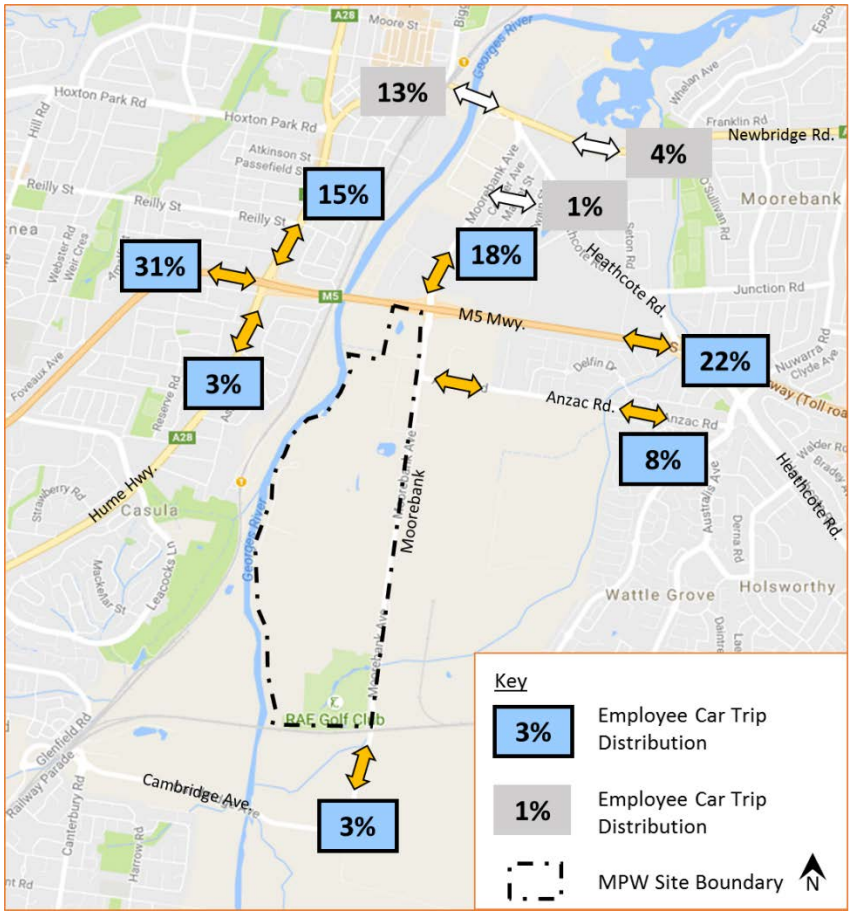


Figure 5-6 Employee Car Traffic Distribution to Precinct in the AM Peak

5.3 Regional Benefits of the Proposal

From a strategic perspective, the Moorebank Intermodal Terminal Project Environmental Impact Statement (EIS), 2014, identified that the introduction of the Proposal would result in wider regional benefits including:

- *Transfer of road haulage between Port Botany and Western Sydney to rail freight for redistribution thereby helping to reduce traffic congestion and providing speed benefits for the Sydney road network*
- *Easing the Port Botany bottleneck to enable the Port to cope with future growth and provide largescale freight capacity*
- *Reductions in articulated truck volumes through the Sydney CBD and inner city suburbs, on the M4 Motorway and the M5 Motorway east of the Moorebank Avenue interchange. The changes in articulated truck volumes on the regional Sydney road network would be reductions in heavy vehicle movements between Port Botany and Moorebank, thereby relieving the regional Sydney road network of articulated vehicular traffic.*
- *An increase in articulated truck flows, particularly on the M7, Hume Highway and Mamre Road south of the M4 Motorway as well as the M5 Motorway between Moorebank Avenue interchange and the M7 Motorway.*
- *Reductions in vehicle operating costs for heavy vehicles (i.e. vehicle-kilometres-travelled (VKT) and vehicle –hours travelled (VHT)) on the regional road network*

5.4 Proposed Site Access and Network Upgrades

The primary ingress/egress point for the Proposal is consistent with the MPW Concept Plan Approval. Two access points are proposed for access to the Proposal site. Access to the Proposal site will be via an upgraded Moorebank Avenue/Anzac Road signalised intersection and Moorebank Avenue/Bapaume Road as shown in Figure 5-7.

Trucks would enter the Proposal site via the main entrance at the upgraded Moorebank Avenue/Anzac Road intersection and continue along the internal road on the western perimeter of the Proposal site.

Once in the warehouse, trucks would be loaded/unloaded via manual handling equipment. Once loaded the trucks would then head to intended markets via the nearby major road network, or transported to the adjacent terminal on the MPE Stage 1 site, or transported directly to the IMT facility for dispatch to interstate, intrastate or port shuttle via rail.

Figure 5-7 also shows other proposed alterations to existing intersections on Moorebank Avenue. The existing signalised intersection with Chatham Avenue would be decommissioned.

It is noted that Table 7.20 of the MPW RtS provides potential road network solutions which are not to be delivered by the MPW Project. These solutions have been considered and have been updated to reflect the modelling undertaken for the Proposal.

5.4.1 Moorebank Avenue / Anzac Road Intersection Upgrade

Alterations to the existing signalised intersection of Moorebank Avenue/Anzac Road would be required to facilitate access to the Proposal site. The proposed configuration of the upgraded Moorebank Avenue/Anzac Road signalised intersection would include lane capacity improvements on the northern and southern approaches, and the construction of the new western approach to provide the main access point into the Proposal site. The current configuration on Anzac Road (eastern approach) will be retained. The upgraded intersection will be designed to comply with relevant Roads and Maritime design standards.

5.4.2 Moorebank Avenue/Bapaume Road Intersection

Bapaume Road would be reconfigured for left out (only) onto Moorebank Avenue. The reconfigured Bapaume Road would allow improved traffic dispersal with the following movements:

- Inbound traffic to the ABB site would be directed to the upgraded Moorebank Avenue/Anzac Road intersection
- Northbound traffic out of the ABB site and the proposed truck parking area would use Bapaume Road (left-out) to enter Moorebank Avenue
- Southbound traffic out of the ABB site would use the upgraded Moorebank Avenue/Anzac Road intersection.
- The reconfigured intersection will be designed to comply with relevant Roads and Maritime design standards.

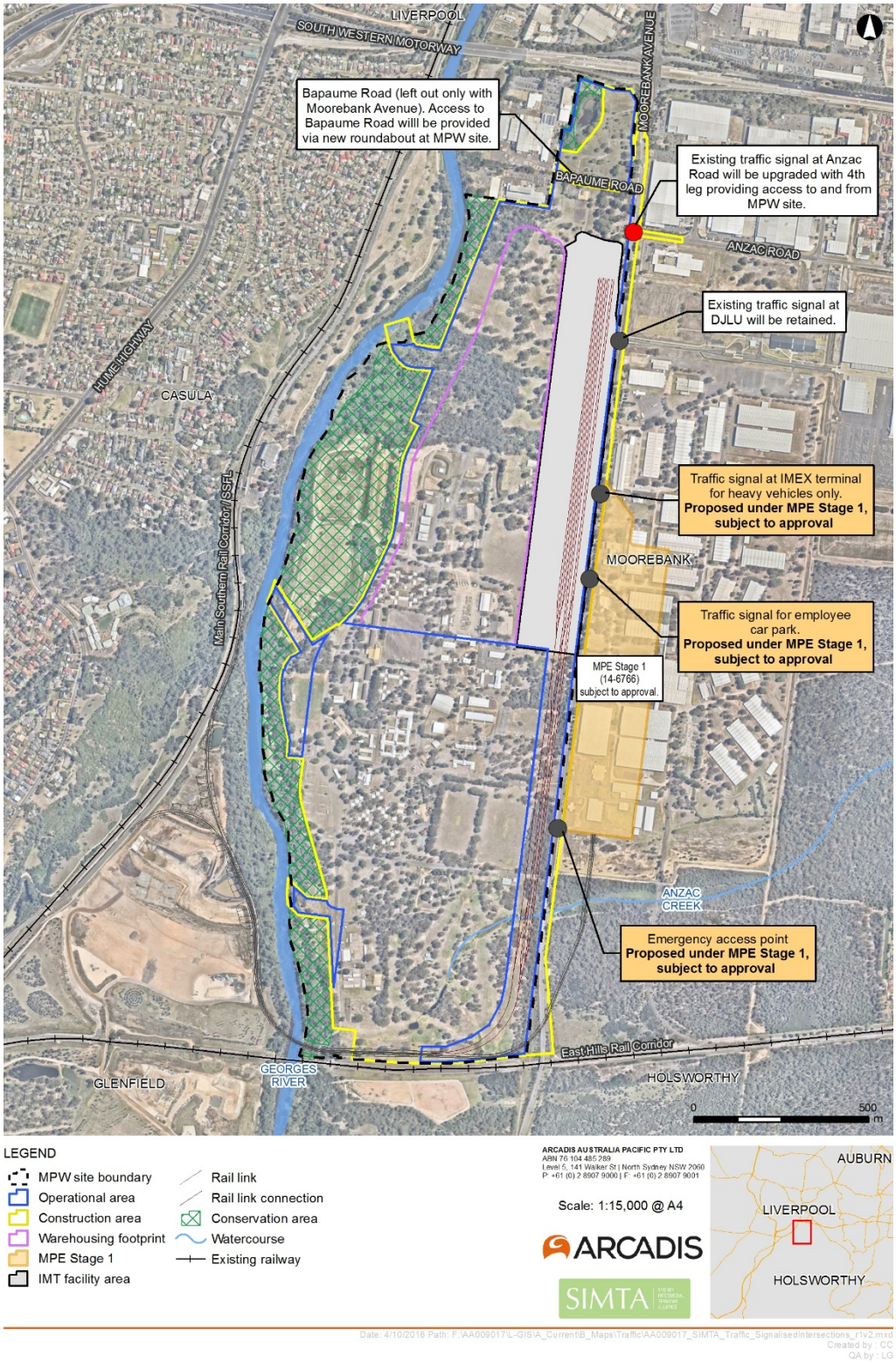


Figure 5-7 Moorebank Avenue Access Strategy for MPW Stage 2 Operation

5.4.3 M5 Motorway / Moorebank Avenue intersection

Upgrades to the intersection are required primarily to needed to cater for the Proposal traffic and includes providing additional capacity on westbound on-ramp, eastbound off-ramp and increased storage lengths of the existing (two-lane) right turn bay on Moorebank Avenue northern approach. Changes to the signals to vehicle actuation to improve the performance of the west and north approaches are proposed. In line with the upgrades, widening of Moorebank Avenue to four lanes between the M5 Motorway / Moorebank Avenue intersection and Moorebank Avenue/Anzac Road intersection will be required.

5.4.4 M5 Motorway / Hume Highway intersection

To improve signal operation and throughput at the intersection, changes to the signals to vehicle actuation is proposed.

5.4.5 Moorebank Avenue / Newbridge Road intersection

To provide added intersection capacity, an additional right turn lane from Moorebank Avenue south approach is proposed and signal vehicle actuation is proposed to improve traffic signal operations.

5.4.6 Moorebank Avenue / Heathcote Road intersection

To provide added intersection capacity, extend right turn lane from Moorebank Avenue south approach and signal vehicle actuation is proposed to improve traffic signal operations.

5.4.7 M5 Motorway / Heathcote Road intersection

Change the signal to vehicle actuated in PM peak to improve traffic signal operations.

5.5 Daily Traffic Volumes with the Proposal

The Proposal would partly help to reduce the potential increase in regional freight movements along the M5 Motorway between Port Botany and Moorebank Avenue. This would be primarily through a mode transfer from road to rail. Notwithstanding this, it would increase traffic movements within the vicinity of the Proposal site, particularly on Moorebank Avenue, resulting from freight distribution from the Proposal site and employees accessing the site.

The potential increase in traffic generated by the Proposal on the road network was assessed by comparing forecast 2019 (opening year) and 2029 (10 year horizon) daily traffic volumes on Moorebank Avenue, Anzac Road and Cambridge Avenue with and without the Proposal as shown in Table 5-2 and Table 5-3, respectively.

Table 5-2 Daily Traffic Volumes and Heavy Vehicle Volumes in 2019 (Opening Year)

ID	Road Locations	2019 without the Proposal		2019 with the Proposal		Traffic Increase Contributed by the Proposal in 2019 Opening Year (% of Background Traffic)
		All vehicle	Heavy Vehicles (%)	All vehicle	Heavy Vehicles (%)	
M-1	Moorebank Avenue, north of Anzac Road	23,200	1,200 (5%)	27,040	2,700 (10%)	3,840 (16.6%)
M-2	Moorebank Avenue, south of Anzac Road	19,000	980 (5%)	19,080	980 (5%)	80 (0.4%)
M-3	Anzac Road, east of Moorebank Avenue	11,100	510 (5%)	11,310	510 (5%)	210 (1.9%)
M-4	Moorebank Avenue, north of Cambridge Avenue	19,000	1,050 (6%)	19,080	1,050 (6%)	80 (0.4%)
M-5	Cambridge Avenue, west of Moorebank Avenue	17,900	630 (4%)	17,980	630 (4%)	80 (0.4%)

Note: Traffic increase contributed by the Proposal equals to Proposal traffic generation divided by background traffic.

Table 5-3 Daily Traffic Volumes and Heavy Vehicle Volumes in 2029 (10-Year Horizon)

ID	Road Locations	2029 without the Proposal		2029 with the Proposal		Traffic Increase Contributed by the Proposal in 2029 Opening Year (% of Background Traffic)
		All vehicle	Heavy Vehicles (%)	All vehicle	Heavy Vehicles (%)	
M-1	Moorebank Avenue, north of Anzac Road	28,000	1,450 (5%)	31,840	2,910 (9%)	3,840 (13.7%)
M-2	Moorebank Avenue, south of Anzac Road	23,500	1,220 (5%)	23,580	1,220 (5%)	80 (0.3%)
M-3	Anzac Road, east of Moorebank Avenue	12,800	590 (5%)	13,010	590 (5%)	210 (1.6%)
M-4	Moorebank Avenue, north of Cambridge Avenue	23,600	1,310 (6%)	23,680	1,310 (6%)	80 (0.3%)
M-5	Cambridge Avenue, west of Moorebank Avenue	22,300	780 (3%)	22,380	780 (3%)	80 (0.4%)

Note: Traffic increase contributed by the Proposal equals to Proposal traffic generation divided by background traffic.

In the opening year (2019), the highest traffic increase attributable to the Proposal is forecast on Moorebank Avenue (north of Anzac Road) with an increase of 17%. The Proposal traffic would also increase traffic on Anzac Road (east of Moorebank Avenue) by approximately 1.9%. The analysis indicates minor traffic increase (less

than 0.5%) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the Proposal.

In the 10-year design horizon (2029), the traffic increase attributable to the Proposal is expected to be reduced to 14% on Moorebank Avenue (north of Anzac Road) and 1.6% on Anzac Road (east of Moorebank Avenue). This is due to the growth in background traffic between 2019 and 2029. The analysis indicates minor traffic increase (less than 0.5 %) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the Proposal by 2029.

5.6 Impact on Network Operation with the Proposal

An assessment of the potential increase in traffic generated by the Proposal at the eight key intersections was conducted for 2019 and 2029 as shown in Table 5-4.

The highest traffic increase attributable to the Proposal is predicted at Moorebank Avenue / Anzac Road intersection which provides vehicular access to the Proposal site. In 2019, the Proposal would increase traffic at Moorebank Avenue / Anzac Road intersection by 20% to 26 % during the peak hour. The increase is expected to reduce to between 6% and 7% by 2029 due to the growth in background traffic but Proposal traffic remaining constant from year of opening.

It is also predicted to increase traffic at M5 Motorway / Moorebank Avenue intersection by 11% to 14% in 2019 and reducing to 3.5% to 4.0% by 2029. Increases in traffic due to the Proposal at the M5 Motorway / Hume Highway are less than 2%.

To the north, the analysis found that likely traffic increase attributable to the Proposal at Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road intersections would be minor (less than 3%). To the east, likely traffic increases at the M5 Motorway / Heathcote Road would be marginal (less than 0.5%). Similarly, to the south on Cambridge Avenue, likely traffic increase at two assessed roundabouts would be marginal (less than 1%).

It should be noted that the predicted increase in traffic generated by the Proposal which are less than 5% of the observed are within the limits of the variations in day to day traffic volumes. As such, their impacts are considered marginal.

Table 5-4 Traffic Increase Attributed to the Proposal in 2019 and 2029

ID	Intersections	Traffic Increase Contributed by the Proposal in 2019 Opening Year (% of Background Traffic)		Traffic Increase Contributed by the Proposal in 2029 Opening Year (% of Background Traffic)	
		AM Peak	PM Peak	AM Peak	PM Peak
I-1	Moorebank Avenue / Anzac Road / MPW Access Road	19.8%	26.5%	7.0%	5.8%
I-2	M5 Motorway / Moorebank Avenue	10.9%	13.7%	4.2%	3.4%
I-3	M5 Motorway / Hume Highway	1.2%	1.5%	0.4%	0.4%
I-4	Moorebank Avenue / Newbridge Road	1.5%	1.8%	0.5%	0.4%
I-5	Moorebank Avenue / Heathcote Road	2.2%	2.7%	0.8%	0.6%
I-6	M5 Motorway / Heathcote Road	0.2%	0.2%	0.1%	0.1%
I-7	Cambridge Avenue / Glenfield Road	0.1%	0.1%	0.1%	0.1%
I-8	Cambridge Avenue / Canterbury Road	0.4%	0.5%	0.1%	0.1%

Note: Traffic increase contributed by the Proposal equals to Proposal traffic generation divided background traffic generation in total vehicles

The impact of traffic attributable to the Proposal on the network operation has been undertaken for the eight key intersections in 2019 and 2029. Table 5-5 and Table 5-5 show the predicted intersection level of service (LoS) without and with the addition of Proposal traffic in 2019 and 2029, respectively.

In determining the required intersection improvements to mitigate the impact of Proposal traffic on the road network, a “no-worsening of the without Proposal intersection performance” approach has been adopted as this identifies improvements directly attributable to the Proposal i.e. not due to growth in background traffic. The proposed network improvements to mitigate the impact of Proposal traffic are discussed in Section 5.3.

Moorebank Avenue / Anzac Road

Modifications to the existing signalised intersection of Moorebank Avenue/Anzac Road would be required to facilitate access to the Proposal site. The proposed configuration of the upgraded Moorebank Avenue/Anzac Road signalised intersection would include lane capacity improvements on the northern and southern approaches, and the construction of the new western approach main access into the Proposal site. The current configuration on Anzac Road (eastern approach) will be retained.

The analysis shows that in 2019 the upgraded intersection with the Proposal is expected to perform at LoS C which is comparable to the without Proposal scenario with LoS B in 2019. Given that the comparison in intersection performance is between a three-leg intersection (without Proposal) and a four-leg intersection (with Proposal), this has been deemed acceptable. In 2029, with the Proposal the intersection is expected to perform at LoS D which is better than LoS F without the Proposal.

M5 Motorway / Moorebank Avenue

With the Proposal and proposed upgrades, the modelling predicted a LoS B in 2019 and LoS C in 2029 which is better than without the Proposal with LoS D in 2019 and LoS F in 2029.

M5 Motorway / Hume Highway

With the Proposal and proposed upgrades, the modelling predicted a LoS E in 2019 and LoS F in 2029 which is better than/comparable to without the Proposal with LoS F in 2019 and 2029.

Moorebank Avenue / Newbridge Road

With the Proposal and proposed upgrades, the modelling predicted a LoS D in 2019 and 2029 which is better than without the Proposal with LoS E in 2019 and LoS F in 2029.

Moorebank Avenue / Heathcote Road

With the Proposal and proposed upgrades, the modelling predicted a LoS E/F in 2019 and 2029 which is comparable to without the Proposal with LoS E/F in 2019 and 2029.

M5 Motorway / Heathcote Road

With the Proposal and proposed upgrades, the modelling predicted a LoS C in 2019 and LoS F in 2029 which is better than/comparable to without the Proposal with LoS F in 2019 and 2029.

Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road

The modelling indicated satisfactory roundabout operations at both locations with LoS A/B with and without the Proposal.

Table 5-5 Intersection Level of Service with and without the Proposal - 2019

ID	Intersection	Layout	2019 without the Proposal				Layout	2019 with the Proposal			
			AM Peak (8-9am)		PM Peak (5-6pm)			AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (sec)	LoS	Delay (sec)	LoS		Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	Existing Layout	24	B	16	B	With Upgrade & Improve Signals	41	C	42	C
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	49	D	27	B		20	B	20	B
I-3	M5 Motorway / Hume Highway	Existing Layout	134	F	32	C	Improve Signals	56	E	28	B
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	61	E	60	E	With Upgrade & Improve Signals	47	D	37	C
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	66	E	63	E		75	F	34	C
I-6	M5 Motorway / Heathcote Road	Existing Layout	78	F	69	E	Improve Signals	31	C	36	C
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	8	A	12	A	Existing Layout	8	A	12	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	10	A	7	A		8	A	7	A

Table 5-6 Intersection Level of Service with and without the Proposal - 2029

ID	Intersection	Layout	2029 without the Proposal				Layout	2029 with the Proposal			
			AM Peak (8-9am)		PM Peak (5-6pm)			AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (s)	LoS	Delay (s)	LoS		Delay (s)	LoS	Delay (s)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	Existing Layout	52	D	95	F	With Upgrade & Improve Signals	53	D	45	D
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	74	F	125	F		30	C	38	C
I-3	M5 Motorway / Hume Highway	Existing Layout	155	F	129	F	Improve Signals	73	F	38	C
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	78	F	94	F	With Upgrade & Improve Signals	50	D	42	C
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	78	F	153	F		70	E	78	F
I-6	M5 Motorway / Heathcote Road	Existing Layout	78	F	336	F	Improve Signals	38	C	77	F
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	10	A	7	A	Existing Layout	8	A	8	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	14	B	10	A		20	B	7	A

5.7 Impact on Cambridge Avenue

The Proposal will result in minor increases in peak hour traffic volumes on Cambridge Avenue with an estimated increase of 0.5% in 2019 and reducing to 0.1% by 2029. Due to the relatively low traffic volumes, both roundabouts at Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road are forecast to operate at LoS between A and B with the Proposal.

The majority of the Proposal traffic will travel north along Moorebank Avenue and mitigation measures to reduce travel to the south are implemented via the Operational Traffic Management Plan.

5.8 Cumulative Impact during Operation

It is understood that the MPE Stage 1 Project, subject to approval, is likely to be operational by the 2019 opening year of the Proposal. The MPE Stage 1 Project includes the operation of an intermodal terminal facility with a capacity of 250,000 TEU throughput per annum. The MPE Stage 1 Project does not include any warehousing.

As a 'worst case' scenario, an assessment of the cumulative development impacts of the Proposal and the MPE Stage 1 Project has been conducted in both a 2019 and 2029 full operational scenario. Table 5-7 and Table 5-8 show the predicted intersection level of service (LoS) of the eight key intersections with the addition of the cumulative development in 2019 and 2029, respectively. Similarly, a "no-worsening of without Proposal intersection performance" approach has been adopted for the assessment of improvements directly attributable to the Proposal. The proposed network improvements to mitigate the impact of the Cumulative development traffic are similar to the Proposal as discussed in Section 5.4.3. In summary the results for the cumulative development scenario, presented in the above tables, are as follows:

Moorebank Avenue / Anzac Road

With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS D in 2019 and LoS E in 2029 which is comparable to without the Proposal traffic with LoS B in 2019 and LoS F in 2029.

M5 Motorway / Moorebank Avenue

With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS C in 2019 and LoS D in 2029 which is better than without the Proposal traffic with LoS D in 2019 and LoS F in 2029.

M5 Motorway / Hume Highway

With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS D in 2019 and LoS F in 2029 which is better than/comparable to without the Proposal traffic with LoS F in 2019 and 2029.

Moorebank Avenue / Newbridge Road

With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS D in 2019 and 2029 which is better than without the Proposal traffic with LoS E in 2019 and LoS F in 2029.

Moorebank Avenue / Heathcote Road

With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS E/F in 2019 and 2029 which is better than/comparable to without the Proposal traffic with LoS F in 2019 and 2029.

M5 Motorway / Heathcote Road

With the Cumulative development traffic and proposed upgrades, the modelling predicted a LoS C in 2019 and LoS E in 2029 which is better than without the Proposal traffic with LoS F in 2019 and 2029.

Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road

The modelling indicated satisfactory roundabout operations at both locations with LoS A/B with and without the Cumulative development traffic.

Table 5-7 Intersection Level of Service with and without Cumulative Development Scenario – 2019

ID	Intersection	Layout	2019 without the Proposal				Layout	2019 with Cumulative Development I			
			AM Peak (8-9am)		PM Peak (5-6pm)			AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (sec)	LoS	Delay (sec)	LoS		Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	Existing Layout	24	B	16	B	With Upgrade & Improve Signals	42	D	44	D
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	49	D	27	B		21	B	35	C
I-3	M5 Motorway / Hume Highway	Existing Layout	134	F	32	C	Improve Signals	56	D	30	C
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	61	E	60	E	With Upgrade & Improve Signals	42	D	35	C
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	66	E	63	E		71	F	33	C
I-6	M5 Motorway / Heathcote Road	Existing Layout	78	F	69	E	Improve Signals	32	C	35	C
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	8	A	12	A	Existing Layout	7	A	12	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	10	A	7	A		8	A	7	A

Note: Cumulative Development Scenario = MPW Stage 2 + MPE Stage 1

Table 5-8 Intersection Level of Service with and without Cumulative Development Scenario - 2029

ID	Intersection	Layout	2029 without the Proposal				Layout	2029 with Cumulative Development			
			AM Peak (8-9am)		PM Peak (5-6pm)			AM Peak (8-9am)		PM Peak (5-6pm)	
			Delay (sec)	LoS	Delay (sec)	LoS		Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	Existing Layout	52	D	95	F	With Upgrade & Improve Signals	52	D	57	E
I-2	M5 Motorway / Moorebank Avenue	Existing Layout	74	F	125	F		35	C	53	D
I-3	M5 Motorway / Hume Highway	Existing Layout	155	F	129	F	Improve Signals	75	F	39	C
I-4	Moorebank Avenue / Newbridge Road	Existing Layout	78	F	94	F	With Upgrade & Improve Signals	43	D	51	D
I-5	Moorebank Avenue / Heathcote Road	Existing Layout	78	F	153	F		62	E	85	F
I-6	M5 Motorway / Heathcote Road	Existing Layout	78	F	336	F	Improve Signals	34	C	69	E
I-7	Cambridge Avenue / Glenfield Road	Existing Layout	10	A	7	A	Existing Layout	8	A	8	A
I-8	Cambridge Avenue / Canterbury Road	Existing Layout	14	B	10	A		15	B	8	A

Note: Cumulative Development Scenario = MPW Stage 2 + MPE Stage 1

5.9 Parking Provisions

5.9.1 Car Parking Provisions

The Roads and Maritime Services' (Roads and Maritime) key reference document for guidance on traffic generation and parking provision is the *Guide to Traffic Generating Development (RTA, 2002)*. The Guide makes no specific requirement for minimum parking numbers required on intermodal terminals.

For warehouses, it states that "All new warehouses on undeveloped sites must provide on-site parking for all vehicles used by employees. In the case of wholly redeveloped sites each site is treated on its merit."

For warehouse and office land uses, Roads and Maritime recommends the following car parking provision:

- 1 car space per 300 m^2 Gross Floor Area (GFA) for warehouses
- 1 car space per 40 m^2 GFA for offices

Based on the Roads and Maritime parking standards and the proposed warehouse, and office gross floor areas (GFAs – m^2) for the Proposal, a total of 983 car parking spaces are proposed. A detailed breakdown is provided in Table 5-9..

Table 5-9 Parking Provision with the Proposal

Proposed development	General location	Warehouse (m^2)	Office (m^2)	Car parking spaces
Warehouse 1A	Northern-most warehouse, located directly east of the proposed main site entry roundabout.	21,000	1,000	95
Warehouse 2A	Directly south of Warehouse 1A, north of the open stormwater channel and adjacent to the IMT facility.	21,000	1,000	95
Warehouse 1B	Directly south of the open stormwater channel and Warehouse 2A, and adjacent to the IMT facility	38,000	1,000	152
Warehouse 2B	Directly south of Warehouse 1B and adjacent to the IMT facility.	30,000	1,000	125
Warehouse 3B	Directly west of Warehouse 2B.	30,000	1,000	125
Warehouse 1C	Directly south of Warehouse 2B and adjacent to the IMT facility.	71,000	2,000	287
Warehouse 2C	In the south western corner of the operational area, directly west of Warehouse 1C.	4,000	300	29
Intermodal Terminal Office	Directly east of Warehouse 1A and adjacent to the IMT and Moorebank Avenue	-	2,000	50

Proposed development	General location	Warehouse (m^2)	Office (m^2)	Car parking spaces
Freight Village	Directly west of Warehouse 2A and adjacent to the Internal Road	-	800	25
Total		215,000	10,100	983

5.9.2 Bicycle Facilities Provisions

Arcadis have undertaken a review of the relevant bicycle facilities guidelines attributed to similar types of development throughout the Greater Sydney Metropolitan Area and NSW. A consideration of the following guidelines was undertaken:

- Liverpool City Council DCP 2008, Part 1, General Controls for All Developments
- *City of Sydney Section 3 - General Provisions*
- DIPNR (referred to currently as the Department of Planning and Environment) *Planning Guidelines for Walking and Cycling 2004*

The *City of Sydney Section 3 – General Provisions* was considered a suitable guideline in that it specified bicycle provisions for individual land uses[7], similar types of development and providing a standard which is mid-range (i.e. did not over or under provide). The *City of Sydney Section 3 – General Provisions* stipulates the following on-site bike parking rates for Industry or Warehouse/Distribution Centres:

- 1 bicycle rack per 10 staff/employees
- 1 personal locker for each bike parking space
- 1 shower and change cubicle for up to 10 bike parking spaces
- 2 shower and change cubicles for 11 to 20 or more bike parking spaces are provided
- 2 additional showers and cubicles for each additional 20 bike parking spaces or part thereof.

Based on the proposed warehouse and office GFAs for the Proposal, an indicative total of 127 bicycle parking spaces, 127 lockers and 15 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*.

[7] The Liverpool DCP did not break down controls into individual land uses however used a generalised approach which is not considered suitable for this type of development.

5.10 Impact on Crashes/Accidents

5.10.1 Moorebank Avenue

There were a total of 51 reported crashes on the section of Moorebank Avenue between the M5 Motorway interchange and Cambridge Avenue (approximately 3.5 km) during the last five years between 2010 and 2015 inclusive. This translates to approximately 10.2 crashes per year and represents the existing condition (refer to Section 2 of this report).

The Proposal will increase daily traffic volumes on Moorebank Avenue (north of Anzac Road) by approximately 17% in 2019 and this will reduce to 14% by 2029. The analysis indicates that daily traffic volumes are expected to increase on Moorebank Avenue (north of Anzac Road) from 21,300 vehicles (2015) to 27,040 vehicles in 2019 and 31,840 vehicles in 2029, with the Proposal. This translates to approximately 3,840 additional vehicles per day predicted to use Moorebank Avenue (north of Anzac Road) due to the Proposal.

Two access points on Moorebank Avenue will be provided for car and trucks as part of the Proposal. The existing traffic signal at the Moorebank Avenue/ Anzac Road intersection will be upgraded with a left-out arrangement at the Moorebank Avenue/ Bapaume Road intersection. The net impact of the additional traffic generated by the Proposal, as well as the proposed access points and improvements associated with the Proposal would result in an increase from 10.2 crashes per year to 11.6 crashes per year.

5.10.2 Cambridge Avenue

There were a total of 25 reported crashes on the section of Cambridge Avenue between Moorebank Avenue and Canterbury Road roundabout (about 1.8 km) between 2010 and 2015 inclusive. This translates to approximately 5.0 crashes per year and represents the existing condition.

The Proposal will have minor increase of daily traffic volumes on Cambridge Avenue by less than 0.5%. Approximately 80 additional vehicles (employee cars) are predicted to use Cambridge Avenue as a result of the Proposal. The analysis indicates that daily traffic volumes increase on the Cambridge Avenue (east of Canterbury Road) from 15,700 vehicles (2015) to 17,980 vehicles (forecast 2019 with the Proposal) and 22,380 vehicles in 2029. With the Proposal, the crash rate on the Cambridge Avenue is forecast to increase to approximately 5.2 crashes per year.

5.11 Impact on Bus Public Transport

In general, the Proposal site can be accessed by bus public transport via a feeder bus service (route no. 901) to the train stations at Liverpool and Holsworthy. The existing service arrangements suggest poor service frequencies for the feeder bus service outside peak times and only one service during peak periods servicing Moorebank Avenue to the south of Anzac Road.

The walking distance to the ‘full-time’ bus stops at Moorebank Road and Anzac Road intersection from the Proposal site has an acceptable walking distance for the northern part of the site (as shown in Figure 5-8), however, due to the proposed location of the IMT rail connection, direct accessibility to the warehouses from Moorebank Avenue is not possible. To improve bus transport access to the precinct, additional bus stops are proposed on the internal road in order to ensure a 400m walking distance (“as the crow flies”) to all proposed warehouses and offices.

Whilst there would be additional heavy vehicles on Moorebank Avenue, the service frequencies of the buses are considered low and as such the Proposal is not anticipated to have any substantial impacts on bus public transport services.

Overall it is considered that the existing public transport supply arrangements are suitable for accommodating the expected demand associated with the Proposal, however, additional stops would be required to ensure adequate accessibility to all proposed warehouses and offices.

The location of these bus stops would be further discussed with TfNSW as part of the detailed design of the Proposal.

Moorebank Avenue Bus Stop Options

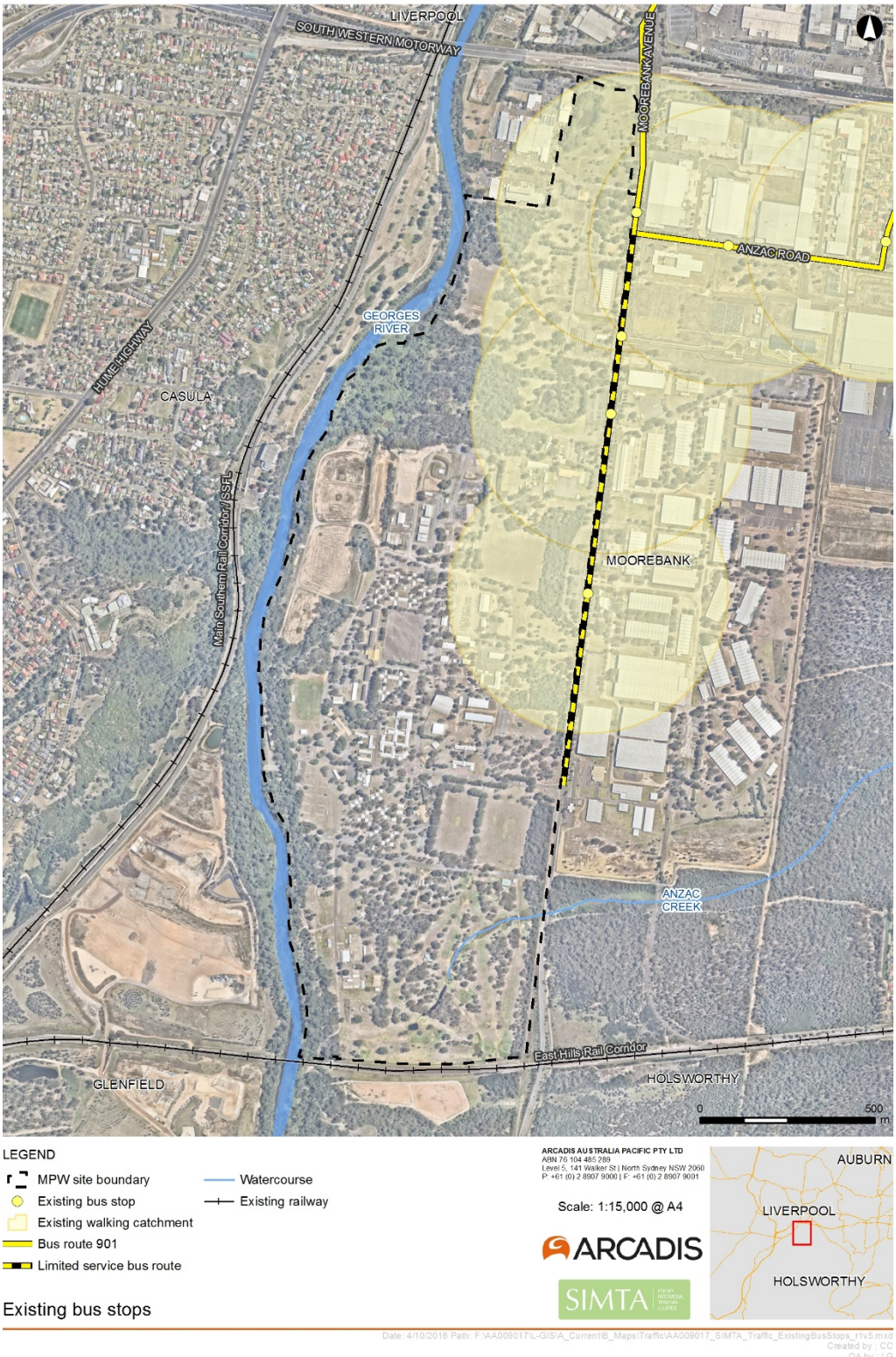


Figure 5-8 Existing Bus Route and Stop Locations

5.12 Impact on Cycling and Walking

5.12.1 Cycling Impacts

Generally, the existing cycling infrastructure in the area is considered adequate i.e. on-road cycle facilities are currently available along Moorebank Avenue. As the Proposal does not involve any alterations to the Moorebank Avenue carriageway, cycling along the sealed and marked shoulders of Moorebank Avenue remains suitable. The Proposal would not result in any adverse impact to cycle accessibility. It is proposed that off-road pedestrian/cycle paths and on-road cycle provisions will be provided within the Proposal site along the internal perimeter road. Figure 5-9 shows the proposed connectivity between the Proposal site and the surrounding network.

5.12.2 Pedestrian Impacts

Generally, the existing pedestrian infrastructure in the area is considered adequate i.e. sealed footpath is provided on one side of Moorebank Avenue (the western side) with pedestrian crossing facilities located at signalised T-intersections along Moorebank Avenue. Direct connection to the surrounding pedestrian paths on Moorebank Avenue and Anzac Road from the Proposal site is proposed to be through the signalised intersection at Moorebank Avenue/ Anzac Road. The Proposal is considered to have minimal impact on pedestrian links in the area. However, the location of the proposed IMT railway line restricts pedestrian movements directly to the Proposal site from Moorebank Avenue. This restriction is to facilitate operational safety and security for the Proposal. However, pedestrians can only access the Proposal site via the internal perimeter road, as identified in Figure 5-9.

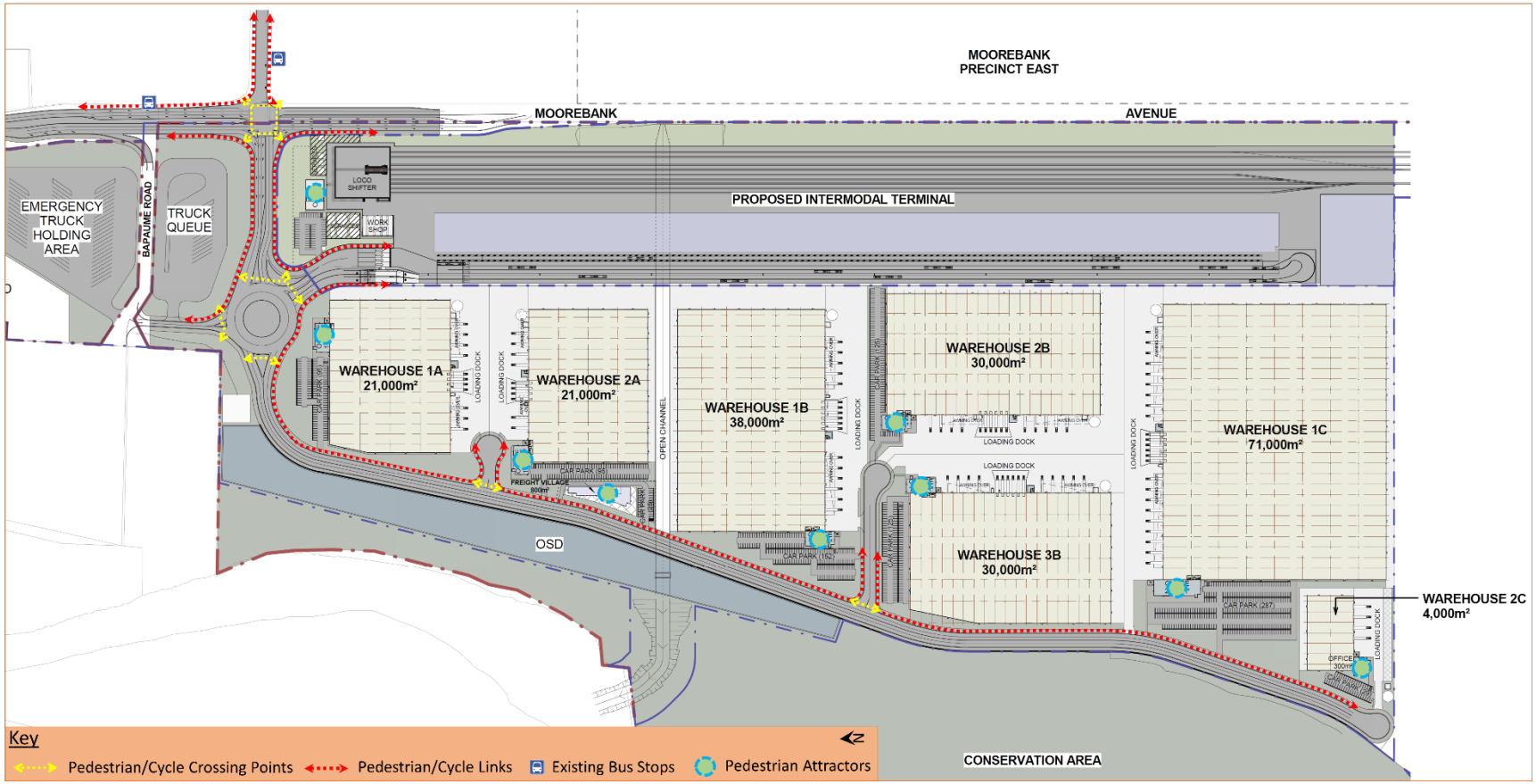


Figure 5-9 Proposed Pedestrian and Cyclist Connectivity

6 NETWORK IMPROVEMENT AND MITIGATION MEASURES

The road network will need to be improved to cater for the forecast increase in traffic volumes which will result from both the Proposal and general growth in background traffic passing through the study area.

6.1 Potential Infrastructure Upgrade

The analysis examined the traffic impacts of future traffic demand on the surrounding road network from both background traffic growth and the additional traffic generated by the Proposal when the site is fully developed. This investigation reviewed the existing infrastructure and then identified the required road and intersection improvements needed to mitigate the additional traffic generated by both the Proposal and MPE Stage 1 in 2029, which is the cumulative development (worse case) scenario of 750,000 TEU terminal throughput per annum and 215,000 sq.m warehouse GFA.

The road network will need to be improved to cater for the forecast increase in traffic volumes which will result from both the general growth in background traffic and operational vehicles from the Proposal passing through the study area.

The study identified road network improvements to ensure that satisfactory intersection performance could be achieved based on no-worsening of the performance of the eight key intersections without the Proposal.

In addition to the recommended improvements at the eight key intersections, improvements are also recommended for the wider road network to provide sufficient capacity to meet the anticipated demand from the Proposal.

As discussed in the report, a number of key intersections are currently operating at an unsatisfactory level of service as a result of background traffic and anticipated background traffic growth, i.e. without the Proposal. These intersections would need to be upgraded by Roads and Maritime to ensure that the network operates sufficiently and that local traffic in the area does not continue to decline in performance.

It is noted that some intersections are directly impacted by the Proposal and therefore upgrades, either in full or part, are to be undertaken as part of the Proposal subject to further negotiations with Roads and Maritime and the Precinct Modelling (refer to Section 1.8 of this report).

Mitigation measures for the Proposal

A summary of the intersection which is to be upgraded (in part of full) as part of the Proposal, subject to negotiations with Roads and Maritime, are discussed in Table 6-1.

Table 6-1 Recommended Road Network Improvements with the Proposal

ID	Intersection	Recommended Network Improvements to Mitigate Proposal Traffic	Indicative Timing
I-1	Moorebank Avenue / Anzac Road	1. Upgrade Moorebank Avenue/Anzac Road signalised intersection to include lane capacity improvements on the northern and southern approaches, and the construction of a new access road into the Proposal site (new western approach). The current configuration on Anzac Road (eastern approach) will be retained. 2. Implement vehicle actuated signals 3. Upgraded intersection to comply with relevant RMS design standards	2019

Potential network solutions

A summary of the intersections which would operate at a level of service which is unsatisfactory without the Proposal are provided below. We would recommend that Roads and Maritime consider these solutions to improve the existing and future operation of the local road network. These are presented as potential road network solutions however are not nominated for delivery for the Proposal.

Table 6-2 Recommendations for Network Improvements due to Background Traffic

ID	Intersection	Recommended Network Improvements due to Background Traffic	Indicative Timing
I-2	M5 Motorway / Moorebank Avenue	1. Provide additional capacity on M5 westbound on-ramp. 2. Provide additional capacity on M5 eastbound off-ramp 3. Increase the storage lengths of the existing (two-lane) right turn bay on Moorebank Avenue northern approach 4. Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue intersection and Moorebank Avenue/Anzac Road intersection 5. Change the signal to vehicle actuated to improve west and north approaches (See Figure 6-1). 6. Upgraded intersection to comply with relevant RMS design standards	Staged upgrading starting from 2019

ID	Intersection	Recommended Network Improvements due to Background Traffic	Indicative Timing
I-3	M5 Motorway / Hume Highway	Change the signal to vehicle actuation in the PM peak to improve traffic signal operations	2019
I-4	Moorebank Avenue / Newbridge Road	1. Add an additional right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	2019
I-5	Moorebank Avenue / Heathcote Road	1. Extend right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	2019
I-6	M5 Motorway / Heathcote Road	Change the signal to vehicle actuated in PM peak to improve traffic signal operations.	2019
I-7	Cambridge Avenue / Glenfield Road	No improvements required	
I-8	Cambridge Avenue / Canterbury Road	No improvements required	

Figure 6-1 Proposed upgrades at the M5 Motorway/Moorebank Avenue intersection

Developer contributions

- The analysis has identified a number of intersections which are in part impacted by the Proposal and require upgrade (refer to Table 6-1). It is considered acceptable that developer contributions, from SIMTA, would be provided to assist with the development of these intersections however this would need to be confirmed through discussions with Roads and Maritime.
- Notwithstanding this, the Precinct Model is currently envisaged to provide a whole of precinct based approach which will provide Roads and Maritime with further information on upgrades to be undertaken for each stage of the Moorebank Precinct. It is understood, from discussions with Roads and Maritime that the Precinct Model, although part of a separate process to the EIS for the Proposal, would be used to guide developer contributions for the Precinct. Therefore, it is likely that a decision on developer contributions for the Proposal would be deferred until the Precinct Model is available.

6.2 Public Transport and Active Transport Provision

In terms of the public transport and active transport provision that is required to cater for the Proposal, that the following mitigation measures are considered suitable:

- SIMTA to undertake consultation with relevant bus provider(s) regarding the potential to extend the 901 bus service and additional bus stops to ensure adequate accessibility to and within the Proposal site. Consultation with TfNSW will be conducted regarding the provision for active transport to/from the Proposal site and along the internal perimeter road, as part of detailed design for the Proposal.
- Bicycle and end of trip facilities would be provided in accordance with The *City of Sydney Section 3 – General Provisions.*

7 CONCLUSION

This Operational Traffic and Transport Impact Assessment Report has been prepared by Arcadis to support the Proposal. This assessment has identified the traffic impacts and required improvements to mitigate the impact on the safety and operation of the adjacent road network. Eight intersections were assessed consistent with the SEARs requirements including:

- Moorebank Avenue / Anzac Road
- M5 Motorway / Moorebank Avenue
- M5 Motorway / Hume Highway
- Moorebank Avenue / Newbridge Road
- Moorebank Avenue / Heathcote Road
- M5 Motorway / Heathcote Road
- Cambridge Avenue and two associated intersections at Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road.

Existing Network Performance

The modelling results indicate that the existing Moorebank Avenue / Newbridge Road, and Moorebank Avenue / Heathcote Road intersections are operating at capacity with LoS E in the peak periods. Upgrades are needed at these intersections to cater for existing peak background traffic demand. Future growth in peak demand is expected to worsen the performance of these intersections.

The M5 Motorway/ Hume Highway and M5 Motorway/ Heathcote Road intersections are currently operating close to capacity in the peak periods. The performance of the remaining intersections is satisfactory in the peak periods at LoS D or better.

Network Performance in the Opening Year 2019 and 2029 (without the Proposal and without upgrades)

The analysis showed that the existing Moorebank Avenue / Newbridge Road, and Moorebank Avenue / Heathcote Road, M5 Motorway / Heathcote Road and M5 Motorway / Hume Highway intersections are expected to operate at/above capacity at LoS E/F in the peak periods in 2019. Upgrades are needed at these intersections to cater for the growth in background traffic demand in 2019. The performance of these intersections are expected to worsen in 2029.

In the opening year 2019, the M5 Motorway / Moorebank Avenue intersection is expected to satisfactorily at LoS D and operate unsatisfactorily at LoS F by 2029 without the Proposal. The Moorebank Avenue / Anzac Road intersection is expected to operate satisfactorily in 2019 but performs unsatisfactorily in 2029 at LoS F.

Proposal Traffic Generation

The Proposal is expected to generate approximately 1,458 truck trips (2-way) and 2,670 car trips (2-way) to and from the precinct each week day. In the cumulative development scenario with the addition of traffic from MPE Stage 1, approximately 2,778 truck trips (2-way) and 2,815 car trips (2-way) are estimated to and from the precinct each week day.

Proposal Site Access

Two access points are proposed for access to the Proposal site. Access to the Proposal site will be via an upgraded Moorebank Avenue/Anzac Road signalised intersection and Moorebank Avenue/Bapaume Road.

Trucks would enter the Proposal site via the main entrance at the upgraded Moorebank Avenue/Anzac Road intersection and continue along the internal road on the western perimeter of the Proposal site.

Once in the warehouse, trucks would be loaded/unloaded via manual handling equipment. Once loaded the trucks would then head to intended markets via the nearby major road network, or transported to the adjacent terminal on the MPE Stage 1 site, or transported directly to the IMT facility for dispatch to interstate, intrastate or port shuttle via rail.

Impact at Key Road Sections

In the opening year (2019), the highest traffic increase attributable to the Proposal is forecast on Moorebank Avenue (north of Anzac Road) with an increase of 17%. The Proposal traffic would also increase traffic on Anzac Road (east of Moorebank Avenue) by approximately 1.9%. The analysis indicates minor traffic increase (less than 0.5%) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the Proposal.

In the 10-year design horizon (2029), the traffic increase attributable to the Proposal is expected to be reduced to 14% on Moorebank Avenue (north of Anzac Road) and 1.6% on Anzac Road (east of Moorebank Avenue). This is due to the growth in background traffic between 2019 and 2029. The analysis indicates minor traffic increase (less than 0.5 %) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the Proposal by 2029.

Network Performance in the Opening Year 2019 and 2029 (with the Proposal and with upgrades)

The recommended intersection improvements (to mitigate the traffic impacts of the Proposal) are adequate and perform within an acceptable LoS with no-worsening of the performance without the Proposal.

Summary Findings

- The upgraded Moorebank Avenue /Anzac Road signalised intersection will adequately cater for the Proposal in 2019 and 2029
- The Proposal would likely exceed the current capacity at the M5 Motorway/ Moorebank Avenue intersection and upgrading of the intersection is required.
- Capacity improvements are required at the signalised intersections of Moorebank Avenue/Newbridge Road and Moorebank Avenue / Heathcote Road due to an existing operational network problem, without consideration of the Proposal. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- Capacity improvements are required at the M5 Motorway / Hume Highway and M5 Motorway / Heathcote Road signalised intersections to cater for the growth in background traffic. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- The analysis identified minor impact to roundabouts of Glenfield Road and Canterbury Road with Cambridge Avenue attributable to the Proposal. No upgrades are required at the existing roundabouts.

Car Parking Provision

Based on the Roads and Maritime parking standards and the proposed warehouse, and office gross floor areas for the Proposal, a total of 983 car parking spaces are proposed to be provided.

Bicycle Facilities Provision

Based on the proposed warehouse and office GFAs for the Proposal, an indicative total of 127 bicycle parking spaces, 127 lockers and 15 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*.

Public Transport and Active Transport Provision

In terms of the public transport and active transport provision that is required to cater for the Proposal, that the following mitigation measures are considered suitable:

- SIMTA to undertake consultation with relevant bus provider(s) regarding the potential to extend the 901 bus service and additional bus stops to ensure adequate accessibility to and within the Proposal site
- Consultation with TfNSW will be conducted regarding the provision for active transport to/from the Proposal site and along the internal perimeter road, as part of detailed design for the Proposal.

Regional Network Impacts

The Proposal would partly help to reduce the potential increase in regional freight movements along the M5 Motorway between Port Botany and Moorebank Avenue. From a strategic perspective, the Moorebank Intermodal Terminal Project Environmental Impact Statement (EIS), 2014, identified that the introduction of the Precinct (and the Proposal) would result in wider regional benefits including:

- *Transfer of road haulage between Port Botany and Western Sydney to rail freight for redistribution thereby helping to reduce traffic congestion and providing speed benefits for the Sydney road network*
- *Easing the Port Botany bottleneck to enable the Port to cope with future growth and provide largescale freight capacity*
- *Reductions in articulated truck volumes through the Sydney CBD and inner city suburbs, on the M4 Motorway and the M5 Motorway east of the Moorebank Avenue interchange. The changes in articulated truck volumes on the regional Sydney road network would be reductions in heavy vehicle movements between Port Botany and Moorebank, thereby relieving the regional Sydney road network of articulated vehicular traffic.*
- *An increase in articulated truck flows, particularly on the M7, Hume Highway and Mamre Road south of the M4 Motorway as well as the M5 Motorway between Moorebank Avenue interchange and the M7 Motorway.*
- *Reductions in vehicle operating costs for heavy vehicles (i.e. vehicle-kilometres-travelled (VKT) and vehicle –hours travelled (VHT)) on the regional road network*

APPENDIX A - STAKEHOLDER CONSULTATION FEEDBACK AND RESPONSE – TRAFFIC PRESENTATION

MINUTES

ARCADIS Design & Consultancy for natural and built assets

Issue date	27/09/2016
Issue to	All
Issued by	Westley Owers (Arcadis)
Subject	MPW Stage 2 Proposal – Agency Traffic Meeting
Reference	AA008765
Client	SIMTA
Meeting date	7/09/2016
Time	12:30pm – 2:30pm
Location	Liverpool City Council, Liverpool
Attendees	See below.

Name	Abbreviation	Organisation	Role
Tim Dewey	TD	Transport for NSW (TFNSW)	Senior Transport Planner
Mark Ozinga	MO	Transport for NSW (TFNSW)	Principal Manager Land Use Planning and Development
Mark Birkinshaw	MB	Transport Ideas	Business partner RMS
Owen Hodgson	OH	Liverpool City Council (LCC)	Transport Planner
Charles Wiafe	CW	LCC	Transport & Traffic Manager, LCC
Ash Chand	AC	LCC	Executive Planner
Bruce Macnee	BM	LCC	Manager Strategic Planning
Kevin Lynch	KL	Campbelltown City Council (CCC)	Executive manager infrastructure
Ajay Arora	AA	CCC	Coordinator Traffic And Road Design
Nathan Cairney	NC	Tactical Group	Project Manager
Steve Ryan	SR	Tactical Group	Director
Tony Vaccaro	TV	Moorebank Intermodal Company (MIC)	Delivery Director
Paul Nguyen	PN	MIC	Project Engineer
Peter Rand	PR	Arcadis	Technical Director - Environment
Michael Yong	MY	Arcadis	Integrated Transport Planning Manager QLD
Westley Owers	WO	Arcadis	Principal Environmental Planner
Callan Stirzaker	CS	WSP-PB	Principal Engineer, Integrated Transport Planning

Minutes

PR (Arcadis) undertook the role of Chairperson for this meeting.

ITEM	COMMENTS
1.0	**Introductions**
	• PR (Arcadis) indicated that the purpose of this meeting was to present the modelling for the MPW Stage 2 Proposal and, in particular, address Condition 12 of the MPW Concept Plan Approval (SSD 5066). • All introduced themselves (name, organisation and role) (refer to list above).
2.0	**Precinct Background**
	• NC (Tactical Group) provided an overview of the Precinct Planning Approvals.
3.0	**Traffic presentation**
3.1	*Precinct traffic modelling*[1]
	• CS (WSP-PB) provided an overview of the modelling for the Precinct.
3.2	*MPW Stage 2 operational traffic modelling*
	• MY (Arcadis) provided a summary of the operational traffic modelling for the MPW Stage 2 Proposal.
4.0	**Questions**
Precinct modelling/ MPW Stage 2 modelling (general)	• CW (LCC) requested that a Precinct Model is prepared to assess the traffic impacts of both intermodal terminals (MPW/MPE) at full build, rather than providing separate impact assessments within separate applications. MO (RMS) supported this way forward. It was also suggested that the EIS for the MPW Stage 2 Proposal and Precinct Modelling (in particular 2026 modelling) should be submitted to agencies concurrently. • MY (Arcadis) indicated that the traffic modelling identifying all impacts of the MPW/MPE Projects is currently under preparation by Arcadis. Concurrently, PB are undertaking Precinct Modelling to assess the traffic impacts of both intermodal terminals for the ultimate full build scenario. • CS (WSP-PB) indicated that this modelling (the 2026 and 2036 models) would be completed over the next couple of months. This modelling includes a process of consolidation and alignment of assumptions for both sites. • WO (Arcadis) reiterated that both Concept Plan Approvals provide a cumulative traffic impact assessment and that these results are being refined by Parsons Brinckerhoff as part of the Precinct Model. Also it was identified that the MPW Stage 2 Proposal and Precinct Modelling would be provided separately, i.e. not submitted at the same time due to timeframe concerns, and particularly as a result of receiving

[1] Precinct Modelling or the Precinct Model refers to the 'full build' scenario modelling, under preparation by Parsons Brinckerhoff, which assesses the impacts of the Moorebank Precinct with 1.55million TEU per annum processing and 850,000 GFA of warehousing. This modelling assesses years 2026 and 2036.

ITEM	COMMENTS
	an update to the LMARI AIMSUM models in June 2016 (i.e. after modelling had already commenced). • CW (LLC) also indicated that the MPW Stage 2 modelling does not provide an assessment of the future development on the MPE site (particularly MPE Stage 2 Proposal). • WO (Arcadis) and SR (Tactical Group) indicated that an assessment (including cumulative assessment) of the MPW Stage 2 Proposal and MPE Stage 2 Proposal would be provided on submission of MPE Stage 2 Proposal (end of 2016). The traffic modelling would also provide an assessment of both stages of development. • CW (LCC) requested that the Precinct Model be provided to update traffic numbers/impacts for the Precinct so LCC can update the community. MB (Transport Ideas) supported this comment. • SR (Tactical Group) indicated that this information would be available in the coming months, as part of the Precinct Model and, that it could be distributed to the public.
Peak (AM & PM) hour traffic assessment	• CW (LCC) suggested that the modelling needs to consider an accurate background numbers for the AM and PM peaks. • CS (WSP- PB) indicated that the Precinct Modelling also considers, in addition to the AM/PM peak periods, an inter-peak period and potential traffic impacts from the Precinct. • MY (Arcadis) indicated that Arcadis are exploring various network mitigation strategies including vehicle-actuation at signals, improved signal phasing arrangements, and “yellow-boxes” at priority intersections. “Peak spreading” of traffic demand is also being considered recognising that travel patterns do shift in response to acute congestion in the peak periods. • OH (LCC) asked whether the peak spread within the MPW Stage 2 modelling is accurate. • MY (Arcadis) replied that peak spreading is an observable phenomenon in acutely congested networks as commuters change their departure times to avoid extensive travel time delays. If accepted, the peak spreading would only be applied to the background traffic growth between 2026 and 2029. Precinct traffic will remain unchanged.
MPW Stage 2 Proposal model (general)	• MY (Arcadis) indicated that the basis of the traffic impact assessment and mitigation have been predicated on the philosophy of no worsening of the “Do Nothing” scenario. MY asked whether if this was an acceptable assessment approach by Roads and Maritime. • MO (RMS) agreed with this approach (in principle) for the MPW Stage 2 Proposal, however wanted to consider it in the context of all upgrades for the Precinct.
Voluntary Planning Agreement	• TV (MIC) stated that a Voluntary Planning Agreement (VPA) is going to be prepared and signed off by the end of the year to address all stages of the MPW/MPE Projects (i.e. the Moorebank Precinct). The VPA would be prepared based on outcomes of the Precinct Modelling to identify required upgrades for each stage of development of the Precinct. • MO (Roads and Maritime) asked which approval was the VPA going to be tied to.

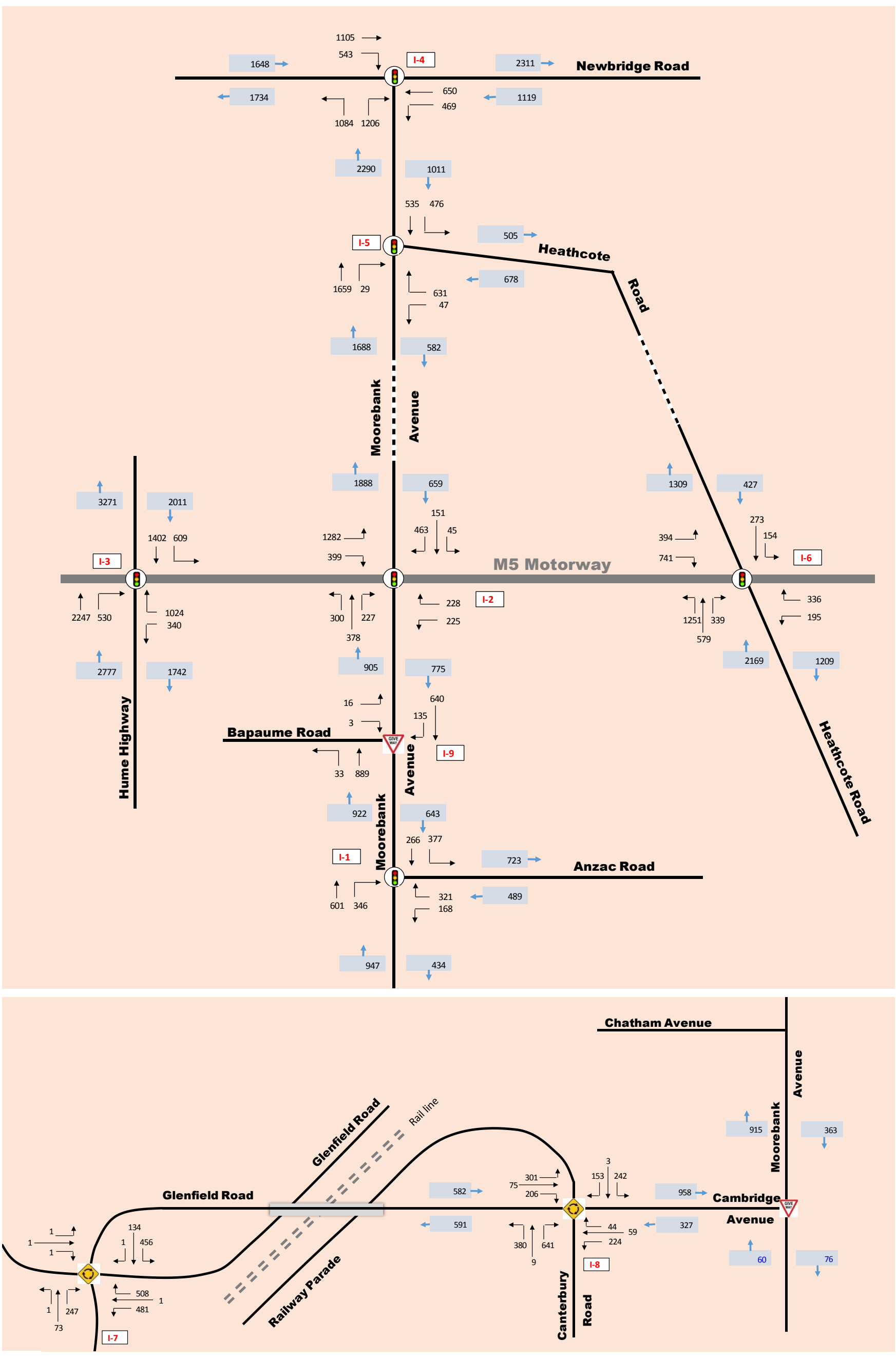
ITEM	COMMENTS
	• TV (MIC) indicated that this has yet to be confirmed and that discussions would be undertaken with Roads and Maritime Services/Department of Planning and Environment (DP&E) relating to this VPA by the end of 2016.
Cambridge Avenue upgrade	• KL (CCC) suggested that modelling could be updated to consider Cambridge Avenue as an access for the MPW Stage 2 Proposal and the Precinct, subject to consideration of upgrading Cambridge Avenue. CW (LCC) supported this comment. • MB (Transport Ideas) said the Proposal would not affect traffic on Cambridge Avenue, and said that a previous conversation with Ian Hunt (Chief Executive Officer, MIC) indicated that an upgrade of Cambridge Avenue could be considered. It was noted further that Cambridge Avenue has additional traffic capacity however cannot be used in its current form due to the narrow causeway (over the Georges River). • KL (CCC) noted that one road in and one road out makes the development vulnerable and the use of Cambridge Avenue could improve the operation of the Project. • SR (Tactical Group) supported the use of Cambridge Avenue however indicated that currently it was outside of the scope of the MPW Stage 2 Proposal/Precinct as Roads and Maritime have not confirmed that this would be upgraded.
Freight distribution and LMARI modelling	• CW (LCC) suggested that further freight modelling needs to be undertaken by Roads and Maritime Services. • MO (Roads and Maritime) indicated that they would defer sign-off of the freight modelling until the Precinct Model was prepared. • CW (LCC) indicated that SIMTA should also consider impacts on travel times as a result of the MPW Stage 2 Proposal. • MY (Arcadis) said that impacts on travel times are being examined by the MPW Stage 2 Proposal and the Precinct Model. • MB (Transport Ideas) asked whether the Precinct Model consider the most recent LMARI (June 2016) model. • CS (WSP-PB) indicated that it does and that the MPW Stage 2 Proposal modelling considers an older modelling (March 2016 model) which is more relevant to a 2019 opening time.
M5 Upgrade	• TD (TfNSW) asked whether an M5 Upgrade is relevant to the Precinct or only the MPW Stage 2 Proposal. • MY (Arcadis)/ SR (Tactical) Group / NC (Tactical Group) indicated that it is relevant to all stages, however for the purposes of this consultation, discussion has only been provided on the upgrade to the M5 Motorway which is relevant to the MPW Stage 2 Proposal (i.e. this is the purpose of this meeting). Further upgrades would be considered as part of the Precinct Model.
Intersections LoS	• MB (Transport Ideas) asked is the identified approach, within the MPW Stage 2 model, of ensuring intersections meet or better the Level of Service (LoS) due to background traffic, acceptable. • MY (Arcadis) indicated that this is considered acceptable as this approach identifies road network upgrades that specifically mitigate the impact of Precinct traffic.

ITEM	COMMENTS
	Network improvements to mitigate the deterioration in LoS due to background traffic is the responsibility of the relevant road agency. WO (Arcadis) added that the modelling is considered suitable in that it proposes upgrades to the specific intersections affected by the MPW Stage 2 Proposal. It is considered outside of the scope of the modelling, and planning approvals, to resolve existing LoS issues within the network which are not considered to be substantially impacted by the MPW Stage 2 Proposal.
3 shifts for operational staff	• MO (Roads and Maritime) asked whether there were any example of facilities operating at a 3-shift scenario, as proposed in year 2029 for the MPW Stage 2 Proposal. Please provide examples in the EIS to confirm this scenario. • SR (Tactical Group) indicated that this shift scenario is based on real life examples. • MO (Roads and Maritime) asked that an example of a 3-shift IMT/warehouse operation (or other validation of the likelihood of 3 shifts occurring) be provided within the modelling reporting.
Proposed MPW Stage 2 site access	• MB (Transport Ideas) asked why only one intersection is provided and suggest that traffic could be more accurately dispersed with the use of a number of intersections from the MPW Stage 2 site. • WO (Arcadis) /SR (Tactical Group) indicated that the MPW Stage 2 Proposal includes a rail siding to accommodate regional trains (1.8km in length) and that vehicles would not be able to cross these siding without impacting on safety and operations of the IMT. Further, the rail siding has been designed to accommodate a transition of trains to the Rail link to reduce impacts on the Southern Sydney Freight Line (SSFL). This rail siding length does not allow for this intersection to be in another location. Also the inclusion of only one access to the MPW Stage 2 site provides an opportunity to decommission a number of existing intersections and reduce conflicts between operational vehicles and background traffic on Moorebank Avenue (south of Anzac Road). • MY (Arcadis) indicated that two access points are provided (i.e. main access via an upgraded Moorebank Avenue/Anzac Road intersection and Bapaume Road -left-out only). The main access point makes use of the existing Moorebank Avenue/Anzac Road intersection being located 450 metres away from the M5 interchange. • MB (Transport Ideas) also asked whether an overpass between MPW and MPE sites could be built to improve site connectivity. • SR (Tactical Group) indicated that consideration has been given to this however it was not considered reasonable and feasible in the context of the Precinct development.
Moorebank Avenue widening	• CW (LCC) asked whether there is an option to widen Moorebank Avenue between the M5 Motorway and the proposed MPW Stage 2 site intersection. • MY (Arcadis) indicated that this is being examined in the modelling for the MPW Stage 2 Proposal. This would also be considered in the Precinct Modelling.
SIMTA as a joint venture	• MB (Transport Ideas), asked that as Aurizon is no longer part of the joint venture (with Qube) for the development of the Moorebank Precinct, whether there would be any changes to the development of the precinct.

ITEM	COMMENTS
	• TV (MIC)/SR (Tactical Group) indicated that there would be no change to the development of the Precinct. Qube (under SIMTA) and MIC would be responsible for the development of the Precinct.
5.0	**Next steps and reporting**
5.1	*Addressing conditions minutes/response*
	• NC (Tactical Group)/ WO (Arcadis) indicated that all comments provided in this meeting would be summarised within meeting minutes (issued to all for comment) and also the EIS/Traffic reporting for the MPW Stage 2 Proposal. • PR (Arcadis) noted that the documentation to be provided would clarify what is going to be addressed through the EIS (MPW Stage 2 Proposal model) and what is going to be addressed subsequent to the EIS.
5.2	*EIS Lodgement timeframe*
	• NC (Tactical Group) indicated that the EIS (MPW Stage 2 Proposal) is to be provided to DP&E by the end of September 2016, with a view to public exhibition being undertaken soon after. • MO (RMS) requested that the Precinct Model be submitted at the same time as the EIS (MPW Stage 2 Proposal).

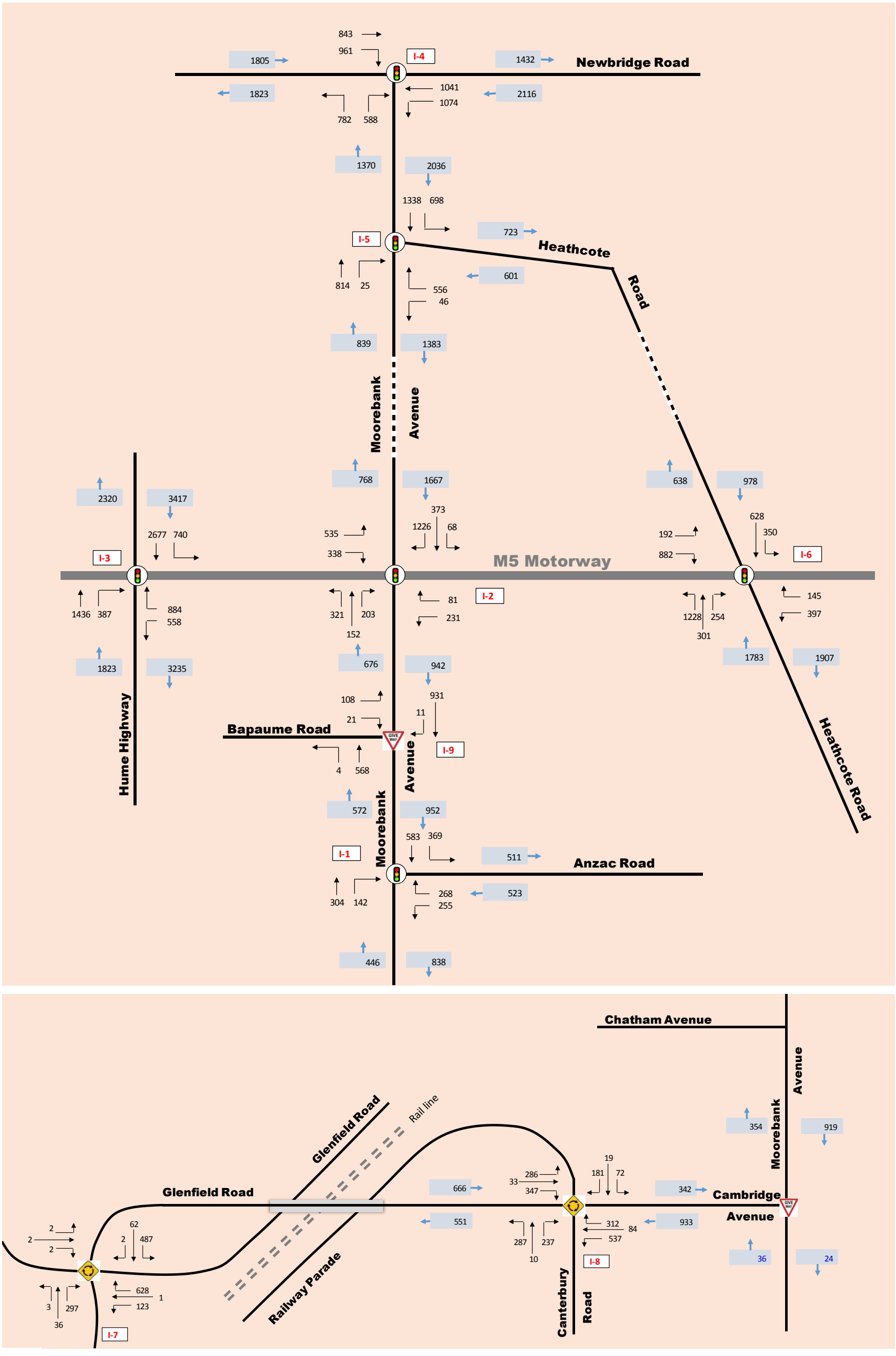
APPENDIX B- TRAFFIC DATA AND ASSUMPTIONS USED IN TRAFFIC AND ACCESSIBILITY IMPACT ASSESSMENT

Existing 2015 AM Peak 8:00 to 9:00



Source: RMS, Arcadis

Existing 2015 PM Peak 17:00 to 18:00



Source: RMS, Arcadis

APPENDIX C - TRAFFIC GENERATION AND UNDERLYING ASSUMPTIONS (WSP | PARSONS BRINKERHOFF)

PARSONS BRINCKERHOFF

Memo

Date	1 September 2016
To	Tony Vaccaro, Steve Ryan
Copy	John Webster
From	Callan Stirzaker
Ref	2189293E-ITP-MEM-002-RevF
Subject	Moorebank Intermodal Precinct: Traffic generation and underlying assumptions

1. Introduction

Parsons Brinckerhoff have been engaged by Moorebank Intermodal Company (MIC) to undertake transport modelling for the assessment of traffic impacts associated with the planned Moorebank Intermodal Terminal.

The Moorebank Intermodal Terminal is a facility is designed to process containers being imported and exported from Australia. The ultimate annual container demand for the site has been calculated as approximately 1.5 million TEUs (Twenty Foot Equivalents). Of the containers which are processed via the site, some will be transferred to onsite warehouses prior to leaving the site. Containers are also transferred as interstate and intrastate movements.

From a traffic perspective there are therefore three distinct components of the site:

1. **Staff demand:** Workers who will travel to/from the facility by car.

2. **Terminal demand:** Freight (truck) demand relating to the import/export of full container load (FCL) and empty (MT) container TEUs for the IMEX and Interstate facilities. Intrastate rail movements also exist.

3. **Warehouse demand:** Freight (truck) demand relating to the import of goods via the onsite warehouses.

The memo will discuss each of the above components separately before combining to present the estimation for the total traffic generation.

1.1 Purpose of memo

The purpose of this memo is to document the revised assumptions relating to traffic generation of the proposed Moorebank Intermodal Terminal. The memo will also summarise the estimated traffic generation for the entire development.

1.2 Memo history

This memo is an updated version to two previous issued memos dated: 22 September 2015 and 8 February 2016. Since the last version of the traffic generation and underlying assumptions, the following changes have occurred:

- Consolidation of information and assumptions between MIC and SIMTA to develop a co-ordinated and consistent assessment of the Moorebank Intermodal Terminal precinct.
- Update to development staging and development timeframes.
- Update to assumptions relating to site operations and container movements within the precinct.
- Update to assumptions relating to warehouse back loading.

1.3 Transport modelling

A traffic assessment of the site as part of the Environmental Impact Statement (EIS) was undertaken utilising assessment techniques suitable for the planning stage of the project. This primarily relied on SIDRA to assess intersection performance and industry parameters for traffic generation. The assessment also assessed only the peak 1 hour commuting period during the AM and PM peak time periods.

The planned mesoscopic modelling activity is the next step assessing impacts across a wider network and at a greater level of detail.

2. Ultimate IMT facility and traffic demand

2.1 IMT demands

Table 2.1 provides a summary of the proposed ultimate site configurations and the resulting TEU demand forecasts per major facility.

Table 2.1 Site development assumptions

Item	Input/Assumption
Total TEU demand	**1,500,000** per annum (2026).
Warehouse facilities	850,000 m^2 ▪ The make-up of the warehouses will be determined by market forces and will be a mix of retail operators and freight forwarders.
Terminal demand Annual – based on NMC calculations	**1,500,000 TEUs (935,000 transferred offsite by road)** ▪ IMEX: 1,000,000 ▪ Interstate: 500,000 *Note: 245,000 containers pass through via rail and not forecast to leave facility via road.*
Warehouse demand Annual – based on Deloitte calculations	**320,000 TEUs (equivalent) as 'de stuffed' goods** Equivalent to 1.38 TEUs per 1,000m^2 GFA warehousing per weekday.

Source: Neil Matthews Consulting (May 2016)

2.2 Development staging

The proposed development has a planned development over three stages. Stage 1, already approved, will be operational by 2018. Stage 2 and Stage 3 (ultimate) are planned for operations in 2022 and 2026 respectively.

2.3 Seasonality

A review of the freight movements at Port Botany was undertaken on the basis of the *Trade Statistics Bulletin (1 July 2013–30 June 2014)* publication by NSW Ports. Analysis of the monthly freight imports (see Figure 2.1) indicated that there were approximately 3,000 TEU/day with a peak demand occurring throughout November of approximately 3,500 TEUs per day. Export demands (see Figure 2.2 and Figure 2.3) however was less seasonal with a peak periods occurring throughout the year.

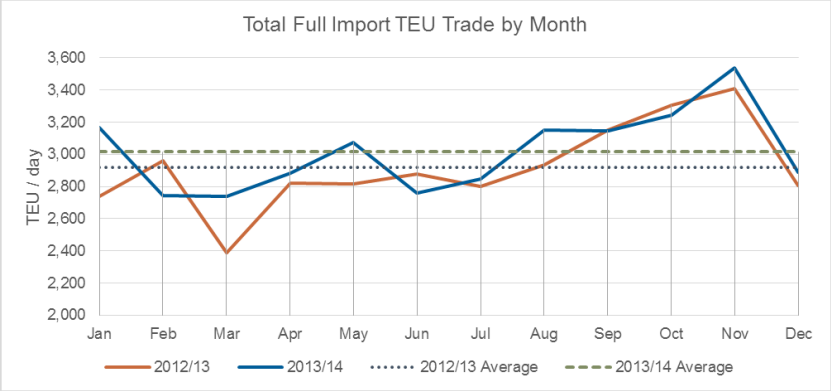


Figure 2.1 Imported full TEUs/day (estimated) by month

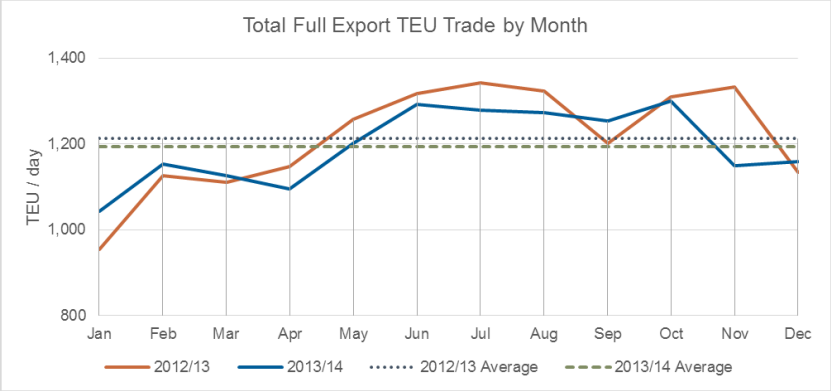


Figure 2.2 Exported full TEUs/day (estimated) by month

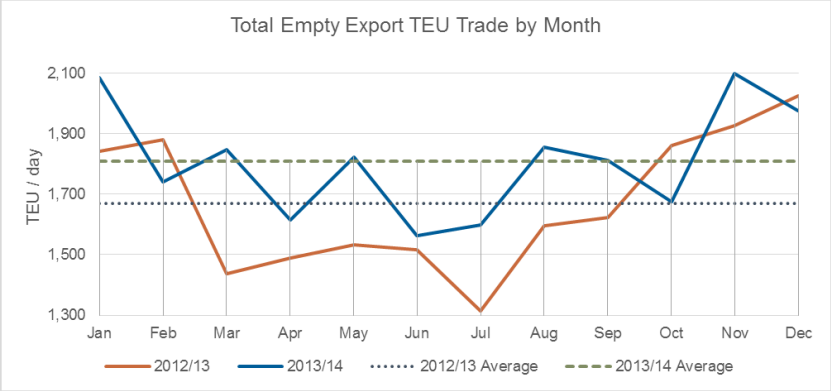


Figure 2.3 Exported empty TEUs/day (estimated) by month

Figures 2.4 to 2.6 highlight that when normalising the import and export demands a ‘busy’ period factor can be established.

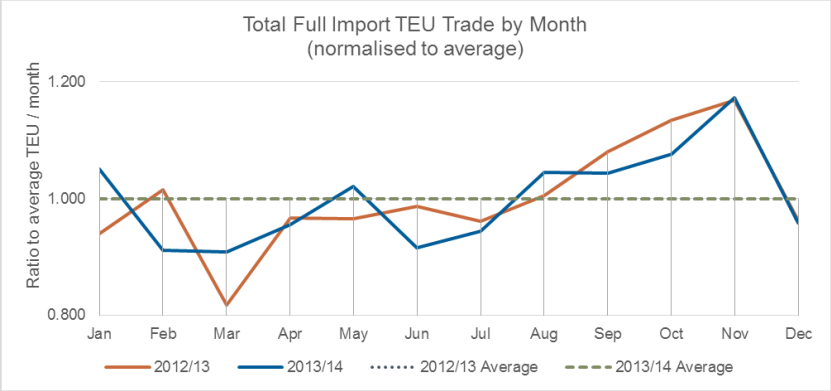


Figure 2.4 Normalised (by average) imported full TEU/day by month

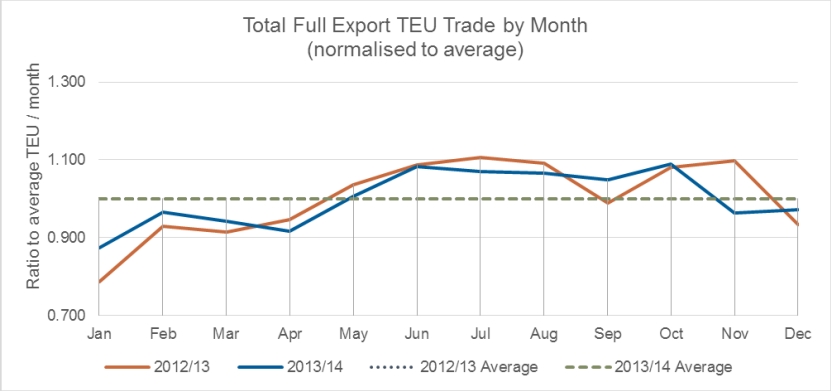


Figure 2.5 Normalised (by average) exported full TEU/day by month

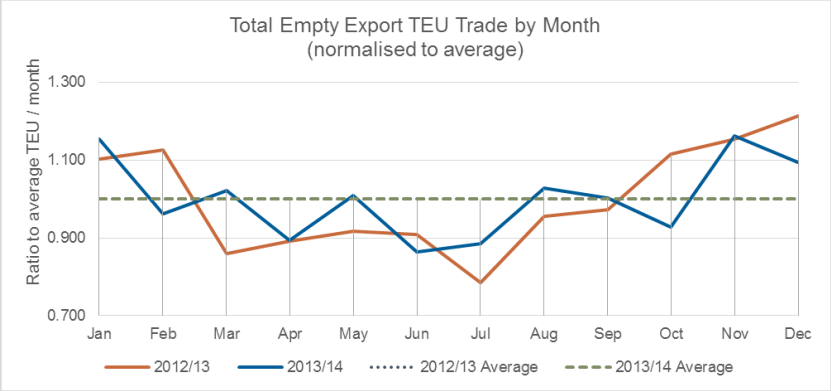


Figure 2.6 Normalised (by average) exported empty TEU/day by month

From a traffic generation assumption we propose two scenarios:

1. *Assessment:* An 'average' weekday where TEU imports and exports are both considered average based on forecast annual TEU demands at the Moorebank facility.

2. *Sensitivity:* A 'busy' weekday where daily TEU (full) imports to warehouses (and empty exports to port from ECP) are 20% greater than average and TEU (full and empty) imports and exports between terminal and external depots are 10% greater than average. This would be applied to 1 million of the 1.5 million TEU capacity of the intermodal terminal.

3. Traffic generation assumptions

Table 3.1 provides the summary of all traffic and transport relating assumptions to be used as part of the assessment of the IMT. These assumptions are valid at the time of the development of this memo. They remain subject to change as further information becomes available.

Table 3.1 Revision to traffic assumptions for mesoscopic modelling

Assumption	MIC assumption (2015)	SIMTA assumption (2015)	Revised assumption (31 August 2016)	Commentary for change
Annual to daily conversion factors				
Weeks of operation	52	52	52	No change.
Days of week operation	7	7	7	No change.
Terminal weekday to week relative to week demands	85% occur on weekdays	85% occur on weekdays	85% occur on weekdays	No change.
Warehouse weekday relative to week demands	95% occur on weekdays	95% occur on weekdays	95% occur on weekdays	No change. Over time, there is a high likelihood that this will decrease (i.e. a greater level of operation on weekends).
Terminal seasonality (daily demands)	Flat profile assumed		'busy' period + 10% for imports + 10% for exports	Based Port Botany information shown in section 2.2. Daily imports/exports for a year would be necessary to calculate an 85th percentile demand. *Note: Daily demand profiles are different during the peak period reflecting the distribution across the day. The peak hour demand percentage decrease results in a peak hour increase of approximately 10% for warehouse demands only.*
Warehouse seasonality (daily demands)	Flat profile assumed		'busy' period + 20% for imports + 0% for exports	
Total site daily operation				
IMT hours of operation	24 hours	24 hours	24 hours	No change.
Terminal operations	24 hours	24 hours	24 hours	
Warehouse hours of operation	18 hours, transitioning to 24 hours (2030+)	18 hours, transitioning to 24 hours (2030+)	18 hours, transitioning to 24 hours (2026+)	No change.

Assumption	MIC assumption (2015)	SIMTA assumption (2015)	Revised assumption (31 August 2016)	Commentary for change
Staff shift work	Ultimately; Three shifts per day: 6.00 am to 2.00 pm 2.00 pm to 10.00 pm 10.00 pm to 6.00 am		Based on specific start and end times such as those previously assumed.	Whilst individual sites will have very specific start and finish times, at a precinct level, the different sites would likely have slightly different shift times. This phenomenon was shown in recent traffic surveys where multiple warehouses were surveyed.
Administration staff	8.30 am to 5.00 pm			
Staff specific operations (relating to light vehicle traffic generation)				
Number of staff	Back calculated from Roads and Maritime Guidelines.	N/A	Back calculated from Roads and Maritime Guidelines.	A review of the warehouse surveys conducted in June and November showed that while one or two warehouses generate traffic in very specific periods relative to shift times, a group of different warehouse operators (as proposed) will result in a more dispersed arrival and departure profile.
Mode share	90% car-driver	N/A	90% car driver	
Traffic profiles	Journey to work trips to occur in hour preceding shift start time and during the hour after shift end time.		As per the traffic surveys which showed a greater spread in arrival and departure demands. Peak hour generation approximately 15% of daily generation (two shifts per day)	
Terminal specific operations (relating to heavy vehicles)				
AM peak period	7.45 am to 8.45 am (1 hour) 7.7% of daily generation	7.7% of daily generation	6.00 am to 10.00 am	For the ‘average weekday’, the mesoscopic modelling will consider the time periods and relative proportions outlined below:
Inter peak period	Not considered	Not considered	12.00 pm to 3.00 pm (school peak)	

<table>
<tr><th>Assumption</th><th>MIC assumption (2015)</th><th>SIMTA assumption (2015)</th><th>Revised assumption (31 August 2016)</th><th>Commentary for change</th></tr>
<tr><td>PM peak period</td><td>4.30 pm to 5.30 pm
(1 hour)
9.3% of daily generation</td><td>9.3% of daily generation</td><td>3.00 pm to 7.00 pm</td><td><table><tr><th>AM peak
6.00 am to
10.00 am</th><th>Interpeak
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7.00 pm</th></tr><tr><td>3.0%</td><td>5.5%</td><td>8.0%</td></tr><tr><td>6.5%</td><td>6.0%</td><td>8.5%</td></tr><tr><td>6.0%</td><td>7.0%</td><td>8.0%</td></tr><tr><td>5.0%</td><td></td><td>7.0%</td></tr></table></td></tr>
<tr><th colspan="5">Warehouse specific operations (relating to heavy vehicles)</th></tr>
<tr><td>AM peak period</td><td>7.45 am to 8.45 am
(1 hour)
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6.00 am to
10.00 am</th><th>Interpeak
12.00 pm to
3.00 pm</th><th>PM peak
3.00 pm to
7.00 pm</th></tr><tr><td>6.3% (2.5%)</td><td>7.9% (3.5%)</td><td>5.9% (4.0%)</td></tr><tr><td>7.6% (2.0%)</td><td>7.0% (5.0%)</td><td>4.8% (2.5%)</td></tr><tr><td>8.5% (1.5%)</td><td>7.2% (5.5%)</td><td>3.3% (2.5%)</td></tr><tr><td>9.2% (1.5%)</td><td></td><td>2.3% (3.0%)</td></tr></table>Numbers presented in (brackets) are for B-double vehicles only. All other heavy vehicles as per the primary profile</td></tr>
<tr><td>Inter peak period</td><td>Not considered</td><td>Not considered</td><td>12.00 pm to 3.00 pm
(school peak)</td></tr>
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(1 hour)
9.3% of daily generation</td><td>9.3% of daily generation</td><td>3.00 pm to 7.00 pm</td></tr>
<tr><th colspan="5">Vehicle generation, carrying capacity and fleet assumptions</th></tr>
<tr><td>Staff generation rate</td><td colspan="3">As per Roads and Maritime guidelines:
three car based trips per employee:
two trips for journey to work
one trip during shift.</td><td rowspan="2">No change.</td></tr>
<tr><td>Intermodal terminal TEU vehicle capacity</td><td>2.4 TEU/B-double
1.6 TEU/Semi-trailer</td><td>2.4 TEU/B-double
1.6 TEU/Semi-trailer</td><td>2.4 TEU/B-double
1.6 TEU/Semi-trailer</td></tr>
</table>

Assumption	MIC assumption (2015)	SIMTA assumption (2015)	Revised assumption (31 August 2016)	Commentary for change
Intermodal terminal TEU fleet mix	20% B-double 80% Semi-Trailer	20% B-double 80% Semi-Trailer	20% B-double 80% Semi-Trailer	
Terminal truck back loading	30% for semi-trailers only	30% for semi-trailers only	30% for semi-trailers only	Based on advice received by NMC, For a hub like Moorebank, higher levels of back loading will be achievable due to integration of empty container park and intermodal terminal. Truck schedules will coordination the movement of empty containers for each movement of a loaded container.
Warehouse truck back loading	0%	0%	30% for semi-trailers only	
Warehouse vehicle capacity	20 tonnes/Semi-Trailer (1.6 TEU) 10 tonnes/Rigid Truck (0.8 TEU)	10 tonnes/Rigid Truck (0.8 TEU)	30 tonnes/B-double (2.4 TEU) 20 tonnes/Semi-Trailer (1.6 TEU) 10 tonnes/Rigid Truck (0.8 TEU)	Changes based on traffic surveys at existing warehouses in Western Sydney. Refer to the warehouse site surveys technical memo: Name: *Analysis of warehouse traffic surveys* Date: *11 January 2016* Ref: *2189293E-ITP-MEM-Surveys-Updated* Note, a subsequent independent review of tube counts by Tactical Group and Neil Matthews Consulting in August 2016 have revised the fleet mix and updated assumptions accordingly
Warehouse vehicle fleet mix	34% Semi-trailer 66% Rigid	100% Rigid	5% B-double 59% Semi-trailer 36% Rigid	
TEU to de-stuffed vehicle utilisation	-	-	60% - based on 2.4 trucks per TEU and vehicle fleet mix	
Handling capacity of warehouse	1.68 TEU per 1,000 m^2 GFA per day	-	1.38 TEU per 1,000 m^2 GFA per day during average conditions.	Based on calculations provided by Neil Matthews Consulting.

4. Staff traffic (light vehicles)

With the increase in the warehouse GFA from 308,000 m^2 to 850,000 m^2, the number of staff assumed for the warehouse has increased. A breakdown for each facility is provided in Table 3.1. Staffing numbers are consistent with the underlying assumptions of the Traffic and Transport Impact Assessment (TTIA) prepared by Parsons Brinckerhoff in April 2015 and have been calculated by reverse engineering the Roads and Maritime traffic generation rates. The calculations/assumptions include:

- staffing levels calculated through an assumed daily total vehicle trip generation rate of 2.1 trips per 100 m^2 GFA. Assuming that 70% of trips involve light vehicles (as staff trips) and an average staff trip rate of three trips per person, per day
- shift hours for administration, and operations and maintenance staff:
  - 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
- once many warehouses are built, whilst most staff will arrive in the hour prior to the typical shift start time, and depart in the hour after the typical shift end time many will also arrive and depart in other periods. The assumed profile is shown in Figure 4.1. Terminals and office staff, arrival and departure demands are in the hour before and after only.

Table 4.1 Moorebank Intermodal Terminal staff numbers (ultimate)

Staff type	IMEX	Interstate	Warehouse(1)	Total daily
Administration	35	35	59	129
Operations (by shift – 3/day)	104	78	1,329	4,581
Maintenance (by shift – 3/day)	9	7		

(1) *Warehouse staffing sourced via Roads and Maritime Guide to Traffic Generating Developments, 2013*

Staff numbers at Terminals based on Moorebank IMT Staffing Requirements – Version 4, August 18, 2011 (Deloitte) and haven't changed since TTIA

The staff numbers, and the corresponding trip generation, have been divided into an hourly breakdown as summarised in Table 4.2. As stated earlier, this breakdown is based upon the assumption in the TTIA that three trips are made per worker (i.e. 50% of the staff undertaking trips outside of their commute to/from work, or small vehicle deliveries for operations and maintenance) per shift/day.

Journey to work and non-journey to work daily traffic demands were subsequently profiled throughout the day based on traffic profiles recorded by tube counters placed in Eastern Creek in June and November 2015. The average inbound and outbound light vehicle profile based on the surveys showed that:

- For individual sites operating two shifts per day, a peak arrival hourly demand approximately 24% of the daily arrival traffic was surveyed. For departure traffic volumes, a peak departure hourly demand of approximately 20% of the daily departure volumes may occur.

- For precincts, which contained numerous warehouses with different operating patterns the peak arrival and departure demands, do not all occur at the same time, resulting in a spread out profile. Peak hour arrival and departure volumes of approximately 12–13% was recorded in the surveys.

An assumption on arrival and departure profile of staff vehicles surrounding shift start/end times is shown in Figure 4.1. The resultant peak hour arrival and departure demand is approximately 15% of the respective daily arrival and departure demands and is slightly higher than the surveyed results for Eastern Creek.

Figure 4.1 Staff (light vehicle) traffic profile near shift start/end times

The resultant breakdown in light vehicle demands for the full Moorebank Intermodal Terminal development is provided in Table 4.2.

Table 4.2 Hourly staff inbound/outbound breakdown

Time	Inbound	Outbound	Two-way
AM peak period			
6.00 am–7.00 am	281	770	1,051
7.00 am–8.00 am	126	281	407
8.00 am–9.00 am	184	126	310
9.00 am–10.00 am	80	80	160
Inter peak period			
12.00 pm–1.00 pm	371	173	544
1.00 pm–2.00 pm	824	317	1,141
2.00 pm–3.00 pm	317	806	1,123

Time	Inbound	Outbound	Two-way
PM peak period			
3.00 pm–4.00 pm	145	300	445
4.00 pm–5.00 pm	74	126	200
5.00 pm–6.00 pm	74	184	258
6.00 pm–7.00 pm	74	74	148
Daily			
Total	**5,564**	**5,564**	**11,128**

In total, the Moorebank Intermodal Terminal is estimated to provide employment for approximately 4,700 workers, which we've assumed will generate approximately 11,000 light vehicle movements per day.

Traffic surveys conducted at Erskine Park (190,000 m^2 GFA) and the Kmart at Eastern Creek (57,000 m^2 GFA) in June show that typical two-way light vehicle demands are approximately 2,580 and 680 vehicles per day respectively. This results in an average light vehicle trip rates of between 1.2 and 1.3 vehicles per day which is comparable to our light vehicle forecast of 1.2 vehicles per day per 100 m^2 GFA of warehousing (which contributes the majority of traffic). Additional traffic surveys conducted in November also validated the daily light vehicle traffic demand of 1.2 vehicles per 100 m^2.

5. Terminal (Interstate and IMEX) traffic

The traffic generation related to the IMEX and Interstate terminals has a direct relationship to the number of TEUs being processed through these facilities. The determination of truck volumes from annual TEU demands was calculated based on the following assumptions consistent with previous documentation:

- 52 week operations *(divide annual TEUs by 52 to get weekly demand)*
- 85% are processed on weekdays *(multiply weekly demand by 0.85 and divide by 5 to get weekday demand)*
- containers are loaded onto trucks; either B-doubles or Semi-trailers. On average, a semi-trailer transports 1.6 TEUs and a B-double transports 2.4 TEUs
- 80% of deliveries will be made by semi-trailers and 20% by B-doubles
- back-loading will occur for 30% of the semi-trailer demands and 0% of the B-doubles.

Table 5.1 contains the resultant average external daily truck generation for the ultimate precinct.

Table 5.1 Daily truck inbound and outbound

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
Total	**1,371**	**255**	**1,371**	**255**	**2,742**	**510**

Source: Neil Matthews Consulting (May 2016)

An assumption which has changed since the RtS (April 2015) relates to the temporal profile of daily truck demands generated by the Interstate and IMEX terminals. The EIS traffic and transport assessment used an Roads and Maritime agreed 7.7% peak for the AM peak and 9.3% peak for the PM peak.

Four scenarios (also shown in Figure 5.1) were considered for the expansion of the temporal profile to include the entire day:

1. An 'Roads and Maritime aligned' normal profile of the traffic which align its AM and PM peak to the target values of 7.7% and 9.3% respectively. Succeeding and preceding hours are all incrementally reduced to create a daily profile. *89% of traffic is generated between 6.00 am and 10.00 pm.*

2. An '18 hour' profile in which the *95% of trucks are generated between 6.00 am and 10.00 pm* with the majority occurring in the afternoon peak, corresponding to observations made at the warehouses.

3. A '24 hour' profile in which trucks will be generated across all 24 hours and a uniform generation during throughout the 6.00 am to 10.00 pm period and reduced demands overnight. In this scenario *77% of demands are generated between 6.00 am and 10.00 pm*.

4. The observed[1] Port Botany truck demands. *72% of trucks are generated between 6.00 am and 10.00 pm*.

For all scenarios, for terminal traffic demands, truck profiles are considered vehicle independent, i.e. the daily profile for semi-trailers and B-doubles are identical.

[1] http://www.freightweek.com.au/Portals/6/Documents/Presentations%20for%20web/Waterfront%20945%20Gunn.pdf

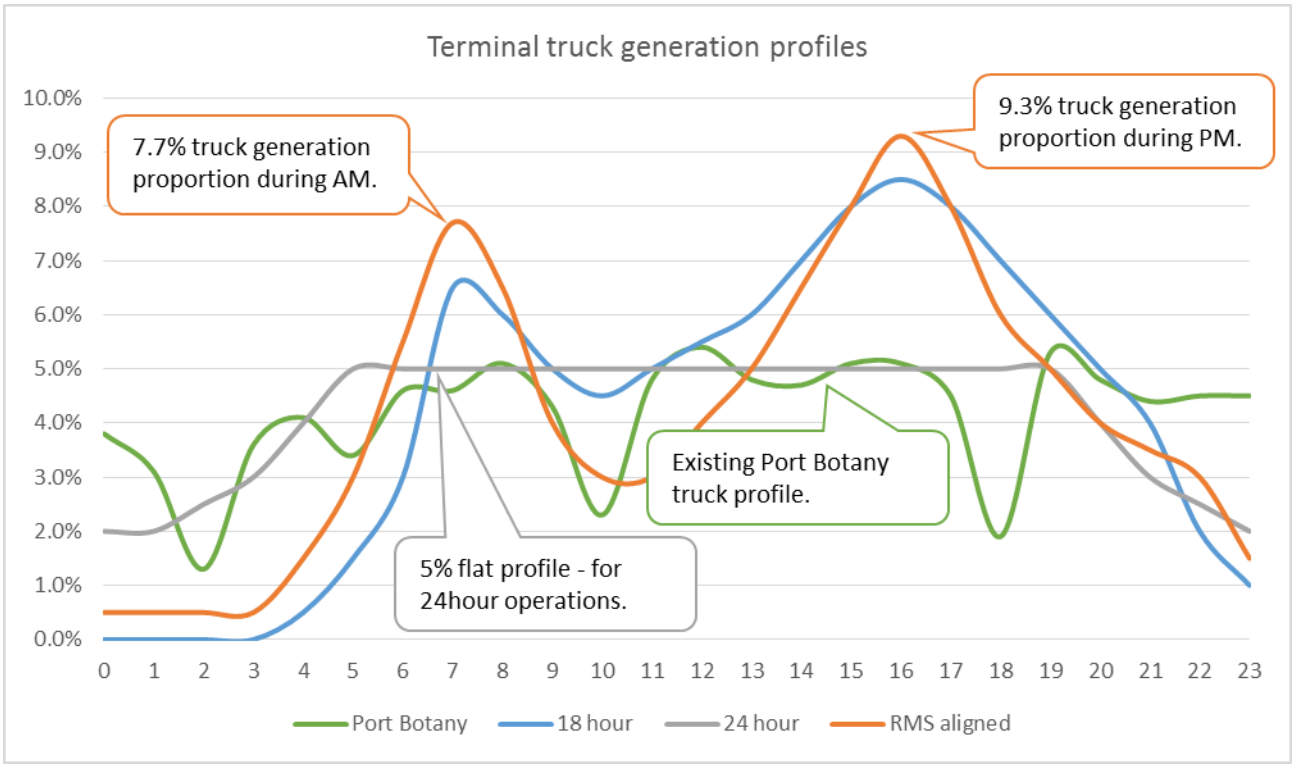

Figure 5.1 Truck profile – Interstate and IMEX terminals

For the purposes of the peak period transport network assessment modelling, Scenario 2 '18 hour' in which 95% of trucks arrive or depart between 6.00 am and 10.00 pm and the peak period generation rates during the AM and PM peak are around 1% lower than that used in the EIS.

This scenario reflects an '18 hour' operational period (16 hours of shift plus an hour either side). The artificial profile draws on the Port Botany observations, but also the warehouse surveys and Figure 5.2 which suggest that the PM peak would remain the 'busier' of the two peak period. It this scenarios it assumes a 6.5%, 7% and 8.5% peak hour proportion of daily demand for the AM, inter and PM peak periods respectively.

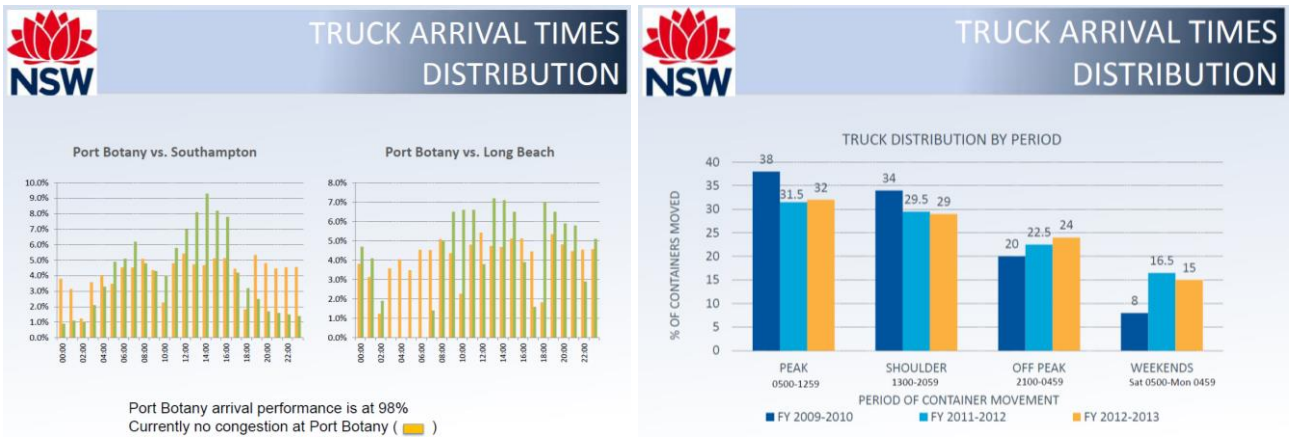

Figure 5.2 Extracts from Port Botany Landside Improvement Strategy Presentation[2]

2 http://www.freightweek.com.au/Portals/6/Documents/Presentations%20for%20web/Waterfront%20945%20Gunn.pdf

The resultant hourly truck generation for an average weekday is shown in Table 5.2.

Table 5.2 Hourly truck inbound/outbound breakdown – 'average' weekday

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
AM peak period						
6.00 am–7.00 am	41	8	41	8	**82**	**15**
7.00 am–8.00 am	89	17	89	17	**178**	**33**
8.00 am–9.00 am	82	15	82	15	**165**	**31**
9.00 am–10.00 am	69	13	69	13	**137**	**25**
Inter peak period						
12.00 pm–1.00 pm	75	14	75	14	**151**	**28**
1.00 pm–2.00 pm	82	15	82	15	**165**	**31**
2.00 pm–3.00 pm	96	18	96	18	**192**	**36**
PM peak period						
3.00 pm–4.00 pm	110	20	110	20	**219**	**41**
4.00 pm–5.00 pm	117	22	117	22	**233**	**43**
5.00 pm–6.00 pm	69	13	69	13	**137**	**26**
6.00 pm–7.00 pm	96	18	96	18	**192**	**36**
Daily						
	1,371	**255**	**1,371**	**255**	**2,742**	**510**

With the assumption that during 'busy periods', the terminal TEU demands are 10% greater for both imports and exports, the truck volumes will also increase by 10%. Table 5.4 provides the forecast truck generation during 'busy' periods.

Table 5.3 Hourly truck inbound/outbound breakdown – 'busy' weekday

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
AM peak period						
6.00 am–7.00 am	44	8	44	8	**83**	**21**
7.00 am–8.00 am	95	18	95	18	**180**	**45**
8.00 am–9.00 am	88	16	88	16	**166**	**42**
9.00 am–10.00 am	73	14	73	14	**139**	**35**

Time	Inbound		Outbound		Two-way	
	Semi	B-double	Semi	B-double	Semi	B-double
Inter peak period						
12.00 pm–1.00 pm	80	15	80	15	**161**	**30**
1.00 pm–2.00 pm	88	16	88	16	**175**	**33**
2.00 pm–3.00 pm	102	19	102	19	**205**	**38**
PM peak period						
3.00 pm–4.00 pm	117	22	117	22	**234**	**44**
4.00 pm–5.00 pm	124	23	124	23	**249**	**46**
5.00 pm–6.00 pm	73	14	73	14	**146**	**27**
6.00 pm–7.00 pm	102	19	102	19	**205**	**38**
Daily						
	1,462	**272**	**1,462**	**272**	**2,925**	**544**

6. Warehouse traffic

850,000 m^2 of warehousing is proposed for the MIT, an increase from the previous development mix. Traffic surveys conducted at warehouses in Western Sydney has also resulted in a number of revised assumption relating to the daily operating profile. These assumptions are summarised in section 3.The determination of truck volumes from annual TEU demands is calculated based on the following assumptions consistent with previous documentation:

- 52 week operations *(divide annual TEUs by 52 to get weekly demand).*
- 95% are processed on weekdays *(multiply weekly demand by 0.95 and divide by 5 to get weekday demand).*
- Containers are loaded onto trucks; B-doubles, Semi-trailers, or Rigid trucks. B-doubles are assumed to carry 18 tonnes, semi-trailers 12 tonnes and rigid trucks, 6 tonnes of goods each.
- 59% of deliveries will be made by semi-trailers, 36% by rigid trucks and 5% by B-doubles.
- 30% back loading will occur for Semi-trailers and B-doubles.

Table 6.1 contains the resultant average daily truck generation for the ultimate development.

Table 6.1 Daily truck inbound and outbound

Time	Inbound			Outbound			Two-way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
Total	**308**	**508**	**46**	**308**	**508**	**46**	**617**	**1,015**	**92**

Source: Neil Matthews Consulting (August 2016)

The assumed daily traffic temporal profile for warehouse truck generation is included in Figure 6.1. This temporal profile is based on the observed 16–18 hour operations for warehouses in Western Sydney. Whilst many of the deliveries were made during the middle of the day, the small number of B-doubles were often observed towards the middle of the day or during the later evenings. It is surmised that this reflects the longer distance nature of their journeys and time required to travel to destinations throughout NSW.

The resultant hourly truck generation for an average weekday is shown in Table 6.2.

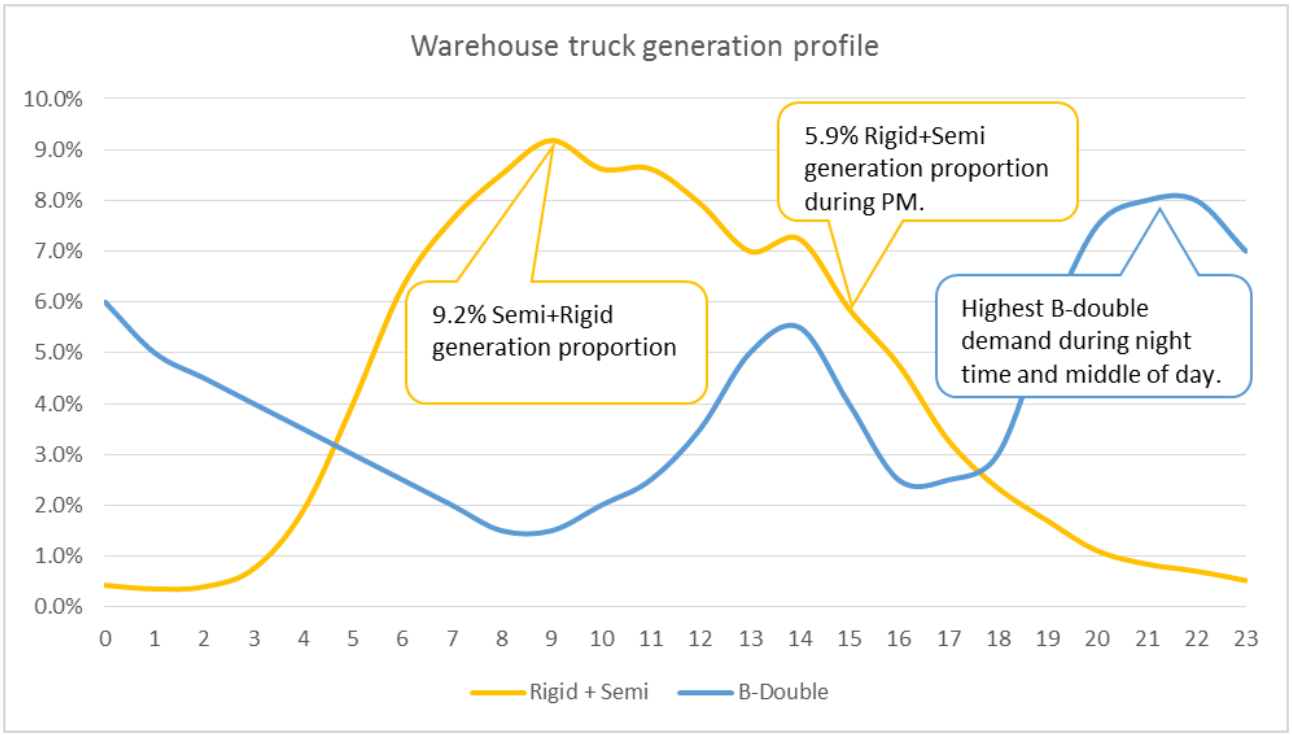

Figure 6.1 Warehouse daily truck profile

Table 6.2 Daily truck inbound and outbound – 'average' weekday

Time	Inbound			Outbound			Two-way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
AM peak period									
6.00 am–7.00 am	19	32	1	19	32	1	**39**	**64**	**2**
7.00 am–8.00 am	23	39	1	23	39	1	**47**	**77**	**2**
8.00 am–9.00 am	26	43	1	26	43	1	**52**	**86**	**1**
9.00 am–10.00 am	28	47	1	28	47	1	**57**	**93**	**1**
Interpeak period									
12.00 pm–1.00 pm	24	40	2	24	40	2	**49**	**80**	**3**
1.00 pm–2.00 pm	22	36	2	22	36	2	**43**	**71**	**5**
2.00 pm–3.00 pm	22	37	3	22	37	3	**44**	**73**	**5**

Time	Inbound			Outbound			Two-way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
PM peak period									
3.00 pm–4.00 pm	18	30	2	18	30	2	**36**	**60**	**4**
4.00 pm–5.00 pm	15	24	1	15	24	1	**30**	**49**	**2**
5.00 pm–6.00 pm	10	17	1	10	17	1	**20**	**33**	**2**
6.00 pm–7.00 pm	7	12	1	7	12	1	**14**	**23**	**3**
Daily									
	309	**508**	**46**	**309**	**508**	**46**	**617**	**1,015**	**92**

The warehouse 'busy' traffic generation estimates are shown in Table 6.3. For this scenario, the truck volumes are increased by 20%.

Table 6.3 Daily truck inbound and outbound – 'busy' weekday

Time	Inbound			Outbound			Two-Way		
	Rigid	Semi	B-double	Rigid	Semi	B-double	Rigid	Semi	B-double
AM peak period									
6.00 am–7.00 am	23	38	1	23	38	1	**47**	**77**	**3**
7.00 am–8.00 am	28	46	1	28	46	1	**56**	**93**	**2**
8.00 am–9.00 am	31	52	1	31	52	1	**63**	**104**	**2**
9.00 am–10.00 am	34	56	1	34	56	1	**68**	**112**	**2**
Interpeak period									
12.00 pm–1.00 pm	29	48	2	29	48	2	**58**	**96**	**4**
1.00 pm–2.00 pm	26	43	3	26	43	3	**52**	**85**	**6**
2.00 pm–3.00 pm	27	44	3	27	44	3	**53**	**88**	**6**
PM peak period									
3.00 pm–4.00 pm	22	36	2	22	36	2	**44**	**72**	**4**
4.00 pm–5.00 pm	18	29	1	18	29	1	**36**	**58**	**3**
5.00 pm–6.00 pm	12	20	1	12	20	1	**24**	**40**	**3**
6.00 pm–7.00 pm	9	14	2	9	14	2	**17**	**28**	**3**
Daily									
	370	**609**	**55**	**370**	**609**	**55**	**740**	**1,218**	**110**

7. Summary and application

7.1 Summary

This memo provides a summary of the calculated traffic generation for the ultimate Moorebank Intermodal Terminal and the assumptions underlying these generation calculations.

7.2 Assumptions

Where possible assumptions made are based on evidence, Roads and Maritime guidelines, or accepted Roads and Maritime values. Assumptions made in this technical note are subject to change based on more up to date and/or relevant data.

7.3 Total site generation

The revised total average weekday site traffic generation estimates for the ultimate scenario are provide in the tables below.

Table 7.1 Light vehicles (average day)

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	29	208	252	562	**281**	**770**
	7.00–8.00	29	29	97	252	**126**	**281**
	8.00–9.00	93	29	91	97	**184**	**126**
	9.00–10.00	31	31	49	49	**80**	**80**
Interpeak	12.00–1.00	90	47	281	126	**371**	**173**
	1.00–2.00	240	43	584	274	**824**	**317**
	2.00–3.00	43	222	274	584	**317**	**806**
PM peak	3.00–4.00	36	36	109	264	**145**	**300**
	4.00–5.00	29	29	45	97	**74**	**126**
	5.00–6.00	29	93	45	91	**74**	**184**
	6.00–7.00	29	29	45	45	**74**	**74**
Daily		865	865	4,699	4,699	**5,564**	**5,564**

Table 7.2 Rigid heavy vehicles (average day)

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	0	0	19	19	**19**	**19**
	7.00–8.00	0	0	23	23	**23**	**23**
	8.00–9.00	0	0	26	26	**26**	**26**
	9.00–10.00	0	0	28	28	**28**	**28**
Inter peak	12.00–1.00	0	0	24	24	**24**	**24**
	1.00–2.00	0	0	22	22	**22**	**22**
	2.00–3.00	0	0	22	22	**22**	**22**
PM peak	3.00–4.00	0	0	18	18	**18**	**18**
	4.00–5.00	0	0	15	15	**15**	**15**
	5.00–6.00	0	0	10	10	**10**	**10**
	6.00–7.00	0	0	7	7	**7**	**7**
Daily		0	0	309	309	**309**	**309**

Table 7.3 Semi-trailer (Heavy) vehicles (average day)

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	41	41	32	32	**73**	**73**
	7.00–8.00	89	89	39	39	**128**	**128**
	8.00–9.00	82	82	43	43	**125**	**125**
	9.00–10.00	69	69	47	47	**115**	**115**
Inter peak	12.00–1.00	75	75	40	40	**115**	**115**
	1.00–2.00	82	82	36	36	**118**	**118**
	2.00–3.00	96	96	37	37	**133**	**133**
PM peak	3.00–4.00	110	110	30	30	**140**	**140**
	4.00–5.00	117	117	24	24	**141**	**141**
	5.00–6.00	69	69	17	17	**85**	**85**
	6:00–7.00	96	96	12	12	**108**	**108**
Daily		1,371	1,371	508	508	**1,879**	**1,879**

Table 7.4 B-double (Heavy) vehicles

Model period	Hour	Terminals		Warehouses		Total Site	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak	6.00–7.00	8	8	1	1	**9**	**9**
	7.00–8.00	17	17	1	1	**17**	**17**
	8.00–9.00	15	15	1	1	**16**	**16**
	9.00–10.00	13	13	1	1	**13**	**13**
Inter peak	12.00–1.00	14	14	2	2	**16**	**16**
	1.00–2.00	15	15	2	2	**18**	**18**
	2.00–3.00	18	18	3	3	**20**	**20**
PM peak	3.00–4.00	20	20	2	2	**22**	**22**
	4.00–5.00	22	22	1	1	**23**	**23**
	5.00–6.00	13	13	1	1	**14**	**14**
	6.00–7.00	18	18	1	1	**19**	**19**
Daily		255	255	46	46	**301**	**301**

APPENDIX D - MPE STAGE 2 / MPW STAGE 2 – CONTAINER HANDLING MOVEMENTS, NEIL MATTHEWS CONSULTING PTY LTD

Neil Matthews Consulting

Date	4/08/2016
To	Nathan Cairney (Tactical Group)
From	Neil Matthews (Neil Matthews Consulting)
Copy to	Westley Owers (Arcadis)
Subject	MPE Stage 2 Proposal/ MPW Stage 2 Proposal – Container handling movements

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NMC is a consultancy providing advisory services to the public and private sectors regarding land transport and regional freight systems, policy development, value chain analysis, demand and capacity forecasting, infrastructure assessment, supply chain design, quantitative analysis, operations management and governance. A capability statement is shown attached, and provides a synopsis of recent projects undertaken.

NMC was engaged to work with Arcadis Traffic and Transport team to establish an appropriate basis of assumptions for the combined Moorebank Precinct. This information cascaded into the Operational Traffic Impact Assessment for the Moorebank Precinct West (MPW) Stage 2 Proposal and will also inform other stages of development for the Moorebank Precinct. The assumptions combine, revise and update the existing road freight forecasts previously produced by the Sydney Intermodal Terminal Alliance (SIMTA) (MPW Concept Plan Approval (SSD 5066)) and the Moorebank Intermodal Terminal Company (MIC) (MPE Concept Plan Approval (MP 10_0193) to produce forecasts for a combined approach to the Moorebank intermodal freight precinct facility operations (i.e. the Ultimate development scenario).

At the heart of the Moorebank Intermodal freight precinct are two rail terminals each with different functions and end markets, being:

- The MPE Import Export (IMEX) terminal which services trains operating to/from Port Botany carrying import-export containers
- The MPW Intermodal terminal facility which services trains operating to/from interstate, as well as to/from regional NSW and to/from Port Botany.

The assumptions used throughout this process were as follows:

- Pathways: Four discrete container and truck pathways were identified as being relevant to the site, as shown over page in Table 1.
- Types of movements:

  Four movement types to, from and within the precinct were identified. These are:

  1. Loaded containers – an internal or external movement carrying a loaded container
  2. Empty containers – an internal or loaded movement carrying an empty container
  3. Distribution – for non-containerised consignments being moved from onsite warehouses to offsite metro customers
  4. Empty truck running – of vehicles not carrying any containers or goods.

Table 1 Pathway assumptions

Pathway		Import	Export (IMEX)	Domestic/Interstate
Internal	Rail terminal to/from warehouse	Full container to warehouse for unloading, with empty returned back to IMEX terminal	Empty container from IMEX to warehouse for loading, then loaded container returned to IMEX terminal	None
	Rail terminal to/from warehouse	Not relevant as imports rarely get moved to country	Transfer of empty containers from IMEX to MPW, then move loaded export container within the precinct rail operations for forwarding to Port Botany	None
External	Rail terminal to/from offsite customer	Full container to warehouse for unloading, with empty container return back to IMEX	Empty container from IMEX to warehouse for loading, then loaded container returned to IMEX	Collection and delivery of domestic containers to/from offsite customers, with a corresponding empty truck move
	Onsite warehouse to/from offsite customer	Goods de-stuffed from containers and loaded onto pallets, then moved on pallets to offsite third parties	Palletised goods moved from offsite third parties to Moorebank warehouses. These goods may be held in storage for dispatch against export orders, or may be consignments which are less than a full container and consolidated as FAK (Freight All Kinds)	Consignments to/from onsite warehouses forwarded to the rail terminal for movement to/from interstate destinations

Operational considerations

The logistics industry seeks to schedule transport activities to optimise back loading activities where ever possible. While vehicle movements to/from Port Botany do not achieve a high level of back-loading, transport operations through a hub, such as the Moorebank Precinct, will provide significantly higher back-loading, especially due to the integration of an empty container park within the MPE Intermodal terminal facility. This reduces the overall truck movements of the Moorebank Precinct, when operating collectively (i.e. as one precinct, rather than two separate sites).

I am confident in the accuracy, validity and appropriateness of the assumptions adopted for the precinct container movements and associated road based traffic volumes and can confirm that they are based on my detailed understanding of freight logistics.

Please find attached my capability statement and CV for your reference.

Neil Matthews

Director

ATTACHMENT F: OTTIA ADDENDUM (RTS – COMPLETE DOCUMENT)

ARCADIS Design & Consultancy for natural and built assets

Moorebank Precinct West Stage 2 Proposal
Response to Submissions

Appendix C: Operational Traffic Impact Assessment

SIMTA SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 4, Division 4.1, State Significant Development

June 2017

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MOOREBANK PRECINCT WEST - STAGE 2 PROPOSAL

Operational Traffic and Transport Impact Assessment – Addendum

Author	Jerry Xiang, Luke Goldsworthy	
Checker	Michael Yong	
Approver	Michael Yong	

Revision F

REVISIONS

Revision	Date	Description	Prepared by	Approved by
A	24/02/2017	Draft OTTIA Addendum	JX, LG	MY
B	06/03/2017	Draft 2 OTTIA Addendum	JX, LG	MY
C	13/02/2017	OTTIA Addendum for Client Review	JX, LG	MY
D	28/04/2017	OTTIA Addendum	JX, LG	MY
E	25/05/2017	Draft Final Revised OTTIA	JX, LG	MY
F	23/06/2017	Final	JX, LG	MY

CONTENTS

1 INTRODUCTION

SIMTA are seeking approval for the construction and operation of Stage 2 of the Moorebank Precinct West (MPW) Proposal (the Proposal) as part of the second stage of development under the MPW Concept Approval (SSD 5066).

An Environmental Impact Statement (EIS) was prepared for the Proposal seeking approval under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In particular, the EIS was prepared to address, and be consistent with, the following:

- The Secretary's Environmental Assessment Requirements (SEARs) (SSD 16-7709) for the Proposal, which were issued on 14 July 2016
- The relevant requirements of the MPW Concept Approval (SSD 5066) granted by the Planning Assessment Commission (PAC) on 3 June 2016
- The relevant requirements of the approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (No. 2011/6086).

The EIS was publicly exhibited, in accordance with clause 83 of the *Environmental Planning and Assessment Regulations 2000* (EP&A Regulations), between 26 October 2016 and 25 November 2016. During this exhibition period submissions were invited from all stakeholders including members of the community and government stakeholders. In response to the submissions received, and also to respond to design progression, amendments have been made to the Proposal (the Amended Proposal), as detailed below.

1.1 Report purpose

The purpose of this report is to provide further assessment of the traffic and transport impacts of the Amended Proposal and serve as an addendum to the Operational Traffic and Transport Impact Assessment (OTTIA) provided as Appendix M to the EIS. A summary of the works included in the Amended Proposal is provided in Section 1.1.1 below.

1.1.1 Amended Proposal

The MPW Stage 2 Proposal (the Proposal) involves the construction and operation of an intermodal terminal (IMT) facility to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum. The Proposal also includes the construction and operation of approximately 215,000 m^2 GFA of warehousing, freight village (800 m^2) and associated infrastructure.

The Amended Proposal alters the Proposal based on submissions received during exhibition of the EIS, consultation with key stakeholders and design development. A summary of the amendments to the Proposal is as follows:

- Alignment of the operational hours for warehouses to the IMT facility and Port freight operations to enable freight movements outside of peak traffic times.
- Alterations to the drainage design, including:
  - Inclusion of the OSD (Basin 10) and relocation of another OSD (Basin 3) along the eastern boundary of the operational area, adjacent to the western verge of Moorebank Avenue
  - Re-sizing of OSD basins along the western boundary of the operational area
  - Reduction to the widths of selected OSD outlet channels

  - Provision of an additional covered drain within the Endeavour Energy easement
- Establishment of a container wash-down facility with de-gassing area within the IMT facility
- Illuminated backlit signage within the warehousing area
- Inclusion of an upgraded layout for the Moorebank Avenue/Anzac Road intersection

The amendments to the Proposal are shown in Figure 1-1.

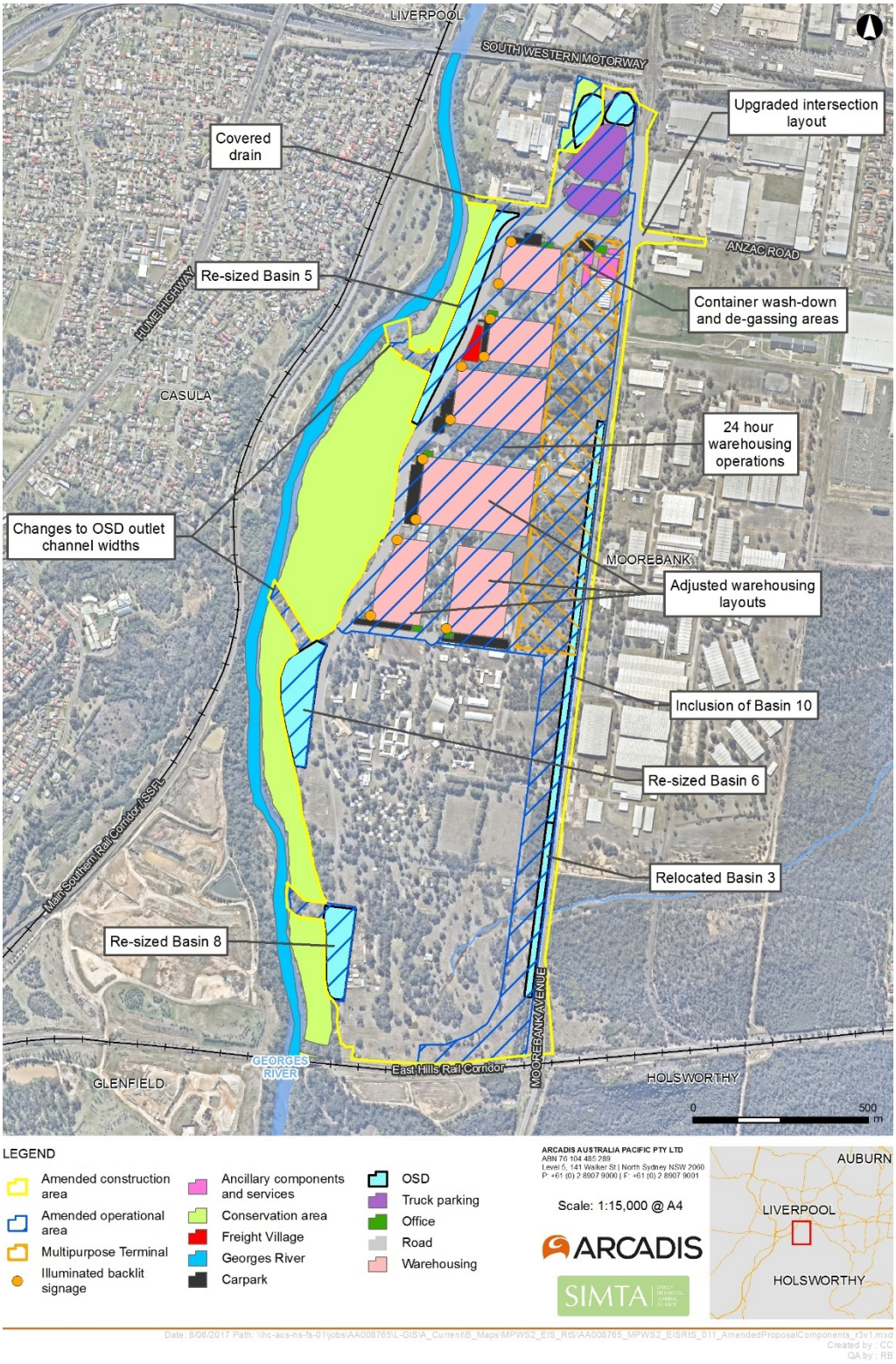

Figure 1-1: Amendments to the Proposal

2 IMPACT ASSESSMENT

2.1 MPW Stage 2 EIS Proposal Assessment

The Operational Traffic and Transport Impact Assessment Report (OTTIA) of the MPW Stage 2 Proposal Assessment included in Appendix M of the EIS was prepared by Arcadis to support the Proposal. The assessment included undertaking network modelling to identify the traffic impacts and required improvements to mitigate the impact on the safety and operation of the adjacent road network.

Eight intersections were assessed consistent with the SEARs requirements including:

- Moorebank Avenue / Anzac Road
- M5 Motorway / Moorebank Avenue
- M5 Motorway / Hume Highway
- Moorebank Avenue / Newbridge Road
- Moorebank Avenue / Heathcote Road
- M5 Motorway / Heathcote Road
- Cambridge Avenue and two associated intersections at Cambridge Avenue / Glenfield Road and Cambridge Avenue / Canterbury Road.

Existing Network Performance

The modelling results indicated that the existing Moorebank Avenue / Newbridge Road, and Moorebank Avenue / Heathcote Road intersections are operating at capacity with LoS E in the peak periods. Upgrades are needed at these intersections to cater for existing peak background traffic demand. Future growth in peak demand is expected to worsen the performance of these intersections.

The M5 Motorway/ Hume Highway and M5 Motorway/ Heathcote Road intersections are currently operating close to capacity in the peak periods. The performance of the remaining intersections is satisfactory in the peak periods at LoS D or better.

Network Performance in the Opening Year 2019 and 2029 (without the Proposal and without upgrades)

The analysis showed that the existing Moorebank Avenue / Newbridge Road, and Moorebank Avenue / Heathcote Road, M5 Motorway / Heathcote Road and M5 Motorway / Hume Highway intersections are expected to operate at/above capacity at LoS E/F in the peak periods in 2019. Upgrades are needed at these intersections to cater for the growth in background traffic demand in 2019. The performance of these intersections are expected to worsen in 2029.

In the opening year 2019, the M5 Motorway / Moorebank Avenue intersection is expected to satisfactorily at LoS D and operate unsatisfactorily at LoS F by 2029 without the Proposal. The Moorebank Avenue / Anzac Road intersection is expected to operate satisfactorily in 2019 but performs unsatisfactorily in 2029 at LoS F.

As described in the ‘network improvement and mitigation measures’ section below and Section 6 of the EIS OTTIA, a suggested network improvement has been included for this location, which would cater for background traffic demand and improve the future operation of the local road network.

Proposal Traffic Generation

The Proposal is expected to generate approximately 1,458 truck trips (2-way) and 2,670 car trips (2-way) to and from the precinct each week day. In the cumulative development scenario with the addition of traffic from MPE Stage 1, approximately 2,778 truck trips (2-way) and 2,815 car trips (2-way) are estimated to and from the precinct each week day.

Proposal Site Access

Two access/egress points are proposed for the Proposal site. The primary access/egress for the Proposal site will be via an upgraded Moorebank Avenue/Anzac Road signalised intersection. The Moorebank Avenue/Bapaume Road intersection will be changed from an all-movement three-leg priority controlled intersection to a left-out only intersection and will be used for ABB traffic to exit onto Moorebank Avenue and for trucks utilising the emergency parking area, if required. Additional detail regarding the operational traffic movements at these locations would be included in the Operational Traffic Management Plan (OTMP) for the Proposal.

Trucks would enter the Proposal site via the main entrance at the upgraded Moorebank Avenue/Anzac Road intersection and continue along the internal road on the western perimeter of the MPW Stage 2 Proposal site.

Once in the warehouse, trucks would be loaded/unloaded via manual handling equipment. Once loaded the trucks would then head to intended markets via the nearby major road network, or transported to the adjacent terminal on the MPE Stage 1 site, or transported directly to the IMT facility for dispatch to interstate, intrastate or port shuttle via rail.

The Moorebank Avenue/ Bapaume

Impact at Key Road Sections

The OTTIA noted that in the opening year (2019), the highest traffic increase attributable to the Proposal is forecast on Moorebank Avenue (north of Anzac Road) with an increase of 17%. The Proposal traffic would also increase traffic on Anzac Road (east of Moorebank Avenue) by approximately 1.9%. The analysis indicates minor traffic increase (less than 0.5%) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the MPW Stage 2 Proposal.

In the 10-year design horizon (2029), the traffic increase attributable to the Proposal is expected to be reduced to 14% on Moorebank Avenue (north of Anzac Road) and 1.6% on Anzac Road (east of Moorebank Avenue). This is due to the growth in background traffic between 2019 and 2029. The analysis indicates minor traffic increase (less than 0.5 %) along Moorebank Avenue (south of Anzac Road) and Cambridge Avenue attributable to the Proposal by 2029.

Network improvement and mitigation measures

The road network will need to be improved to cater for the forecast increase in traffic volumes which will result from both the Proposal and general growth in background traffic passing through the study area. The OTTIA identified road network improvements to ensure that satisfactory intersection performance could be achieved.

In addition to the recommended improvements at the eight key intersections, improvements are also recommended for the wider road network to provide sufficient capacity to meet the anticipated demand from the Proposal.

A number of key intersections are currently operating at an unsatisfactory level of service as a result of background traffic and anticipated background traffic growth, i.e. without the Proposal. These intersections would need to be upgraded by Roads and Maritime to ensure that the network operates sufficiently and that local traffic in the area does not continue to decline in performance.

It is noted that some intersections are directly impacted by the Proposal and therefore upgrades, either in full or part, are to be undertaken as part of the Proposal subject to further negotiations with Roads and Maritime and the Precinct Modelling.

The OTTIA recommended that as part of the Proposal, the Moorebank Avenue/ Anzac Road intersection be upgraded (indicative timing of 2019) to mitigate Proposal-generated traffic, including:

1. Upgrade Moorebank Avenue/Anzac Road signalised intersection to include lane capacity improvements on the northern and southern approaches, and the construction of a new access road into the Proposal site (new western approach). The current configuration on Anzac Road (eastern approach) will be retained.
2. Implement vehicle actuated signals
3. Upgraded intersection to comply with relevant RMS design standards

In addition, the OTTIA for the Proposal included an analysis of the traffic impacts of future traffic demand on the surrounding road network from both background traffic growth and the additional traffic generated by the Proposal when the Proposal site is fully developed. This investigation reviewed the existing infrastructure and then identified the required road and intersection improvements needed to mitigate the additional traffic generated by the Proposal under the cumulative development scenario. It was identified as part of the OTTIA that the road network will need to be improved to cater for the forecast increase in traffic volumes which will result from both the general growth in background traffic and operational vehicles from the Proposal passing through the study area.

A summary of the intersections which would operate at a level of service which is unsatisfactory without the Proposal are provided below. As included in the OTTIA, we would recommend that Roads and Maritime consider these solutions to improve the existing and future operation of the local road network. These are presented as potential road network solutions in Table 2-1 below; however are not nominated for delivery for the Proposal.

Table 2-1 Recommendations for Network Improvements due to background traffic

ID	Intersection	Recommended Network Improvements due to Background Traffic	Indicative Timing
I-2	M5 Motorway / Moorebank Avenue	1. Provide additional capacity on M5 westbound on-ramp. 2. Provide additional capacity on M5 eastbound off-ramp 3. Increase the storage lengths of the existing (two-lane) right turn bay on Moorebank Avenue northern approach 4. Widen Moorebank Avenue to four lanes between the M5 Motorway/Moorebank Avenue intersection and Moorebank Avenue/Anzac Road intersection 5. Change the signal to vehicle actuated to improve west and north approaches (See Figure 6-1). 6. Upgraded intersection to comply with relevant RMS design standards	Staged upgrading starting from 2019
I-3	M5 Motorway / Hume Highway	Change the signal to vehicle actuation in the PM peak to improve traffic signal operations	2019
I-4	Moorebank Avenue / Newbridge Road	1. Add an additional right turn lane from Moorebank Avenue south approach and change the signal to	2019

ID	Intersection	Recommended Network Improvements due to Background Traffic	Indicative Timing
		vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	
I-5	Moorebank Avenue / Heathcote Road	1. Extend right turn lane from Moorebank Avenue south approach and change the signal to vehicle actuation in the PM peak to improve traffic signal operations. 2. Upgraded intersection to comply with relevant RMS design standards	2019
I-6	M5 Motorway / Heathcote Road	Change the signal to vehicle actuated in PM peak to improve traffic signal operations.	2019
I-7	Cambridge Avenue / Glenfield Road	No improvements required	
I-8	Cambridge Avenue / Canterbury Road	No improvements required	

Network Performance in the Opening Year 2019 and 2029 (with the Proposal and with upgrades)

The recommended intersection improvements (to mitigate the traffic impacts of the Proposal) are adequate and perform within an acceptable LoS with no-worsening of the performance without the Proposal.

Summary Findings

- The upgraded Moorebank Avenue / Anzac Road signalised intersection will adequately cater for the Proposal in 2019 and 2029
- The Proposal would likely exceed the current capacity at the M5 Motorway / Moorebank Avenue intersection and upgrading of the intersection is required as a result of existing (background) traffic not only on at the intersection but also the M5 motorway and associated on-ramps
- Capacity improvements are required at the signalised intersections of Moorebank Avenue / Newbridge Road and Moorebank Avenue / Heathcote Road at approximately 2019 due to an existing operational network problem, without consideration of the Proposal. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- Capacity improvements are required at the M5 Motorway / Hume Highway and M5 Motorway / Heathcote Road signalised intersections at approximately 2019 to cater for the growth in background traffic. These intersections need to be upgraded to cater for the growth in background traffic demand (i.e. not due to the Proposal)
- The analysis identified minor impact to roundabouts of Glenfield Road and Canterbury Road with Cambridge Avenue attributable to the Proposal. No upgrades are required at the existing roundabouts.

Car Parking Provision

Based on the Roads and Maritime parking standards and the proposed warehouse, and office gross floor areas for the Proposal, a total of 983 car parking spaces are proposed to be provided.

Bicycle Facilities Provision

Based on the proposed warehouse and office GFAs for the Proposal, an indicative total of 127 bicycle parking spaces, 127 lockers and 15 shower/change cubicles are proposed to be included in the Proposal. Notwithstanding this, the specific number would be confirmed as part of detail design for the Proposal in accordance with the *City of Sydney Section 3 – General Provisions*.

Public Transport and Active Transport Provision

In terms of the public transport and active transport provision that is required to cater for the Proposal, that the following mitigation measures are considered suitable:

- SIMTA to undertake consultation with relevant bus provider(s) regarding the potential to extend the 901 bus service and additional bus stops to ensure adequate accessibility to and within the Proposal site
- Consultation with TfNSW will be conducted regarding the provision for active transport to/from the Proposal site and along the internal perimeter road, as part of detailed design for the Proposal.

Regional Network Impacts

The Proposal would partly help to reduce the potential increase in regional freight movements along the M5 Motorway between Port Botany and Moorebank Avenue. From a strategic perspective, the Moorebank Intermodal Terminal Project Environmental Impact Statement (EIS), 2014, identified that the introduction of the Precinct (and the Proposal) would result in wider regional benefits including:

- Transfer of road haulage between Port Botany and Western Sydney to rail freight for redistribution thereby helping to reduce traffic congestion and providing speed benefits for the Sydney road network
- Easing the Port Botany bottleneck to enable the Port to cope with future growth and provide largescale freight capacity
- Reductions in articulated truck volumes through the Sydney CBD and inner city suburbs, on the M4 Motorway and the M5 Motorway east of the Moorebank Avenue interchange. The changes in articulated truck volumes on the regional Sydney road network would be reductions in heavy vehicle movements between Port Botany and Moorebank, thereby relieving the regional Sydney road network of articulated vehicular traffic.
- An increase in articulated truck flows, particularly on the M7, Hume Highway and Mamre Road south of the M4 Motorway as well as the M5 Motorway between Moorebank Avenue interchange and the M7 Motorway. It should be noted that traffic flow refers to the rate at which vehicles pass a given point on the roadway, whereas volume refers simply to the number of vehicles that pass a given point on the roadway at a specific period of time. It is stated in Section 5.3 of the OTTIA that wider regional benefits of the Proposal would include an increase in articulated truck flows, generated by a reduction in truck volumes.

Reductions in vehicle operating costs for heavy vehicles (i.e. vehicle-kilometres-travelled (VKT) and vehicle –hours travelled (VHT)) on the regional road network

2.2 Amended Proposal Assessment

2.2.1 Methodology

An assessment of operational traffic and transport impacts has been undertaken for all amendments to the Proposal as identified below:

- Hours of warehousing operations
- Drainage works
- Container wash-down facilities and degassing facility within the Proposal site
- Illuminated backlit signage
- Upgraded layout for the Moorebank Avenue / Anzac Road intersection
- Adjustments to warehouse layouts

A breakdown of the assessment methodology for all of the amendments to the Proposal is provided below.

Hours of warehousing operations

The OTTIA included as Appendix M of the EIS considered the impacts of 24-hour warehousing operations on the Proposal site.

As such, the proposed changes to the hours of warehousing operations would not alter the operational traffic impacts of the Proposal, and has therefore not been assessed as part of this report.

Drainage works

Inclusion of the western OSD

Inclusion of the western OSD as part of the Amended Proposal would not change the operational traffic impacts of the Proposal as described in the EIS as they do not contribute to operational trip generation of the Proposal and has therefore not been assessed as part of this report.

Container wash-down facilities and de-gassing areas

To determine the potential operational traffic and transport impacts associated with the Amended Proposal, a high-level qualitative assessment was undertaken to identify any potential generation of trips as a result of the container wash-down facilities and de-gassing areas and their likely impact on the safety and operation of the road network. Details of the assessment are provided in Section 2.2.2.

Illuminated backlit signage

Illuminated backlit signage as part of the Amended Proposal would not change the operational traffic impacts of the Proposal as described in the EIS. Illuminated signage does not contribute to the operational trip generation of the Proposal and has therefore not been assessed as part of this report.

Upgraded layout for the Moorebank Avenue / Anzac Road intersection

Additional traffic modelling using the AIMSUM modelling software was undertaken to identify the potential impacts of the upgraded layout for the Moorebank Avenue / Anzac Road intersection on the road network performance for the following scenarios:

- Scenario 1 – "With Proposal + Upgrades" (i.e. as per MPW Stage 2 EIS)
  - 2019 (opening year) AM and PM Peak
  - 2029 (10-years after opening year) AM and PM Peak
- Scenario 2 – "With Cumulative Development + Upgrades" (same scenario as assessed in the MPW Stage 2 EIS, i.e. MPW Stage 2 and MPE Stage 1)
  - 2019 (opening year) AM and PM Peak
  - 2029 (10-years after opening year) AM and PM Peak

For the purpose of assessing the upgraded layout, the AIMSUM model used to assess traffic and transport impacts in the EIS have been adapted, and modified to include the upgraded layout. The modelling assumptions included in the model used for the EIS remained unchanged for this assessment with the exception of the Moorebank Avenue / Anzac Road intersection layout.

The upgraded Moorebank Avenue / Anzac Road layout adopted for this assessment is shown in Figure 2-1. The upgraded layout for the Moorebank Avenue / Anzac Road intersection layout provides additional capacity to this intersection by adding an additional right-turn lane on Anzac Road (east approach).The main difference between the Anzac Road / Moorebank Avenue intersection layout adopted for the EIS and the proposed upgraded Moorebank Avenue / Anzac Road intersection layout is that the upgraded layout has two right-turn lanes with a short through lane and a short left lane on Anzac Road (east approach); whereas, the intersection modelled in the EIS comprised one right-turn lane and one left turn lane on Anzac Road (east approach).

Amended warehouse layout

To determine the potential operational traffic and transport impacts associated with the amended warehouse layout, a high-level qualitative assessment was undertaken to determine any potential generation of trips as a result of the amended warehouse layout and their likely impact on the safety and operation of the road network. Details of the assessment are provided in Section 2.2.2.

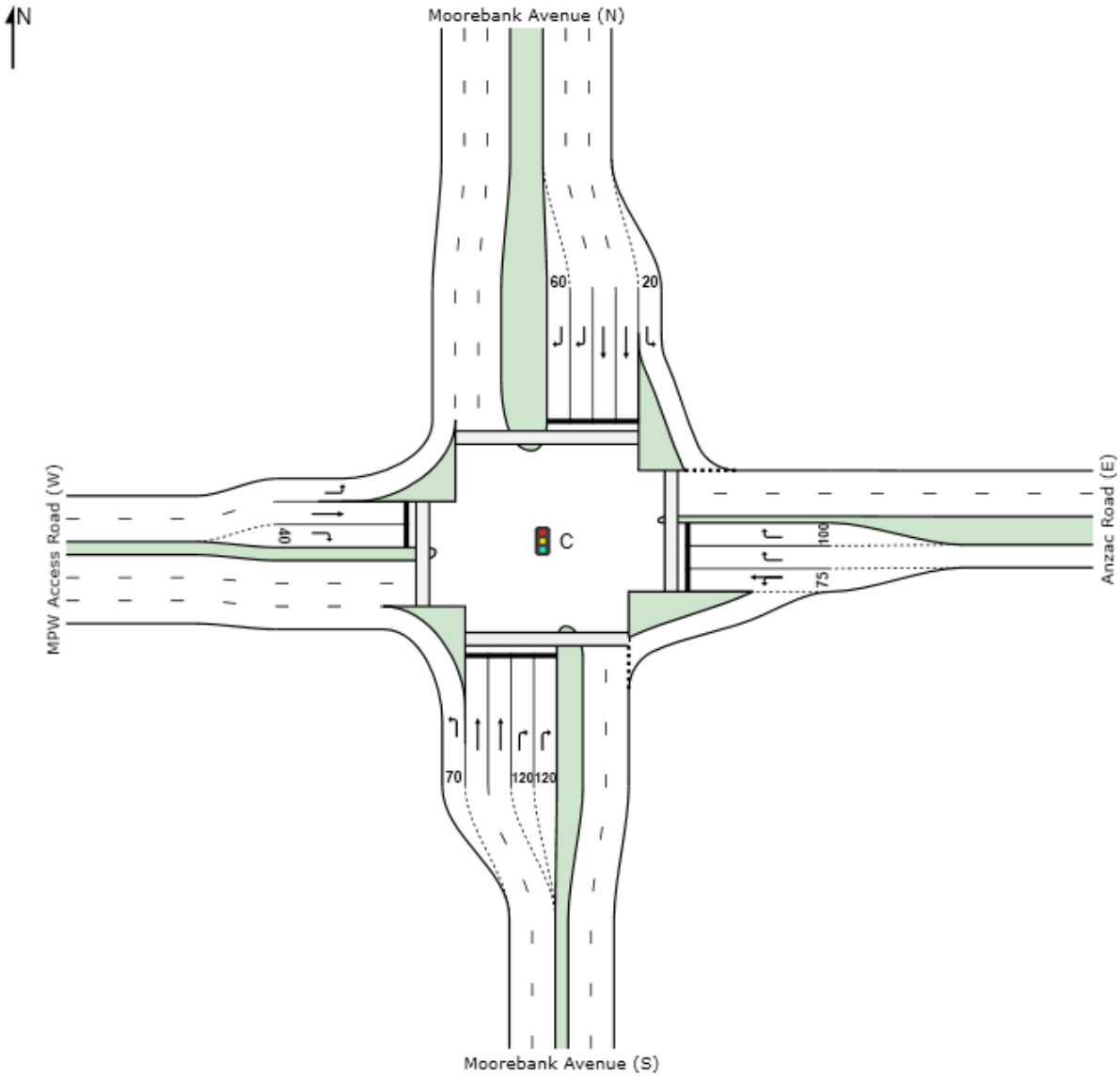

Figure 2-1 Upgraded Moorebank Avenue / Anzac Road intersection layout

2.2.2 Results

Container wash-down facilities and de-gassing areas

It is envisaged that there would be vehicle movements through the MPW site for access and egress into the wash-down and de-gassing facility as part of standard site operations. The alteration in vehicle circulation within the Proposal site would not change traffic impacts, rather it would be a deviation in the way traffic moves within the site and would be managed through the Operational Traffic Management Plan for the Proposal, where necessary.

Upgraded layout for the Moorebank Avenue / Anzac Road intersection

The predicted intersection performance (i.e. delay (in seconds) and level of service (LoS)) of the eight key intersections in the core traffic study area with the Amended Proposal under Scenario 1 and Scenario 2 for the 2019 and 2029 AM and PM peak periods, both with and without the Proposal, based on the revised traffic modelling to include the upgraded Moorebank Avenue/ Anzac Road intersection layout, are described in Table 2-2 to Table 2-5 below.

The proposed upgraded layout for the Moorebank Avenue / Anzac Road intersection is predicted to increase intersection capacity and either improve or maintain the intersection performance when compared to the intersection layout adopted in the EIS.

In 2019 and 2029 under Scenario 2, the intersection performance of a number of intersections is reduced. As the only modification to the operational traffic model was the inclusion of the upgraded Moorebank Avenue/ Anzac Road intersection layout, worsening in the LoS at these intersections is a result of variability in the operational traffic model in the 2029 under both Scenario 1 and Scenario 2. Variability in the traffic modelling analysis for 2029 is indicative of a heavily congested road network and insufficient network-wide capacity, where there is any capacity changes in one part of the network, re-distribution occurs across the network resulting in inconsistent results at intersections that have otherwise would not experience any actual changes in performance, as described in the EIS.

The following key findings have been identified from the revised traffic modelling and analysis:

Scenario 1 (operation of the Proposal only, with the amendments)

- In 2019 under Scenario 1, all intersections would continue to operate at an acceptable LoS in the AM and PM peak, consistent with the operational traffic and transport impact assessment prepared for the EIS.
- In 2029 under Scenario 1, all intersections would continue to operate at an acceptable LoS in the AM and PM peak, consistent with the operational traffic and transport impact assessment prepared for the EIS, with the exception of the following two intersections, where intersection performance would improve from a LoS F to a LoS E:
  - The M5 Motorway/ Hume Highway in the AM peak
  - The M5 Motorway/ Heathcote Road in the PM peak.

Scenario 2 (cumulative operational scenario, with the amendments)

- In 2019 under Scenario 2, all intersections would continue to operate at an acceptable LoS in the AM and PM peak, consistent with the operational traffic and transport impact assessment prepared for the EIS, with the exception of the following intersections:
  - The M5 Motorway/ Hume Highway, where the intersection performance would reduce from a LoS D to a LoS E in the AM peak. As shown in Table 2-4, the delay of 56 seconds at this intersection without the Proposal is at the threshold point between LoS D and LoS E (i.e. threshold of up to 56 seconds for LoS D and over 57 seconds for LoS E) i.e. Any minor increase in delay would result in the LoS at this intersection reducing to a LoS E.
  - Moorebank Avenue / Heathcote Road, where intersection performance would improve from a LoS F to a LoS E in the AM peak.
  - Moorebank Avenue/ Anzac, where the intersection performance would improve from a LoS E to a LoS C in the AM and PM peak.
- In 2029 under Scenario 2, all intersections would continue to operate at an acceptable LoS in the AM and PM peak, consistent with the operational traffic and transport impact assessment prepared for the EIS, with the exception of the following intersections in the PM peak:
  - The M5 Motorway/ Moorebank Avenue, where intersection performance would reduce from a LoS D to a LoS E.
  - The M5 Motorway/ Hume Highway, where intersection performance would reduce from a LoS C to a LoS E.
  - The M5 Motorway/ Heathcote Road, where intersection performance would reduce from a LoS E to a LoS F.
  - Moorebank Avenue/ Anzac Road where intersection performance would improve from a LoS E to a LoS C.

    As detailed above, as the only modification to the operational traffic model was the inclusion of the upgraded Moorebank Avenue/ Anzac Road intersection layout, worsening in the LoS at these intersections is a result of variability in the operational traffic model in the 2029 under both Scenario 1 and Scenario 2. Variability in the traffic modelling analysis for 2029 is indicative of a heavily congested road network and insufficient network-wide capacity, where there is any capacity changes in one part of the network, re-distribution occurs across the network resulting in inconsistent results at intersections that have otherwise would not experience any actual changes in performance, as described in the EIS.

Table 2-2 2019 with and Without Proposal Development (Existing Layout, EIS Layout and Upgraded Intersection Layout) – Scenario 1

ID	Intersection	2019 without Proposal Development (Existing Layout at Moorebank Avenue / Anzac Road intersection)				2019 with Proposal Development (EIS Layout at Moorebank Avenue / Anzac Road intersection)				2019 with Proposal Development (Upgraded Layout at Moorebank Avenue / Anzac Road intersection)			
		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
		Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	24	B	16	B	41	C	42	C	39	C	31	C
I-2	M5 Motorway / Moorebank Avenue	49	D	28	B	20	B	20	B	20	B	20	B
I-3	M5 Motorway / Hume Highway	134	F	32	C	56	E	28	B	59	E	28	B
I-4	Moorebank Avenue / Newbridge Road	44	D	31	C	47	D	37	C	55	D	33	C
I-5	Moorebank Avenue / Heathcote Road	53	D	44	D	75	F	34	C	74	F	31	C
I-6	M5 Motorway / Heathcote Road	78	F	69	E	31	C	36	C	37	C	35	C
I-7	Cambridge Avenue / Glenfield Road	8	A	12	A	8	A	12	A	8	A	10	A
I-8	Cambridge Avenue / Canterbury Road	10	A	7	A	8	A	7	A	9	A	6	A

Table 2-3 - 2029 with and Without Proposal Development (Existing Layout, EIS Layout and Upgraded Intersection Layout) – Scenario 1

ID	Intersection	2029 without Proposal Development (Existing Layout at Moorebank Avenue / Anzac Road intersection)				2029 with Proposal Development (MPW Stage 2 Proposal EIS Layout at Moorebank Avenue / Anzac Road intersection)				2029 with Proposal Development (Upgrade Layout at Moorebank Avenue / Anzac Road intersection)			
		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
		Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	52	D	95	F	53	D	45	D	47	D	33	C
I-2	M5 Motorway / Moorebank Avenue	74	F	125	F	30	C	38	C	33	C	37	C
I-3	M5 Motorway / Hume Highway	155	F	129	F	73	F	38	C	68	E	39	C
I-4	Moorebank Avenue / Newbridge Road	48	D	94	F	50	D	42	C	46	D	47	D
I-5	Moorebank Avenue / Heathcote Road	66	E	153	F	70	E	78	F	68	E	80	F
I-6	M5 Motorway / Heathcote Road	46	D	336	F	38	C	77	F	40	C	70	E
I-7	Cambridge Avenue / Glenfield Road	10	A	7	A	9	A	8	A	8	A	8	A
I-8	Cambridge Avenue / Canterbury Road	14	B	10	A	20	B	7	A	18	B	8	A

Table 2-4 - 2019 with and Without Cumulative Development (Existing Layout, EIS Layout and Upgraded Intersection Layout) – Scenario 2

ID	Intersection	2019 without Proposal Development (Existing Layout at Moorebank Avenue / Anzac Road intersection)				2019 with Cumulative Development (MPW Stage 2 Proposal EIS Layout at Moorebank Avenue / Anzac Road intersection)				2019 with Cumulative Development (Upgraded Layout at Moorebank Avenue / Anzac Road intersection)			
		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
		Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	24	B	16	B	42	D	44	D	39	C	37	C
I-2	M5 Motorway / Moorebank Avenue	49	D	28	B	21	B	36	C	20	B	38	C
I-3	M5 Motorway / Hume Highway	134	F	32	C	56	D	29	C	63	E	30	C
I-4	Moorebank Avenue / Newbridge Road	44	D	31	C	42	D	35	C	46	D	34	C
I-5	Moorebank Avenue / Heathcote Road	53	D	44	D	71	F	33	C	67	E	32	C
I-6	M5 Motorway / Heathcote Road	78	F	69	E	32	C	35	C	30	C	36	C
I-7	Cambridge Avenue / Glenfield Road	8	A	12	A	8	A	12	A	8	A	13	A
I-8	Cambridge Avenue / Canterbury Road	10	A	7	A	8	A	7	A	8	A	7	A

Table 2-5 - 2029 with and Without Cumulative Development (Existing Layout, EIS Layout and Upgraded Intersection Layout) – Scenario 2

ID	Intersection	2029 without Proposal Development (Existing Layout at Moorebank Avenue / Anzac Road intersection)				2029 with Cumulative Development (MPW Stage 2 Proposal EIS Layout at Moorebank Avenue / Anzac Road intersection)				2029 with Cumulative Development (Upgraded Layout at Moorebank Avenue / Anzac Road intersection)			
		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)		AM Peak (8-9am)		PM Peak (5-6pm)	
		Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS	Delay (sec)	LoS
I-1	Moorebank Avenue / Anzac Road / MPW access road	52	D	95	F	52	D	57	E	47	D	37	C
I-2	M5 Motorway / Moorebank Avenue	74	F	125	F	35	C	53	D	33	C	60	E
I-3	M5 Motorway / Hume Highway	155	F	129	F	75	F	39	C	74	F	56	E
I-4	Moorebank Avenue / Newbridge Road	48	D	94	F	43	D	51	D	45	D	51	D
I-5	Moorebank Avenue / Heathcote Road	66	E	153	F	62	E	85	F	61	E	83	F
I-6	M5 Motorway / Heathcote Road	46	D	336	F	34	C	69	E	35	C	109	F
I-7	Cambridge Avenue / Glenfield Road	10	A	7	A	8	A	8	A	9	A	7	A
I-8	Cambridge Avenue / Canterbury Road	14	B	10	A	15	B	8	A	18	B	7	A

Amended warehouse layout

Warehouse sizes and their layout on the Proposal site have been changed as part of the Proposal amendment (i.e. amalgamation and de-amalgamation of GFAs); however, the resulting warehouse GFA remains unchanged at 215,000 m^2 (i.e. as per assumptions in the EIS) and therefore the traffic and trip generation assumptions remain the same as used in the EIS. Therefore, this amendment would not change the operational traffic impacts of the Proposal, and has therefore not been assessed as part of this report.

Access to the warehouses will be from three main entrances off the internal access road compared to two main entrances proposed in the EIS. The increased number of entrances to warehouses from the internal road network would facilitate better traffic dispersal within the Proposal site. The northernmost entrance will provide access to Warehouse 1 and 2, while the middle entrance provides access to Warehouses 3 and 4 and the southern entrance will provide access to Warehouses 5 and 6.

The proposed changes to the warehouse layout does not have an impact on the traffic generation, impact assessment and findings, as submitted in the EIS.

2.2.3 Mitigation measures

As the reduction in broader intersection performance in 2019 and 2029 under scenario 2 is a result of model variability (i.e. due to the congestion of the existing road network), no additional mitigation measures are required for the operation of the Amended Proposal.

2.3 Conclusion

This assessment concludes that the Amended Proposal would result in consistent impacts to those already identified and assessed as part of the existing OTTIA. Therefore, the outcomes and recommendations of the assessment undertaken for the OTTIA are still relevant and appropriate for the assessment of the Amended Proposal.