Appendix E
Traffic and Transport Impact Assessment

Appendix L

Strategic traffic modelling report (August 2014)

Moorebank Intermodal Company

Strategic Traffic Modelling for Moorebank Intermodal Terminal

26 September 2014

PARSONS BRINCKERHOFF
A BALFOUR BEATTY COMPANY

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1. Introduction

The Moorebank Intermodal Terminal (IMT) Project (the Project) involves the construction and operation of an IMT and associated commercial facilities and warehousing on a site of approximately 220 hectares. The development includes a rail connecting spur to the planned Southern Sydney Freight Line (SSFL) and road entry and exit points from Moorebank Avenue.

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

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

The Project site is currently largely occupied by the Department of Defence's (Defence) School of Military Engineering (SME). Under the approved Moorebank Units Relocation (MUR) Project, the SME is planned to be relocated to Holsworthy Barracks by mid-2015, which would enable the construction of the Project to commence.

The key features/components of the Project comprise:

- *an IMEX freight terminal* – designed to handle up to 1.05 million TEU per annum (525,000 TEU inbound and 525,000 TEU outbound) of IMEX containerised freight to service 'port shuttle' train services between Port Botany and the Project;
- *an Interstate freight terminal* – designed to handle up to 500,000 TEU per annum (250,000 TEU inbound and 250,000 TEU outbound) of interstate containerised freight to service freight trains travelling to and from regional and interstate destinations; and
- *warehousing facilities* – with capacity for up to 300,000 square metres (m^2) of warehousing to provide an interface between the IMT and commercial users of the facilities such as freight forwarders, logistics facilities and retail distribution centres.

The proposal concept described in the main EIS (refer Chapters 7 and 8) provides an indicative layout and operational concept for the Project, while retaining flexibility for future developers and operators of the Project. The proposal concept is indicative only and subject to further refinement during detailed design. The EIS considers three rail access options for the site.

1.1 Project location and study area

The Project is situated in the Sydney suburb of Moorebank; NSW located approximately 35 km south west from the centre of Sydney and approximately 2 km south of Liverpool CBD. It is located in the Liverpool City Council (LCC) Local Government Area (LGA). The site is bounded by Moorebank Avenue to the east, the East Hills Railway Line to the south, the Georges River to the west and the ABB (a power and automation technology manufacturer) and the M5 South Western Motorway to the north. The M5 provides access to other Sydney motorways, with the M7 interchange approximately 5 km by road west of the proposed site.

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

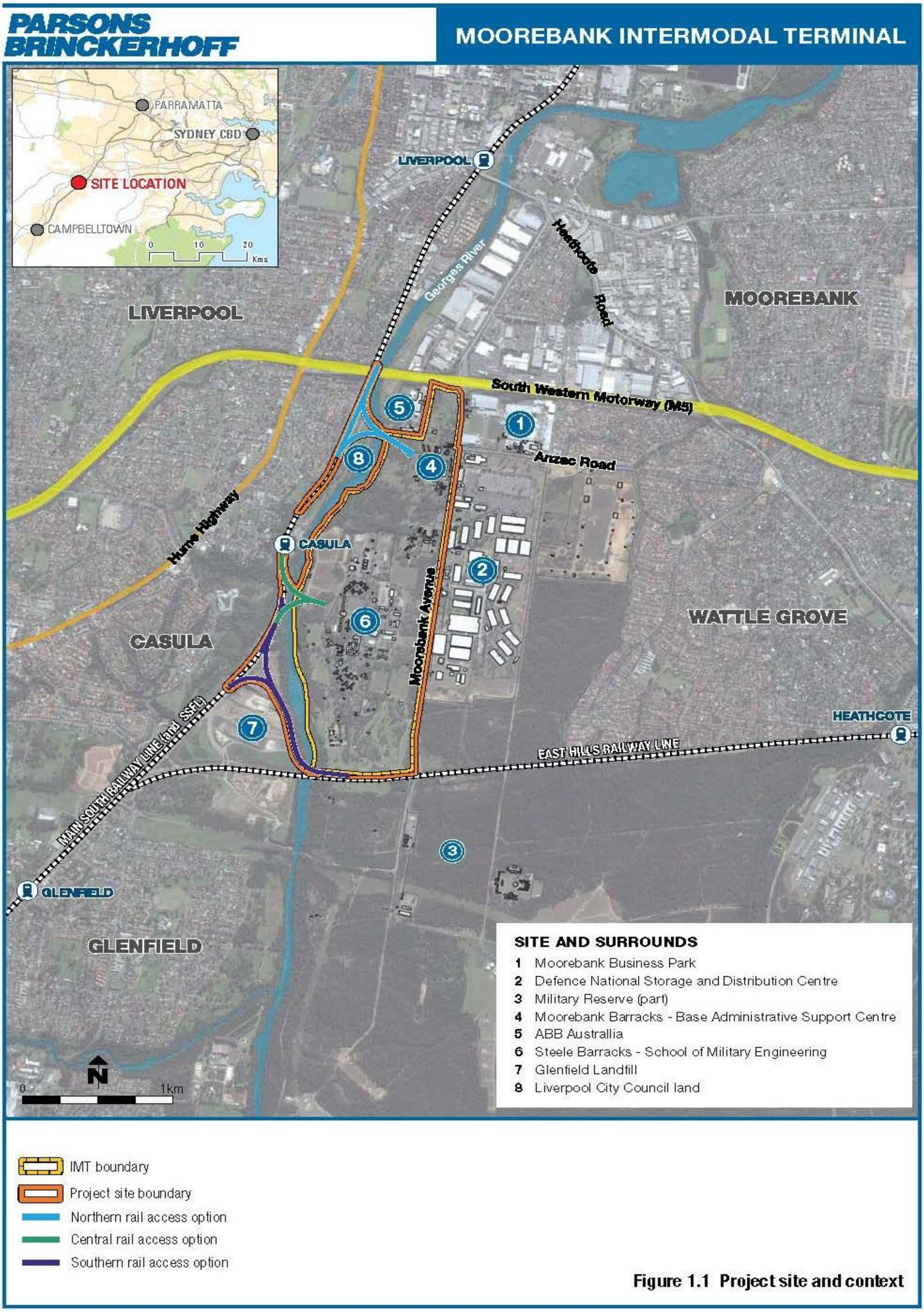


Figure 1.1 Project site and context

1.2 Strategic modelling scope

This report describes the strategic modelling which has been undertaken to provide forecasts input for the transport and accessibility impact assessment. The key output from the strategic model is the changes in the level of articulated truck movements on the local and the wider strategic road network as a consequence of the Project. The strategic level changes are to be based on the differences between the 'Project Case' compared to 'Base Case' scenarios which represents the operation of the road network with and without the Project.

Since the reduction of trucks vehicle kilometres on the roads is one of the projects main goals, the extent to which this goal could be achieved is investigated and reported. This is based around the premise that the Moorebank IMT is an effective means for managing future growth in congestion.

The wider operation of the network can be assessed by considering the metrics of vehicle kilometres travelled (VKT) and vehicle hours travelled (VHT) that together represent the change in usage of the road network. The strategic modelling considers the operation of the Moorebank IMT for the following:

- Planning years (2018 and 2030)
- Time periods (Two hours AM peak , and total daily)
- Class of vehicles (Articulated trucks, and background traffic)
- Traffic on impacted corridors including the M5,M7,and F3 motorways as well as Hume Highway/Cumberland Highway, Foreshore Road, General Holmes Drive and Pennant Hills Road

2. Existing strategic models

2.1 Introduction

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

The travel demand sources available to the study include:

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

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

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

These four data sources are outlined in Table 2.1.

Table 2.1 Strategic model components

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

These data sources have all been developed with the same geographic coverage and modelling zoning system (2006 travel zones) to provide a compatible set of travel demand trip tables. An overview of each of these models is provided in the following sections.

2.2 Sydney Strategic Travel Model

The Sydney Strategic Travel Model (STM) is a State Government model that is owned and operated by BTS an independent entity with TfNSW. The STM has been developed over the last 15 to 20 years to represent the movement of people in Sydney Greater Metropolitan Area (GMA), Newcastle and Illawarra. The study area encompasses nearly 5.5 million people (2010) and represents some 20 million trips on a typical weekday (2010).

The STM is the States Government strategic forecasting tool used to support the evaluation of:

- Major infrastructure changes;
- Different population/employment growth and distribution scenarios;
- Service change;
- Pricing change; and
- Policy change.

The STM currently contains a series of demographic and behavioural models which collectively produce estimates of home based travel by travel purpose. The key attributes of the STM are as follows:

- Travel demand is modelled as person tours
- Tour-based models reflect the relationships and constraints between individual trips in terms of mode and destination choices.
- A tour in the STM is any travel from home to a primary destination and back to home. For example, while most employed people will only have one work tour on a working day, those who return home for lunch will have two tours. The Household Travel Surveys (HTS) indicates that in 92% of cases, the outward and return leg of a work tour are symmetrical in terms of mode, so for modelling purposes, symmetry is assumed.
- The tours modelled in the STM do not include any side trips made along the way, and any non-home-based tours. For example, someone on the way to work may drop off children at the school, then, during work may go to a meeting at another location then back to the primary work place, and after work may go shopping before returning to home. These side trips are currently modelled in the STM for car driver mode by factoring the tours by purpose using factors based on the HTS.

The model is implemented in two stages as follows:

- Population Model – the population is segmented into groups based on socio-demographics that influence travel choices, as well as on the basis of car ownership and licence holding. These segments are grown into the future based on population, employment and other projections and trends. This segmentation occurs at the model wide level and the travel zone level.
- Travel Model – a series of travel models in EMME have been developed that represent travel by purpose, of travel frequency, mode and destination choice, calibration based on the Journey-to-Work and HTS data, addition of freight movements, and assignment of travel to the road and public transport networks.

The process is further documented in the ‘Sydney Strategic Travel Model (STM) – Modelling future travel patterns – February 2011 Release – Bureau of Transport Statistics.

The net result of the process is that the STM together with the LCVM and FMM provide traffic forecasts for vehicles on the road network. This demand is estimated at a 24 hour level and then is allocated to four model time periods as follows:

- AM peak (0700-0900)
- Inter peak (0900-1500)
- PM peak (1500-1800)
- Evening/night time period (1800-0700)

The STM has been supplied to the study from BTS and the assumptions relating to this model are detailed in Appendix A.

The STM was supplied with a 2011 base year and future networks for 2016 to 2041 in five year increments. Table 2.2 lists the changes that the STM road network should contain as per the documentation supplied with the model. It is noted that the form/alignment of some of the projects identified in Table 2.2 may differ from the latest planning documentation and this is because the detailed investigations around these projects are still underway.

Table 2.2: Official network changes

Year	Road	Detail
2016	Hunter Motorway	Four-lane expressway from F3 to Branxton
	M2 widening	Widening from Windsor Road to Delhi Road
	M5 widening	Widening Camden Valley Way to King Georges Road
	Western Sydney Employment Hub	Link Roads to the M7 Motorway
	Great Western Highway widening	Widening the highway to four/three lanes between Emu Plains and Mount Victoria.
	South West Rail Link via East Hills	There are some changes to the road network around Edmondson Park that are likely to be related to this project (i.e. links to rail stations, etc.).
2021	WestConnex Stage 1: M5 East Duplication	Duplication from M5 East to King Georges Road It is noted that the changes included in the 2021 network extend to parts of the WestConnex project beyond the M5 East duplication such as the Sydney Airport Access Link, etc (as per the WestConnex – Sydney's next motorway priority, October 2012, RMS document).
	North West Rail Link to Rouse Hill	There are changes to the 2021 model road network around Kellyville which is likely to be associated with this project.
2026	WestConnex Stage 2: M4 Extension and M4 Widening	M4 widening and extension from Parramatta to Haberfield
	NW Growth Centre	The 2026 model road network includes changes to links in the area to the north west of the M7 which are likely to be related to this project.
2031	M2 to F3 Tunnel	Connection between M2 and F3 at Wahroonga
	SW Growth Centre	This is seen in the model as various network changes (i.e. new links, upgraded links, etc) to the west of the Hume Highway and the M7.

The changes between each of the forecast years are shown in Appendix B. However there are changes to the road network which are not covered in Table 2.2 (i.e. not discussed in the documentation provided with the model). The most notable of these changes is the extension of Cambridge Avenue to Campbell Town Road which first appears in 2026 and is also present in the 2031 network. This is the only change that is likely to have a significant bearing on the results of the investigations relating to the Moorebank Intermodal Terminal Development. Discussions with Roads and Maritime Services Indicate that this extension is not currently part of the future 2031 network. Therefore the modelling undertaken for this study has removed this extension from the model network.

2.3 Sydney Light Commercial Vehicle Model

Similar to the STM the Sydney Light Commercial Vehicle Model (LCVM) is owned and operated by BTS an independent entity within TfNSW. The model has been developed ton the same premise as the STM as a strategic forecasting tool used to support the evaluation of transport interventions.

The LCVM produces light commercial vehicle demand based on the Austroads vehicle classes 1 and 2 that relate to light commercial vehicle movements such as delivery vans. The model coverage is the same as the STM and includes the Sydney Greater Metropolitan Area (GMA), Newcastle and Illawarra. The model is calibrated to a 2011 base year, and produces forecasts at five yearly intervals to 2046. To maintain consistency, the LCVM is based around the 2006 travel zone system and utilises the same population and employment data as the STM.

The LCVM is based on a trip attraction / production modelling combined with a trip distribution model. The trip attraction model is based on the zonal level details for

- household forecasts based on August 2012 Release: BTS Population Forecasts
- employment forecasts based on August 2012 Release: BTS Employment Forecasts
- trip attraction rates for households, office, industrial, retail and hospitality based on Service Vehicle Attraction Rate study, 1999 (SVAR)and the LCV Trip Attraction Rates study, 2009 (LTAR)

The trip production is based on assuming the over a 24 hour period that each zones produces the same numbers as it attracts. The trip distribution model is based on a gravity model that uses the trips attracted and produced by each zone in conjunction with a friction factor that combines travel times with calibrated parameters that align with the trip distribution observed in the base year. The 24 hour trip matrices are converted to the four model periods based factors derived from the LCV Trip Attraction Rates study, 2009 (LTAR).

Table 2.3 Time period factors in LCVM

	AM peak (0700-0900)	Inter peak (0900-1500)	PM peak (1500-1800)	Evening / Night Time (1800-0700)
Proportion of 24 hour demand	0.16	0.61	0.13	0.10

Due to the nature and to some extent ambiguities of LCVs, there is a risk of double-counting, since the STM car demand actually includes ‘some’ LCV trips in its estimates of total travel movements, through the data provided from the Household Travel Survey (HTS). While this HTS data for LCVs provides a wealth of detailed information for use in the STM, it does not necessarily provide the most accurate estimate of total LCV movements. Fundamentally, the HTS sample is household (not business) based and the survey expansion variables used are designed to optimize the accuracy of trips for personal (not business) travel. With the February 2014 release of LCVM forecasts, BTS compared the 2011 base year LCVM estimates with HTS estimates. The key finding from this analysis was that, for 2011, the HTS captured 35% of total LCV movements. As a result, the LCVM estimates should be factored by 0.65 (65%) to take into account the overlap in travel demand in the LCVM matrices with the STM car demand. Further details of the LCVM as provided by BTS are provided in Appendix A.

2.4 Sydney Freight Movement Model

Similar to the STM the Sydney Freight Movement Model (FMM) is owned and operated by BTS an independent entity within TfNSW. The model has been developed ton the same premise as the STM as a strategic forecasting tool used to support the evaluation of transport interventions.

The FMM produces heavy commercial vehicle demand based on the splitting demand between rigid and articulated vehicles. The model coverage is the same as the STM and includes the Sydney Greater Metropolitan Area (GMA), Newcastle and Illawarra. The model is calibrated to a 2011 base year, and produces forecasts at five yearly intervals to 2036. To maintain consistency, the FMMs based around the 2006 travel zone system and utilise the same employment data as the STM.

The FMM consists of a number of sub-models as follows:

- Production (and consumption) models which estimate freight produced (and consumed) based on employment and other data.
- A two stage distribution model which estimates freight movements based upon distribution patterns between industry classes, and then between freight areas based on accessibility (employment and travel time).
- Freight vehicle trip models which estimate the number of trips of different mode types given this freight distribution.
- Vehicle assignment model based on assigned the vehicle demand onto the STM network, which estimate the volume of freight vehicles on road sections, given the freight vehicle trip distribution.

The assignment to the road network is based on allocating loads to either rigid or articulated heavy vehicles, which are then assigned to the road network. This method is used for the estimating of heavy goods movements across the strategic model area except for special generators.

The method is revised for special generators such as Port Botany. The movement of freight to and from Port Botany is driven by the growth of import and export activities which is projected to rise at rates above those for general freight movements. This has been recognised in the FMM together with the role of intermodal terminals have in servicing the movement of freight to and from Port Botany. The operation of Ports are typically measured in twenty-foot equivalent unit (TEUs) containers, with Port Botany set to expand from its current 2 million TEUs in financial year 2011/12 to over 7 million TEUs by 2031.

The assumed Port Botany of freight vehicle split between rigid and articulated, the level of back-loading and TEU's per truck are shown in Table 2.4.

Table 2.4 Vehicle characteristics – Port Botany

Vehicle characteristics	2011	2021	2031	2041
Rigid vehicle (% of Total HV)	9%	9%	9%	9%
Articulated vehicle (% of Total HV)	91%	91%	91%	91%
Back-loading	11.3%	13.8%	16.3%	18.8%
TEUs/Truck (laden movements)	2.04	2.14	2.16	2.18
TEUs/Rigid	1.00	1.00	1.00	1.00
TEUs/Articulated	2.14	2.25	2.27	2.30

The assumed level of daily operation and split of movements over the day for Port Botany in the FMM are shown in Table 2.5.

Table 2.5 Operational characteristics – Port Botany

Operational characteristics	2011	2021	2031	2041
Annual Operational Days	303	313	323	333
AM peak (0700-0900)	13.3%	13.3%	11.9%	9.2%
Inter peak (0900-1500)	41.1%	41.1%	37.3%	27.6%
PM peak (1500-1800)	15.0%	17.1%	16.8%	13.8%
Night time (1800-0700)	30.6%	28.6%	34.0%	49.4%

Port Botany is assumed to be serviced by rail using the following inter modal terminals, and the FMM also includes the other IMT (in addition to Moorebank):

- Minto (TZ2006 = 1261)
- Yennora (TZ2006 = 1826)
- Enfield (TZ2006 = 1598)
- Moorebank (TZ2006 = 1120)
- Eastern Creek (TZ2006 = 2185)

The locations of these zones in the model is shown in Figure 2.1.

Figure 2.1: Intermodal terminals

The articulated truck demand to and from the intermodal terminals in the FMM is shown in Table 2.6. The Moorebank IMT has significantly more truck movements than any of the other IMT's with Eastern Creek having the second highest volume of freight movements.

Table 2.6: 2031 FMM articulated truck totals to/from intermodal terminals

Site	Movement	AM peak (0700-0900)	Inter peak (0900-1500)	PM peak (1500-1800)	Evening / Night Time (1800-0700)	Daily Total
Minto	From	28	94	40	76	238
	To	29	97	39	79	244
Yennora	From	28	96	36	77	237
	To	25	88	39	70	222
Enfield	From	10	33	13	26	82
	To	9	33	14	27	82
Eastern Creek	From	44	151	60	121	376
	To	43	144	61	122	371
Moorebank	From	136	466	194	372	1,168
	To	139	476	190	379	1,184

Figures 2.2 and 2.3 show the distribution of articulated trucks from each of the intermodal terminals (IMT's) in the AM and PM peaks respectively in the FMM. These figures show that there is some overlap between the IMT catchments; Moorebank and Minto are the first and second most popular origins/destinations for freight in the model respectively. Freight movements to/from other intermodal terminals are significantly lower.

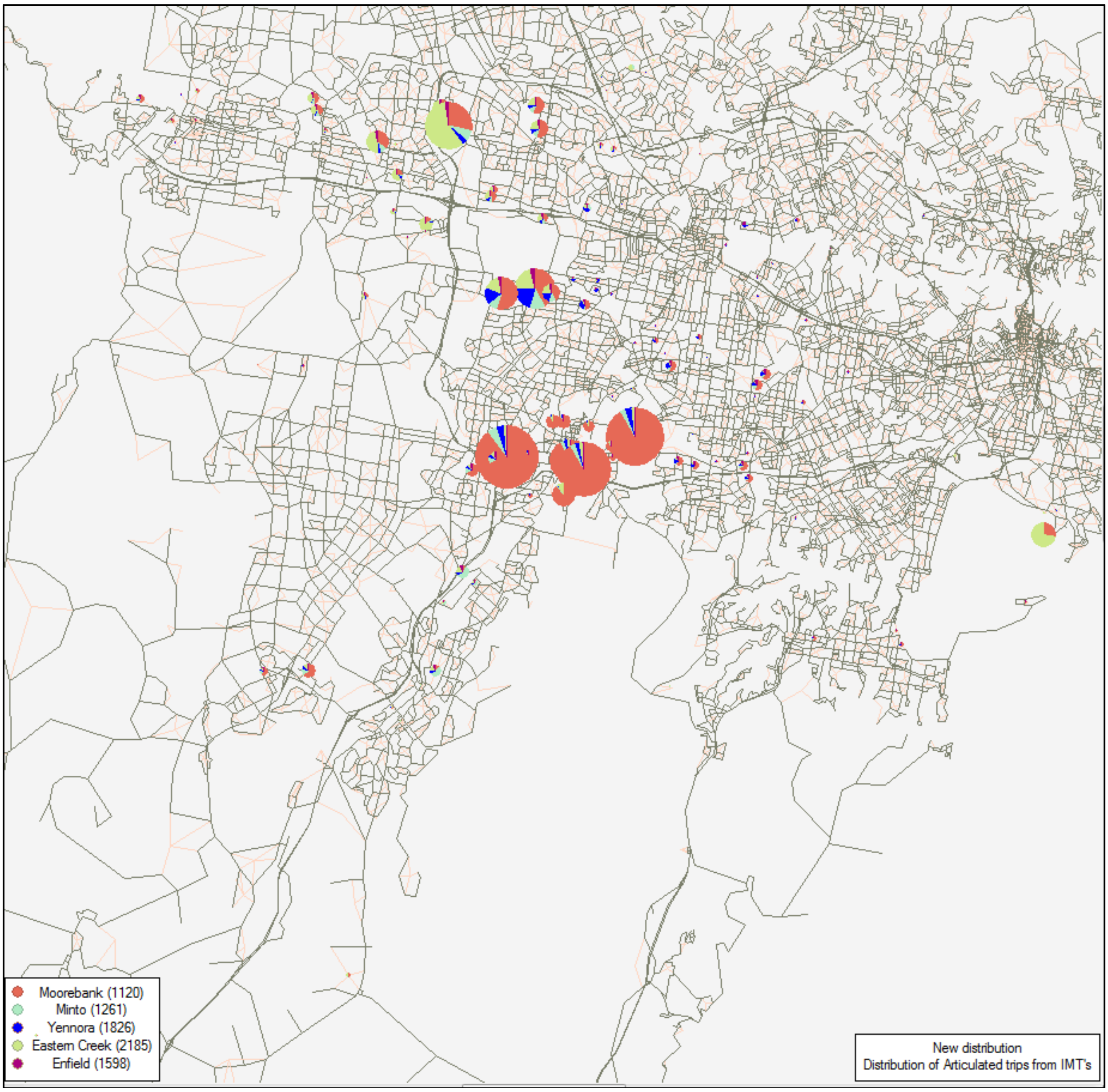


Figure 2.2: Distribution of articulated truck trips from the IMT's in 2031 AM peak

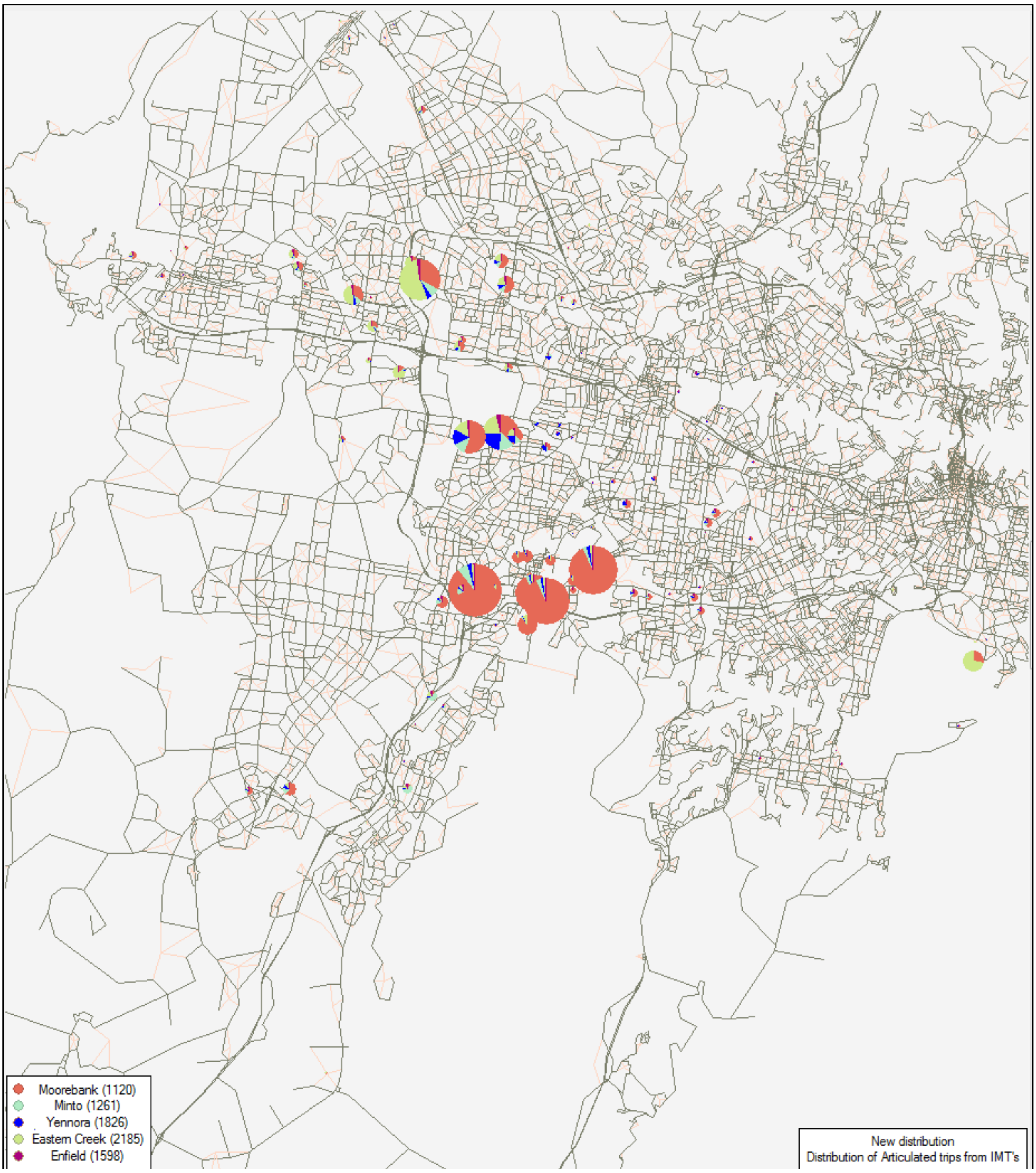


Figure 2.3: Distribution of articulated truck trips from the IMT's in 2031 PM peak

2.5 Summary of strategic models

The strategic models provided by BTS have been reviewed to identify the scale of trip making related to the model has a whole and specifically related to the movements to/from the zones representing the Moorebank IMT and Port Botany zones (i.e. Zone 1120 represents the Moorebank IMT and zones 426 and 556 represent Port Botany).

The scale of the trips for car, LCV, rigid and articulated trucks for the whole of the model and for movements to and from Moorebank and Port Botany are shown in Tables 2.6 to 2.9.

Table 2.7 STM Car/LCV trips in 2031

Movement	AM peak (0700-0900)	Inter peak (0900-1500)	PM peak (1500-1800)	Evening / Night Time (1800-0700)	Daily Total
Total Trips	2,419,566	4,591,602	3,738,389	3,473,856	14,223,413
From Moorebank	153	756	1,433	870	3,212
To Moorebank	1,246	861	335	774	3,216
From Port Botany	120	792	1,757	1,035	3,704
To Port Botany	1,584	948	302	858	3,692

Table 2.8 LCV trips in 2031

Movement	AM peak (0700-0900)	Inter peak (0900-1500)	PM peak (1500-1800)	Evening / Night Time (1800-0700)	Daily Total
Total Trips	171,851	655,183	139,629	105,658	1,072,320
From Moorebank	84	320	68	53	524
To Moorebank	83	320	69	50	522
From Port Botany	99	378	80	63	619
To Port Botany	97	380	81	63	620

Table 2.9 FMM Rigid truck trips in 2031

Movement	AM peak (0700-0900)	Inter peak (0900-1500)	PM peak(1500-1800)	Evening / Night Time (1800-0700)	Daily Total
Total Trips	45,391	147,390	57,329	81,411	331,521
From Moorebank	60	323	125	177	684
To Moorebank	101	329	126	183	738
From Port Botany	95	263	132	402	891
To Port Botany	119	389	149	212	868

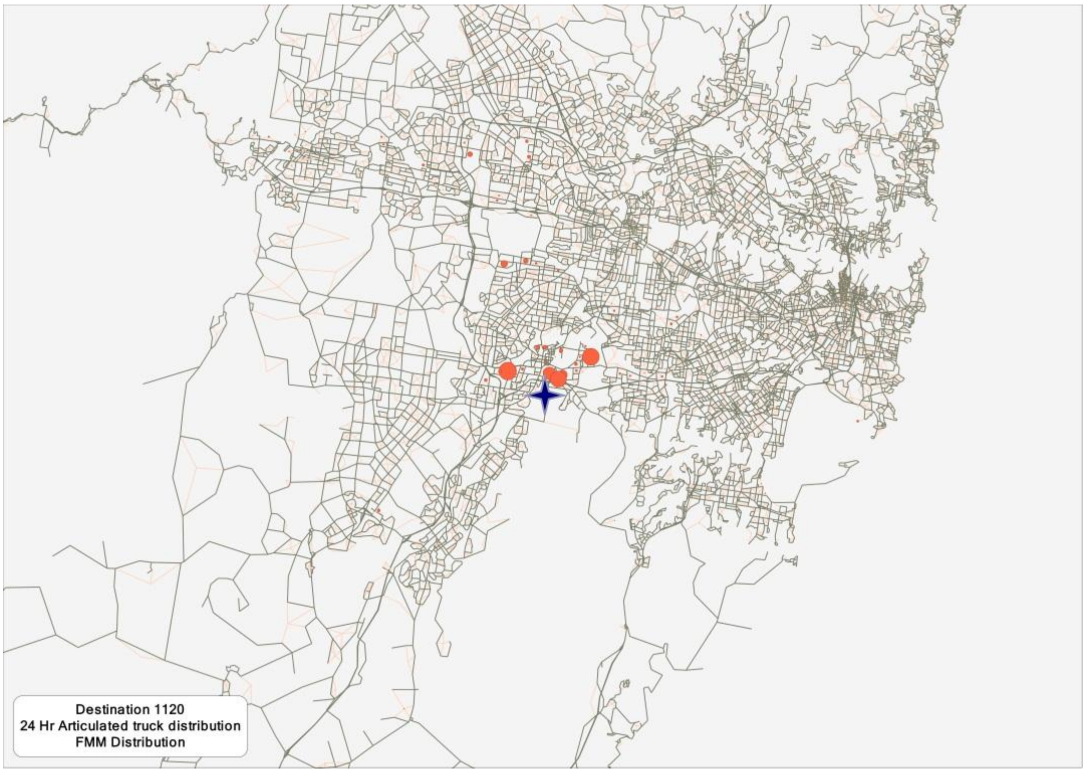
Table 2.10 FMM Articulated truck trips in 2031

Movement	AM peak (0700-0900)	Inter peak (0900-1500)	PM peak (1500-1800)	Evening / Night Time (1800-0700)	Daily Total
Total Trips	17,463	59,203	24,377	48,956	149,998
From Moorebank	136	466	194	373	1,168
To Moorebank	139	476	190	379	1,184
From Port Botany	786	2,187	1,097	3,344	7,414
To Port Botany	836	2,860	1,209	2,287	7,192

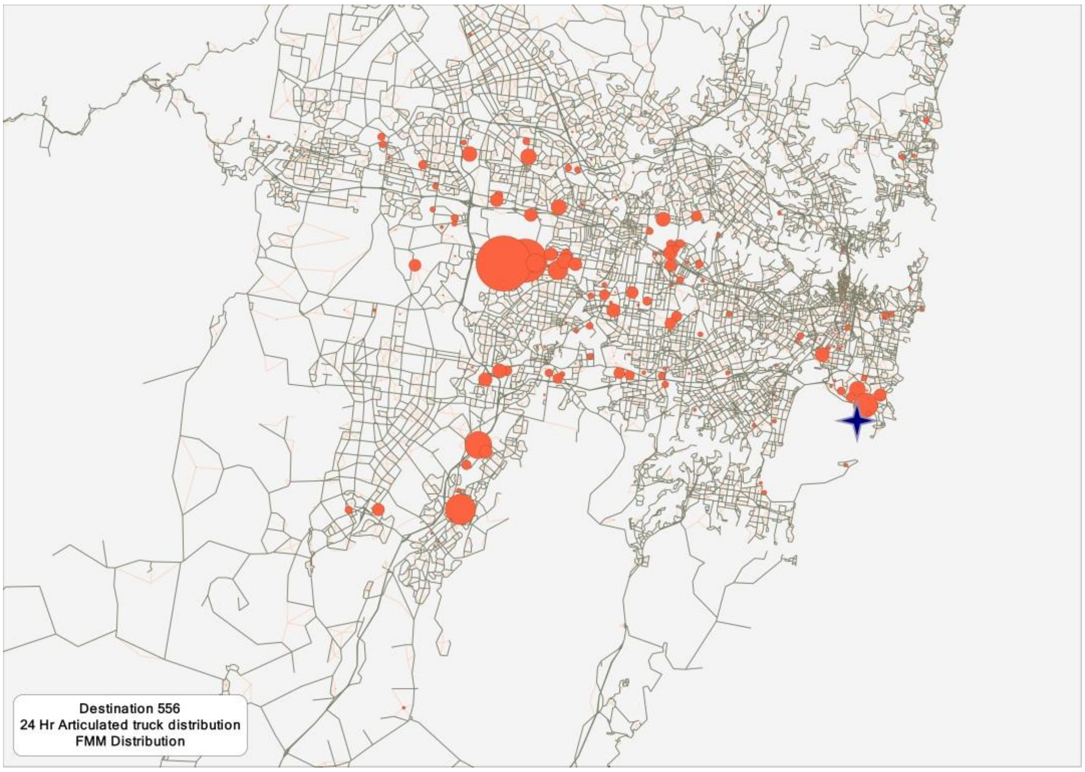
The daily distribution of origins and destinations for articulated trucks to and from Moorebank and Port Botany as represented in the 2031 FMM matrices are shown in Table 2.10. The distribution of articulated trucks to and from the Moorebank zone in the FMM is localised and generally relates to locations within 2 to 3 kilometres of the intermodal terminal. The distributions of articulated trucks to and from the Port Botany zone in the FMM has a wider distribution (than for Moorebank) across the greater Sydney area, and many of the articulated truck trips travel between the industrial precinct at Wetherill Park (just north of Moorebank IMT) and Port Botany.

Table 2.11: FMM Distribution of articulated truck trips to/from Port Botany and Moorebank

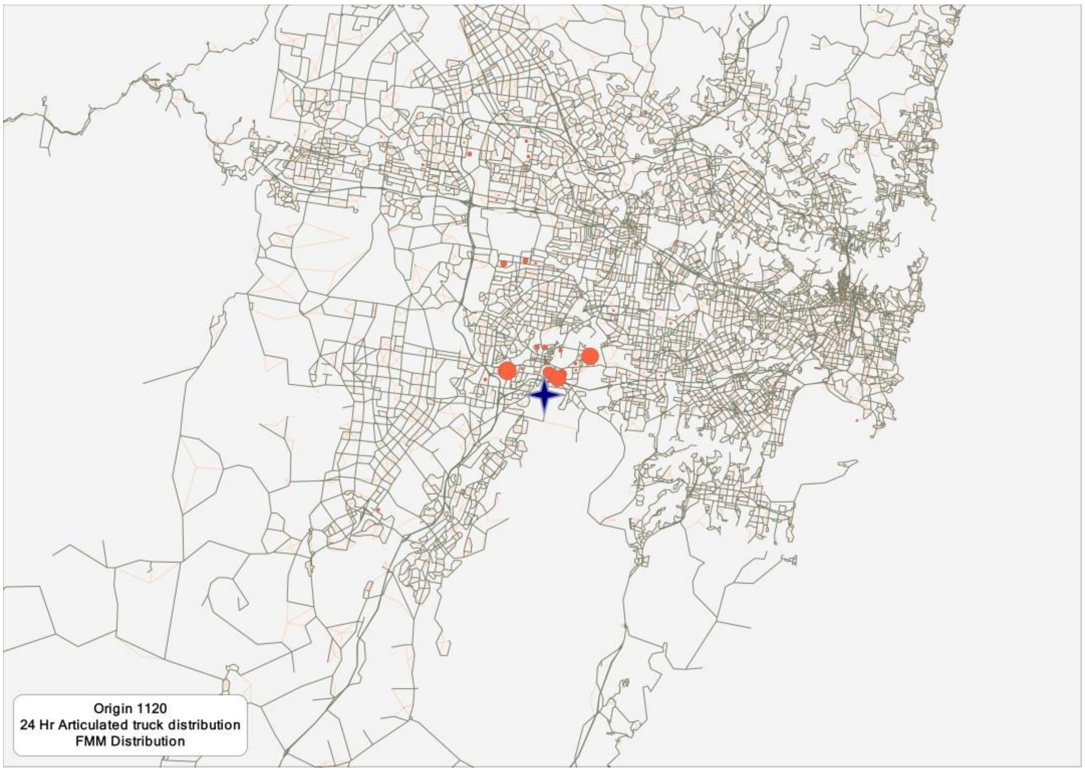
To Moorebank



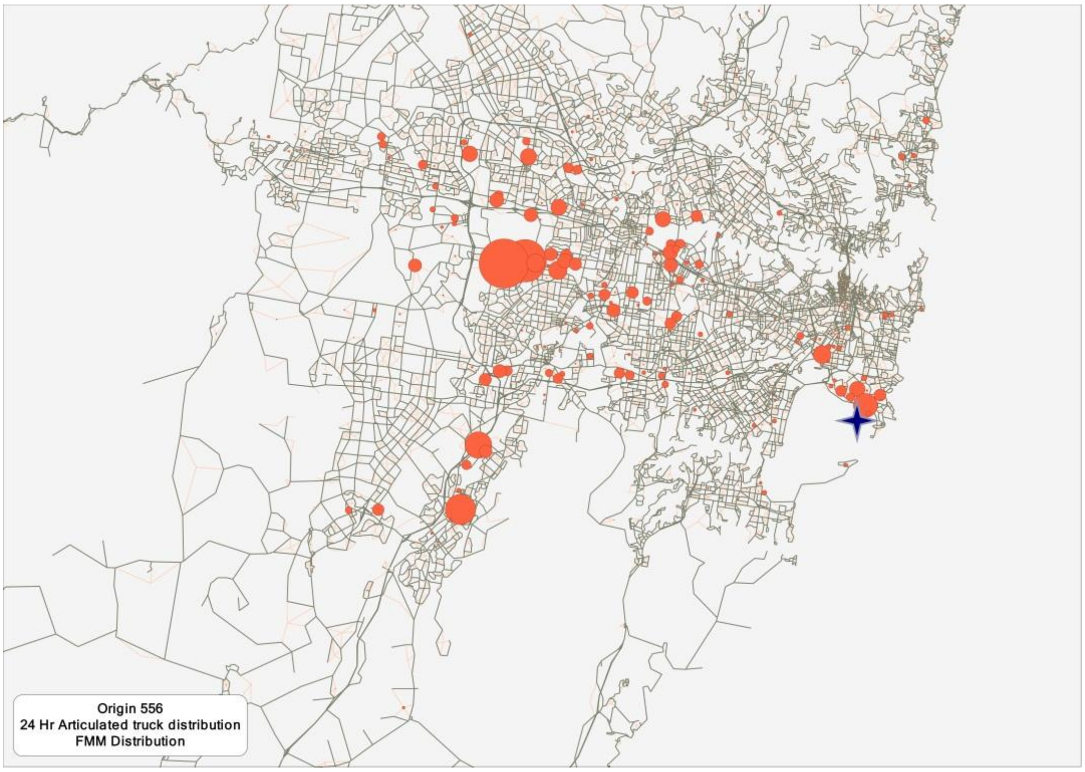
To Port Botany



From Moorebank



From Port Botany



3. Articulated truck demand

3.1 Introduction

The strategic models provide the framework for the analysis of the strategic traffic changes relating to the provision of the Moorebank Intermodal Terminal Project.

Deloitte were commissioned to undertake the task of determining the impact of the opening of Moorebank Intermodal terminal and assess the resulting articulated truck movements to and from Port Botany and Moorebank. To carry out this task Deloitte employed economic modelling to project future import and export demand and distribution across the Sydney metropolitan area. The information supplied related to the following scenarios:

- 'Base Case' : Port Botany operating without Moorebank Intermodal Terminal
- 'Project Case' : Port Botany operating without Moorebank Intermodal Terminal

The level of import and export activity is outlined below together with the related truck movements.

3.2 Import and export demand

The assumed level of import and export activity on the road network related to the port and Moorebank Intermodal Terminal is summarised in Table 3.1.

Table 3.1 Import and export demand road based TEUS/year

Scenario	2018	2020	2025	2030	2035	2040
'Base Case'						
Port Botany	1,574,677	1,787,546	2,414,936	3,206,501	4,205,204	5,465,247
'Project Case'						
Port Botany	1,468,186	1,368,107	1,366,106	2,157,671	3,156,374	4,416,417
Moorebank	106,491	419,439	1,048,830	1,048,830	1,048,830	1,048,830
Total	1,574,677	1,787,546	2,414,936	3,206,501	4,205,204	5,465,247
Supplied by Deloitte – Appendix C provides the distribution of TEU locations by Local Government Area						

This demand is assumed to be distributed on to the road network with both Port Botany and Moorebank operating 7 days per week and for 50 weeks a year resulting in yearly TEUs being divided by 350 to give daily operations.

The level of TEUs shown in Table 3.1 were then converted to truck movements based on allocating loads to articulated and B-Double trucks. This was undertaken by Deloitte's and supplied to Parsons Brinckerhoff in the form of truck movements specific to Port Botany and Moorebank for the 'Base Case' and 'Project Case' scenarios as shown in Table 3.2.

Table 3.2 Daily Truck Movements – Round Trips

Scenario	Vehicle Type	2018	2020	2025	2030	2035	2040
'Base Case'							
Port Botany	Semi-trailer	1,566	1,892	2,402	3,190	4,183	5,436
	B-Double	696	790	1,068	1,418	1,859	2,416
	Total	2,262	2,682	3,470	4,608	6,042	7,852
'Project Case'							
Port Botany	Semi-trailer	1,460	1,361	1,359	2,146	3,140	4,393
	B-Double	649	605	604	954	1,395	1,953
	Total	2,109	1,966	1,963	3,100	4,535	6,346
Reduction to Port Botany		153	716	1,507	1,508	1,507	1,506
Moorebank	Semi-trailer	127	499	1,248	1,248	1,248	1,248
	B-Double	21	83	208	208	208	208
	Total	148	582	1456	1456	1456	1456
Total	Semi-trailer	1,587	1,860	2,607	3,394	4,388	5,641
	B-Double	670	688	812	1,162	1,603	2,161
	Total	2,257	2,548	3,419	4,556	5,991	7,802

Supplied by Deloitte, Appendix C provides the distribution of daily truck movements by Local Government Area

Note: 1 round trip results in the trip matrices of 1 trip to the site and 1 trip from the site.

The forecast truck movements supplied by Deloitte does not align with the strategic model years and therefore the demand in Table 3.2 for 2030 and 2035 has been interpolated to estimate truck movements in 2031. Since the Moorebank Intermodal Terminal import and export movements remain unchanged from 2025 the interpolation only applies to movements relating to Port Botany. The daily truck movements in Table 3.2 have been incorporated as articulated trips within the FMM trip matrices for the assignment process by replacing the original trips with the quantum and distribution defined by Deloitte. The remaining articulated trip movements remain unchanged.

3.3 Interstate demand

The Moorebank Intermodal Terminal is assumed to capture the interstate movements from Chullora once it closes from 2030 onwards. In the 'Base Case' it is assumed that Chullora continues to operate with a capacity of 350,000 TEUs per annum. In the 'Project Case' case it is assumed that Chullora closes from 2030 and that the freight activities transfer to Moorebank. The level of truck trips related to the transfer of the interstate traffic to Moorebank is as follows:

- 410 daily truck movements in 2030
- 430 daily truck movements in 2035
- 460 daily truck movements in 2040

The road based freight trips that service Chullora are assumed to move to Moorebank with the distribution remaining the same as those used in the FMM when Chullora was operational.

3.4 Background traffic

Other vehicles utilise and impact on the operation of the road network. This is known as the background traffic since it does not change with respect to the 'Base Case' and 'Project Case' scenarios. This traffic is comprises cars, LCVs, rigid and articulated goods vehicles. This traffic has been sourced from the STM, LVC and FMM trip matrices and is assigned to the road networks provided.

3.5 Time profile

The strategic modelling for the project has utilised the time periods that are compatible with the STM structure which is based on modelling the travel demand for the following four time periods:

- AM peak (0700-0900)
- Inter peak (0900-1500)
- PM peak (1500-1800)
- Evening/night time period (1800-0700)

The Moorebank Intermodal Terminal is expected to operate 24 hours per day from 2030 onwards.

To distribute the total daily volume of IMEX traffic to/from Port Botany and Moorebank specified by Deloitte across the four model time periods, it was assumed that these distributions would follow the same pattern as IMEX traffic to/from Port Botany across the time periods in the FMM model (see Table 3.3).

Table 3.3 FMM distribution of articulated trips to/from Port Botany across time periods

	AM Peak	Inter-peak	PM Peak	Evening period
From Port Botany	11%	29%	15%	45%
To Port Botany	11%	40%	17%	32%

Interstate traffic was assumed to have a uniform hourly arrival/departure profile. This was due to the longer distances that interstate trucks are required to travel and the greater likelihood that the arrival/departure of these trucks would be more random (and therefore equally likely to occur at any time of the day) than traffic travelling from within the Sydney area.

Background traffic is assumed to have the time profiles as defined in the strategic models.

3.6 Truck distributions for Port Botany and Moorebank

The truck distribution for the movement of freight to Port Botany and Moorebank as presented in Tables 3.1 and 3.2 is based on the following assumptions.

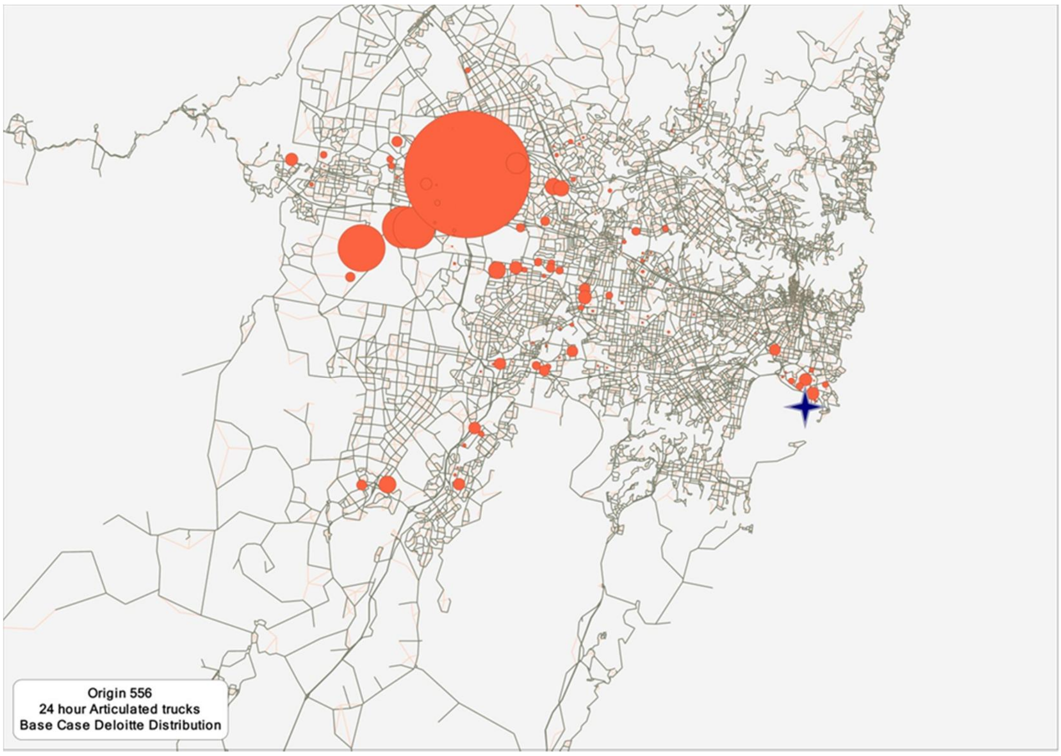
- Import and export movements are to be based on the demand split defined by Deloitte for each of the Local Government Areas (LGA) within the Sydney Greater Metropolitan Area (GMA).
- For the six of the LGA's with the highest proportion of trips to/from Moorebank (i.e. Penrith, Blacktown, Liverpool, Fairfield, Campbelltown and Camden) a further breakdown by postcode was provided by Deloitte. Details of this breakdown by postcode are provided in Appendix D.
- Within each LGA (or postcode where provided) it is assumed that the trips are spread across each of the Travel Area Zones (TAZ) in line with the FMM distribution.

- Interstate trucks are assumed to have the ultimate trip end (origin/destination) that reflect the FMM forecast share for the Chullora facility.

The daily distribution of truck movements to and from Port Botany in the 'Base Case' scenario is shown in Table 3.4, while for the 'Project Case' scenario is shown in Table 3.5 and 3.6 for Port Botany and Moorebank. These distributions relate to the movement of truck trips to the strategic model zone.

Table 3.4: 'Base Case' articulated truck distributions to/from Port Botany

From Port Botany



To Port Botany

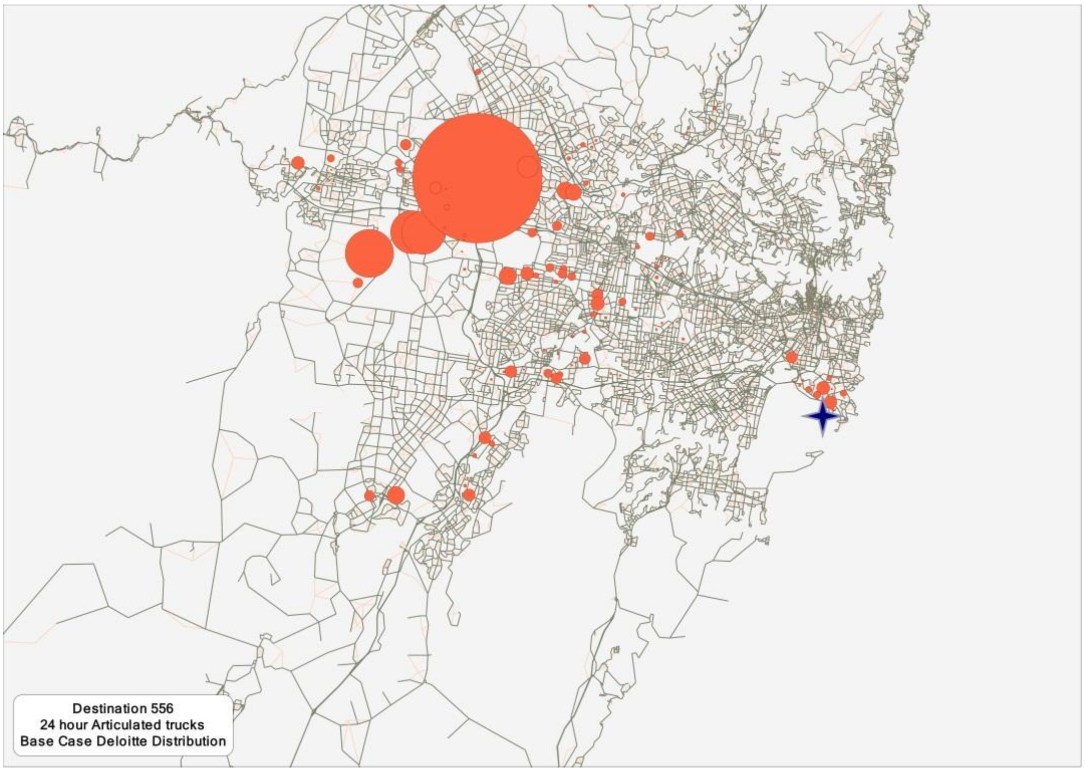
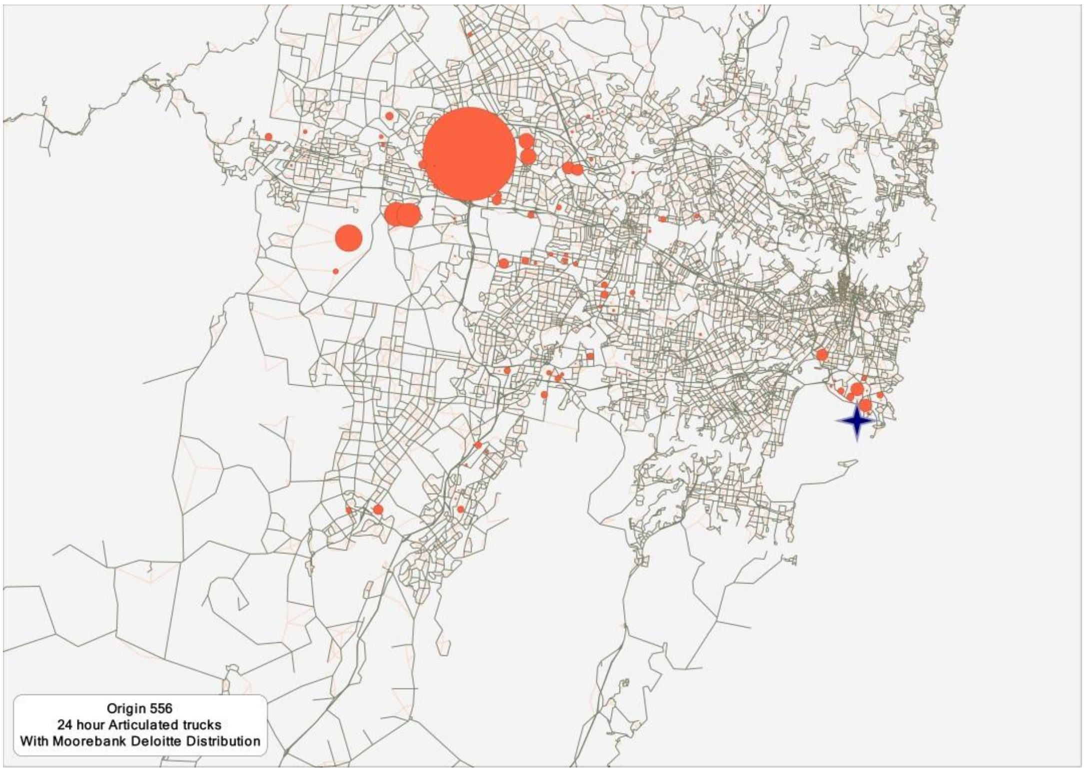


Table 3.5: 'Project Case' articulated truck distributions to/from Port Botany

From Port Botany



To Port Botany

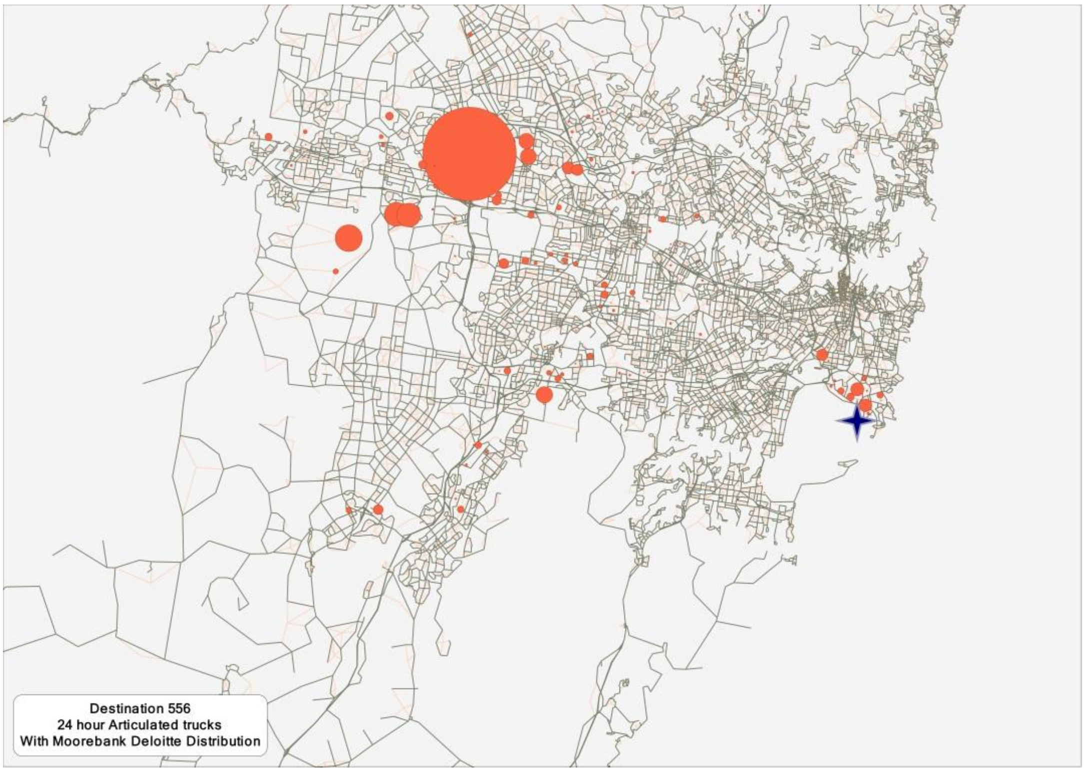
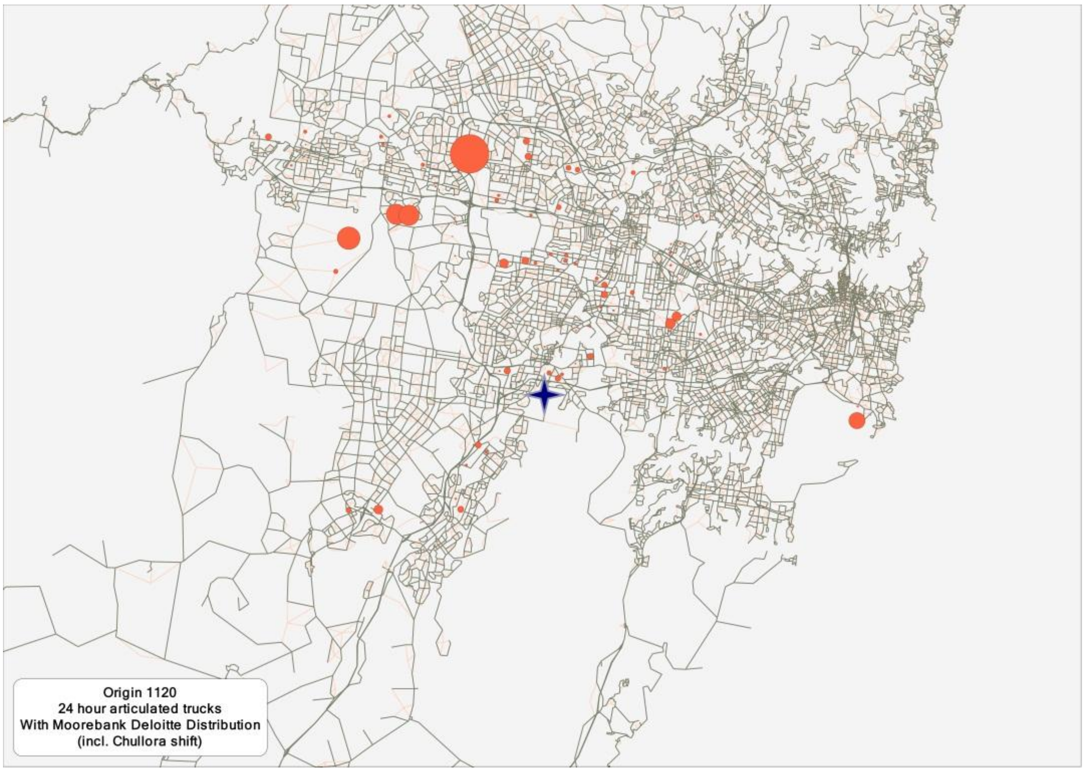
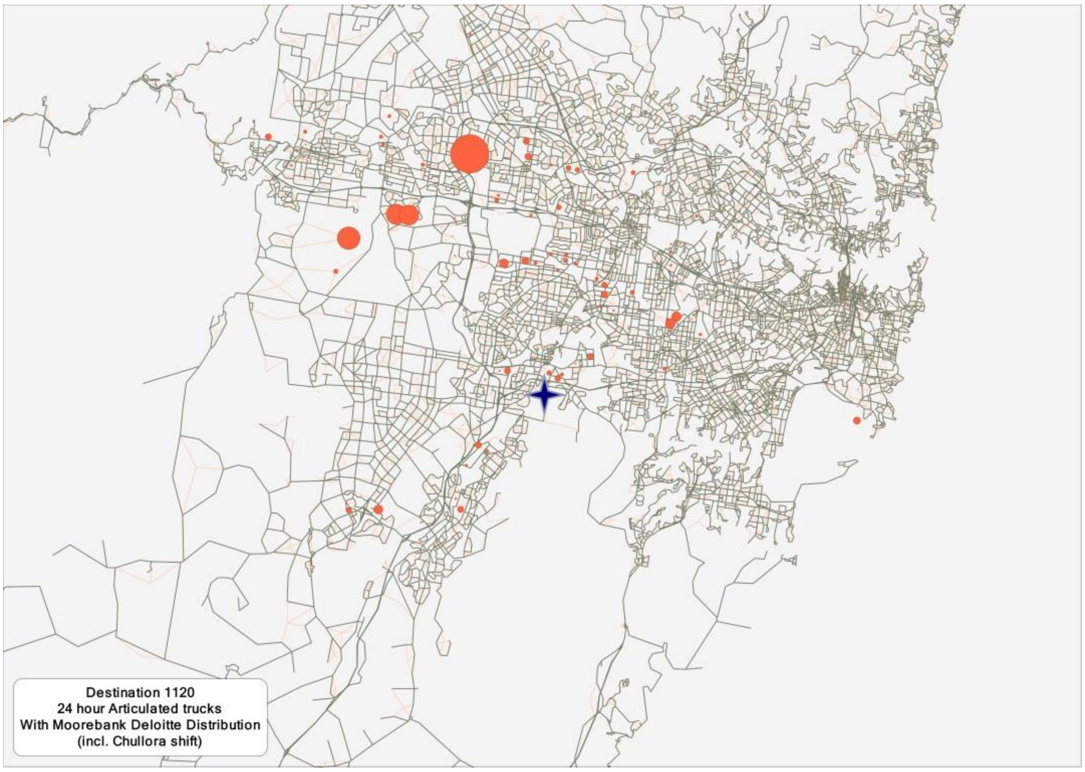


Table 3.6: 'Project Case' articulated truck distributions to/from Moorebank

From Moorebank



To Moorebank



4. Strategic network performance

4.1 Introduction

Performance of the strategic network in the ‘Base Case’ and ‘Project Case’ scenarios has compared using the following metrics:

- Network wide performance based vehicle kilometres and hours travelled
- Key corridor flows on the following roads:
  - M5 Motorway
  - M7 Motorway
  - Foreshore Road / Botany Road
  - General Holmes Drive
  - M2 Motorway
  - Pennant Hills Road
  - M1 Motorway (to Newcastle)
  - Hume and Cumberland Highway

The key corridors are shown in Figure 4.1.

4.2 Network performance

The performance of the whole network can be assessed by considering the vehicle kilometres and hours travelled in each of the assignments by the users of the road network. Table 4.1 and 4.2 compares the vehicle kilometres travelled (VKT) and vehicle hours travelled (VHT) across the modelled network by class of vehicle and time period for the ‘Base Case’ and ‘Project Case’.

The results in indicate that:

- the ‘Project Case’ results in a decrease in both VKT and VHT across the network as a whole compared to the ‘Base Case’, with most of the reductions seen in articulated truck movements. Although articulated truck trips to and from Port Botany see the greatest reduction in VKT and VHT, other (i.e. background) articulated truck traffic are also expected to see decreases in VKT and VHT under the ‘Project Case’.
- on an average weekday the implementation of the ‘Project Case’ results in a reduction of 45,460 vehicle kilometres travelled and 3,800 vehicle hours travelled by all vehicles across the network
- on an average weekday the implementation of the ‘Project Case’ results a reduction of articulated truck vehicle kilometres travelled of 36,185 and 670 fewer vehicle hours travelled.
- assuming that Port Botany and Moorebank operate for 350 days per year this is an annual reduction of 12,665,365 vehicle kilometres and 234,160 vehicle hours travelled by articulated trucks to and from Port Botany and Moorebank. (This annual savings calculation is an approximation based on applying the calculation of savings on an average weekday to 350 days, but it is noted that only a maximum of 260 will be working days. However it is not possible to determine the impact of the project on non-working days as the strategic models are setup to model an average weekday.)

It is noted that while there appears to be a slight increase in VKT for rigid trucks and cars/LCV under the ‘Project Case’, these modes see reductions in VHT under the ‘Project Case’. This is likely to be the result of rerouting of car/LCV and rigid truck movements in the ‘Project Case’ scenario model to use routes that are longer but require less time.

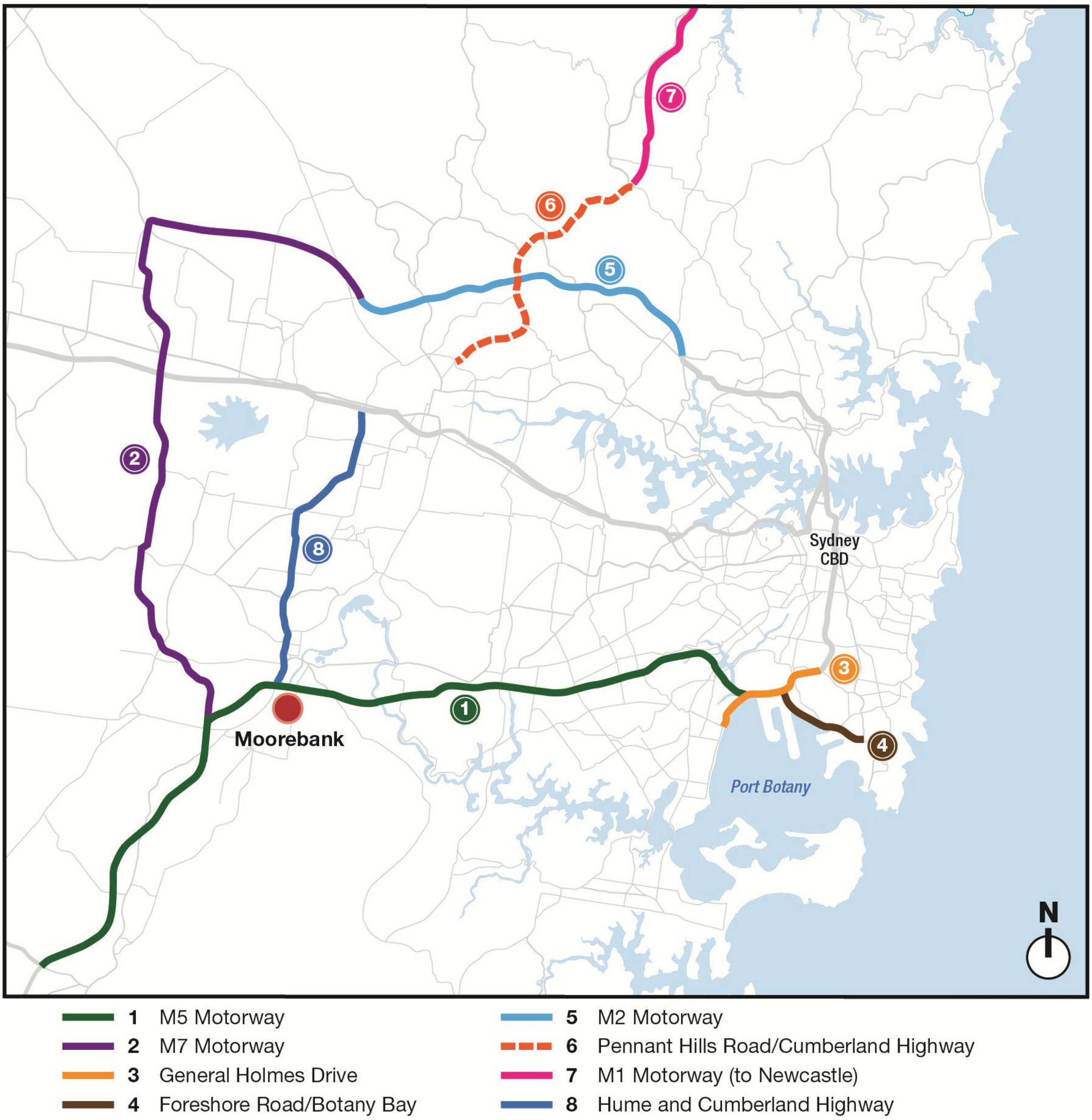


Figure 4.1 Strategic assessment corridors

Table 4.1 Comparison of vehicle kilometres travelled in 2031

Scenario		AM peak (0700-0900)	Inter peak (0900-1500)	PM peak (1500-1800)	Evening / Night Time (1800-0700)	Daily Total
'Base Case'						
Back'd	Cars/LCV	26,372,160	44,427,270	35,339,960	32,255,885	138,395,280
	Rigid	1,081,310	3,498,060	1,365,460	1,948,635	7,893,460
	Articulated	707,500	2,412,920	984,585	1,936,065	6,041,070
Port Botany	Articulated	42,840	134,645	61,155	149,670	388,310
'Project Case'						
Back'd	Cars/LCV	26,373,920	44,430,700	35,342,360	32,258,965	138,405,950
	Rigid	1,081,410	3,498,000	1,365,575	1,948,265	7,893,250
	Articulated	705,055	2,406,070	981,100	1,929,115	6,021,335
Port Botany	Articulated	28,335	89,135	40,480	98,745	256,690
Moorebank	Articulated	28,335	89,135	40,480	98,745	256,690
Difference relative to 'Base Case'						
Back'd	Cars/LCV	1,760	3,430	2,400	3,080	10,670
	Rigid	100	-60	115	-365	-205
	Articulated	-2,450	-6,845	-3,485	-6,955	-19,735
Port Botany	Articulated	-14,510	-45,510	-20,675	-50,925	-131,620
Moorebank	Articulated	10,785	33,425	15,610	35,615	95,430
Total	Cars/LCV	1,760	3,430	2,400	3,080	10,670
	Rigid	100	-60	115	-365	-205
	Articulated	-6,170	-18,930	-8,550	-22,265	-55,920

Table 4.2 Comparison of vehicle hours travelled in 2031

Scenario		AM peak (0700-0900)	Inter peak (0900-1500)	PM peak (1500-1800)	Evening / Night Time (1800-0700)	Daily Total
'Base Case'						
Back'd	Cars/LCV	958,400	1,131,115	1,115,095	715,835	3,920,445
	Rigid	32,640	77,245	36,215	37,615	183,710
	Articulated	15,945	43,075	20,095	31,240	110,355
Port Botany	Articulated	1,440	2,950	1,695	2,830	8,910
'Project Case'						
Back'd	Cars/LCV	957,520	1,130,495	1,114,420	715,480	3,917,915
	Rigid	32,610	77,185	36,180	37,585	183,565
	Articulated	17,205	45,670	21,590	33,685	118,145
Port Botany	Articulated	940	1,920	1,105	1,835	5,800
Moorebank	Articulated	390	820	485	740	2,440
Difference relative to 'Base Case'						
Back'd	Cars/LCV	-880	-620	-675	-355	-2,530
	Rigid	-30	-60	-30	-25	-145
	Articulated	-75	-150	-95	-130	-450
Port Botany	Articulated	-495	-1,030	-590	-995	-3,110
Moorebank	Articulated	390	820	485	740	2,440
Total	Cars/LCV	-880	-620	-675	-355	-2,530
	Rigid	-30	-60	-30	-25	-145
	Articulated	-180	-355	-200	-385	-1,120

Figure 4.2 shows the change in articulated truck volumes on the network between the 'Project Case' and the 'Base Case'. This plot shows that the introduction of the Moorebank Intermodal Terminal:

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

Figure 4.3 shows the net difference of articulated truck volumes relating to Port Botany and Moorebank only on the network. Comparing this to Figure 4.2 confirms that the changes in articulated truck volumes on the network are generally the result of changes at Port Botany and Moorebank; the changes to background articulated truck traffic is not significant.

Appendix E shows the change in articulated truck movements to/from Port Botany and Moorebank between the 'Base Case and the 'Project Case 'scenarios on corridors of interest. In general:

- The reductions in truck movements are generally experienced closer to the Sydney CBD (i.e. the M5 east of Moorebank Avenue, General Holmes Drive, Foreshore Road as well as the M2)
- The increases in truck movements are mostly seen in the corridors immediately around the Moorebank development (i.e. M7 south of the M4, and the Hume Highway).
- Some of the increases in truck movements (such as the increase on the M1 to Newcastle) are due to the shift of some articulated truck movements from Chullora to Moorebank in the Project Case (to account for the shift of interstate traffic to Moorebank from Chullora in 2031).

Figure 4.4 shows the contribution of Moorebank-traffic to total articulated truck flows on the network. As expected Moorebank traffic makes up a large portion of all articulated truck movements on parts of the network closer to Moorebank and in some cases closer to the other origin/destination zone. Moorebank traffic accounts for up to 20% of the articulated truck volumes on the M7 and up to 34% of the articulated truck traffic on the Hume highway

The Figures in Appendix F show the change in speed between the 'Base Case and 'Project Case' scenarios for each of the model time periods. In general the road links with reduced volumes (as per Figure 4.2) experience improved travel speeds in the 'Project Case' than the base case and conversely roads that see increased articulated truck movements in the "Project Case' experience degraded travel speeds in the 'Project Case' than the 'Base Case'. It is noted that the change in speed is small, with a maximum change of about 4 km/hr on the wider network (the road links closer to Moorebank experience greater changes; up to 8 km/hr). This is to be expected as the changes attributed to the project would only have a small impact on a network as large as the Sydney road network.

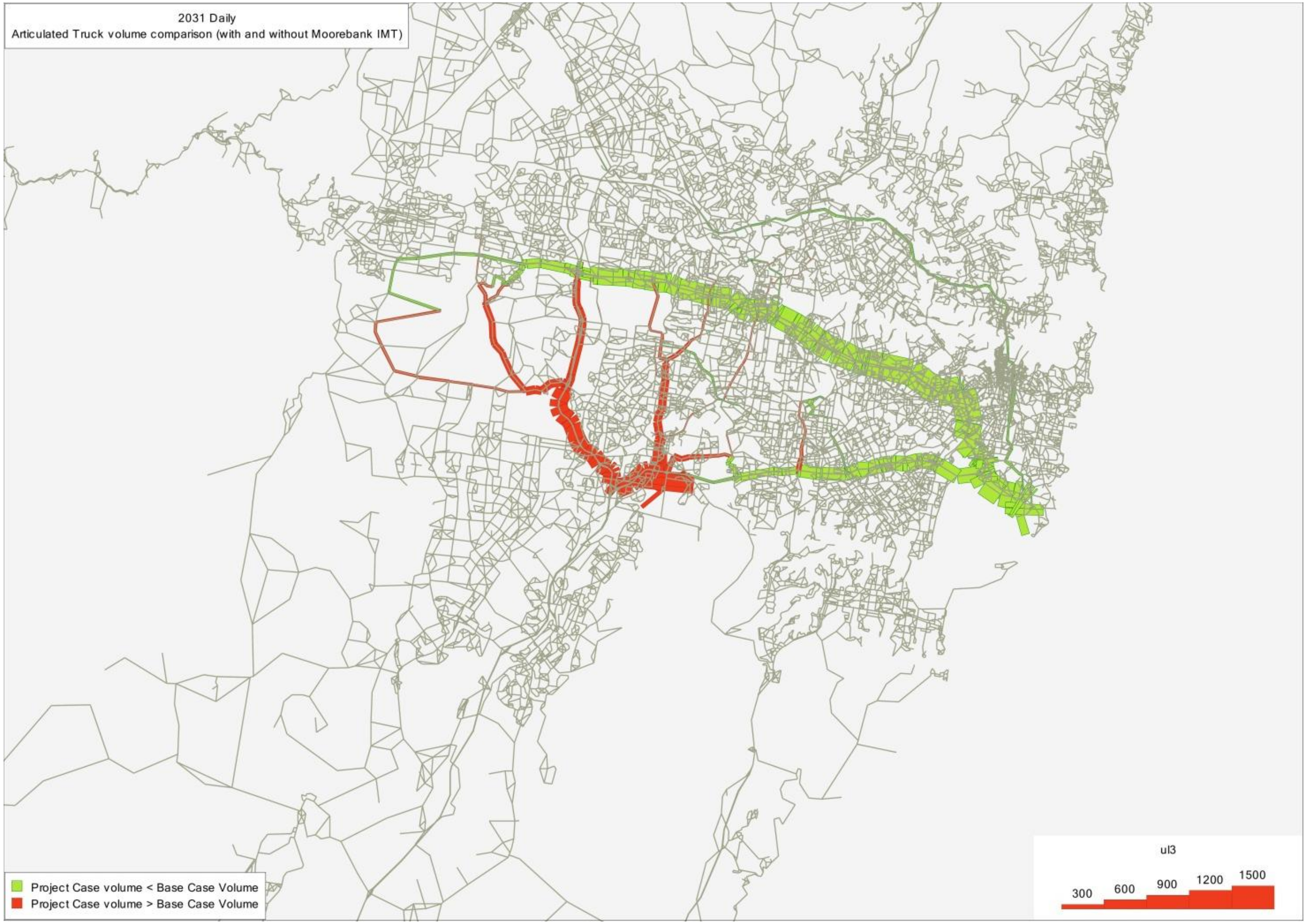


Figure 4.2: Comparison of articulated truck volumes ('Project Case' versus 'Base Case')

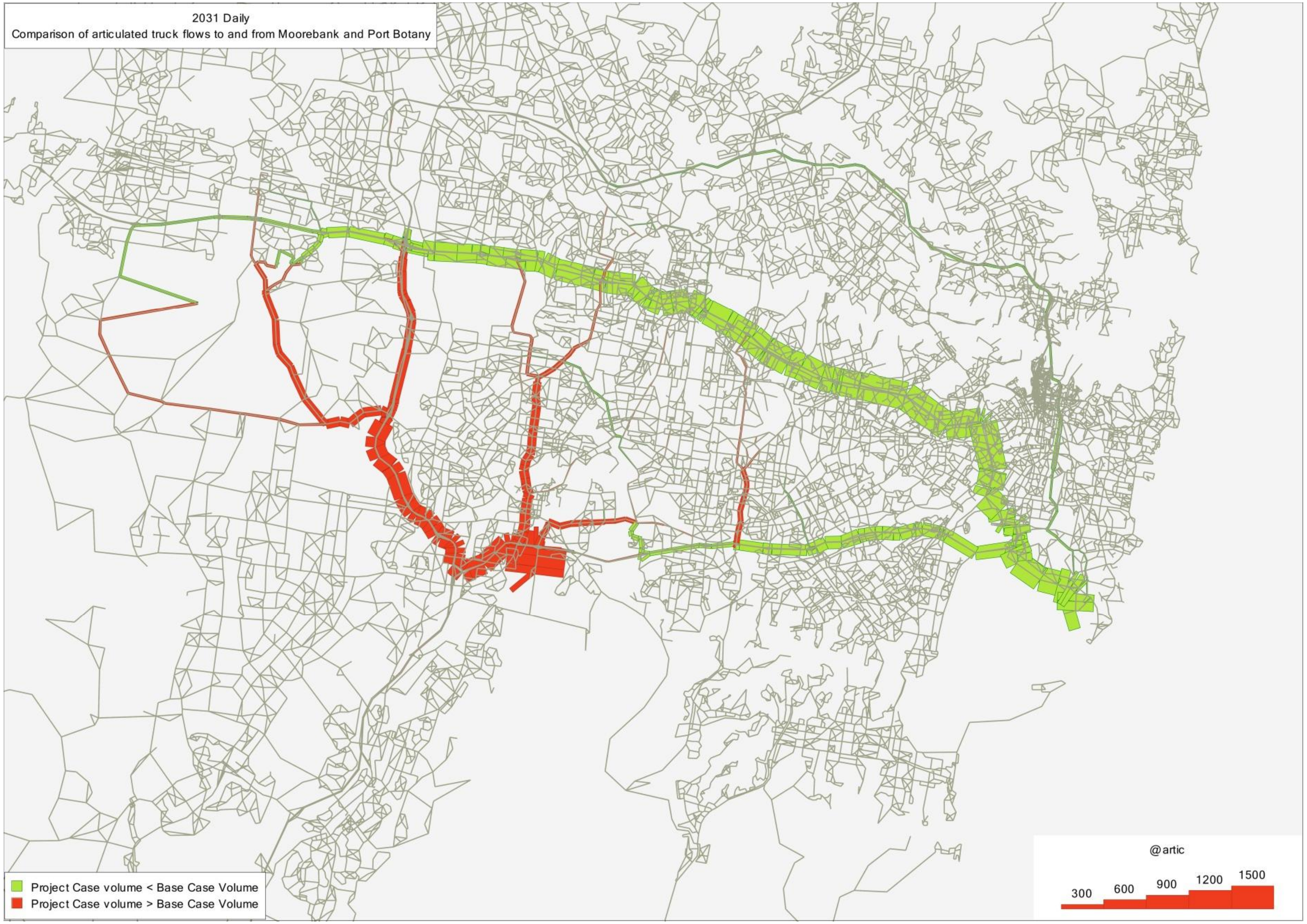


Figure 4.3: Comparison of articulated truck volumes to/from Port Botany and Moorebank only ('Project Case' versus 'Base Case')

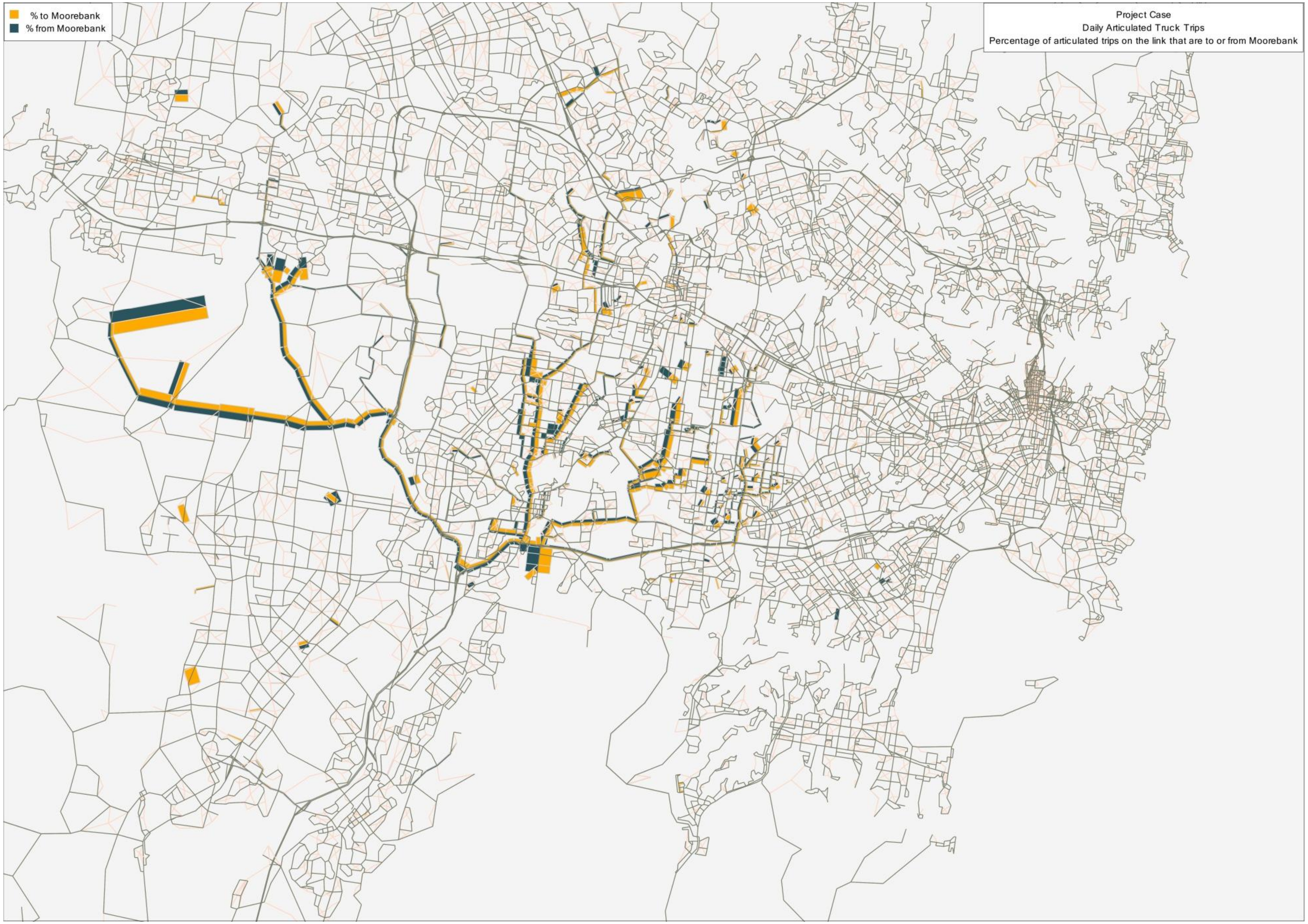


Figure 4.4 Percentage of articulated truck traffic to/from Moorebank (of all articulated truck flows on links – 'Project Case')

Appendix A

Strategic modelling assumptions

A1. Sydney Strategic Travel Model

The Sydney Strategic Travel Model (STM) was supplied to the project with the following documentation of the key assumptions. These assumptions have been reproduced from information supplied by BTS.

A1.1 Model version

STM 2.5 based on the calculation of travel demand using 7 travel purposes, 7 travel modes, 2690 travel zones, 4 times of day) The purposes and modes are as follows:

Travel purposes:

- Work (commute from home to work and back)
- Business
- Primary education
- Secondary education
- Tertiary education
- Shopping
- Other

Travel mode

- Car driver
- Car passenger
- Train / Light rail / Ferry
- Bus
- Cycle
- Walk
- Taxi

The four time periods modelled are as follows:

- AM peak period (0700-0900)
- Inter peak period (0900-1500)
- PM peak (1500-1800)
- Evening/night time period (1800-0700)

A1.2 Network assumptions

The STM network is based on the Long Term Transport Master Plan and includes the following changes in the supply network. Assumptions are for scenario modelling purposes and do not necessarily reflect Government policy).

Table A1.1 Network assumptions

Year	Road	Rail / Light Rail	Bus / Ferry
2006	▪ Network version July 2009	▪ Network version ITIS March 2007	▪ Network version ITIS March 2007
2011	▪ Lane Cove Tunnel ▪ Inner West Busway (Iron Cove Bridge duplication) ▪ F3 widening ▪ Hume Highway widening	▪ Enhanced 2009 timetable network ▪ Cronulla duplication ▪ ECRL	▪ 131500 bus network and 2011 ferry network
2016	▪ Hunter Motorway (F3-Branxton) ▪ M2 widening ▪ M5 widening ▪ W-Sydney Employment Hub ▪ Gt.Western Highway widening	▪ SWRL via East Hills ▪ LRT Dulwich Hill extension	▪ Bus route adjustments in SWRL sector, revised ferry network for 2016
2021	▪ WestConnex Stage 1: M5 East Duplication	▪ North West Rail Link to Rouse Hill ▪ CBD and South East Light Rail	▪ CBD Bus plan, Regional level 1 and level 2 bus network, bus route adjustments in NWRL and SWRL sectors, bus priority, ▪ revised ferry network
2026	▪ WestConnex Stage 2: M4 Extension and M4 Widening ▪ NW Growth Centre	▪ 2021 heavy rail base (20 trains/h over SHB and City Circle)	
2031	▪ M2 to F3 Tunnel ▪ SW Growth Centre	▪ 2021 heavy rail base (20 trains/h over SHB and City Circle)	
2036	▪ F6 ▪ NW Growth Centre	▪ 2036 heavy rail base (20 trains/h over SHB and City Circle)	
2041	▪ M2 extension via Gladesville Bridge to M4 East ▪ Spit bridge upgrade	▪ 2036 heavy rail base (20 trains/h over SHB and City Circle)	
All years Travel Costs	▪ Fuel and toll costs rise with CPI	▪ MyZone fare system ▪ Fares rise with CPI, light rail treated as heavy rail for fare calculation purpose	▪ MyZone fare system ▪ Fares rise with CPI

A1.3 Land use assumptions

Table A1.2 Land use assumptions

Year	GMA Population – Aug 2012 BTS Forecasts	GMA Employment – Aug 2012 BTS Forecasts
2006	5,133,000	2,467,000
2011	5,578,000	2,685,000
2016	5,961,000	2,904,000
2021	6,331,000	3,095,000
2026	6,705,000	3,271,000
2031	7,077,000	3,432,000
2036	7,443,000	3,595,000
2041	7,805,000	3,752,000
2046	8,165,000	3,901,00

A1.4 Heavy vehicle demand assumptions

BTS Freight Movement Model (FMM) – Freight Forecast December 2013 release.

A1.5 Behavioural assumptions

- Behavioural models estimated using Household Travel Survey data up to and including 2008 and Journey to Work data up to and including 2006 Census.
- Assumed 1% growth in real income per annum
- Travel behaviour responses to times, costs and modes within synthetic household classes (128 different types) assumed not to vary over time, although the number of people within each household class will vary along with demographic change and socio-economic change.

A1.6 Cautions

- Aside from acknowledging that these forecasts are the product of the set of assumptions listed above, none of which may occur in reality, and which may not reflect government policy, users should also be aware of some other limitations inherent in Strategic Travel Models such as the STM:
- The STM is a simplification of reality. It breaks the GMR into 2,690 travel zones, and further by 128 population segments within each travel zone. These 350,000 segments by travel zone represent over 5 million people in the GMR, and thus involve using averages and simplifying assumptions to predict behaviour and access to the transport system.
- The STM does not currently apply a capacity constraint on public transport use. What this means is that in effect, each public transport vehicle is infinitely large. It is possible to identify where services are over capacity by dividing predicted demand by known supply. The BTS believes that the most likely response to congestion on public transport is a shift of travel time, not of mode, thus it stands by the STM's 2 or 3.5 hour peak estimates of travel demand by mode.

- Whilst the STM has been validated to ensure that it reproduces reasonable estimates of current travel behaviour, it has not been calibrated to match base year travel in this implementation.

A1.7 Fitness for purpose

The STM is a strategic multi-modal modelling tool incorporating the latest population and employment forecasts. The STM has been successfully used to inform evidence-based policy development and decision-making in strategic, metropolitan scale land use and transport scenario modelling projects.

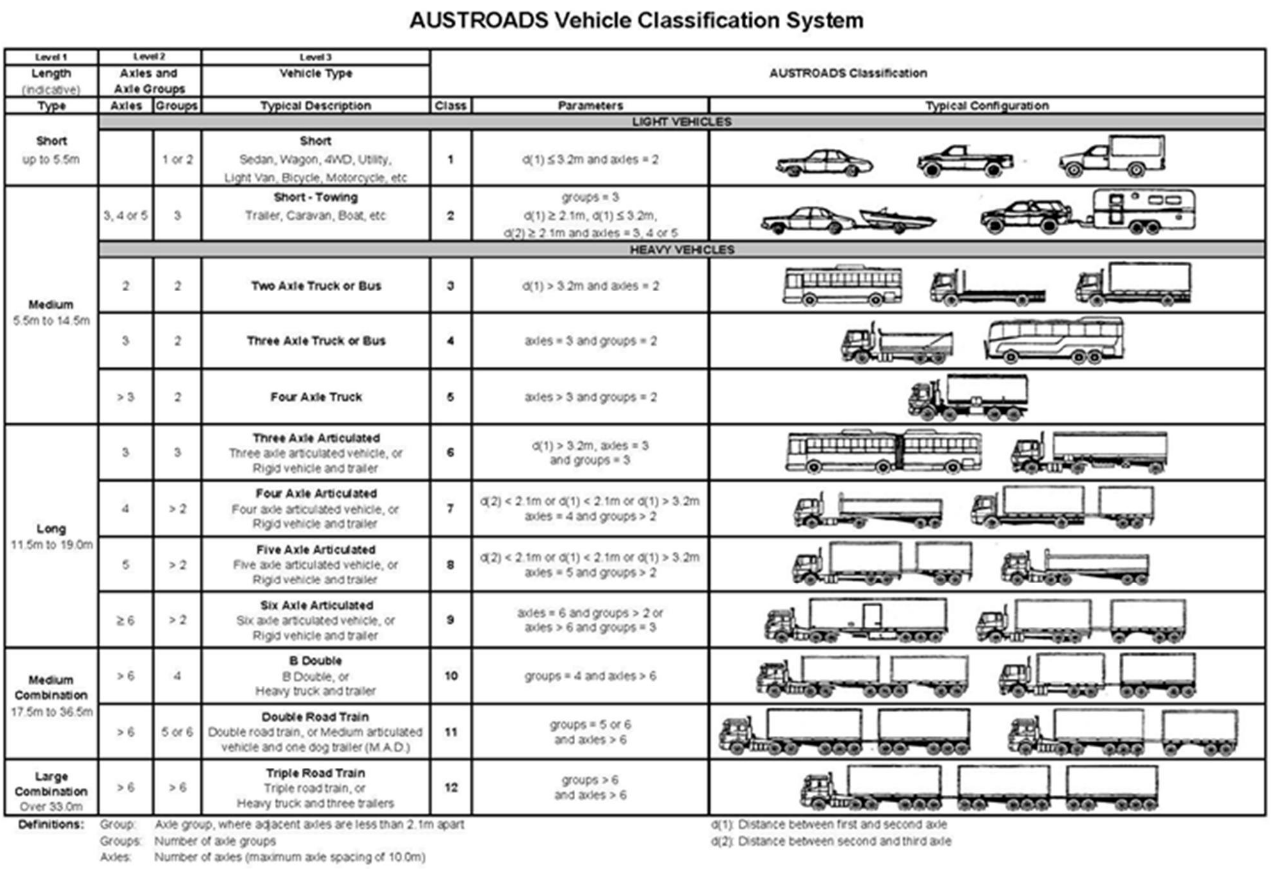
For specific projects, the STM results should be used as a starting point to produce estimates of overall demand in response to alternative land use and/or transport supply scenarios. However, the STM, due to its limitations as a strategic modelling tool, may need to be supplemented with more detailed analyses for project evaluation purposes.

A2. BTS Light Commercial Vehicle forecasts - February 2014 release

A2.1 Introduction

This report documents the methodology and output of the February 2014 Release Bureau of Transport Statistics (BTS) Light Commercial Vehicle Forecasts. The methodology and output of the February 2014 Release BTS Heavy Vehicle Forecasts are documented in a separate report.

For the purposes of these forecasts, Light Commercial Vehicles (LCVs) refer to Class 1 or 2 vehicles under the Austroads vehicle classification system, but excluding bicycles and motorcycles (see Figure A2.1). The base and forecast year trip estimates relate solely to usage of LCVs for load-bearing commercial activities and services. This includes direct movements of goods for commercial purposes ('Light Goods Vehicles'), and movements of goods which are used for commercial operations but are not themselves for sale e.g. tools of trade ('Service Vehicles'). Movements of an LCV for personal reasons are excluded, irrespective of whether goods or tools of trade are carried.



AUSTROADS Vehicle Classification System

Level 1 Length (indicative) Type	Level 2 Axles and Axle Groups Axles	 Groups	Level 3 Vehicle Type Typical Description	AUSTROADS Classification Class	 Parameters	 Typical Configuration
			LIGHT VEHICLES			
Short up to 5.5m		1 or 2	**Short** Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc	1	d(1) ≤ 3.2m and axles = 2	
Medium 5.5m to 14.5m	3, 4 or 5	3	**Short - Towing** Trailer, Caravan, Boat, etc	2	groups = 3 d(1) ≥ 2.1m, d(1) ≤ 3.2m, d(2) ≥ 2.1m and axles = 3, 4 or 5	
			HEAVY VEHICLES			
	2	2	**Two Axle Truck or Bus**	3	d(1) > 3.2m and axles = 2	
	3	2	**Three Axle Truck or Bus**	4	axles = 3 and groups = 2	
	> 3	2	**Four Axle Truck**	5	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	**Three Axle Articulated** Three axle articulated vehicle, or Rigid vehicle and trailer	6	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	**Four Axle Articulated** Four axle articulated vehicle, or Rigid vehicle and trailer	7	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	**Five Axle Articulated** Five axle articulated vehicle, or Rigid vehicle and trailer	8	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	≥ 6	> 2	**Six Axle Articulated** Six axle articulated vehicle, or Rigid vehicle and trailer	9	axles = 6 and groups > 2 or axles > 6 and groups = 3	
Medium Combination 17.5m to 36.5m	> 6	4	**B Double** B Double, or Heavy truck and trailer	10	groups = 4 and axles > 6	
	> 6	5 or 6	**Double Road Train** Double road train, or Medium articulated vehicle and one dog trailer (M.A.D.)	11	groups = 5 or 6 and axles > 6	
Large Combination Over 33.0m	> 6	> 6	**Triple Road Train** Triple road train, or Heavy truck and three trailers	12	groups > 6 and axles > 6	

Definitions:
Group: Axle group, where adjacent axles are less than 2.1m apart
Groups: Number of axle groups
Axles: Number of axles (maximum axle spacing of 10.0m)
d(1): Distance between first and second axle
d(2): Distance between second and third axle

Figure A2.1 Austroads Vehicle Classification System

A2.2 Methodology

The BTS light commercial vehicle forecasts are produced from the Light Commercial Vehicle Model (LCVM). The LCVM produces base year and forecast estimates of LCV travel movements for the Sydney Greater Metropolitan Area (GMA) at travel zone level. For the February 2014 Release, the base year is changed from 2006 to 2011 and the forecasts are at five yearly intervals to 2046 (including 2006). The zonal system used is BTS's 2006 Travel Zones.

A2.2.1 Trip Attraction

The methodology for estimating LCV movements is based on LCV attraction rates i.e. the rate of attraction of LCVs to (1) households and (2) businesses, measured by the number of employees. These attraction rates are applied to the number of households and amount of employment in each travel zone to obtain the total number of LCVs attracted to the zone i.e.

LCV trips attracted to zone = Trips attracted to households in zone + Trips attracted to businesses in zone , where

> Trips attracted to households in zone = the number of households in zone LCV attraction rate for households, and

> Trips attracted to businesses in zone = the amount of employment in zone LCV attraction rate for businesses

To estimate trip attractions for the February 2014 Release Light Commercial Vehicle Forecasts, the following household and employment forecasts were used:

- Household forecasts – the August 2012 Release BTS Population Forecasts (which includes household forecasts).
- Employment forecasts – the August 2012 Release BTS Employment Forecasts.

The attraction rates used were based on two BTS studies of LCV attraction rates: the Service Vehicle Attraction Rate study (SVAR, 1999) and the LCV Trip Attraction Rates study (LTAR, 2009). For households, a single household attraction rate was used. For businesses, there were separate attraction rates used for the categories 'Office', 'Industrial', 'Retail' and 'Hospitality', as the SVAR study had established that there were significantly different attraction rates for these broad categories. The linkage between ANZSIC industry classes and these categories is shown in Table A2.1 below.

Table A2.1 LCV Business Attraction Rate Categories

ANZSIC Code	ANZSIC Description	LCV Attraction Rate Category
A	Agriculture, Forestry and Fishing	Industry
B	Mining	Industry
C	Manufacturing	Industry
D	Electricity, Gas, Water and Waste Services	Industry
E	Construction	Industry
F	Wholesale Trade	Industry
G	Retail Trade	Retail
H	Accommodation and Food Services	Hospitality
I	Transport, Postal and Warehousing	Industry

J	Information Media and Telecommunications	Office
K	Financial and Insurance Services	Office
L	Rental, Hiring and Real Estate Services	Office
M	Professional, Scientific and Technical Services	Office
N	Administrative and Support Services	Office
O	Public Administration and Safety	Office
P	Education and Training	Office
Q	Health Care and Social Assistance	Office
R	Arts and Recreation Services	Office
S	Other Services	Office

The attraction rates used for the February 2014 Release forecasts are shown in Table A2.2 below.

Table A2.2: LCV Attraction Rates

Rate	Value	Unit
Household Attraction Rate	0.188	Per household per weekday
Business Attraction Rate (Office)	0.115	Per employee per weekday
Business Attraction Rate (Industrial)	0.237	Per employee per weekday
Business Attraction Rate (Retail)	0.319	Per employee per weekday
Business Attraction Rate (Hospitality)	0.177	Per employee per weekday

Source: SVAR&LTAR

Once trip attractions are established, we apply a factor to allow for 'dead running'. A dead running trip is the 'away' trip from an initial trip made for commercial purposes. It most commonly refers to cases where freight is delivered to a location, and the freight carrying vehicle then returns empty to its original loading location. However, for consistency, BTS also applies the concept to light goods and service vehicle movements. If a plumber, say, travels to a household to do work, the subsequent trip away from the household is regarded as having been generated by the initial trip to the household.

It is important to understand that the dead running factor is not simply double the number of trips attracted to a household or business i.e. that it is not the case that for every trip attraction there is a concomitant away trip. The following example shows why this is so.

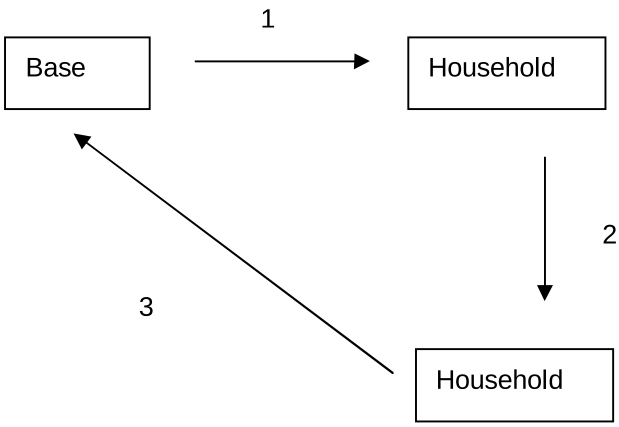


Figure A2.2 An example of LCV Vehicle tour

In this example, there are three trips. Our same plumber, say, travels from his base to do work at a household. He then travels to another household to do work, then travels back to base. There are thus two trips attracted to households for commercial purposes. If we were to apply the simple assumption that every trip attraction generated a concomitant away trip, we would estimate that four trips resulted from these two attractions, which is obviously wrong. This is because the ‘away’ trip from the first household (Trip 2) is actually an attraction to the second household, and to count it solely as an away trip can lead to double-counting. Thus, for this example, the dead running factor is actually 0.5 i.e. the total number of trips = total trip attractions (2) * (1 + 0.5) = 3.

The actual dead running factor for LCVs used in the February 2014 Release was 0.5. This was calculated by examining data from BTS’s Household Travel Survey (HTS). The HTS provides detailed information on all trips made by a respondent in a day, and includes data from respondents driving LCVs for commercial purposes. As a result, it was possible to analyze the tour patterns for LCV drivers and quantify the average amount of dead running.

A2.2.2 Trip production

To produce a zonal origin-destination matrix, it is necessary to estimate the number of trips produced (i.e. generated) from a zone in addition to estimating the number of trips attracted to the zone. Currently, BTS has no production rate data to complement its attraction rate data for LCVs. As a result, it used the assumption that within a 24 hour period the number of LCV trips produced from a zone is identical to the number attracted.

A2.2.3 Trip distribution

Once LCV trip productions and attractions have been estimated for each travel zone, the movements between zones (i.e. the origin-destination matrix) are estimated using a gravity model. Unlike the BTS heavy vehicle origin-destination matrices, the LCV matrix is not adjusted by a matrix estimation process. Matrix estimation uses counts of vehicles on the road network to produce a ‘maximum likelihood’ estimation of vehicle movements based on observed data. For heavy vehicles, BTS has undertaken a number of classified count studies to obtain such counts for rigid and articulated trucks, and consequently is able to use matrix estimation to estimate its heavy vehicle origin-destination matrices. However, equivalent counts for LCVs are not available, and as a result the matrix estimation process cannot be applied to the LCV origin-destination matrices.

The LCV gravity model takes the form:

$$T_{ij} = T_i \times \frac{A_j \times FF_{ij}}{\sum A_j \times FF_{ij}}$$

Where:

$$T_{ij} = T_i \times \frac{A_j \times FF_{ij}}{\sum A_j \times FF_{ij}}$$

Friction factors are used to represent travel time or impedance in the gravity model, as follows:

$$FF_{ij} = TT_{ij}^{\alpha} \times \exp(\beta \times TT_{ij})$$

Where is the travel time between zone and , and and are calibrated parameters.

The trip distribution process was implemented in CUBE using travel times skimmed from standard Sydney Strategic Travel Model runs. A trip length distribution was used to perform friction factor calibration. In the absence of observed trip length data for LCVs, the average trip length and trip length distribution from HTS LCV analysis was used. The resulting parameters for the friction factor equation were:

α = -0.02
β = -0.148

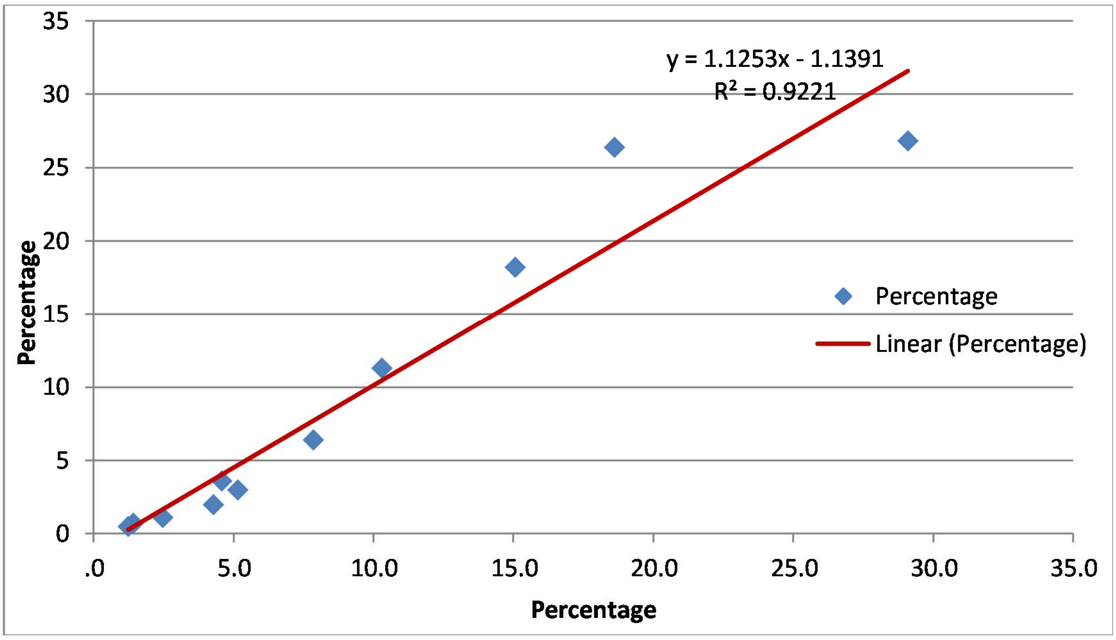


Figure A2.3 LCV Trip Distribution Comparisons in 5 Minutes Bin

Estimated versus observed plots are useful in determining if the parameters are set up properly. A high R2 indicates a good degree of fit. Figure 2.2 shows the trip length distribution from HTS versus LCVM in 5 minutes bin.

A2.2.4 Time Period Estimation

The direct output from the LCV gravity model is LCV trips by origin zone and destination zone on an average weekday. Time period factors are then used to disaggregate average weekday trips to trips in individual time periods. These factors were derived from the LTAR (2009) study, where the time of each LCV trip attracted to a household or business was collected. The factors used are shown in Table 2.3 below.

Table A2.2 Time period factors used for the February 2010 Release LCV estimates

Am Peak 7.00am – 9.00am	Inter Peak 9.00am – 3.00pm	Pm Peak 3.00pm – 6.00pm	Evening 6.00pm – 7.00am
0.16	**0.61**	**0.13**	**0.10**

Source: LTAR, 2009

A2.2.5 Sydney Airport

Sydney Airport is the largest LCV trip generator within Sydney GMA. BTS conducted a video camera study around the Sydney Airport Precinct over two consecutive weekdays in 2013. The study provides detailed classified traffic counts on Domestic and International Terminal access roads. There are more than 10,000 LCV trips to/from International and Domestic terminals daily in the study period. The projected future growth of airport LCV traffic is based on the reported airport passenger forecasts.

A2.3 LCV Model Results

Table 3.1 compares 2011 LCV trip estimates from the BTS February 2014 Release with the earlier BTS release ('the BTS February 2010 Forecasts'). The comparisons show that a slightly higher number of trips in the current model relative to the old model. This can be largely attributed to more service employment in the 2010 land use forecast.

Table A2.3 Total LCV trips and Average Trip Length on Average Weekday, 2011

2011	BTS February 2010 Release estimates	BTS February 2014 Release estimates	Difference
Total trips (Weekday)	1,259,621	1,301,791	+ 3.3%
Average Trip Length (km)	**11**	**14**	**+ 27.3%**

The average trip length from the revised model estimates is calibrated against the trip length from HTS LCV analysis.

A2.3.1 Comparison with external data

The VKT (Vehicle Kilometres Travelled) estimates associated with the February 2014 Release trip estimates for 2011 can be compared with the ABS Survey of Motor Vehicle Use (SMVU) VKT estimates released in 2012, as shown in Table A2.4 below.

Table A2.4 Total Business Kilometres Travelled by LCVs (Sydney SD)

	SMVU	BTS February 2010 Release estimates	Difference
Annual VKT (million)	**4,344**	**3,677**	**-15%**

It is important to note that the figure of 4,344 million annual business VKT for the SMVU shown in Table 3.2 is a BTS estimate of what the SMVU data would be if it used the same definition of LCV trips as applied by BTS[1] . However, this SMVU estimate only provides an indicative comparison with the BTS estimates, as it is not possible to directly compare SMVU and BTS estimates of VKT for LCVs, due to the factor that some trips are treated differently in the two data sets.

It should also be noted that ABS reports an increase of more than 40% LCV annual business VKT from 2006 to 2011; whereas Road and Maritime Service's (RMS) vehicle registration data show that the registered LCVs for Sydney GMA increased around 8% in the same time period. It should be noted that the SMVU estimates are subject to a Relative Standard Error (RSE) of 12.9%. The vehicle registration data from RMS is considered to be more reliable.

A2.3.2 Comparison with the Household Travel Survey (HTS)

The BTS Strategic Travel Model (STM) includes LCV trips in its estimate of total travel movements, where the LCV trip data is obtained from BTS's Household Travel Survey (HTS). While this HTS data for LCVs provides a wealth of detailed information for use in the STM, it does not necessarily reflect the true number of total LCV movements. This is because the HTS sample is household, not business, based, and the survey expansion variables that are applied are designed to optimize the accuracy of trips for personal, not business, reasons.

The number of business trips included in the STM is estimated by analysing 3-years (2009, 2010 and 2011) of pooled HTS data. Vehicles with the following body type are considered to be LCV:

- 4 Van / Pvan / Ute
- 41 Goods Van
- 42 Panel Van
- 43 Utility

A business trip is defined as a trip with the purpose of:

- Go to work
- Return to work
- Work related business

For the February 2014 Release LCV forecasts, BTS compared the 2011 base year LCV estimates with HTS estimates for the same year. This analysis showed that for 2011 the HTS captured 35% of total LCV movements. As a result, the LCV data from LCVM should be factored by 65% to take into account the overlapping when assign STM car demand and LCV demand together.

A2.4 LCV Forecasts

The key inputs to BTS's forecasts of LCV movements are:

- Forecasts of households by travel zone.
- Forecasts of employment by industry group by travel zone.

[1] The figure is calculated as the SMVU total VKT for 'Capital City' multiplied by the SMVU ratio of work-related VKT to total VKT for NSW (where 'Work-related' is defined as 'All business use' plus 'To and from work', and the 'Personal and other' category is excluded)

The household and employment forecasts used for the February 2014 Release LCV Forecasts were the BTS August 2009 Release Population and Employment Forecasts, respectively.

The forecasts of LCV movements are produced by:

- •Calculating future zonal trip ends based on household and employment forecasts. Note: Both household and business LCV attraction rates are assumed to be constant in future years.
- Using the Fratar method to forecast (back-cast) future (2006) trip tables based on zonal growth factors and the base 2011 trip table.

Figure A2.4 shows the future growth of land use and the total number of LCVs. It can be seen that the growth is LCV is consistent with the land use growth.

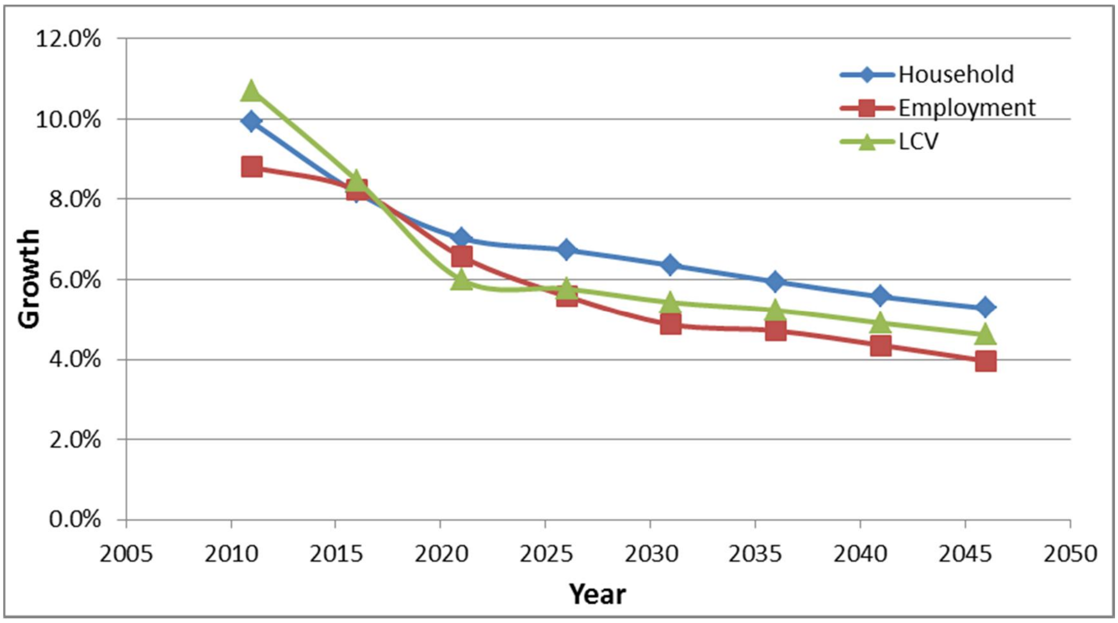


Figure A2.4 LCV and Land Use Growth

A2.5 Trip tables

Field names and descriptions for BTS's LCV trip tables for the February 2014 Release LCV forecasts are shown in Appendix 1.

A2.6 References

Service Vehicle Attraction Rates (SVAR), consultancy report to the Transport Data Centre, 1999.

Final report for the light commercial vehicle trip attraction rates study for the Transport Data Centre (LTAR), consultancy report to the Transport Data Centre, 2009.

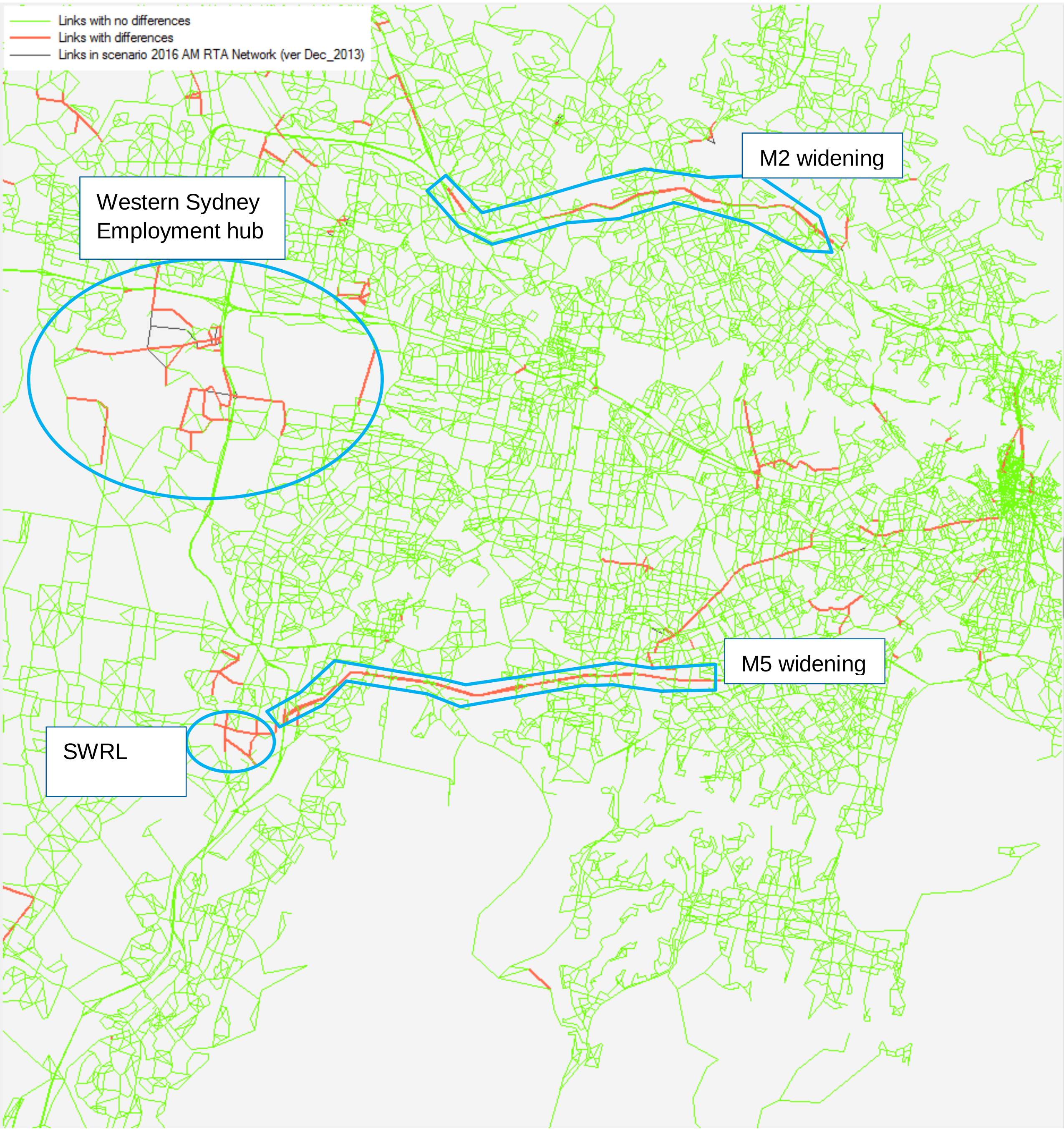
A2.7 Appendix 1 BTS LCV trip table

Field Name	**Description**
O_TZ06	Origin 2006 Travel Zone
O_SLA06	Origin 2006 SLA
O_LGA06	Origin 2006 LGA
O_SSD06	Origin 2006 SSD
O_SD06	Origin 2006 SD
O_SUBREGION_METRO	Origin Metropolitan Strategy Subregion
D_TZ06	Destination 2006 Travel zone
D_SLA06	Destination 2006 SLA
D_LGA06	Destination 2006 LGA
D_SSD06	Destination 2006 SSD
D_SD06	Destination 2006 SD
D_SUBREGION_METRO	Destination Metropolitan Strategy Subregion
ROAD_DISTANCE_KM	Road distance in km between O_TZ06 and D_TZ06
TRIPS_2006_AMPEAK	The number of trips in 2006 AM Peak 2h
TRIPS_2006_INTERPEAK	The number of trips in 2006 Inter-Peak 2h
TRIPS_2006_PMPEAK	The number of trips in 2006 PM Peak 2h
TRIPS_2006_EVENING	The number of trips in 2006 Night Time Period 2h
……	……
TRIPS_2046_AMPEAK	The number of trips in 2046 AM Peak
TRIPS_2046_INTERPEAK	The number of trips in 2046 Inter-Peak
TRIPS_2046_PMPEAK	The number of trips in 2046 PM Peak
TRIPS_2046_EVENING	The number of trips in 2046 Night Time Period
O_TZ06_NAME	Origin 2006 Travel Zone name
O_SLA06_NAME	Origin 2006 SLA name
O_LGA06_NAME	Origin 2006 LGA name
O_SSD06_NAME	Origin 2006 SSD name
O_SD06_NAME	Origin 2006 SD name
O_SUBREGION_METRO_NAME	Origin Metropolitan Strategy Subregion name
D_TZ06_NAME	Destination 2006 Travel zone name
D_SLA06_NAME	Destination 2006 SLA name
D_LGA06_NAME	Destination 2006 LGA name
D_SSD06_NAME	Destination 2006 SSD name
D_SD06_NAME	Destination 2006 SD name
D_SUBREGION_METRO_NAME	**Destination Metropolitan Strategy Subregion name**

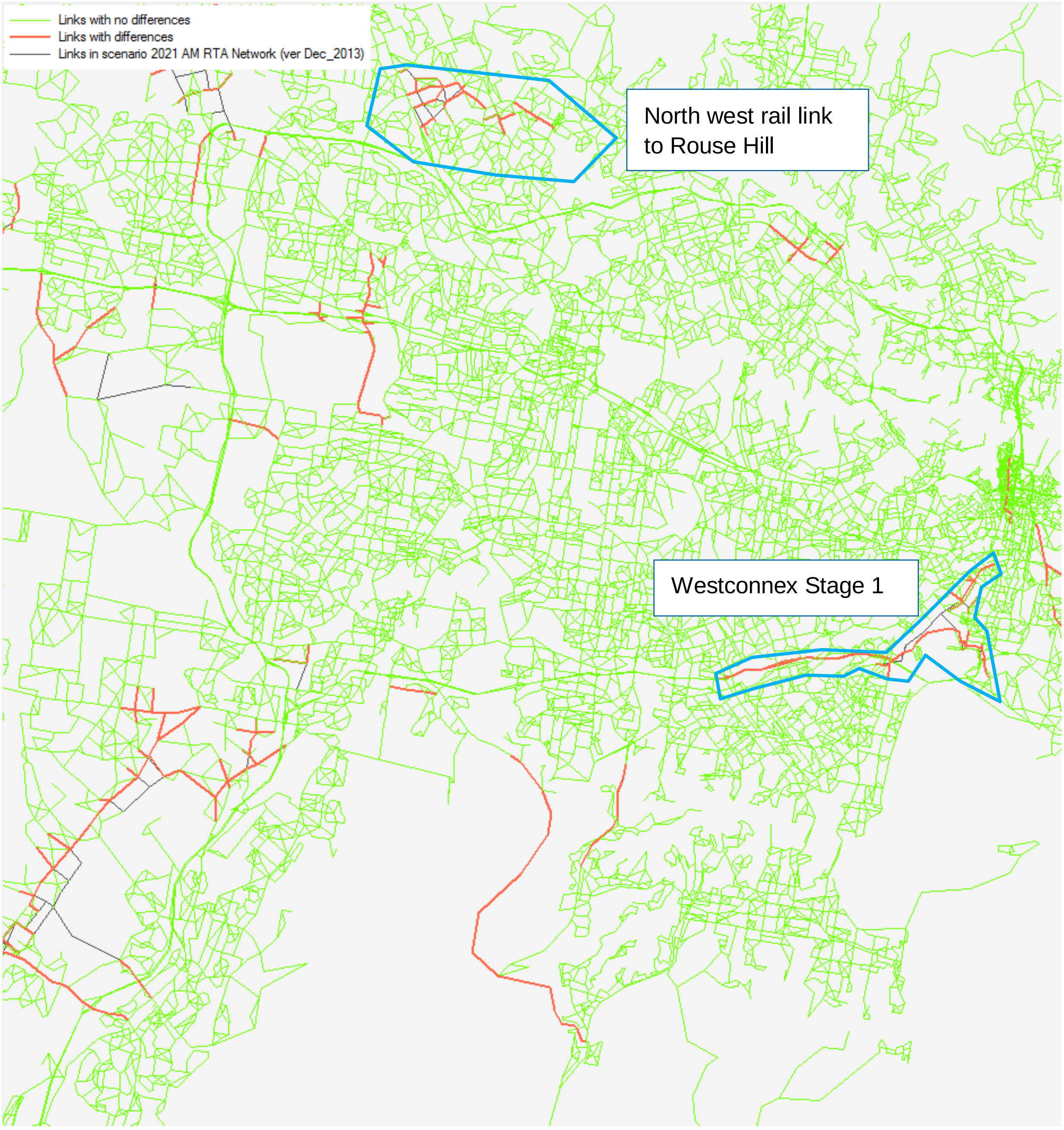
Appendix B

STM Network comparisons

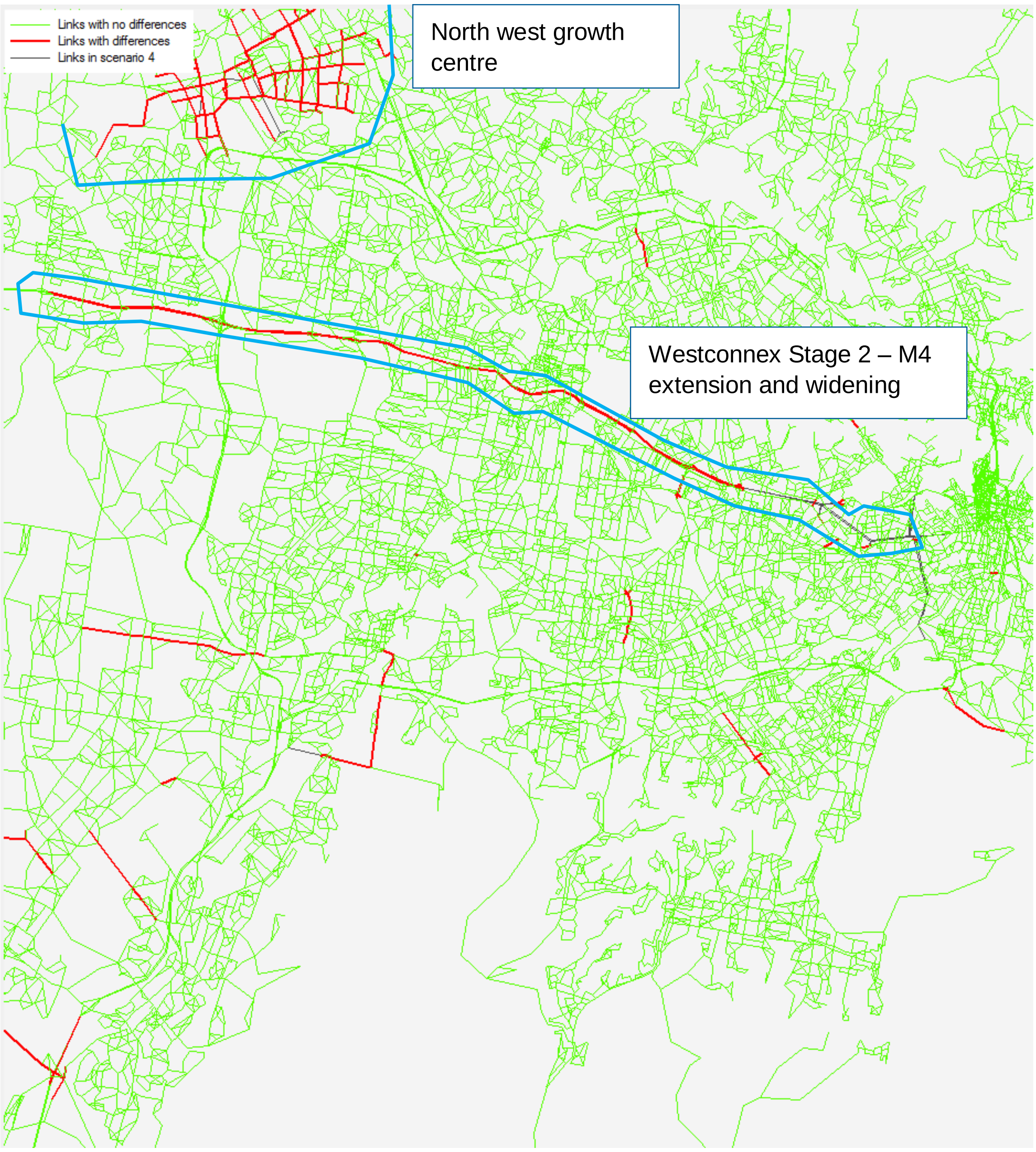
B1. Changes in the 2016 Network (from the 2011 network)



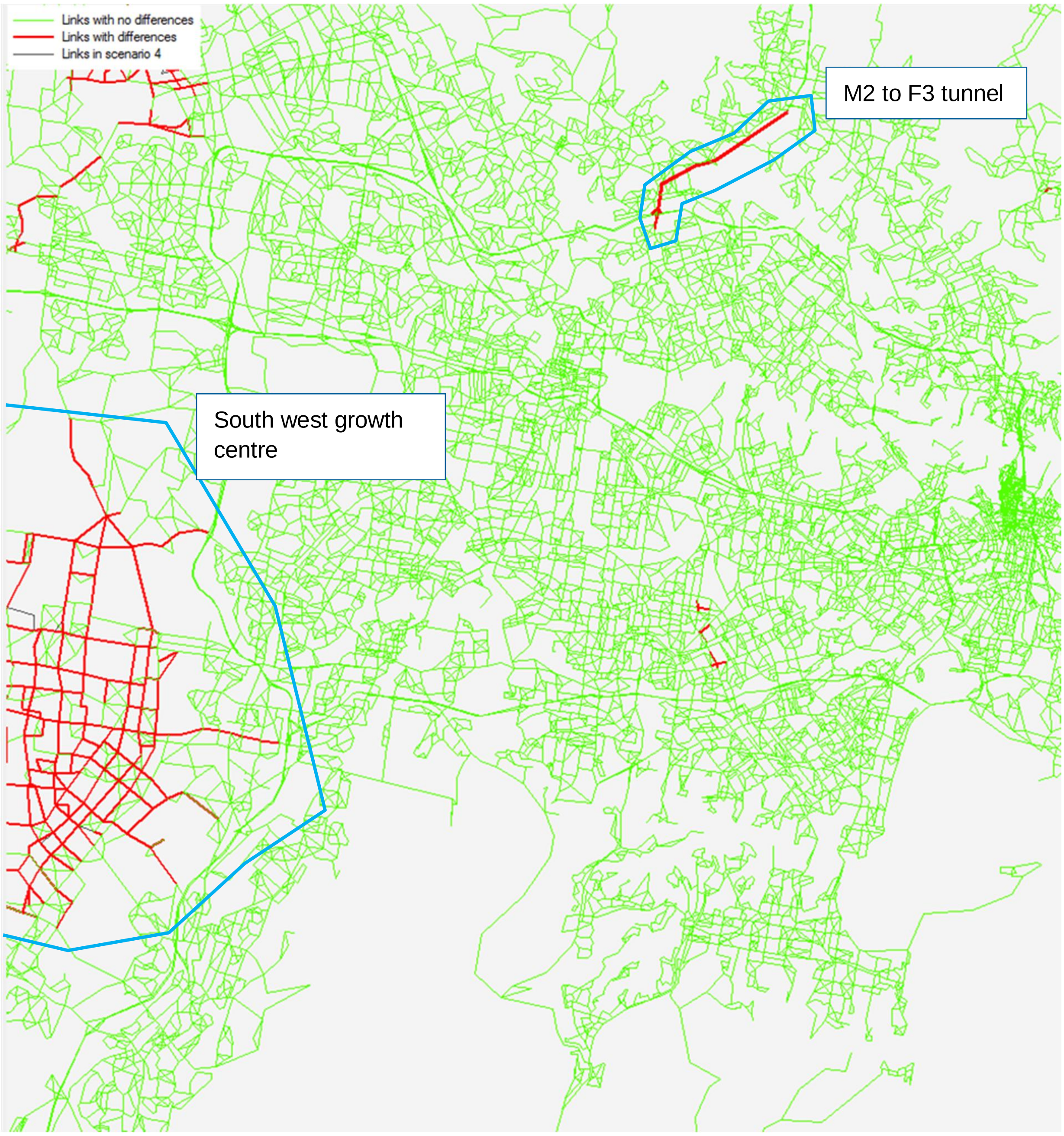
B2. Changes in the 2021 network (from the 2016 network)



B3. Changes to the 2026 network (from the 2021 network)



B4. Changes to the 2031 network (from the2026 network)



Appendix C

Deloitte Distribution Data (by LGA)

C1. Deloitte distribution data

The distribution assumptions used in this assessment are based on information supplied by Deloitte to Parsons Brinckerhoff. The distribution data was supplied at the level of Local Government Areas (LGA) for the Sydney Greater Metropolitan Area. The data was supplied broken down into TEUS and truck level based on the Deloitte's analysis of loading factors and splits of loads to articulated and B-Double trucks as outlined in section 3.

This appendix details the supplied data as shown in Table C.1 to C.9.

Table C1.1 Road distribution for ‘Base Case’ scenario for Port Botany - Volume (TEUs)

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	374	391	432	443	439	445	448	448	507	569	633	701	771	1,179	1,705
Auburn	26,675	28,887	33,179	35,484	36,716	39,058	41,416	43,782	49,522	55,534	61,833	68,431	75,344	115,164	166,561
Bankstown	22,893	24,499	27,796	29,351	29,972	31,449	32,876	34,243	38,732	43,434	48,361	53,521	58,928	90,072	130,271
Baulkham Hills	67,523	71,832	76,392	81,215	86,317	91,714	97,422	103,459	108,508	113,795	119,334	125,136	131,213	166,214	210,362
Blacktown	445,030	479,002	515,176	553,685	594,667	638,271	684,654	733,979	769,792	807,305	846,599	887,758	930,871	1,179,182	1,492,389
Botany Bay	103,423	107,010	110,705	114,509	118,424	122,453	126,597	130,858	137,085	143,608	150,442	157,601	165,101	208,304	262,813
Burwood	5,352	5,645	6,307	6,552	6,573	6,769	6,934	7,066	7,992	8,962	9,979	11,044	12,159	18,586	26,881
Camden	21,929	25,971	30,290	34,902	39,826	45,083	50,695	56,682	61,831	67,180	72,740	78,525	84,549	118,742	161,193
Campbelltown	33,840	39,315	44,954	50,760	56,735	62,880	69,199	75,692	83,980	92,708	101,894	111,557	121,717	180,751	255,924
Canada Bay	1,420	1,497	1,672	1,737	1,742	1,793	1,837	1,871	2,117	2,374	2,643	2,925	3,220	4,922	7,119
Canterbury	3,811	4,013	4,475	4,639	4,645	4,771	4,875	4,954	5,603	6,284	6,996	7,743	8,525	13,031	18,846
Fairfield	110,466	120,008	130,081	140,712	151,932	163,770	176,260	189,436	201,355	213,845	226,934	240,651	255,024	337,881	442,504
Holroyd	68,825	72,872	77,014	81,249	85,576	89,995	94,504	99,102	106,612	114,486	122,739	131,390	140,457	192,753	258,827
Hornsby	16,955	17,781	19,741	20,366	20,282	20,713	21,026	21,211	23,991	26,904	29,955	33,152	36,501	55,792	80,692
Hunters Hill	340	352	384	390	380	380	376	369	417	468	521	576	634	970	1,403
Hurstville	2,442	2,577	2,879	2,992	3,002	3,093	3,169	3,231	3,654	4,098	4,563	5,050	5,560	8,498	12,290
Kogarah	1,431	1,454	1,506	1,519	1,510	1,513	1,509	1,499	1,617	1,742	1,872	2,008	2,151	2,973	4,025
Ku-ring-gai	471	505	573	605	619	650	680	709	802	899	1,001	1,108	1,220	1,865	2,697
Lane Cove	1,601	1,677	1,860	1,916	1,905	1,943	1,968	1,981	2,241	2,513	2,798	3,097	3,410	5,212	7,538
Leichhardt	1,095	1,173	1,334	1,411	1,443	1,518	1,590	1,660	1,877	2,105	2,344	2,594	2,856	4,365	6,314
Liverpool	155,660	161,727	167,986	174,441	181,098	187,963	195,042	202,341	212,214	222,556	233,388	244,735	256,620	325,074	411,418
Manly	220	212	202	191	178	164	148	129	136	142	149	156	163	206	260
Marrickville	9,813	10,100	5,977	6,250	10,975	11,191	11,385	11,553	12,467	13,424	14,426	15,476	16,576	22,914	26,509
Mosman	782	758	731	699	662	621	574	521	545	571	599	627	657	829	1,046
North Sydney	5,406	5,064	4,677	4,243	3,756	3,213	2,611	1,943	2,036	2,133	2,234	2,341	2,452	3,094	3,903
Parramatta	74,474	76,440	78,404	80,362	82,310	84,243	86,156	88,044	92,340	96,840	101,553	106,491	111,662	141,448	179,019
Penrith	278,077	299,354	322,012	346,134	371,808	399,125	428,185	459,091	481,492	504,955	529,532	555,277	582,244	737,557	933,463
Pittwater	1,095	1,144	1,264	1,298	1,286	1,305	1,316	1,318	1,490	1,671	1,861	2,059	2,267	3,466	5,012
Randwick	47,432	49,296	51,229	53,235	55,316	57,474	59,713	62,034	64,986	68,078	71,318	74,712	78,267	98,748	124,588
Rockdale	6,230	6,537	7,003	7,324	7,570	7,902	8,239	8,581	9,260	9,970	10,715	11,495	12,312	17,019	23,044
Ryde	2,928	2,944	3,114	3,037	2,832	2,675	2,469	2,211	2,501	2,805	3,123	3,456	3,806	5,817	8,413
Strathfield	8,895	9,580	10,943	11,637	11,970	12,657	13,338	14,010	15,846	17,770	19,785	21,897	24,109	36,851	53,297
Sutherland Shire	8,699	8,916	5,252	5,466	5,496	5,671	5,824	5,951	6,731	7,549	8,405	9,302	10,241	15,654	22,640
Sydney	26,461	27,279	28,687	29,429	29,806	30,459	31,058	31,595	34,093	36,710	39,451	42,323	45,332	62,663	84,844
Warringah	4,250	4,507	5,064	5,292	5,345	5,543	5,723	5,882	6,653	7,461	8,307	9,194	10,122	15,472	22,378
Waverley	502	487	469	447	423	396	365	330	346	362	379	397	416	525	663
Willoughby	5,934	5,974	6,005	6,026	6,034	6,030	6,012	5,978	6,263	6,561	6,873	7,200	7,543	9,517	12,007
Woollahra	1,925	1,857	1,778	1,688	1,585	1,469	1,337	1,190	1,247	1,306	1,368	1,433	1,502	1,895	2,390
TOTAL	1,574,677	1,678,638	1,787,546	1,901,636	2,021,156	2,146,363	2,277,528	2,414,936	2,558,881	2,709,677	2,867,648	3,033,137	3,206,501	4,205,204	5,465,247

Table C1.2 Road distribution for ‘Project Case’ scenario for Port Botany - Volume (TEUs)

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	340	375	405	417	427	433	437	438	497	558	623	690	761	1,169	1,683
Auburn	21,464	21,404	20,461	18,141	15,312	11,962	13,887	16,451	20,299	24,541	29,180	34,222	39,672	73,387	119,073
Bankstown	20,797	23,532	26,084	27,642	29,165	30,646	32,077	33,448	37,937	42,639	47,566	52,727	58,133	89,277	128,571
Baulkham Hills	62,350	61,258	59,745	57,767	55,277	52,225	57,275	63,487	68,881	74,493	80,336	86,424	92,769	128,895	173,886
Blacktown	410,932	408,490	402,915	393,830	380,825	363,456	402,513	450,401	488,670	528,483	569,936	613,122	658,141	914,430	1,233,611
Botany Bay	103,423	107,010	110,705	114,509	118,424	122,453	126,597	130,858	137,085	143,608	150,442	157,601	165,101	208,304	262,813
Burwood	4,862	5,423	5,919	6,170	6,396	6,596	6,765	6,902	7,828	8,798	9,815	10,880	11,995	18,422	26,530
Camden	19,423	20,035	19,905	18,947	17,068	14,169	17,421	21,805	25,876	30,240	34,901	39,862	45,128	76,340	116,758
Campbelltown	29,973	30,329	29,542	27,556	24,315	19,762	23,780	29,118	35,145	41,732	48,889	56,629	64,967	116,206	185,375
Canada Bay	1,290	1,438	1,569	1,636	1,695	1,748	1,792	1,828	2,073	2,330	2,599	2,881	3,177	4,879	7,026
Canterbury	3,462	3,854	4,199	4,369	4,520	4,649	4,757	4,839	5,488	6,169	6,881	7,628	8,410	12,916	18,600
Fairfield	97,295	92,108	85,087	76,066	64,865	51,291	60,379	72,662	84,034	96,010	108,614	121,874	135,816	216,852	320,093
Holroyd	63,551	55,930	50,375	43,921	36,535	28,186	32,373	38,012	44,494	51,400	58,745	66,540	74,802	123,709	187,227
Hornsby	15,403	17,079	18,526	19,180	19,736	20,184	20,514	20,718	23,499	26,412	29,463	32,660	36,008	55,300	79,639
Hunters Hill	646	338	361	367	370	370	367	360	408	459	512	568	626	961	1,384
Hurstville	4,643	4,832	2,702	2,817	2,922	3,014	3,092	3,156	3,579	4,023	4,488	4,975	5,485	8,423	12,130
Kogarah	1,389	1,435	1,473	1,487	1,496	1,499	1,496	1,486	1,604	1,729	1,859	1,995	2,138	2,960	3,997
Ku-ring-gai	428	485	538	570	602	633	663	692	785	883	985	1,092	1,203	1,848	2,662
Lane Cove	3,044	3,145	1,746	1,805	1,854	1,893	1,920	1,935	2,195	2,467	2,752	3,051	3,364	5,166	7,440
Leichhardt	2,081	1,127	1,252	1,329	1,405	1,479	1,551	1,621	1,839	2,067	2,305	2,555	2,817	4,327	6,231
Liverpool	143,040	129,143	114,024	97,619	79,861	60,680	68,738	79,706	90,837	102,356	114,292	126,674	139,531	212,046	301,420
Manly	220	212	202	191	178	164	148	129	136	142	149	156	163	206	260
Marrickville	9,527	9,969	10,373	10,630	10,868	11,087	11,282	11,452	12,366	13,323	14,325	15,375	16,475	22,813	30,809
Mosman	782	758	731	699	662	621	574	521	545	571	599	627	657	829	1,046
North Sydney	5,406	5,064	4,677	4,243	3,756	3,213	2,611	1,943	2,036	2,133	2,234	2,341	2,452	3,094	3,903
Parramatta	68,768	65,188	61,319	57,160	52,711	47,971	50,652	54,028	58,618	63,394	68,366	73,547	78,947	109,690	147,977
Penrith	256,771	229,759	210,632	187,113	158,737	125,002	146,678	176,093	200,947	226,709	253,442	281,211	310,081	473,364	675,236
Pittwater	2,081	2,144	1,186	1,222	1,251	1,272	1,284	1,287	1,460	1,641	1,830	2,029	2,237	3,435	4,947
Randwick	47,432	49,296	51,229	53,235	55,316	57,474	59,713	62,034	64,986	68,078	71,318	74,712	78,267	98,748	124,588
Rockdale	6,048	6,452	6,851	7,171	7,497	7,828	8,165	8,506	9,185	9,895	10,640	11,420	12,237	16,944	22,883
Ryde	2,660	2,827	2,922	2,860	2,756	2,607	2,409	2,160	2,450	2,754	3,072	3,405	3,754	5,766	8,303
Strathfield	8,081	9,202	10,269	10,959	11,648	12,334	13,014	13,684	15,521	17,445	19,460	21,572	23,784	36,525	52,602
Sutherland Shire	8,445	8,800	9,115	9,296	9,455	9,590	9,700	9,781	10,561	11,378	12,234	13,131	14,071	19,484	26,313
Sydney	25,688	26,924	28,064	28,812	29,518	30,175	30,777	31,319	33,817	36,434	39,175	42,047	45,055	62,387	84,253
Warringah	8,080	4,329	4,752	4,984	5,201	5,402	5,584	5,746	6,517	7,325	8,171	9,057	9,986	15,336	22,086
Waverley	502	487	469	447	423	396	365	330	346	362	379	397	416	525	663
Willoughby	5,934	5,974	6,005	6,026	6,034	6,030	6,012	5,978	6,263	6,561	6,873	7,200	7,543	9,517	12,007
Woollahra	1,925	1,857	1,778	1,688	1,585	1,469	1,337	1,190	1,247	1,306	1,368	1,433	1,502	1,895	2,390
TOTAL	**1,468,186**	**1,418,012**	**1,368,107**	**1,302,880**	**1,220,668**	**1,119,963**	**1,228,699**	**1,366,106**	**1,510,051**	**1,660,847**	**1,818,819**	**1,984,307**	**2,157,671**	**3,156,374**	**4,416,417**

Table C1.3 Road distribution for 'Project Case' scenario for Moorebank - Volume (TEUs)

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Auburn	2,770	6,342	10,675	15,277	20,416	26,098	26,522	26,315	28,206	29,977	31,637	33,193	34,655	40,761	45,316
Bankstown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baulkham Hills	4,796	10,210	16,294	23,107	30,710	39,169	39,837	39,672	39,328	39,005	38,702	38,418	38,151	37,032	36,194
Blacktown	31,610	68,082	109,886	157,532	211,570	272,592	279,965	281,448	279,005	276,716	274,568	272,551	270,656	262,719	256,777
Botany Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Burwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Camden	2,506	5,936	10,385	15,955	22,758	30,914	33,273	34,877	35,955	36,939	37,839	38,664	39,421	42,402	44,435
Campbelltown	3,867	8,986	15,413	23,205	32,420	43,118	45,419	46,574	48,835	50,976	53,005	54,928	56,750	64,545	70,548
Canada Bay	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canterbury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fairfield	12,554	27,291	44,393	64,056	86,486	111,908	115,321	116,225	116,767	117,278	117,759	118,212	118,639	120,447	121,818
Holroyd	4,889	16,572	26,283	36,986	48,714	61,496	61,831	60,802	61,825	62,787	63,690	64,541	65,342	68,712	71,253
Hornsby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hunters Hill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hurstville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogarah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ku-ring-gai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lane Cove	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leichhardt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liverpool	18,457	38,265	59,491	82,206	106,482	132,393	131,285	127,491	126,220	125,030	123,914	122,867	121,885	117,777	114,711
Manly	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marrickville	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mosman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North Sydney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parramatta	5,290	10,865	16,723	22,864	29,284	35,978	35,231	33,761	33,468	33,193	32,936	32,694	32,466	31,514	30,802
Penrith	19,752	68,077	109,895	157,569	211,650	272,732	280,146	281,665	279,220	276,929	274,780	272,762	270,865	262,921	256,975
Pittwater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Randwick	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rockdale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ryde	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Strathfield	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sutherland Shire	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sydney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Warringah	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waverley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Willoughby	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woollahra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**106,491**	**260,625**	**419,439**	**598,756**	**800,488**	**1,026,400**	**1,048,830**	**1,048,830**	**1,048,830**	**1,048,830**	**1,048,830**	**1,048,830**	**1,048,830**	**1,048,830**	**1,048,830**

Table C1.4 Road distribution for 'Base Case' scenario for Port Botany – Semi truck movements per day – round trips

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.7	0.8	1.2	1.7
Auburn	26.5	28.7	33.0	35.3	36.5	38.9	41.2	43.6	49.3	55.2	61.5	68.1	74.9	114.6	165.7
Bankstown	22.8	24.4	27.6	29.2	29.8	31.3	32.7	34.1	38.5	43.2	48.1	53.2	58.6	89.6	129.6
Baulkham Hills	67.2	71.5	76.0	80.8	85.9	91.2	96.9	102.9	107.9	113.2	118.7	124.5	130.5	165.3	209.3
Blacktown	442.7	476.5	512.5	550.8	591.5	634.9	681.0	730.1	765.7	803.1	842.1	883.1	926.0	1,173.0	1,484.5
Botany Bay	102.9	106.4	110.1	113.9	117.8	121.8	125.9	130.2	136.4	142.9	149.6	156.8	164.2	207.2	261.4
Burwood	5.3	5.6	6.3	6.5	6.5	6.7	6.9	7.0	8.0	8.9	9.9	11.0	12.1	18.5	26.7
Camden	21.8	25.8	30.1	34.7	39.6	44.8	50.4	56.4	61.5	66.8	72.4	78.1	84.1	118.1	160.3
Campbelltown	33.7	39.1	44.7	50.5	56.4	62.5	68.8	75.3	83.5	92.2	101.4	111.0	121.1	179.8	254.6
Canada Bay	1.4	1.5	1.7	1.7	1.7	1.8	1.8	1.9	2.1	2.4	2.6	2.9	3.2	4.9	7.1
Canterbury	3.8	4.0	4.5	4.6	4.6	4.7	4.8	4.9	5.6	6.3	7.0	7.7	8.5	13.0	18.7
Fairfield	109.9	119.4	129.4	140.0	151.1	162.9	175.3	188.4	200.3	212.7	225.7	239.4	253.7	336.1	440.2
Holroyd	68.5	72.5	76.6	80.8	85.1	89.5	94.0	98.6	106.1	113.9	122.1	130.7	139.7	191.7	257.5
Hornsby	16.9	17.7	19.6	20.3	20.2	20.6	20.9	21.1	23.9	26.8	29.8	33.0	36.3	55.5	80.3
Hunters Hill	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	1.0	1.4
Hurstville	2.4	2.6	2.9	3.0	3.0	3.1	3.2	3.2	3.6	4.1	4.5	5.0	5.5	8.5	12.2
Kogarah	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	1.9	2.0	2.1	3.0	4.0
Ku-ring-gai	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.9	2.7
Lane Cove	1.6	1.7	1.9	1.9	1.9	1.9	2.0	2.0	2.2	2.5	2.8	3.1	3.4	5.2	7.5
Leichhardt	1.1	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.9	2.1	2.3	2.6	2.8	4.3	6.3
Liverpool	154.8	160.9	167.1	173.5	180.1	187.0	194.0	201.3	211.1	221.4	232.2	243.4	255.3	323.4	409.3
Manly	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
Marrickville	9.8	10.0	5.9	6.2	10.9	11.1	11.3	11.5	12.4	13.4	14.4	15.4	16.5	22.8	26.4
Mosman	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.7	0.8	1.0
North Sydney	5.4	5.0	4.7	4.2	3.7	3.2	2.6	1.9	2.0	2.1	2.2	2.3	2.4	3.1	3.9
Parramatta	74.1	76.0	78.0	79.9	81.9	83.8	85.7	87.6	91.9	96.3	101.0	105.9	111.1	140.7	178.1
Penrith	276.6	297.8	320.3	344.3	369.8	397.0	425.9	456.7	479.0	502.3	526.7	552.4	579.2	733.7	928.5
Pittwater	1.1	1.1	1.3	1.3	1.3	1.3	1.3	1.3	1.5	1.7	1.9	2.0	2.3	3.4	5.0
Randwick	47.2	49.0	51.0	53.0	55.0	57.2	59.4	61.7	64.6	67.7	70.9	74.3	77.9	98.2	123.9
Rockdale	6.2	6.5	7.0	7.3	7.5	7.9	8.2	8.5	9.2	9.9	10.7	11.4	12.2	16.9	22.9
Ryde	2.9	2.9	3.1	3.0	2.8	2.7	2.5	2.2	2.5	2.8	3.1	3.4	3.8	5.8	8.4
Strathfield	8.8	9.5	10.9	11.6	11.9	12.6	13.3	13.9	15.8	17.7	19.7	21.8	24.0	36.7	53.0
Sutherland Shire	8.7	8.9	5.2	5.4	5.5	5.6	5.8	5.9	6.7	7.5	8.4	9.3	10.2	15.6	22.5
Sydney	26.3	27.1	28.5	29.3	29.6	30.3	30.9	31.4	33.9	36.5	39.2	42.1	45.1	62.3	84.4
Warringah	4.2	4.5	5.0	5.3	5.3	5.5	5.7	5.9	6.6	7.4	8.3	9.1	10.1	15.4	22.3
Waverley	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.7
Willoughby	5.9	5.9	6.0	6.0	6.0	6.0	6.0	5.9	6.2	6.5	6.8	7.2	7.5	9.5	11.9
Woollahra	1.9	1.8	1.8	1.7	1.6	1.5	1.3	1.2	1.2	1.3	1.4	1.4	1.5	1.9	2.4
TOTAL	**1,566**	**1,670**	**1,778**	**1,892**	**2,011**	**2,135**	**2,266**	**2,402**	**2,545**	**2,695**	**2,853**	**3,017**	**3,190**	**4,183**	**5,436**

Table C1.5 Road distribution for 'Base Case' scenario for Port Botany – B-Double truck movements per day – round trips

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.5	0.8
Auburn	11.8	12.8	14.7	15.7	16.2	17.3	18.3	19.4	21.9	24.6	27.3	30.3	33.3	50.9	73.6
Bankstown	10.1	10.8	12.3	13.0	13.3	13.9	14.5	15.1	17.1	19.2	21.4	23.7	26.1	39.8	57.6
Baulkham Hills	29.9	31.8	33.8	35.9	38.2	40.5	43.1	45.7	48.0	50.3	52.8	55.3	58.0	73.5	93.0
Blacktown	196.7	211.8	227.8	244.8	262.9	282.2	302.7	324.5	340.3	356.9	374.3	392.5	411.5	521.3	659.8
Botany Bay	45.7	47.3	48.9	50.6	52.4	54.1	56.0	57.9	60.6	63.5	66.5	69.7	73.0	92.1	116.2
Burwood	2.4	2.5	2.8	2.9	2.9	3.0	3.1	3.1	3.5	4.0	4.4	4.9	5.4	8.2	11.9
Camden	9.7	11.5	13.4	15.4	17.6	19.9	22.4	25.1	27.3	29.7	32.2	34.7	37.4	52.5	71.3
Campbelltown	15.0	17.4	19.9	22.4	25.1	27.8	30.6	33.5	37.1	41.0	45.0	49.3	53.8	79.9	113.1
Canada Bay	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	1.0	1.2	1.3	1.4	2.2	3.1
Canterbury	1.7	1.8	2.0	2.1	2.1	2.1	2.2	2.2	2.5	2.8	3.1	3.4	3.8	5.8	8.3
Fairfield	48.8	53.1	57.5	62.2	67.2	72.4	77.9	83.8	89.0	94.5	100.3	106.4	112.7	149.4	195.6
Holroyd	30.4	32.2	34.0	35.9	37.8	39.8	41.8	43.8	47.1	50.6	54.3	58.1	62.1	85.2	114.4
Hornsby	7.5	7.9	8.7	9.0	9.0	9.2	9.3	9.4	10.6	11.9	13.2	14.7	16.1	24.7	35.7
Hunters Hill	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.6
Hurstville	1.1	1.1	1.3	1.3	1.3	1.4	1.4	1.4	1.6	1.8	2.0	2.2	2.5	3.8	5.4
Kogarah	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.9	1.0	1.3	1.8
Ku-ring-gai	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.8	1.2
Lane Cove	0.7	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.1	1.2	1.4	1.5	2.3	3.3
Leichhardt	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	1.0	1.1	1.3	1.9	2.8
Liverpool	68.8	71.5	74.3	77.1	80.1	83.1	86.2	89.5	93.8	98.4	103.2	108.2	113.5	143.7	181.9
Manly	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Marrickville	4.3	4.5	2.6	2.8	4.9	4.9	5.0	5.1	5.5	5.9	6.4	6.8	7.3	10.1	11.7
Mosman	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.5
North Sydney	2.4	2.2	2.1	1.9	1.7	1.4	1.2	0.9	0.9	0.9	1.0	1.0	1.1	1.4	1.7
Parramatta	32.9	33.8	34.7	35.5	36.4	37.2	38.1	38.9	40.8	42.8	44.9	47.1	49.4	62.5	79.1
Penrith	122.9	132.3	142.4	153.0	164.4	176.5	189.3	203.0	212.9	223.2	234.1	245.5	257.4	326.1	412.7
Pittwater	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.9	1.0	1.5	2.2
Randwick	21.0	21.8	22.6	23.5	24.5	25.4	26.4	27.4	28.7	30.1	31.5	33.0	34.6	43.7	55.1
Rockdale	2.8	2.9	3.1	3.2	3.3	3.5	3.6	3.8	4.1	4.4	4.7	5.1	5.4	7.5	10.2
Ryde	1.3	1.3	1.4	1.3	1.3	1.2	1.1	1.0	1.1	1.2	1.4	1.5	1.7	2.6	3.7
Strathfield	3.9	4.2	4.8	5.1	5.3	5.6	5.9	6.2	7.0	7.9	8.7	9.7	10.7	16.3	23.6
Sutherland Shire	3.8	3.9	2.3	2.4	2.4	2.5	2.6	2.6	3.0	3.3	3.7	4.1	4.5	6.9	10.0
Sydney	11.7	12.1	12.7	13.0	13.2	13.5	13.7	14.0	15.1	16.2	17.4	18.7	20.0	27.7	37.5
Warringah	1.9	2.0	2.2	2.3	2.4	2.5	2.5	2.6	2.9	3.3	3.7	4.1	4.5	6.8	9.9
Waverley	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3
Willoughby	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.6	2.8	2.9	3.0	3.2	3.3	4.2	5.3
Woollahra	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.7	0.8	1.1
TOTAL	**696**	**742**	**790**	**841**	**894**	**949**	**1,007**	**1,068**	**1,131**	**1,198**	**1,268**	**1,341**	**1,418**	**1,859**	**2,416**

Table C1.6 Road distribution for 'Project Case' scenario for Port Botany – Semi Truck movements per day – round trips

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.7	0.8	1.2	1.7
Auburn	21.4	21.3	20.4	18.0	15.2	11.9	13.8	16.4	20.2	24.4	29.0	34.0	39.5	73.0	118.4
Bankstown	20.7	23.4	25.9	27.5	29.0	30.5	31.9	33.3	37.7	42.4	47.3	52.4	57.8	88.8	127.9
Baulkham Hills	62.0	60.9	59.4	57.5	55.0	52.0	57.0	63.2	68.5	74.1	79.9	86.0	92.3	128.2	173.0
Blacktown	408.8	406.3	400.8	391.8	378.8	361.5	400.4	448.0	486.1	525.7	566.9	609.9	654.7	909.6	1,227.1
Botany Bay	102.9	106.4	110.1	113.9	117.8	121.8	125.9	130.2	136.4	142.9	149.6	156.8	164.2	207.2	261.4
Burwood	4.8	5.4	5.9	6.1	6.4	6.6	6.7	6.9	7.8	8.8	9.8	10.8	11.9	18.3	26.4
Camden	19.3	19.9	19.8	18.8	17.0	14.1	17.3	21.7	25.7	30.1	34.7	39.7	44.9	75.9	116.1
Campbelltown	29.8	30.2	29.4	27.4	24.2	19.7	23.7	29.0	35.0	41.5	48.6	56.3	64.6	115.6	184.4
Canada Bay	1.3	1.4	1.6	1.6	1.7	1.7	1.8	1.8	2.1	2.3	2.6	2.9	3.2	4.9	7.0
Canterbury	3.4	3.8	4.2	4.3	4.5	4.6	4.7	4.8	5.5	6.1	6.8	7.6	8.4	12.8	18.5
Fairfield	96.8	91.6	84.6	75.7	64.5	51.0	60.1	72.3	83.6	95.5	108.0	121.2	135.1	215.7	318.4
Holroyd	63.2	55.6	50.1	43.7	36.3	28.0	32.2	37.8	44.3	51.1	58.4	66.2	74.4	123.1	186.2
Hornsby	15.3	17.0	18.4	19.1	19.6	20.1	20.4	20.6	23.4	26.3	29.3	32.5	35.8	55.0	79.2
Hunters Hill	0.6	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6	1.0	1.4
Hurstville	4.6	4.8	2.7	2.8	2.9	3.0	3.1	3.1	3.6	4.0	4.5	4.9	5.5	8.4	12.1
Kogarah	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	1.8	2.0	2.1	2.9	4.0
Ku-ring-gai	0.4	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.8	2.6
Lane Cove	3.0	3.1	1.7	1.8	1.8	1.9	1.9	1.9	2.2	2.5	2.7	3.0	3.3	5.1	7.4
Leichhardt	2.1	1.1	1.2	1.3	1.4	1.5	1.5	1.6	1.8	2.1	2.3	2.5	2.8	4.3	6.2
Liverpool	142.3	128.5	113.4	97.1	79.4	60.4	68.4	79.3	90.4	101.8	113.7	126.0	138.8	210.9	299.8
Manly	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
Marrickville	9.5	9.9	10.3	10.6	10.8	11.0	11.2	11.4	12.3	13.3	14.2	15.3	16.4	22.7	30.6
Mosman	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.7	0.8	1.0
North Sydney	5.4	5.0	4.7	4.2	3.7	3.2	2.6	1.9	2.0	2.1	2.2	2.3	2.4	3.1	3.9
Parramatta	68.4	64.8	61.0	56.9	52.4	47.7	50.4	53.7	58.3	63.1	68.0	73.2	78.5	109.1	147.2
Penrith	255.4	228.5	209.5	186.1	157.9	124.3	145.9	175.2	199.9	225.5	252.1	279.7	308.4	470.9	671.7
Pittwater	2.1	2.1	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.6	1.8	2.0	2.2	3.4	4.9
Randwick	47.2	49.0	51.0	53.0	55.0	57.2	59.4	61.7	64.6	67.7	70.9	74.3	77.9	98.2	123.9
Rockdale	6.0	6.4	6.8	7.1	7.5	7.8	8.1	8.5	9.1	9.8	10.6	11.4	12.2	16.9	22.8
Ryde	2.6	2.8	2.9	2.8	2.7	2.6	2.4	2.1	2.4	2.7	3.1	3.4	3.7	5.7	8.3
Strathfield	8.0	9.2	10.2	10.9	11.6	12.3	12.9	13.6	15.4	17.4	19.4	21.5	23.7	36.3	52.3
Sutherland Shire	8.4	8.8	9.1	9.2	9.4	9.5	9.6	9.7	10.5	11.3	12.2	13.1	14.0	19.4	26.2
Sydney	25.6	26.8	27.9	28.7	29.4	30.0	30.6	31.2	33.6	36.2	39.0	41.8	44.8	62.1	83.8
Warringah	8.0	4.3	4.7	5.0	5.2	5.4	5.6	5.7	6.5	7.3	8.1	9.0	9.9	15.3	22.0
Waverley	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.7
Willoughby	5.9	5.9	6.0	6.0	6.0	6.0	6.0	5.9	6.2	6.5	6.8	7.2	7.5	9.5	11.9
Woollahra	1.9	1.8	1.8	1.7	1.6	1.5	1.3	1.2	1.2	1.3	1.4	1.4	1.5	1.9	2.4
TOTAL	**1,460**	**1,411**	**1,361**	**1,296**	**1,214**	**1,114**	**1,222**	**1,359**	**1,502**	**1,652**	**1,809**	**1,974**	**2,146**	**3,140**	**4,393**

Table C1.7 Road distribution for 'Project Case' scenario for Port Botany – B-Double truck movements per day – round trips

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.5	0.7
Auburn	9.5	9.5	9.0	8.0	6.8	5.3	6.1	7.3	9.0	10.8	12.9	15.1	17.5	32.4	52.6
Bankstown	9.2	10.4	11.5	12.2	12.9	13.5	14.2	14.8	16.8	18.9	21.0	23.3	25.7	39.5	56.8
Baulkham Hills	27.6	27.1	26.4	25.5	24.4	23.1	25.3	28.1	30.5	32.9	35.5	38.2	41.0	57.0	76.9
Blacktown	181.7	180.6	178.1	174.1	168.4	160.7	178.0	199.1	216.0	233.6	252.0	271.1	291.0	404.3	545.4
Botany Bay	45.7	47.3	48.9	50.6	52.4	54.1	56.0	57.9	60.6	63.5	66.5	69.7	73.0	92.1	116.2
Burwood	2.1	2.4	2.6	2.7	2.8	2.9	3.0	3.1	3.5	3.9	4.3	4.8	5.3	8.1	11.7
Camden	8.6	8.9	8.8	8.4	7.5	6.3	7.7	9.6	11.4	13.4	15.4	17.6	20.0	33.8	51.6
Campbelltown	13.3	13.4	13.1	12.2	10.7	8.7	10.5	12.9	15.5	18.4	21.6	25.0	28.7	51.4	82.0
Canada Bay	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.9	1.0	1.1	1.3	1.4	2.2	3.1
Canterbury	1.5	1.7	1.9	1.9	2.0	2.1	2.1	2.1	2.4	2.7	3.0	3.4	3.7	5.7	8.2
Fairfield	43.0	40.7	37.6	33.6	28.7	22.7	26.7	32.1	37.2	42.4	48.0	53.9	60.0	95.9	141.5
Holroyd	28.1	24.7	22.3	19.4	16.2	12.5	14.3	16.8	19.7	22.7	26.0	29.4	33.1	54.7	82.8
Hornsby	6.8	7.6	8.2	8.5	8.7	8.9	9.1	9.2	10.4	11.7	13.0	14.4	15.9	24.4	35.2
Hunters Hill	0.3	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.6
Hurstville	2.1	2.1	1.2	1.2	1.3	1.3	1.4	1.4	1.6	1.8	2.0	2.2	2.4	3.7	5.4
Kogarah	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.9	0.9	1.3	1.8
Ku-ring-gai	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.8	1.2
Lane Cove	1.3	1.4	0.8	0.8	0.8	0.8	0.8	0.9	1.0	1.1	1.2	1.3	1.5	2.3	3.3
Leichhardt	0.9	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.9	2.8
Liverpool	63.2	57.1	50.4	43.2	35.3	26.8	30.4	35.2	40.2	45.3	50.5	56.0	61.7	93.7	133.3
Manly	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Marrickville	4.2	4.4	4.6	4.7	4.8	4.9	5.0	5.1	5.5	5.9	6.3	6.8	7.3	10.1	13.6
Mosman	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.5
North Sydney	2.4	2.2	2.1	1.9	1.7	1.4	1.2	0.9	0.9	0.9	1.0	1.0	1.1	1.4	1.7
Parramatta	30.4	28.8	27.1	25.3	23.3	21.2	22.4	23.9	25.9	28.0	30.2	32.5	34.9	48.5	65.4
Penrith	113.5	101.6	93.1	82.7	70.2	55.3	64.8	77.9	88.8	100.2	112.0	124.3	137.1	209.3	298.5
Pittwater	0.9	0.9	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.9	1.0	1.5	2.2
Randwick	21.0	21.8	22.6	23.5	24.5	25.4	26.4	27.4	28.7	30.1	31.5	33.0	34.6	43.7	55.1
Rockdale	2.7	2.9	3.0	3.2	3.3	3.5	3.6	3.8	4.1	4.4	4.7	5.0	5.4	7.5	10.1
Ryde	1.2	1.2	1.3	1.3	1.2	1.2	1.1	1.0	1.1	1.2	1.4	1.5	1.7	2.5	3.7
Strathfield	3.6	4.1	4.5	4.8	5.1	5.5	5.8	6.0	6.9	7.7	8.6	9.5	10.5	16.1	23.3
Sutherland Shire	3.7	3.9	4.0	4.1	4.2	4.2	4.3	4.3	4.7	5.0	5.4	5.8	6.2	8.6	11.6
Sydney	11.4	11.9	12.4	12.7	13.0	13.3	13.6	13.8	15.0	16.1	17.3	18.6	19.9	27.6	37.2
Warringah	3.6	1.9	2.1	2.2	2.3	2.4	2.5	2.5	2.9	3.2	3.6	4.0	4.4	6.8	9.8
Waverley	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3
Willoughby	2.6	2.6	2.7	2.7	2.7	2.7	2.7	2.6	2.8	2.9	3.0	3.2	3.3	4.2	5.3
Woollahra	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.7	0.8	1.1
TOTAL	**649**	**627**	**605**	**576**	**540**	**495**	**543**	**604**	**668**	**734**	**804**	**877**	**954**	**1,395**	**1,953**

Table C1.8 Road distribution for 'Project Case' scenario for Moorebank – Semi Truck movements per day – round trips

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Auburn	3.3	7.5	12.7	18.2	24.3	31.0	31.6	31.3	33.6	35.7	37.6	39.5	41.2	48.5	53.9
Bankstown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baulkham Hills	5.7	12.1	19.4	27.5	36.5	46.6	47.4	47.2	46.8	46.4	46.0	45.7	45.4	44.1	43.1
Blacktown	37.6	81.0	130.7	187.4	251.7	324.3	333.0	334.8	331.9	329.2	326.6	324.2	322.0	312.5	305.5
Botany Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burwood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Camden	3.0	7.1	12.4	19.0	27.1	36.8	39.6	41.5	42.8	43.9	45.0	46.0	46.9	50.4	52.9
Campbelltown	4.6	10.7	18.3	27.6	38.6	51.3	54.0	55.4	58.1	60.6	63.1	65.3	67.5	76.8	83.9
Canada Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canterbury	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fairfield	14.9	32.5	52.8	76.2	102.9	133.1	137.2	138.3	138.9	139.5	140.1	140.6	141.1	143.3	144.9
Holroyd	5.8	19.7	31.3	44.0	57.9	73.2	73.6	72.3	73.5	74.7	75.8	76.8	77.7	81.7	84.8
Hornsby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hunters Hill	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hurstville	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kogarah	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ku-ring-gai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Cove	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leichhardt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liverpool	22.0	45.5	70.8	97.8	126.7	157.5	156.2	151.7	150.1	148.7	147.4	146.2	145.0	140.1	136.5
Manly	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marrickville	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mosman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Sydney	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parramatta	6.3	12.9	19.9	27.2	34.8	42.8	41.9	40.2	39.8	39.5	39.2	38.9	38.6	37.5	36.6
Penrith	23.5	81.0	130.7	187.4	251.8	324.4	333.3	335.1	332.2	329.4	326.9	324.5	322.2	312.8	305.7
Pittwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Randwick	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rockdale	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ryde	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Strathfield	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sutherland Shire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sydney	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warringah	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waverley	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Willoughby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Woollahra	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**127**	**310**	**499**	**712**	**952**	**1,221**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**	**1,248**

Table C1.9 Road distribution for 'Project Case' scenario for Moorebank – B-Double truck movements per day – round trips

LGA	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040
Ashfield	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Auburn	0.5	1.3	2.1	3.0	4.0	5.2	5.3	5.2	5.6	5.9	6.3	6.6	6.9	8.1	9.0
Bankstown	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Baulkham Hills	1.0	2.0	3.2	4.6	6.1	7.8	7.9	7.9	7.8	7.7	7.7	7.6	7.6	7.3	7.2
Blacktown	6.3	13.5	21.8	31.2	41.9	54.0	55.5	55.8	55.3	54.9	54.4	54.0	53.7	52.1	50.9
Botany Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burwood	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Camden	0.5	1.2	2.1	3.2	4.5	6.1	6.6	6.9	7.1	7.3	7.5	7.7	7.8	8.4	8.8
Campbelltown	0.8	1.8	3.1	4.6	6.4	8.5	9.0	9.2	9.7	10.1	10.5	10.9	11.3	12.8	14.0
Canada Bay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canterbury	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fairfield	2.5	5.4	8.8	12.7	17.1	22.2	22.9	23.0	23.2	23.3	23.3	23.4	23.5	23.9	24.2
Holroyd	1.0	3.3	5.2	7.3	9.7	12.2	12.3	12.1	12.3	12.4	12.6	12.8	13.0	13.6	14.1
Hornsby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hunters Hill	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hurstville	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kogarah	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ku-ring-gai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane Cove	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leichhardt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liverpool	3.7	7.6	11.8	16.3	21.1	26.2	26.0	25.3	25.0	24.8	24.6	24.4	24.2	23.4	22.7
Manly	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marrickville	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mosman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Sydney	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Parramatta	1.0	2.2	3.3	4.5	5.8	7.1	7.0	6.7	6.6	6.6	6.5	6.5	6.4	6.2	6.1
Penrith	3.9	13.5	21.8	31.2	42.0	54.1	55.5	55.8	55.4	54.9	54.5	54.1	53.7	52.1	50.9
Pittwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Randwick	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rockdale	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ryde	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Strathfield	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sutherland Shire	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sydney	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warringah	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waverley	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Willoughby	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Woollahra	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**21**	**52**	**83**	**119**	**159**	**203**	**208**	**208**	**208**	**208**	**208**	**208**	**208**	**208**	**208**

Appendix D

Deloitte Distribution Data (by Postcode)

D1. Allocation by postcode

Table D1.1 Percentage allocation by postcode (for 6 of the LGA's with the greatest volume of traffic to/from Moorebank)

LGA	Postcode	Percentage of LGA volume	LGA	Postcode	Percentage of LGA volume
Penrith	2759	76.2%	Fairfield	2169	48.1%
	2750	13.7%		2165	16.3%
	2760	9.3%		2161	13.6%
	2178	0.3%		2166	8.7%
	2747	0.2%		2163	7.3%
	2749	0.1%		2175	5.5%
Blacktown	2766	42.8%		2177	0.2%
	2148	24.7%	Campbelltown	2566	52.5%
	2147	11.0%		2565	44.5%
	2770	9.2%		2560	3.3%
	2761	6.4%	Camden	2567	99.2%
	2760	3.6%		2570	0.4%
	2765	2.0%		2179	0.3%
Liverpool	2170	75.6%		2557	0.1%
	2173	20.2%			
	2171	3.6%			
	2178	0.2%			
	2556	0.1%			
	2179	0.1%			

Appendix E

Change in articulated truck volumes on key corridors

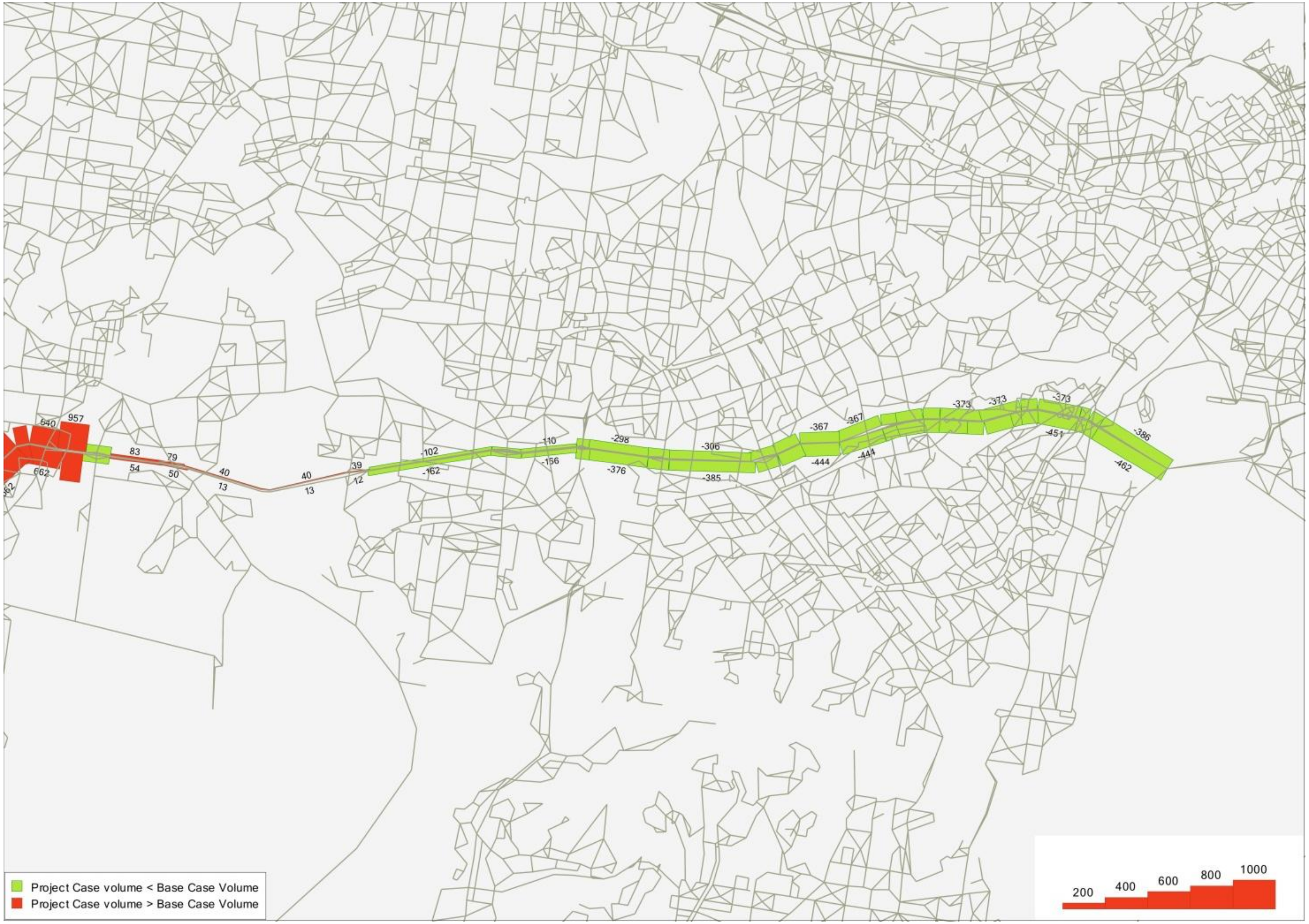


Figure D1.1 Change in articulated vehicle flows to/from Port Botany and Moorebank on the M5 between Sydney Airport and Hume Highway

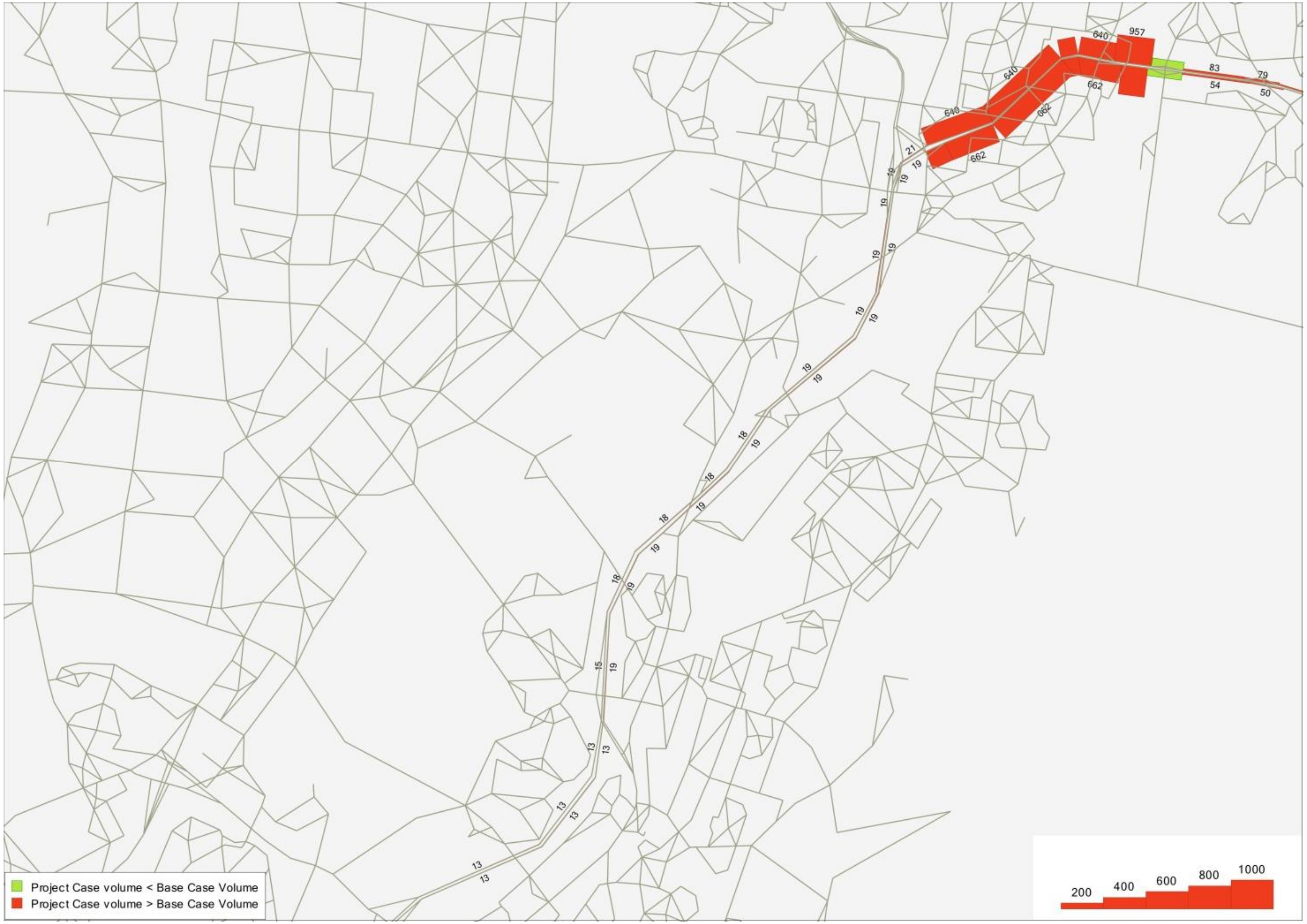


Figure D1.2 Change in articulated vehicle flows to/from Port Botany and Moorebank on the M5 between Hume Highway and Narellan Road

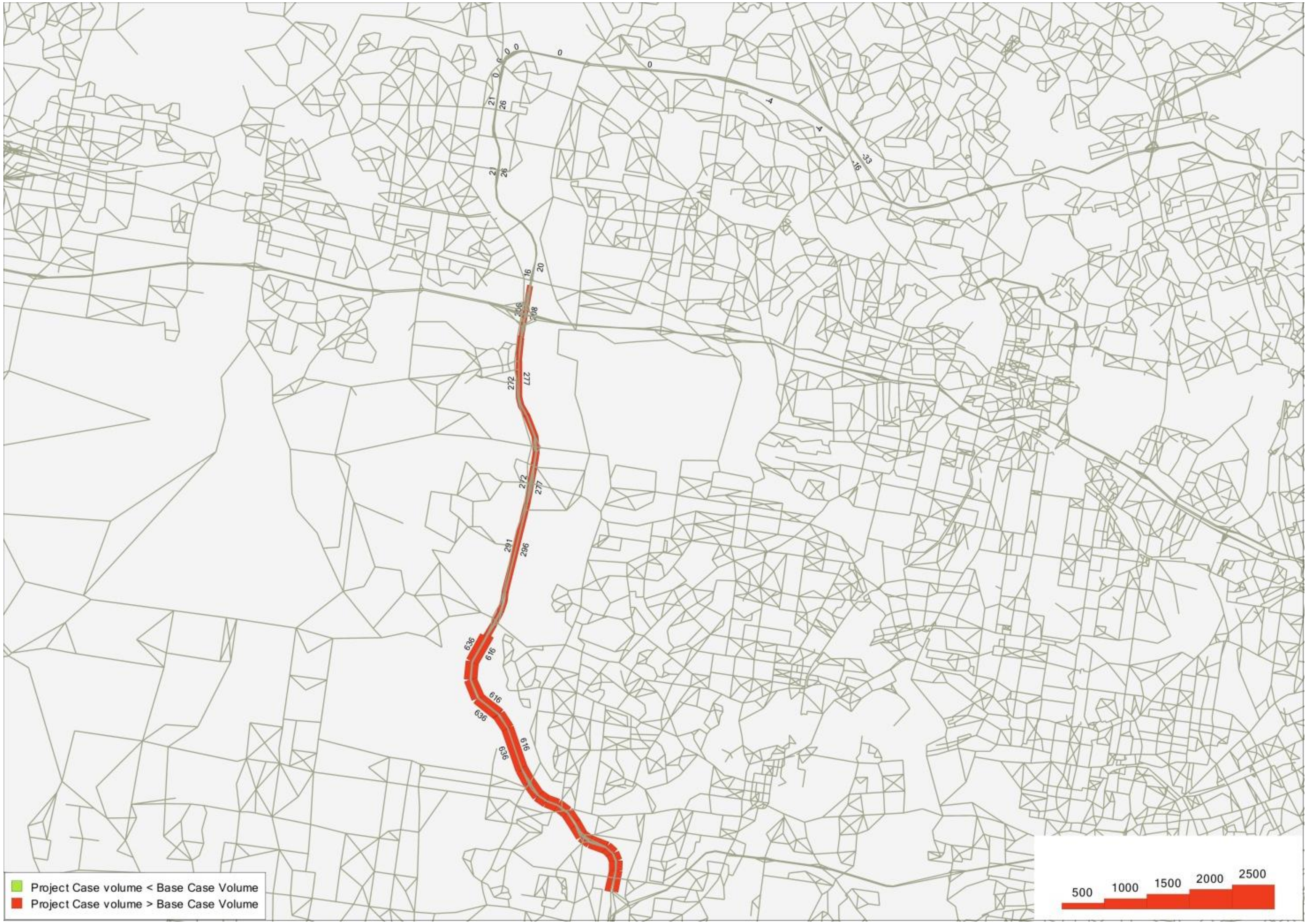


Figure D1.3 Change in articulated vehicle flows to/from Port Botany and Moorebank on the M7 between the M5 and M4

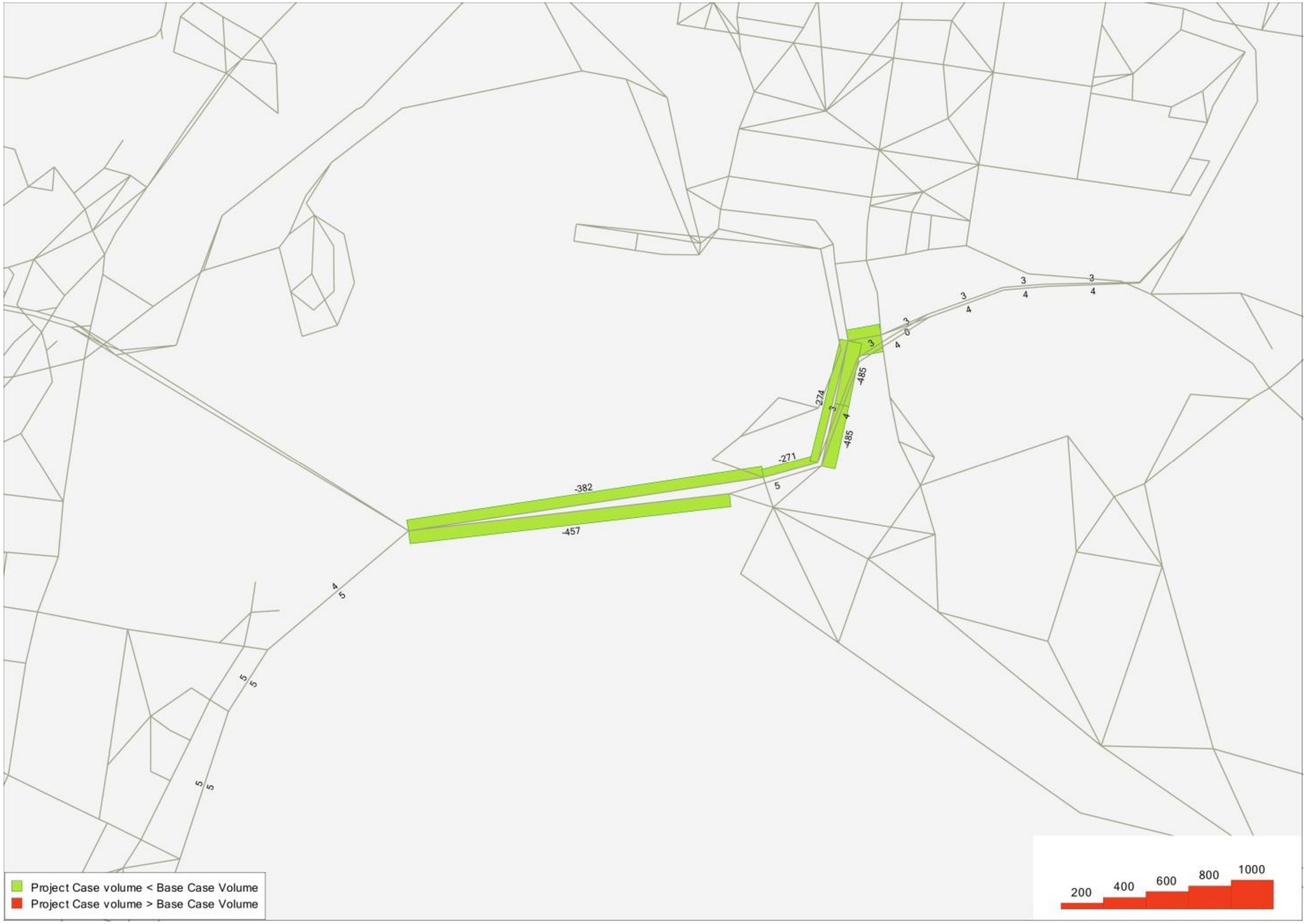


Figure D1.4 Change in articulated vehicle flows to/from Port Botany and Moorebank on General Holmes Drive between Botany Road and The Grand Parade

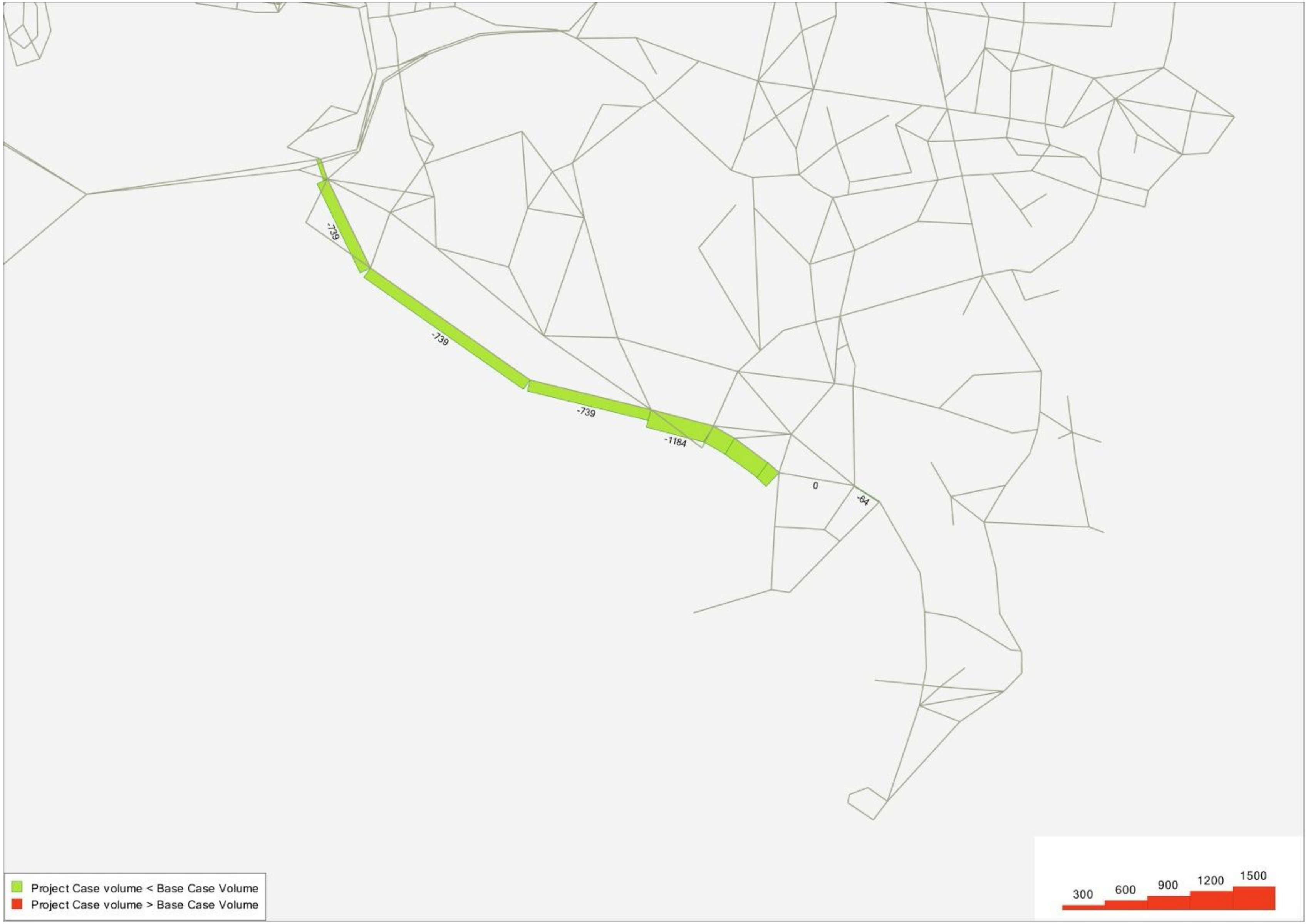


Figure D1.5 Change in articulated vehicle flows to/from Port Botany and Moorebank on Foreshore Road/Botany Road between Southern Cross Road and Bumborah Point Road

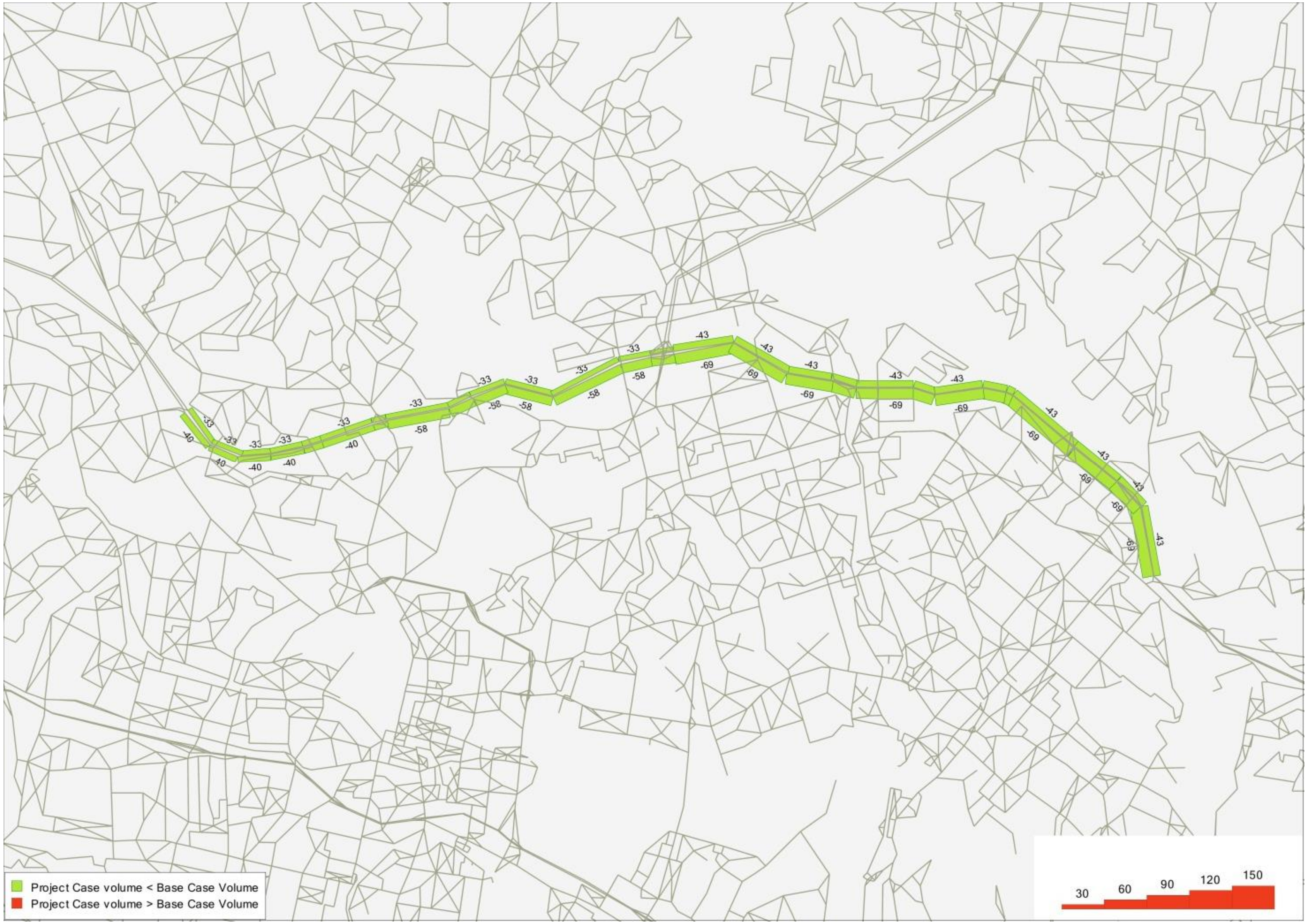


Figure D1.6 Change in articulated vehicle flows to/from Port Botany and Moorebank on the M2 between Delhi Road and Abbott Road

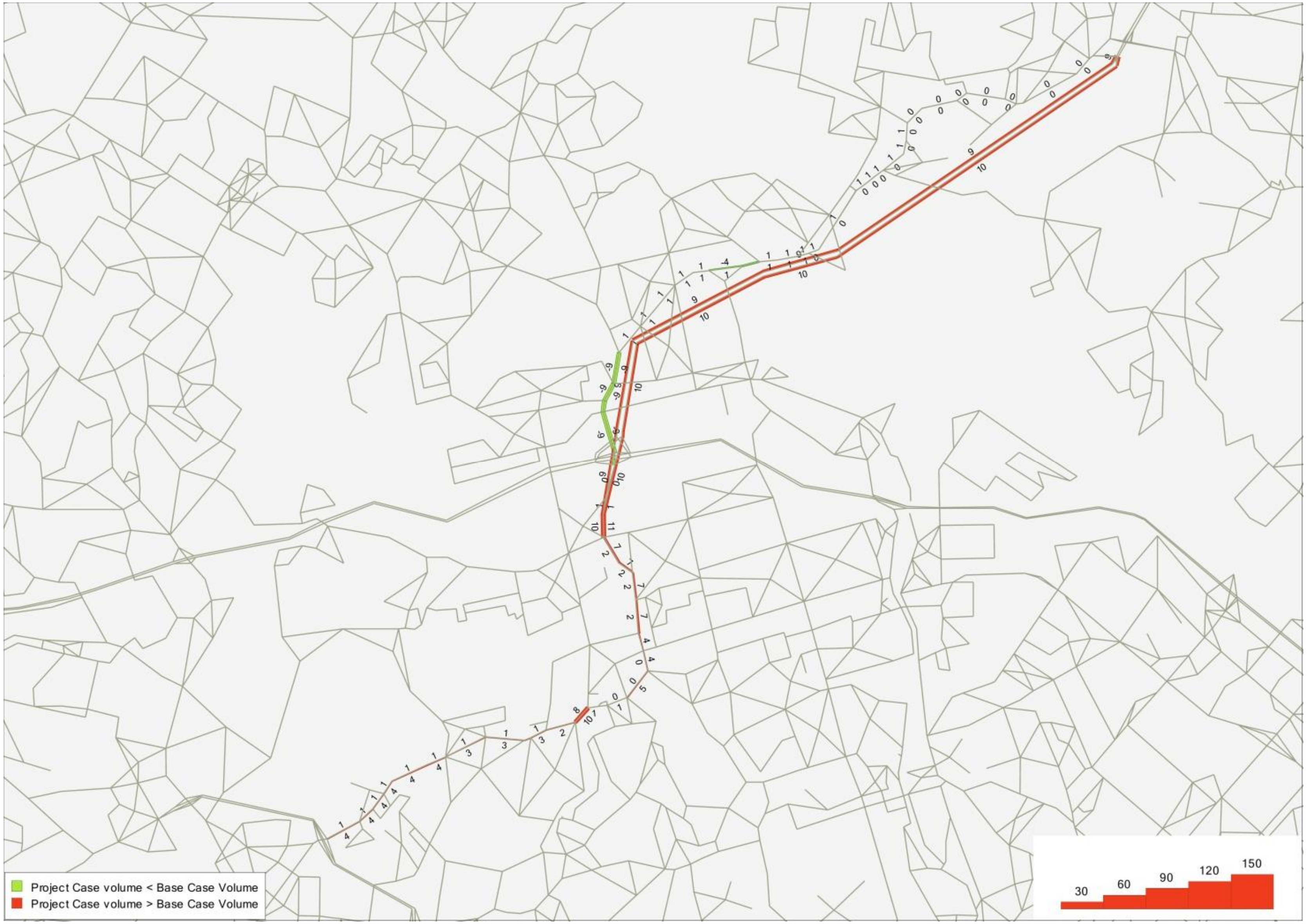


Figure D1.7 Change in articulated vehicle flows to/from Port Botany and Moorebank on Pennant Hills Road/Cumberland Highway between James Ruse Drive and the M1

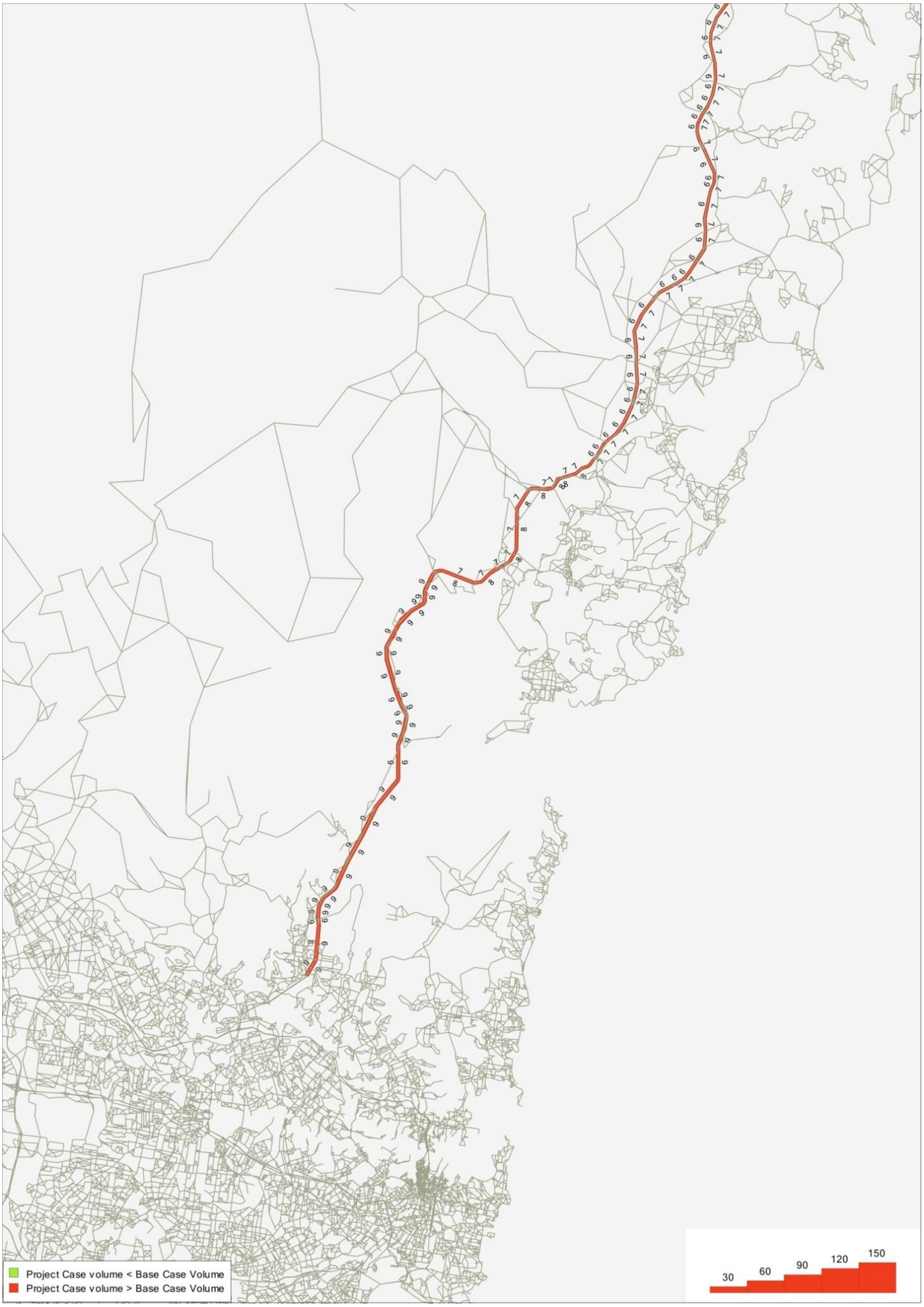


Figure D1.8 Change in articulated vehicle flows to/from Port Botany and Moorebank on the M1 north of Cumberland Highway

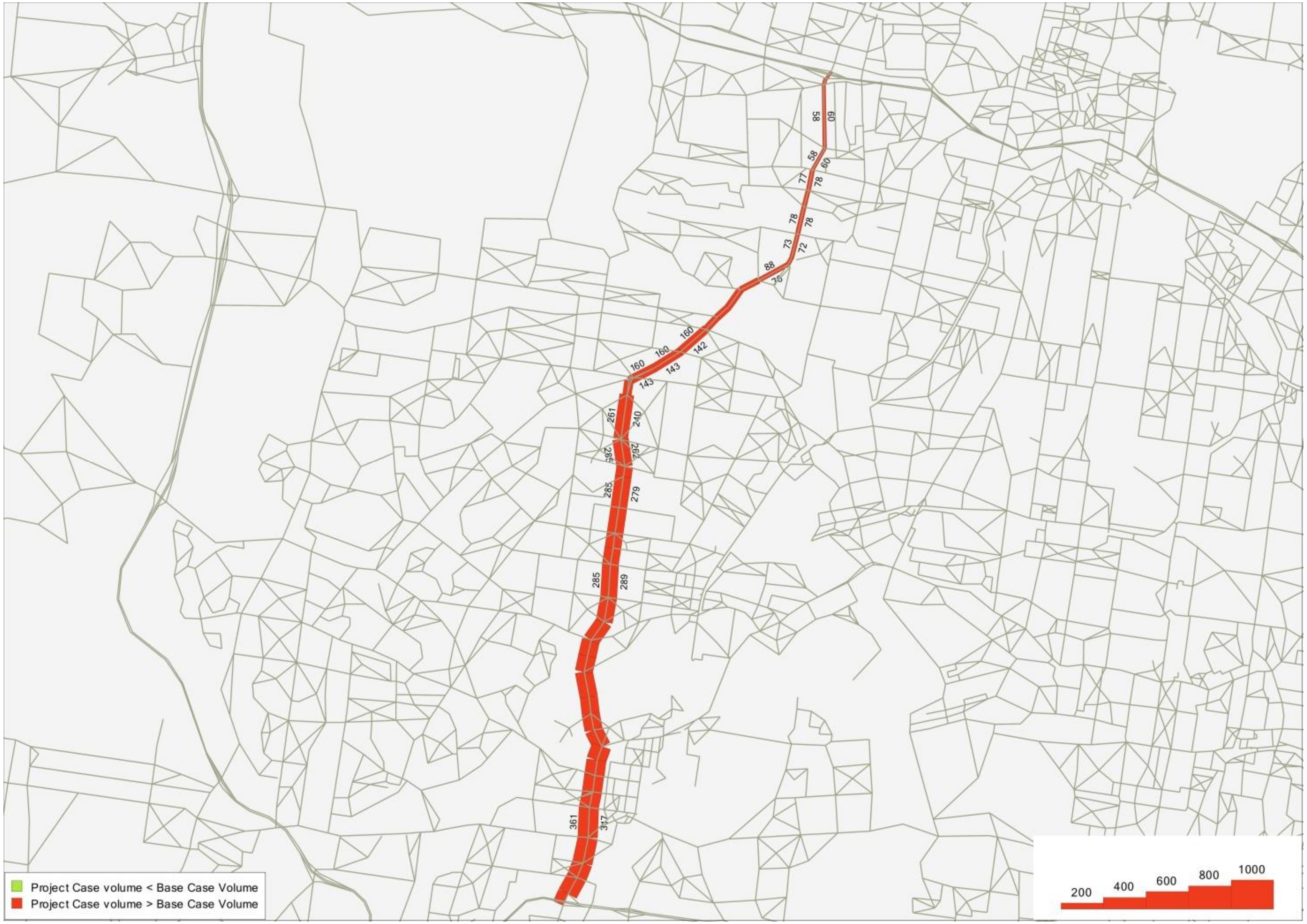


Figure D1.9 Change in articulated vehicle flows to/from Port Botany and Moorebank on the Hume Highway/Cumberland between the M5 and the M4

Appendix F

Change in speed

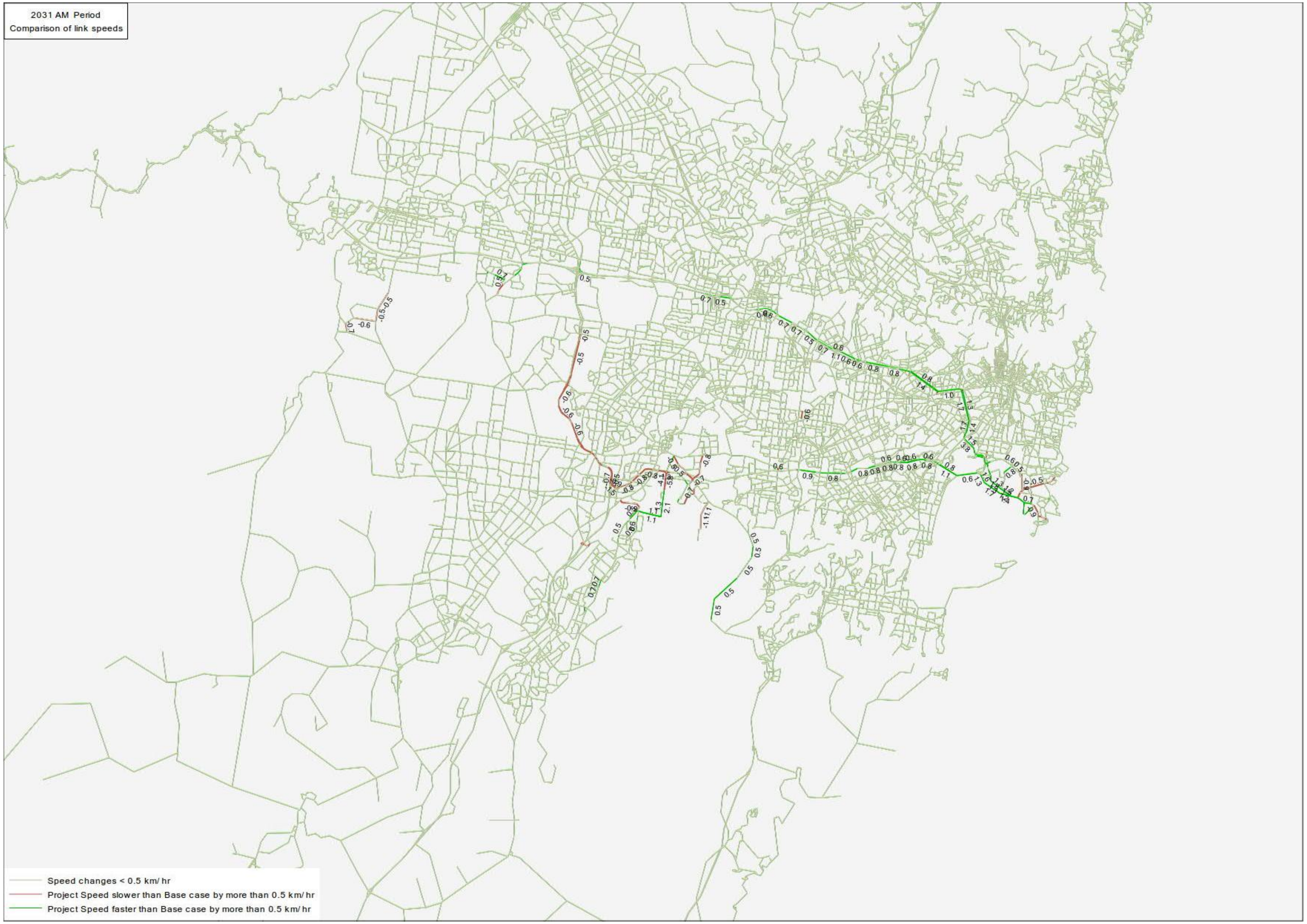


Figure D1.1 Change in speed, 2031 AM Peak ('Project Case' versus 'Base Case')

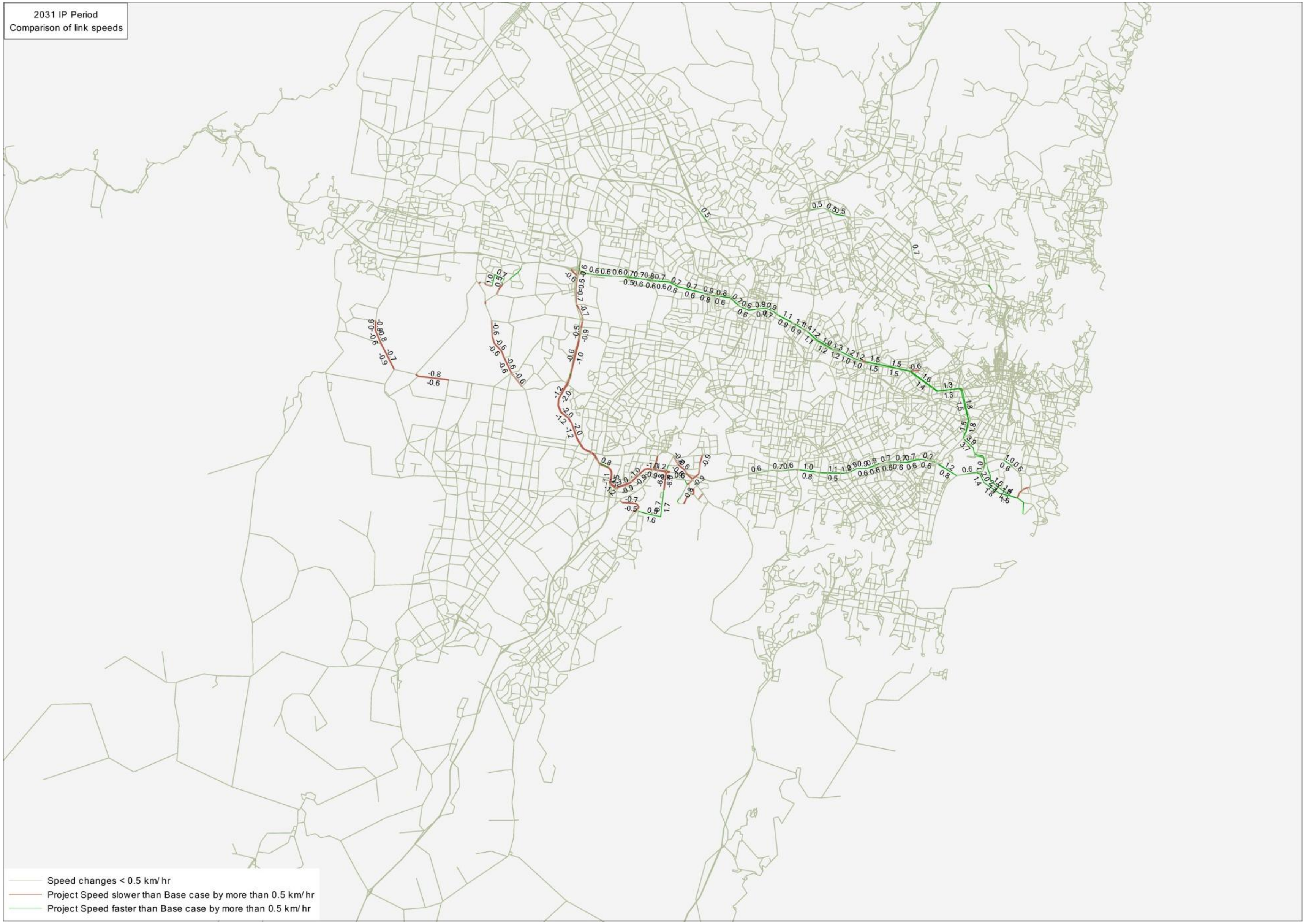


Figure D1.2 Change in speed, 2031 inter-peak period ('Project Case' versus 'Base Case')

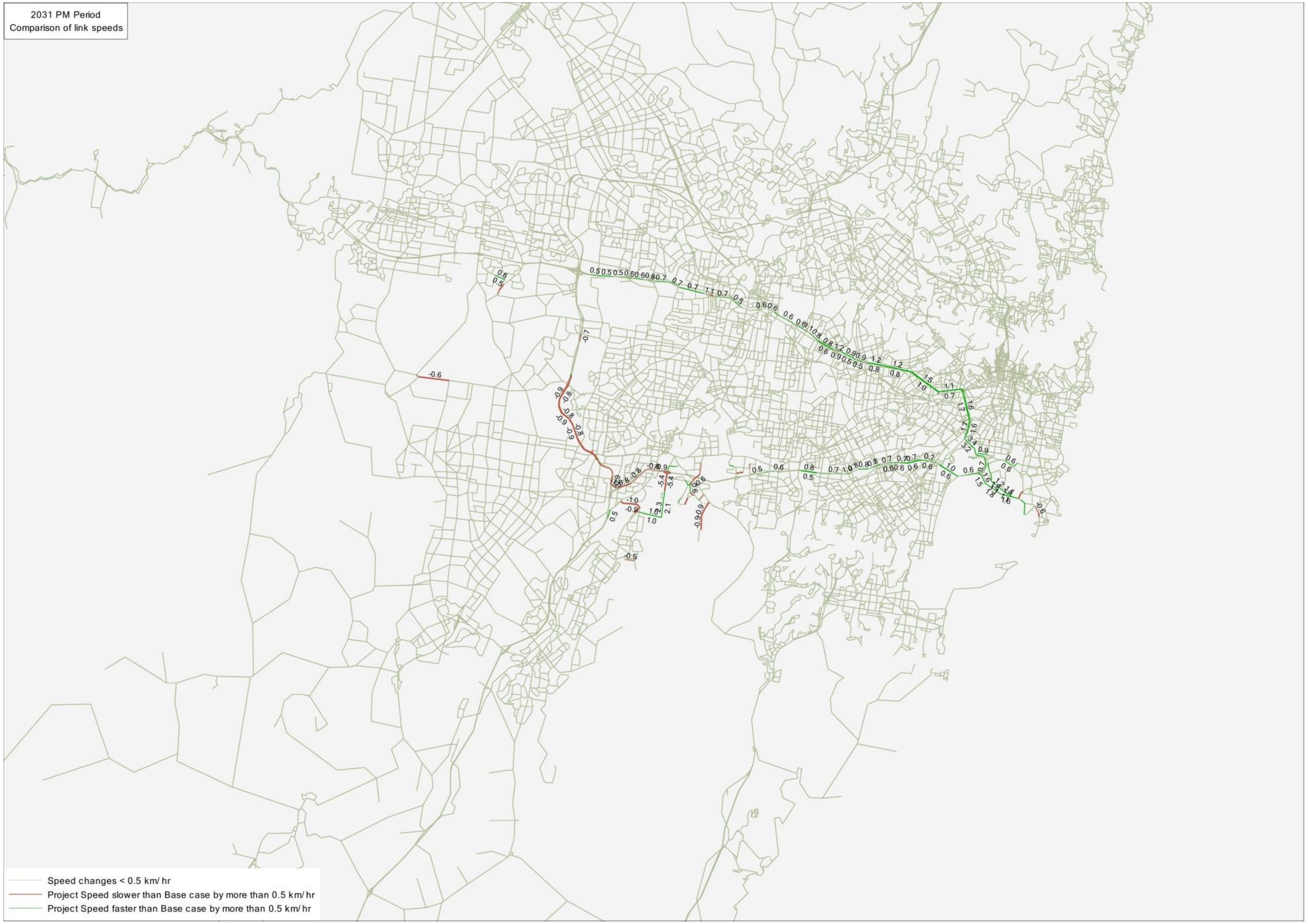


Figure D1.3 Change in speed, 2031 PM peak (‘Project Case versus ‘Base Case’)

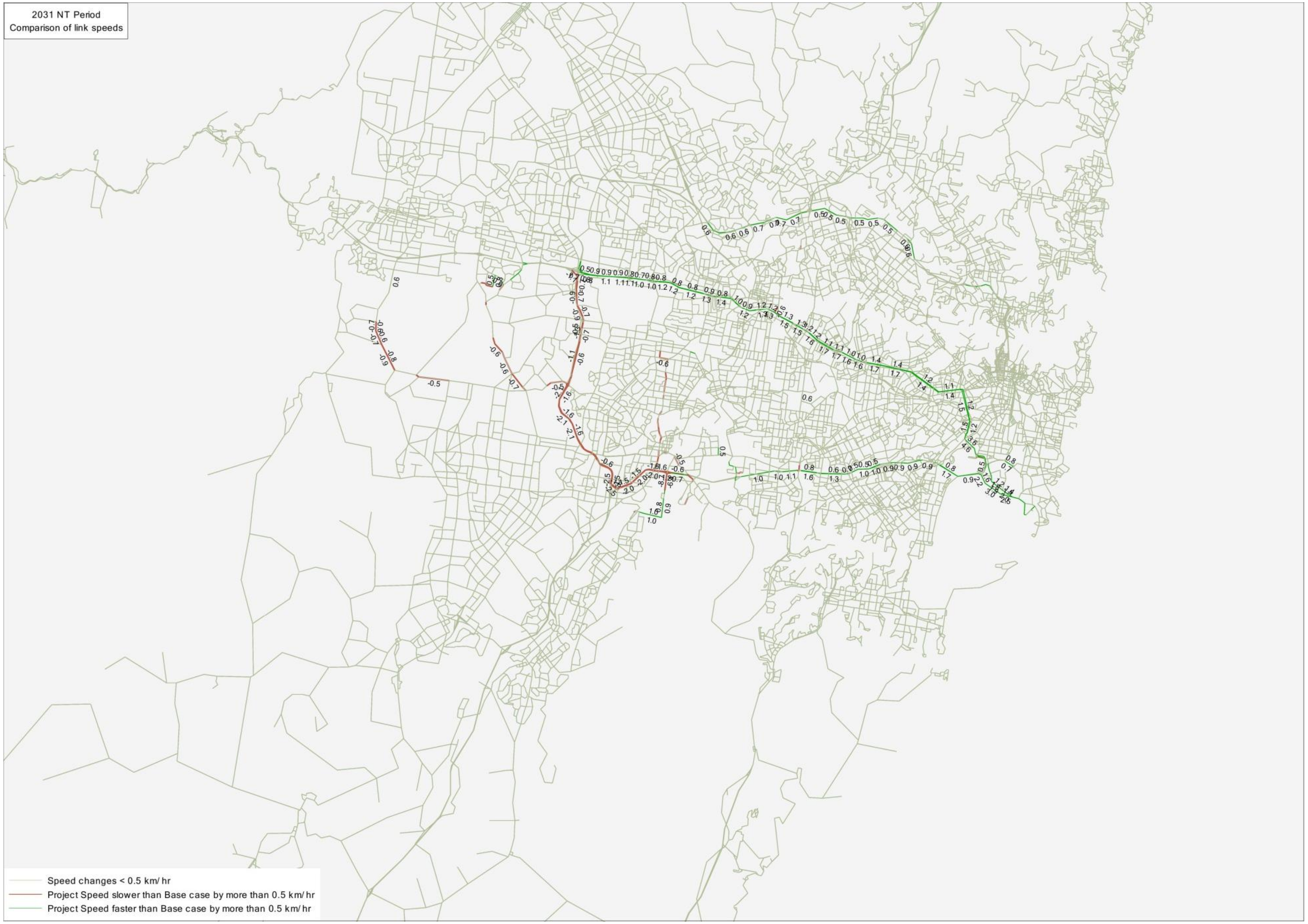


Figure D1.4 Change in speed, 2031 night time period ('Project Case versus 'Base Case')

Appendix M

Deloitte EIS – Supporting Information

Moorebank Intermodal Company

EIS - Supporting Information

2 March 2015

REVISED

Contents

List of Tables and Figures

Glossary

Acronym	Description
$	Australian dollars unless stated otherwise
“ ‘ or ft	Foot, a unit of length
ACBPS	Australian Customs and Border Protection Services
ACFS	Australian Container Freight Services
ARTC	Australian Rail Track Corporation Ltd
BITRE	Bureau of Infrastructure, Transport and Regional Economics
BTS	NSW Bureau of Transport Statistics
BWSGA	Broader Western Sydney Growth Area
DAE	Deloitte Access Economics, a team within Deloitte Touche Tohmatsu
DC	Distribution centre
ECP	Empty container park
FAK	Freight of all kinds
FCL	Full container load
FEU	Forty-foot equivalent unit, a measure used for capacity in container transportation
GDP	Gross domestic product
GSP	Gross state product
Ha	Hectare, a metric unit of area
IMEX	Import-export
IMT	Intermodal terminal
LCL	Less than container load
LGA	Local government areas
m	Metres, a metric unit of length
MIC	Moorebank Intermodal Company Ltd
NSW	New South Wales

Acronym	Description
PBLIS	Port Botany Landside Improvement Strategy
Pick and Pack	Part of a complete supply chain management process commonly used in the distribution of retail goods. It involves processing quantities of product delivered by truck or train by picking relevant products for each final destination (e.g. retail outlet) and re-packaging them for delivery.
PUD	Pickup and delivery
SPC	Sydney Ports Corporation
sq. m	Square metre, a metric unit of area
SSFL	Southern Sydney Freight Line
Stack run	Stack runs are where the transport operator runs containers to its depot at night and progressively distributes containers to customers over the following one to three days. This generally improves delivery reliability and has been adopted as standard practice by a number of large transport operators servicing the port
SWGC	South West Growth Centre
TEU	Twenty-foot equivalent unit, a measure used for capacity in container transportation

1 Introduction

The purpose of this document is to consolidate the various technical notes that have been developed and / or provided to supplement existing reports and data prepared by Deloitte. The technical notes were prepared, in order to inform, in the first instance, the preparation of the Moorebank Intermodal Terminal (Moorebank IMT) Environmental Impact Statement (EIS).

The contents of this document arise from direct requests for additional information or clarification from MIC. The focus of the technical notes has generally been to set out the approach or detailed methodology behind the assumptions and data that have used from reports that Deloitte has prepared and submitted to Moorebank Intermodal Company (MIC).

The document is therefore not a standalone document, nor is it a complete set of detailed explanations behind all of the assumptions and data provided throughout the project.

2 Port Botany forecasts

Market growth expectations for container volumes through Port Botany in the original Detailed Business Case (DBC) were based on forecasts developed by Sydney Ports Corporation (SPC). These forecasts were developed according to number of growth scenarios for containerised freight movements, ranging from a low growth scenario of 4.8%, to a high growth scenario of 7.2%. A “likely” (or medium) growth rate SPC developed of 6.7%, which resulted in a forecasted Port volume of approximately 7 million TEU by 2030-31, was adopted in the analysis.

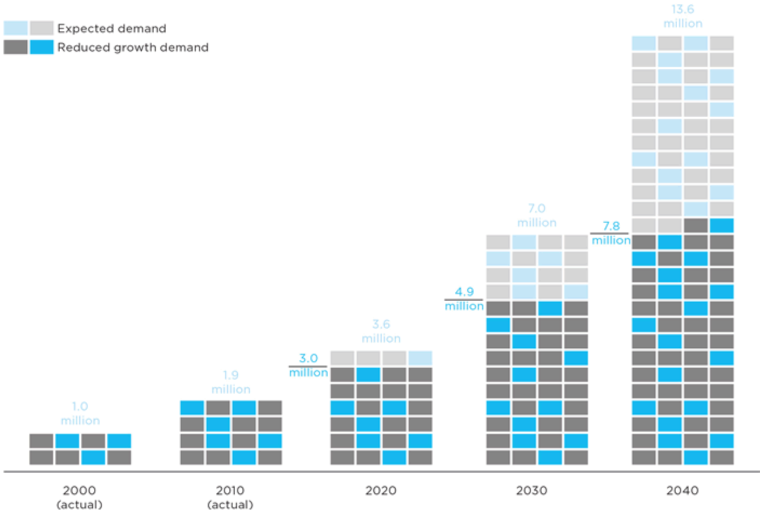
The extent to which these high growth rates could be maintained has been a much discussed subject within the freight industry. On the one hand, there was a view that structural changes within the economy that led to high levels of imports would reach an equilibrium state and growth rates would decline to levels more closely aligned with economic growth. Other views suggested that the high reliance on imports would continue into the foreseeable future as shipping rates remained low and supply chain efficiency improved, thereby allowing an ever-increasing range of products to be transported to Australia from overseas’ markets.

With these issues in mind, the Port Botany throughput revised forecast from the 2013 *NSW Draft Freight Strategy* was used, with the Port’s volumes growing to 4.9 million TEU by 2030, implying an annual growth rate of around 4.8%. As part of an update to Moorebank demand in December 2013, a high level analysis of the relationship between Gross State Product (GSP) and Port throughput indicated that the scenario outlined above be considered adequate given future GSP growth.

It is noted that since this analysis, Transport for NSW released the final *NSW Freight and Ports Strategy*. In their assessment of the future freight task, they maintained a reduced growth demand forecast at 4.9 million TEU by 2030 and provided an updated expected forecast of 7.0 million TEU by 2030 as outlined in the figure overleaf. The demand forecasts in the 2013 *Moorebank Demand Update* have been based on 4.9 million TEU throughput which is consistent with the more conservative reduced growth forecast.

Finally, the scope of demand analysis covered the Sydney Greater Metropolitan Area (GMA) which accounts for around 93% of all container import movements[1] and 75% of all container export movements[2] bringing the container landside freight task to just less than 4 million TEU by 2030-31 for the Sydney GMA.

Figure 1 : NSW container volume forecasts 2020-2040 (Transport for NSW)[3]



Source: NSW Freight and Ports Strategy 2013

3 Spatial Distribution

3.1 Updated Data Sets

Demand estimates for Moorebank IMT in the EIS are underpinned by postcode level import data provided by the Australian Customs and Border Protection Service (ACBPS).

The initial demand data sets developed for the Moorebank IMT development were derived utilising data sourced from ACBPS in 2011. Following this work, MIC engaged Deloitte to obtain new container data from ACBPS and subsequently update the demand analysis. ACBPS was able to provide more comprehensive data for movements since 2010. The new data set provided in September 2013 includes the following additional information:

- Export data with cargo owner and freight forwarder post code.
- Cargo type (for exports).
- Full data sets for import and export containers for financial years 2009 to 2013.

[1] Based on the analysis of data provided by the Australian Customs and Border Protection Service (ACBPS)
[2] NSW Container Freight Improvement Strategy
[3] http://freight.transport.nsw.gov.au/strategy/task/volume.html

With the new data provided, Deloitte was able to derive a more precise picture of container origins and destinations for the Sydney metropolitan area - in particular, the change of actual container distribution between 2010 and 2013. While ACBPS data provided a current picture of container distribution in Sydney, analysis of the NSW Bureau of Transport Statistics' (BTS) employment forecasts was also conducted to provide for a long-term picture of where growth was likely to occur up to 2046 for the transport and warehousing sector in Sydney.

The 2013 ACBPS distributions were forecasted for future periods using BTS' 2012 employment forecast dataset with the transport and warehousing employment growth estimates used as a proxy for future growth in container distribution at the LGA level.

It should be noted that the ACBPS data was provided at a postcode level and BTS employment forecasts were available at the Travel zone (Tz) level in its most disaggregated form. To ensure that datasets are of a similar level of detail, Local Government Areas (LGAs) as defined by the Australian Bureau of Statistics (ABS), were used to develop current and future freight distributions. This process resulted in 38 LGAs that form the possible catchment areas within the Sydney metropolitan area.

3.2 Addition of Industrial Lands data

As part of a separate project (Demand Refresh 2014), where Deloitte had been engaged by MIC to conduct a more comprehensive refresh to Moorebank demand as part of the MIC's ongoing procurement process, additional catchment analysis was carried out looking at other possible datasets to determine drivers and indicators for container distribution.

The project team identified analysis conducted by the NSW Department of Planning and Environment (DoP) on employment lands (*Employment Lands Task Force Report 2011*) which provided, amongst other things, a stocktake of developed and undeveloped industrial land across Sydney. The report also included discussion on the average lead time involved with the development of industrial land (10 to 15 years).

An area for improvement identified in the original forecast approach for container distributions using BTS data were the relatively low growth rates associated with LGAs in western Sydney that were regarded as growth hotspots for future freight activity – in particular for Blacktown, Camden, Campbelltown, Liverpool and Penrith. Conversely, Fairfield is already regarded as relatively developed with little future growth potential outside of significant industrial re-development. This view was supported by DoP allocation of future industrial land with respect to the Broader Western Sydney Employment Area (WSEA) and South West Growth Centre (SWGC).

As such, the share of future developed industrial land for these LGAs were used as a proxy for future container freight distribution, as part of an alternative scenario showing a higher distribution skew towards Sydney's outer west. The remaining LGA container distribution shares were adjusted and re-distributed based on remaining forecast container volumes.

The revised distribution follows a linear interpolation between known container distributions in 2013 and the share of developed industrial land for the aforementioned LGAs in 2026 (based on a 15-year development lead time from 2011) before remaining constant for the remainder of the forecast period.

3.3 Updated Distribution

The following table compares the original estimated spatial distribution for Moorebank containers by LGA for 2030 with the modified spatial distribution by LGA based on the analysis using the updated data outlined above.

The key changes in the results are the reduction in the original estimates for 2030 for catchments closer to the east including Auburn, Holroyd, Parramatta and Fairfield and the increase in the estimated demand for LGA's with considerable industrial land development including Penrith, Blacktown, Campbelltown and Liverpool. The comparative results for each LGA are outlined in **Table 1** below.

Table 1 : Comparison of Moorebank IMT Demand by LGA at 2030

LGA	Original Demand Update 2013 (2030)		Modified Demand Update 2013 based on selected DoP distribution (2030)	
	TEU	*%*	*TEU*	*%*
Ashfield	0	0.0%	0	0.0%
Auburn	96,855	9.3%	34,655	3.3%
Bankstown	0	0.0%	0	0.0%
Baulkham Hills	17,659	1.7%	38,151	3.6%
Blacktown	233,150	22.3%	270,656	25.8%
Botany Bay	0	0.0%	0	0.0%
Burwood	0	0.0%	0	0.0%
Camden	12,017	1.1%	39,421	3.8%
Campbelltown	40,111	3.8%	56,750	5.4%
Canada Bay	0	0.0%	0	0.0%
Canterbury	0	0.0%	0	0.0%
Fairfield	200,352	19.2%	118,639	11.3%
Holroyd	142,169	13.6%	65,342	6.2%
Hornsby	0	0.0%	0	0.0%
Hunters Hill	0	0.0%	0	0.0%
Hurstville	0	0.0%	0	0.0%
Kogarah	0	0.0%	0	0.0%
Ku-ring-gai	0	0.0%	0	0.0%
Lane Cove	0	0.0%	0	0.0%
Leichhardt	0	0.0%	0	0.0%
Liverpool	109,415	10.5%	121,885	11.6%
Manly	0	0.0%	0	0.0%
Marrickville	0	0.0%	0	0.0%
Mosman	0	0.0%	0	0.0%
North Sydney	0	0.0%	0	0.0%
Parramatta	70,012	6.7%	32,466	3.1%
Penrith	124,200	11.9%	270,865	25.8%
Pittwater	0	0.0%	0	0.0%
Randwick	0	0.0%	0	0.0%
Rockdale	0	0.0%	0	0.0%
Ryde	0	0.0%	0	0.0%
Strathfield	0	0.0%	0	0.0%
Sutherland Shire	0	0.0%	0	0.0%

LGA	Original Demand Update 2013 (2030)		Modified Demand Update 2013 based on selected DoP distribution (2030)	
	TEU	*%*	*TEU*	*%*
Sydney	0	0.0%	0	0.0%
Warringah	0	0.0%	0	0.0%
Waverley	0	0.0%	0	0.0%
Willoughby	0	0.0%	0	0.0%
Woollahra	0	0.0%	0	0.0%
Total	**1,045,940**	**100.0%**	**1,048,830**	**100.0%**

The following maps illustrate the changes in local government areas representing the primary demand catchment areas for IMEX cargo for Moorebank for 2030 between the original analysis and the updated analysis using the new data sets. **Figure 2**, the original demand analysis by LGA can be compared to **Figure 3** with the modified analysis in the maps below.

Figure 2 : Original demand update 2013 distribution

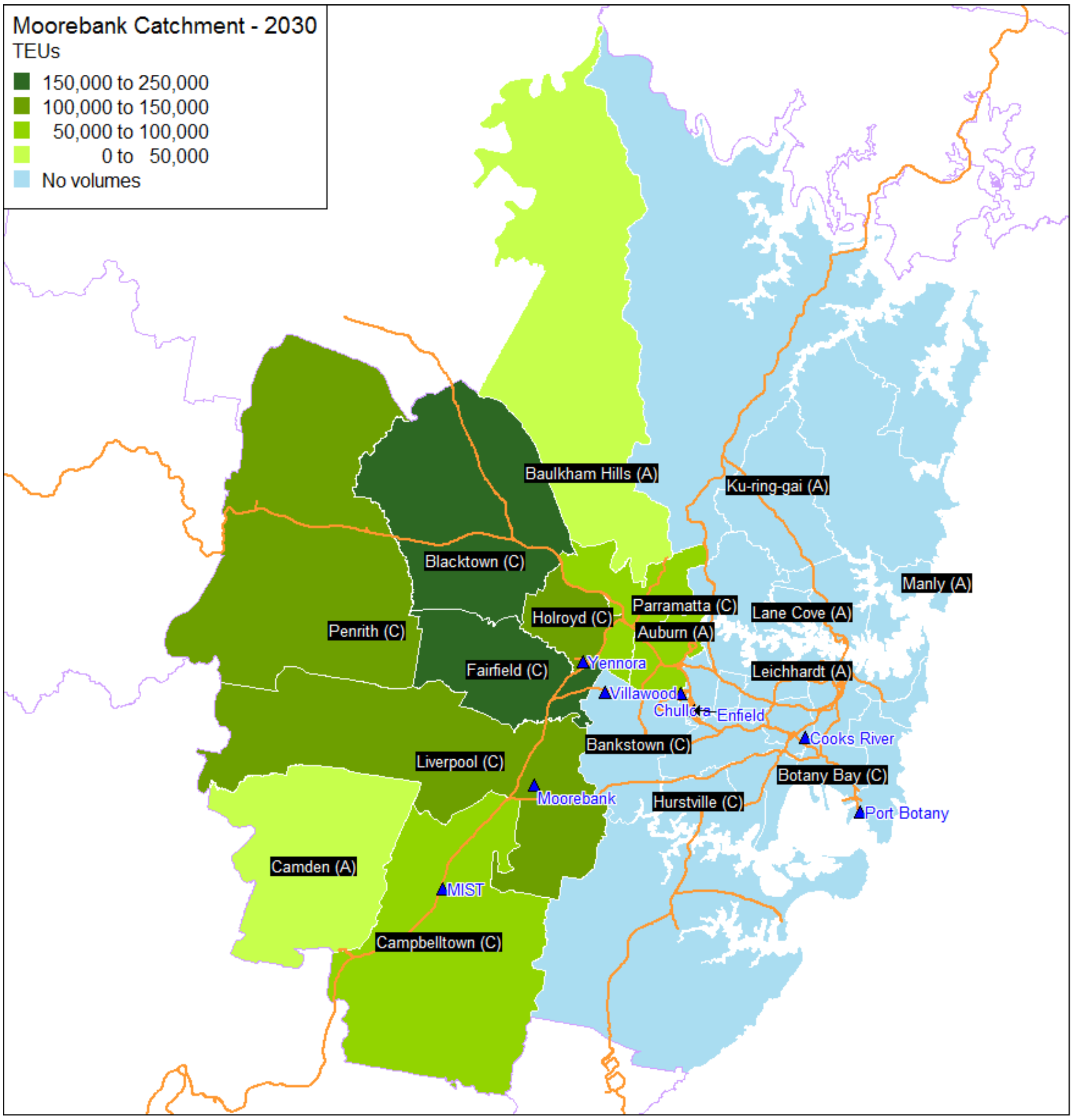
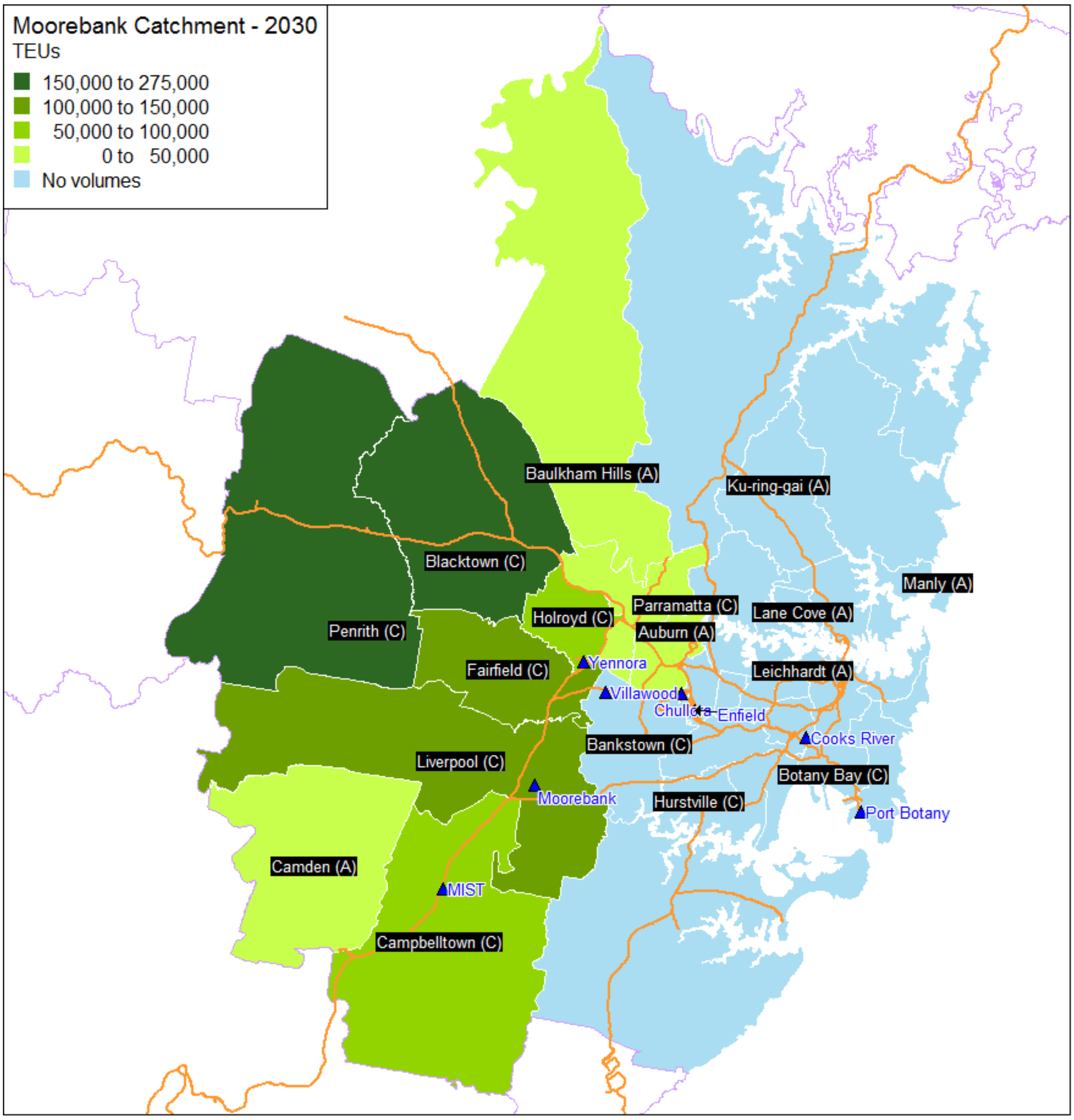


Figure 3 : Modified demand update 2013 based on selected DoP distribution



4 Truck Trip Generation

The following section steps through the underlying assumptions and the approach taken to derive the possible number of trucks generated daily from the Moorebank Intermodal terminal as a result of the rail terminal operations and the warehousing operations onsite.

4.1 Assumptions

The assumptions used in the Calculation of Daily Truck Generation at Moorebank IMT are split into two areas:

1. Truck operations for container movements on and off site.
2. Truck operations for warehousing related activities – palletised cargo.

Table 2 : Terminal Truck Assumptions

Assumption		Basis of assumption
Container movement off-site	74.0% (2030) 75.4% (2050)	The amount of available warehousing on-site can handle approximately 20% of cargo.
Full container movement to warehousing on-site – Freight All Kinds (FAK)	13.0% (2030) 12.3% (2050)	Assumption on possible lessors of warehousing operating within the market.
Container movement to warehousing on-site – Inventory (Inv)	13.0% (2030) 12.3% (2050)	Assumption on possible lessors of warehousing operating within the market.
Terminal operations	52 weeks per year	Reflecting current operations at Port and other IMT's.
Split between Semi-Trailer and B-Double	80% / 20%	Emerging profile at Port Botany.
Semi-Trailer: · **TEU Carrying Capacity** · **Utilisation** · **Average TEUs carried**	 · 2 · 80% · 1.6	Emerging profile at Port Botany – known capacity of vehicle and growth in FEU.
B-Double: · **TEU Carrying Capacity** · **Utilisation** · **Average TEU carried**	 · 3 · 80% · 2.4	Emerging profile at Port Botany – known capacity of vehicle and growth in FEU.
Truck load matching for Semi-Trailer	30%	Market disaggregation by operator, customer and geography will limit backloading opportunities. A maximum of 30% backloading has been assumed. This has been applied only to Semi trailers moving containers off site. The effective backloading rate across all Moorebank volume is therefore significantly lower.
Truck distribution	85% - Weekday 15% - Weekend	Majority of warehouse and distribution facilities operate 5 or 6 day week operations. Truck movements into and out of Port Botany reflect this profile.
Estimated peak hour multiplier of daily traffic	7.7% (AM Peak) 9.3% (PM Peak)	SIMTA Traffic and Accessibility Impact Assessment - Part 3A Concept Plan Application (August 2013).

Table 3 : Warehousing related truck assumptions

Assumption		Basis of assumption
Equivalent pallets loads per TEU for domestic distribution	25	Container mass limit and cubic capacity will generate average general freight volume of 10-12 tonne per TEU – average food and beverage or retail pallet load is approximately 300 – 500 kg.
Truck fleet for palletised cargo - outbound	34% - Semi-trailer 66% - Rigid	Estimate only based on market knowledge.
Truck fleet for palletised cargo – inbound	100% - Rigid	Estimate only based on market knowledge.
Pallets per Semi-Trailer	40	Derived using SIMTA's Traffic and Accessibility Impact Assessment (August 2013) (which formed part of SIMTA's Part 3A concept approval application), where average net load of vehicle referenced in approval is stated to be 20t.
Pallets per Rigid	20	Derived using SIMTA's Traffic and Accessibility Impact Assessment (August 2013) (which formed part of SIMTA's Part 3A concept approval application), where average net load of vehicle referenced in approval is stated to be 10t.
Truck load matching for Semi-Trailer	None	It has been assumed that market disaggregation by operator, customer and geography will limit backloading opportunities.
Truck distribution	95% - Weekday 5% - Weekend	Majority of the market receiving palletised goods does not operate weekend loading/unloaded operations.
Estimated peak hour multiplier of daily traffic	7.7% (AM Peak) 9.3% (PM Peak)	SIMTA Traffic and Accessibility Impact Assessment - Part 3A Concept Plan Application (August 2013).

4.2 Approach to Estimating Truck Trips

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

- Full container load (FCL) movements arriving or departing the terminal by rail and moving directly offsite or onsite by road.
- FCL's moving within the site between the rail terminal and associated warehousing with all cargo arriving or leaving the warehouses by truck as deconsolidated or palletised cargo.
- Empty (MT) containers. Warehouse related FCL's were further broken down equally into two segments: Freight all kinds (FAK) to be deconsolidated and delivered; and inventory (INV), which was assumed to be held in the warehouse for a period prior to delivery. It has been assumed that FCL's and MT's would leave and return to the site on a combination of semi-trailers and b-doubles

whilst FAK and Inventory would leave and return to the site on a mix of semi-trailers and rigid trucks.

Consultation with Roads and Maritime Services (RMS)

Two consultation sessions were undertaken, in February and April 2014, with representatives from RMS (Network Optimisation and Road Network Analysis team) to review both the approach and results. They undertook their own analysis based on the underlying demand volumes and assumptions as documented and during a meeting with RMS personnel, they indicated that they reached similar outcomes.

4.2.1 IMEX and Interstate throughput

The terminal is anticipated to handle 500,000 TEU (250,000 TEU inbound and 250,000 TEU outbound) of interstate and close to 1.1 million TEU (547,000 TEU inbound and 499,000 outbound) of IMEX throughput when it reaches full capacity. It is not expected that this would occur before 2040, particularly for interstate traffic. The demand modelling estimated that, by 2030, the Moorebank IMT would be handling approximately 1.046 million TEU of IMEX cargo per annum (two-way total) and handling approximately 328,000 TEU of interstate cargo per annum (two-way total) and by 2050 the Terminal would be handling approximately 1.046 million TEU of IMEX cargo per annum (two-way total) and handling approximately 406,000 TEU of interstate cargo per annum (two-way total). It is assumed that 94,000 TEU would be transhipped between rail services utilising the terminal. These containers would therefore not be transported between the rail terminal and the warehousing operations on or off site.

4.3 Movements requiring transport off site

Utilising the demand estimates for the respective IMEX and interstate markets, the following steps were taken to identify the nature of the movements into and out of Moorebank IMT and whether the movements were as containers (direct movements to and from the site) or as deconsolidated palletised cargo (via the warehouses). The second consideration was whether or not the internal movements relating to the warehousing on site generated a surplus or a shortfall of empty containers as this would determine whether there would be a requirement to move additional empty containers to and from the site by road.

Table 4 : Onsite empty container imbalance

	Loaded TEU ex rail into Warehouse	Loaded TEU for rail out of Warehouse	Empty TEU surplus (shortfall) generated
IMEX 2030	142,448	45,052	97,396
IMEX 2050	134,332	42,485	91,847
Interstate 2030	31,250	31,250	0
Interstate 2050	36,591	36,591	0

Once these flows were determined then the calculation of the associated truck movements could be estimated.

4.3.1 IMEX market - 2030

1. Of the 1.374 million TEU expected to be handled through the terminal in 2030, the breakdown between IMEX and interstate are as follows:
   1,374,000 TEU = 1,046,000 IMEX TEU + 328,000 interstate TEU

2. Of the 1.046 million IMEX TEUs handled, the breakdown between full imports, full exports and empty containers are as follows:
   1,046,000 TEU = 547,000 full import TEU + 173,000 full export TEU + (326,000 empty TEU)

3. Of the 1.046 million total TEU in 2030 (and 2050), the breakdown between containers inbound and containers outbound are as follows:
   1,046,000 TEU = 547,000 inbound TEU + 499,000 outbound TEU

4. Of the 547,000 TEU containers arriving by rail at the site, the breakdown between loaded and empty containers is as follows:
   547,000 TEU = 547,000 loaded TEU + 0 empty TEU

5. Of the 499,000 TEU containers leaving the site by rail, the breakdown between loaded and empty containers is as follows:
   499,000 TEU = 173,000 loaded TEU + 326,000 empty TEU

6. It was assumed that 74% of the loaded total TEU would move to and from the site as containers and 26% of the loaded total TEU would move through the onsite warehousing. The surplus or shortfall of empty containers were all assumed to move directly to and from the site:
   547,000 loaded TEU from site = (547,000 x 74% direct to site) + (547,000 x 26% to onsite warehousing)

   = 404,552 loaded TEUs direct + 142,448 TEUs via warehouses from site by road

   173,000 loaded TEU to site = (173,000 x 74% direct from site) + (173,000 x 26% from onsite warehousing)

   = 127,948 loaded TEU direct + 45,052 TEUs via warehouses to site by road

   228,604 empty TEU to and from site = 326,000 empty containers from MB by rail + 0 empties into MB by rail – 97,396 surplus empty containers generated on site

7. As outlined above it was assumed that all of the empty containers less the onsite surplus and 74% of the loaded total TEU would move off the site as containers.

   761,104 Direct TEU = 228,604 empty TEU + 127,948 loaded direct into terminal + 404,552 loaded TEU direct out of terminal

8. The 26% going via warehouses was split equally, resulting in 13% going to warehousing onsite for destuffing (FAK) and direct delivery and 13% going to warehousing for destuffing and placement into inventory (Inv) for later delivery.

187,500 TEU via warehouses =
= 142,448 TEUs out of warehouses + 45,052 TEU into warehouses

= (142,448 x 50% FAK) leaving + (142,448 x 50% Inventory) leaving + 45,052 x 50% FAK) arriving + (45,052 x 50% Inventory) arriving

= (71,224 FAK and 71,224 Inv) leaving site from warehouses + (22,526 FAK and 22,526 Inv) arriving at site warehouses

Or

= (71,224 FAK and 22,526 FAK) TEU into/out of warehouses + (71,224 Inv and 22,526 Inv) TEU into/out of warehouses

= 93,750 FAK TEU and 93,750 Inv TEU arriving and leaving via the warehouses

9. This can be further summarised into the total number of IMEX (1.046 million) split into total FCL Direct (761,104) plus total TEUs via the warehousing onsite (187,500) plus empty containers generated onsite (97,396):

1,046,000 TEU =761,104 containers direct to/from customers via road + 93,750 FAK TEU + 93,750 Inventory TEU + 97,396 surplus onsite empty containers

4.3.2 IMEX market - 2050

1. Of the 1.452 million TEU expected to be handled through the terminal in 2050, the breakdown between IMEX and interstate are as follows:
   1,452,000 TEU = 1,046,000 IMEX TEU + 406,000 interstate TEU

2. Of the 1.046 million IMEX TEU handled, the breakdown between full imports, full exports and empty containers are as follows:
   1,046,000 TEU = 547,000 full import TEU + 173,000 full export TEU + (326,000 empty TEs)

3. Of the 1.046 million total TEU in 2050, the breakdown between containers inbound and containers outbound are as follows:
   1,046,000 TEUs = 547,000 inbound TEU + 499,000 outbound TEU

4. Of the 547,000 TEU containers arriving by rail at the site, the breakdown between loaded and empty containers is as follows:
   547,000 TEU = 547,000 loaded TEU + 0 empty TEU

5. Of the 499,000 TEU containers leaving the site by rail, the breakdown between loaded and empty containers is as follows:

499,000 TEUs = 173,000 loaded TEU + 326,000 empty TEU

6. It was assumed that 75.4% of the loaded total TEU would move to and from the site as containers and 24.6% of the loaded total TEU would move through the onsite warehousing. The surplus or shortfall of empty containers were all assumed to move directly to and from the site:

547,000 loaded TEU from site = (547,000 x 75.4% direct to site) + (547,000 x 24.6% to onsite warehousing)

= 412,668 loaded TEUs direct + 134,332 TEUs via warehouses from site by road

173,000 loaded TEU to site = (173,000 x 75.4% direct from site) + (173,000 x 24.6% from onsite warehousing)

= 130,515 loaded TEUs direct + 42,485 TEUs via warehouses to site by road

234,153 empty TEU to and from site = 326,000 empty containers from MB by rail + 0 empties into MB by rail – 91,847 surplus empty containers generated on site

7. As outlined above it was assumed that all of the empty containers less the onsite surplus and 75.4% of the loaded total TEU would move off the site as containers.

777,336 Direct TEU = 234,153 empty TEU + 130,515 loaded direct into terminal + 412,668 loaded TEU direct out of terminal

8. The 24.6% going via warehouses was split equally, resulting in 12.3% going to warehousing onsite for destuffing (FAK) and direct delivery and 12.3% going to warehousing for destuffing and placement into inventory (Inv) for later delivery.

176,817 TEU via warehouses =
= 134,332 TEU out of warehouses + 42,485 TEU into warehouses

= (134,332 x 50% FAK) leaving + (134,332 x 50% Inventory) leaving + 42,485 x 50% FAK) arriving + (42,485 x 50% Inventory) arriving

= (67,166 FAK and 67,166 Inv) leaving site from warehouses + (21,243 FAK and 21,243 Inv) arriving at site warehouses

Or

= (67,166 FAK and 21,243 FAK) TEU into/out of warehouses + (67,166 Inv and 21,243 Inv) TEU into/out of warehouses

= 88,409 FAK TEUs and 88,409 Inv TEU arriving and leaving via the warehouses

9. This can be further summarised into the total number of IMEX (1.046 million) split into total FCL Direct (777,336) plus total TEUs via the warehousing onsite (176,817) plus empty containers generated onsite (91,847):

1,046,000 TEU = 777,336 containers direct to/from customers via road + 88,409 FAK TEU + 88,409 Inventory TEU + 91,847 surplus onsite empty containers

4.3.3 Interstate Market - 2030

1. Of the 1.374 million TEU expected to be handled through the terminal in 2030, the breakdown between IMEX and interstate are as follows:
   1,374,000 TEU = 1,046,000 IMEX TEU + 328,000 interstate TEU

2. Of the 328,000 interstate TEUs handled, the breakdown between full inbound, full outbound and empty containers are as follows:
   328,000 TEU = 120,000 full inbound TEU + 120,000 full outbound TEU + 88,000 empty

3. It was assumed that 74% of the loaded total TEU would move to and from the site as containers and 26% of the loaded total TEU would move through the onsite warehousing. The empty containers were all assumed to move directly to and from the site as there is no surplus or shortfall onsite:
   120,000 loaded TEU to site = (120,000 x 74% direct to site) + (120,000 x 26% to onsite warehousing)

   = 88,750 loaded TEU direct + 31,250 TEUs via warehouses

   120,000 loaded TEU from site = (120,000 x 74% direct from site) + (120,000 x 26% from onsite warehousing)

   = 88,7509 loaded TEU direct + 31,250 TEUs via warehouses

   88,000 empty TEU to and from site = 44,000 empties into MB + 44,000 empties out of MB

4. As outlined above it was assumed that all of the empty containers and 74% of the loaded total TEU would move off-site as containers.

   265,500 Direct TEU = 88,000 empty TEU + 88,750 loaded direct into terminal+ 88,750 loaded TEU direct out of terminal

5. The 26% going via warehouses was split equally, resulting in 13% going to warehousing onsite for destuffing (FAK) and impending delivery and 13% going to warehousing for destuffing and placement into inventory for later delivery.

   62,500 TEU via warehouses = = 31,250 TEU out of warehouses + 31,250 TEU into warehouses

= (31,250 x 50% FAK) leaving + (31,250 x 50% Inventory) arriving + (31,250 x 50% FAK) leaving + (31,250 x 50% Inventory) arriving

= (15,625 FAK and 15,625 Inv) leaving site from warehouses + (15,625 FAK and 15,625 Inv) arriving at site warehouses

= 31,250 TEU leaving and 31,2500 TEU arriving via the warehouses

Or

= (15,625 FAK and 15,625 FAK) TEU into/out of warehouses + (15,625 Inv and 15,625 Inv) TEU into/out of warehouses

= 31,250 FAK TEU and 31,250 Inv TEU arriving and leaving via the warehouses

6. Therefore the total number of Interstate TEU (328,000) can be split into total FCL Direct (265,500) and total TEUs via the warehousing onsite (62,500):

   328,000 TEU = 265,500 containers direct to/from customers + 31,250 FAK TEU + 31,250 Inventory TEU

4.3.4 Interstate Market - 2050

1. Of the 1.452 million TEU expected to be handled through the terminal in 2050, the breakdown between IMEX and interstate are as follows:
   1,452,000 TEU = 1,046,000 IMEX TEU + 406,000 interstate TEU

2. Of the 406,000 interstate TEU handled, the breakdown between full inbound, full outbound and empty containers are as follows:
   406,000 TEU = 149,000 full inbound TEU + 149,000 full outbound TEU + 108,000 empty

3. It was assumed that 75.4% of the loaded total TEU would move to and from the site as containers and 24.6% of the loaded total TEU would move through the onsite warehousing. The empty containers were all assumed to move directly to and from the site:
   149,000 loaded TEU to site = (149,000 x 75.4% direct to site) + (149,000 x 24.6% to onsite warehousing)

   = 112,409 loaded TEU direct + 36,591 TEUs via warehouses

   149,000 loaded TEU from site = (149,000 x 75.4% direct from site) + (149,000 x 24.6% from onsite warehousing)

   = 112,409 loaded TEU direct + 36,591 TEU via warehouses

   108,000 empty TEU to and from site = 54,000 empties into MB + 54,000 empties out of MB

4. As outlined above it was assumed that all of the empty containers and 75.4% of the loaded total TEU would move off the site as containers.

332,817 Direct TEU = 108,000 empty TEU + 112,409 loaded direct into terminal + 112,409 loaded TEUs direct out of terminal

5. The 24.6% going via warehouses was split equally, resulting in 12.3% going to warehousing onsite for destuffing (FAK) and impending delivery and 12.3% going to warehousing for destuffing and placement into inventory for later delivery.

73,183 TEU via warehouses =
= 36,591 TEUs out of warehouses + 36,591 TEU into warehouses

= (36,591 x 50% FAK) leaving + (36,591 x 50% Inventory) leaving + (36,591 x 50% FAK) arriving + (36,591 x 50% Inventory) arriving

= (18,296 FAK and 18,296 Inv) leaving site from warehouses + (18,296 FAK and 18,296 Inv) arriving at site warehouses

= 36,591 TEU leaving and 36,591 TEU arriving via the warehouses

Or

= (18,296 FAK and 18,296 FAK) TEU into/out of warehouses + (18,296 Inv and 18,296 Inv) TEU into/out of warehouses

= 36,591 FAK TEU and 36,591 Inv TEU arriving and leaving via the warehouses

6. Therefore the total number of Interstate TEU handled at the terminal at 2050 (406,000) can be split into total FCL Direct (332,817) and total TEU via the warehousing onsite (73,183):

406,000 TEUs = 332,817 containers direct to/from customers + 36,591 FAK TEU + 36,591 Inventory TEU

4.3.5 Combined IMEX and Interstate at 2030

1. Of the 1.374 million TEU expected to be handled through the terminal in 2030, the breakdown between IMEX and interstate are as follows:
   1,374,000 TEU = 1,046,000 IMEX TEU + 328,000 interstate TEU

2. Of the 1.374 million total TEU in 2030, the breakdown between containers arriving at the site by rail and containers leaving the site by rail are as follows:
   1,374,000 TEU = 711,000 inbound TEU + 663,000 outbound TEUs

3. Of the 711,000 TEU containers leaving the site by road the breakdown between loaded and empty containers is as follows:
   711,000 TEU = 667,000 loaded TEU + 44,000 empty TEUs

4. Of the 663,000 TEU leaving the site by rail, 565,604 TEU arrive at the site by road - the breakdown between loaded and empty containers is as follows:
   565,604 TEU = 293,000 loaded TEU + 272,604 empty TEU

5. It was assumed that 74% of the loaded total TEU would move to and from the site as containers and 26% of the loaded total TEU would move through the onsite warehousing. The empty containers (less surplus onsite) were all assumed to move directly to and from the site:

293,000 loaded TEU to site = (293,000 x 74% direct to site) + (293,000 x 26% to onsite warehousing)

= 216,698 loaded TEU direct + 76,302 TEU via warehouses

667,000 loaded TEU from site = (667,000 x 74% direct from site) + (667,000 x 26% from onsite warehousing)

= 493,302 loaded TEU direct + 173,698 TEU via warehouses

316,604 empty TEU to and from site = 272,604 empties into MB + 44,000 empties out of MB

6. As outlined above it was assumed that all of the empty containers, less any surplus generated through the matching of loads into and out of the warehouse and 74% of the loaded total TEU would move off the site as containers.

1,026,604 Direct TEU = 414,000 empty TEU – 97,396 surplus empties ex warehouse + 216,698 loaded direct into terminal + 493,302 loaded TEU direct out of terminal

7. The 26% going via warehouses was split equally, resulting in 13% going to warehousing onsite for destuffing (FAK) and direct delivery and 13% going to warehousing for destuffing and placement into inventory for later delivery.

250,000 TEU via warehouses =
= 173,698 TEU out of warehouses + 76,302 TEU into warehouses

= (173,698 x 50% FAK) leaving + (173,698 x 50% Inventory) leaving + (76,302 x 50% FAK) arriving + (76,302 x 50% Inventory) arriving

= (86,849 FAK and 86,849 Inv) leaving site from warehouses + (38,151 FAK and 38,151 Inv) arriving at site warehouses

= 125,000 TEU leaving and 125,000 TEU arriving via the warehouses

Or

= (86,849 FAK and 38,151 FAK) TEU into/out of warehouses + (86,849 Inv and 38,151 Inv) TEU into/out of warehouses

= 125,000 FAK TEU and 125,000 Inv TEU arriving and leaving via the warehouses

8. This can be further summarised into the total number of IMEX and Interstate TEU (1.374 million) split into total FCL Direct (1.027m) and total TEUs via the warehousing onsite (250,000) plus empties from onsite (97,396):

1,374,000 TEUs = 1,026,604 containers direct to/from customers + 125,000 FAK TEUs + 125,000 Inventory TEU + 97,396 surplus empties from warehouses

4.3.6 Combined IMEX and Interstate at 2050

1. Of the 1.452 million TEU expected to be handled through the terminal in 2050, the breakdown between IMEX and interstate are as follows:
   1,452,000 TEU = 1,046,000 IMEX TEU + 406,000 interstate TEU

2. Of the 1.452 million total TEU in 2050, the breakdown between containers arriving at the site by rail and containers leaving the site by rail are as follows:
   1,452,000 TEUs = 750,000 inbound TEU + 702,000 outbound TEU
3. Of the 750,000 TEUs containers leaving the site by road the breakdown between loaded and empty containers is as follows:
   750,000 TEU = 696,000 loaded TEU + 54,000 empty TEU

4. Of the 702,000 TEUs leaving the site by rail, 610,153 TEU arrive at the site by road - the breakdown between loaded and empty containers is as follows:
   610,153 TEU = 322,000 loaded TEU + 288,153 empty TEU

5. It was assumed that 75.4% of the loaded total TEU would move to and from the site as containers and 24.6% of the loaded total TEU would move through the onsite warehousing. The empty containers (less surplus onsite) were all assumed to move directly to and from the site:
   322,000 loaded TEU to site = (322,000 x 75.4% direct to site) + (322,000 x 24.6% to onsite warehousing)

   = 242,923 loaded TEU direct + 79,077 TEUs via warehouses

   696,000 loaded TEU from site = (696,000 x 75.4% direct from site) + (696,000 x 24.6% from onsite warehousing)

   = 525,076 loaded TEU direct + 170,924 TEU via warehouses

   342,153 empty TEU to and from site = 288,153 empties into MB + 54,000 empties out of MB

6. As outlined above it was assumed that all of the empty containers, less any surplus generated through the matching of loads into and out of the warehouse and 75.4% of the loaded total TEU would move off the site as containers.

   1,110,153 Direct TEU = 434,000 empty TEU – 91,847 surplus empties ex warehouse + 242,923 loaded direct into terminal + 525,076 loaded TEU direct out of terminal

7. The 24.6% going via warehouses was split equally, resulting in 12.3% going to warehousing onsite for destuffing (FAK) and direct delivery and 12.3% going to warehousing for destuffing and placement into inventory for later delivery.

250,000 TEU via warehouses =
= 170,924 TEUs out of warehouses + 79,077 TEU into warehouses

= (170,924 x 50% FAK) leaving + (170,924 x 50% Inventory) leaving + (79,077 x 50% FAK) arriving + (79,077 x 50% Inventory) arriving

= (85,462 FAK and 85,462 Inv) leaving site from warehouses + (39,538 FAK and 39,538 Inv) arriving at site warehouses

Or

= (85,462 FAK and 39,538 FAK) TEU into/out of warehouses + (85,462 Inv and 39,538 Inv) TEU into/out of warehouses

= 125,000 FAK TEU and 125,000 Inv TEU arriving and leaving via the warehouses

8. This can be further summarised into the total number of IMEX and Interstate TEU (1.452 million) split into total FCL Direct (1.110 million) and total TEUs via the warehousing onsite (250,000) plus empties from onsite (91,847):

1,452,000 TEU = 1,110,153 containers direct to/from customers + 125,000 FAK TEUs + 125,000 Inventory TEUs + 91,847 surplus empties from warehouses

4.3.7 Summary

A summary of the various components is outlined in **Table 5** below for volumes at 2030 and in **Table 6** for volumes at 2050.

Table 5 : Summary of terminal throughput at 2030

		IMEX '000 TEU	Interstate '000 TEU	Total '000 TEU	FCL direct '000 TEU	FAK (pack/ unpack) '000 TEU	Warehouse Inventory '000TEU
Pathway split/share					74%	13%	13%
Inbound to site by rail from port	*Full*	547.000	120.000	667.000	493.302	86.849	86.849
	Empty	-	44.000	44.000	44.000		
	Total	547.000	164.000	711.000	537.302		
Outbound from site by rail to port	*Full*	173.000	120.000	293.000	216.698	38.151	38.151
	Empty	326.000	44.000	370.000	370.000		
	Total	499.000	164.000	663.000	586.698		
	Totals	**1,046.000**	**328.000**	**1,374.000**	**1124.000**	**125.000**	**125.000**

Table 6 : Summary of Terminal throughput at 2050

		IMEX '000 TEU	Interstate '000 TEU	Total '000 TEU	FCL direct '000 TEU	FAK (pack/ unpack) '000 TEU	Warehouse Inventory '000TEU
Pathway split/share					75.4%	12.3%	12.3%
Inbound to site by rail from port	*Full*	547.000	149.000	696.000	525.076	85.462	85.462
	Empty	-	54.000	54.000	54.000		
	Total	547.000	203.000	750.000	579.076		
Outbound from site by rail to port	*Full*	173.000	149.000	322.000	242.923	39.538	39.538
	Empty	326.000	54.000	380.000	380.000		
	Total	499.000	203.000	702.000	622.923		
	Totals	**1,046.000**	**406.000**	**1,452.000**	**1,202.000**	**125.000**	**125.000**

The following diagrams illustrate the flows of TEU for each of the IMEX and Interstate markets at 2030 and when the terminal is close to capacity at 2050. Each diagram depicts both the empty and full containers arriving and leaving the terminal by rail and whether the containers stay within the site for handling through the warehouse, or leave the site for unpacking or packing at a customer site.

Full size diagrams are included in **Appendix A**.

Figure 4 : Moorebank IMEX flows for 2030

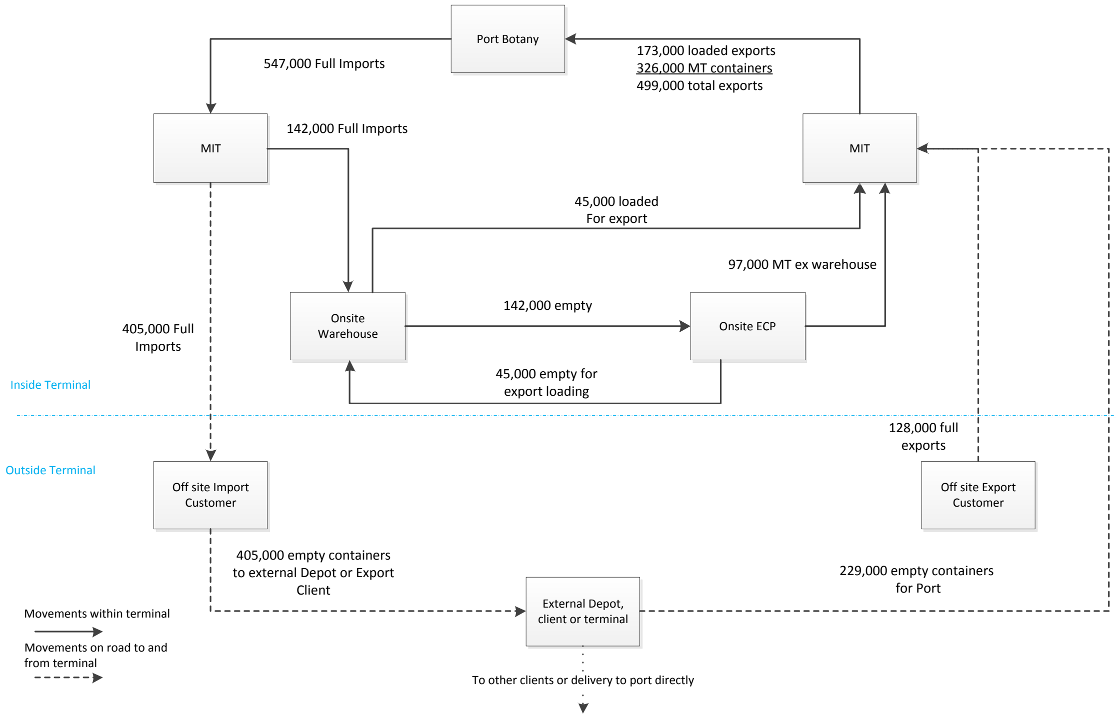


Figure 5 : Moorebank IMEX flows for 2050

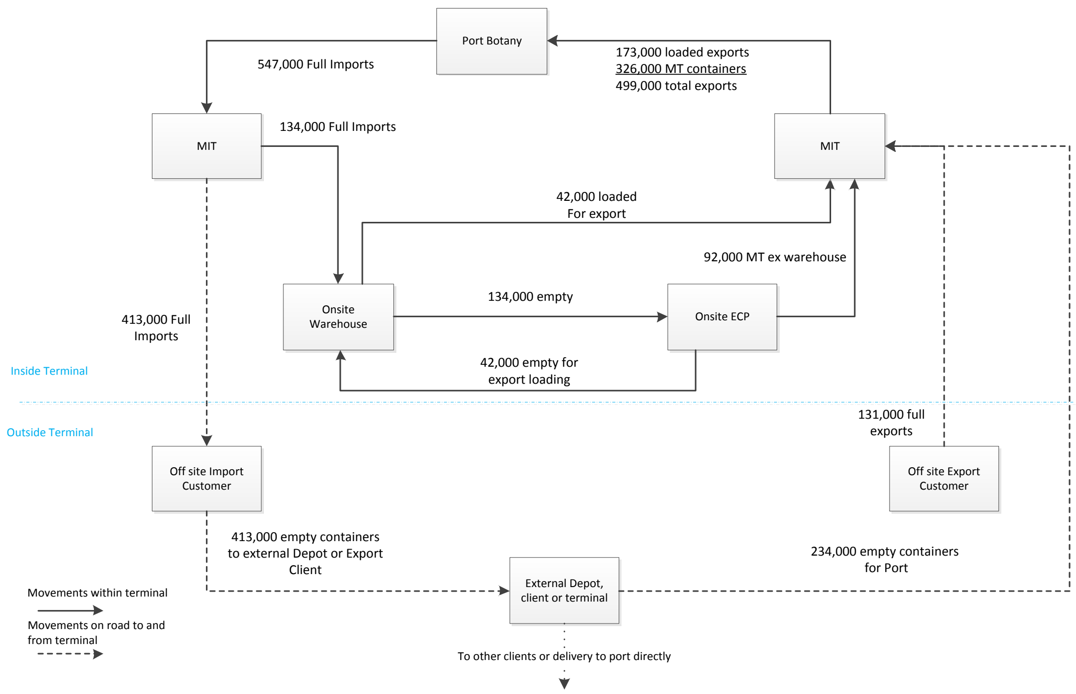


Figure 6: Moorebank Interstate flows for 2030

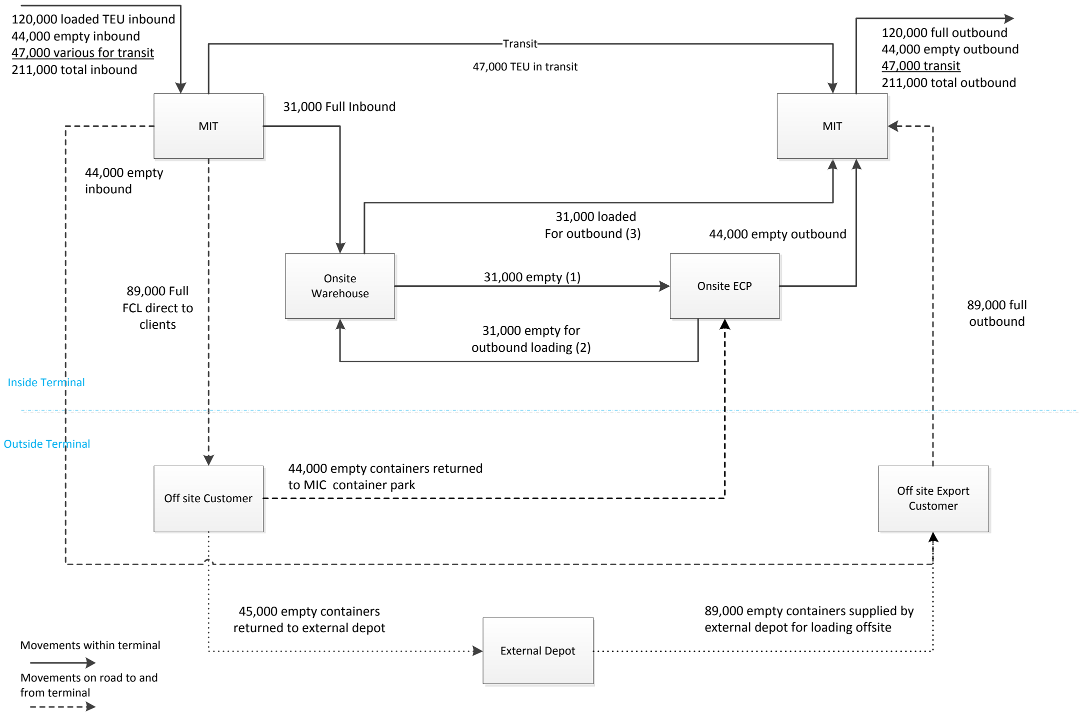
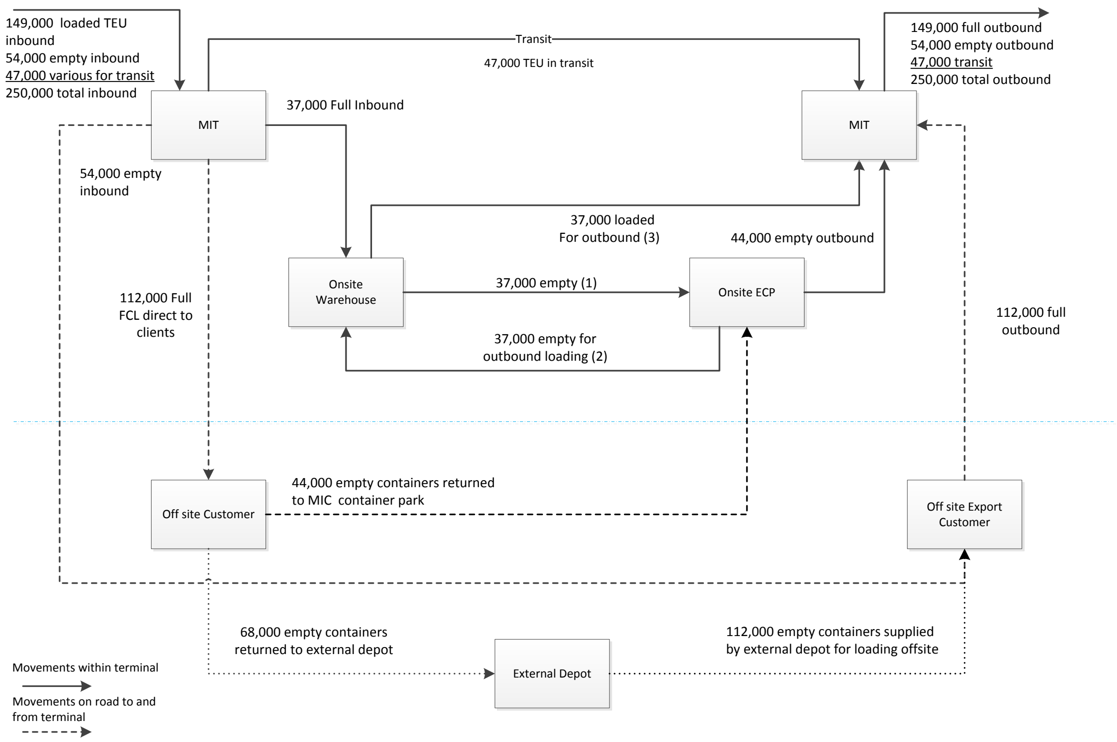


Figure 7 : Moorebank Terminal interstate container flows at 2050



Full size diagrams are included at **Appendix A**.

4.4 Direct FCL and empty container movements

4.4.1 IMEX Market - 2030

The demand analysis has determined likely future demand for IMEX traffics through the terminal. This total demand has then been allocated to cargo moving in the container between the terminal and the customer directly or via the onsite warehouse for consolidation/deconsolidation. In addition, empty containers move between the terminal and offsite locations. A different transport profile has been assumed for containers (whether loaded or empty) moving directly from the terminal to an offsite location.

404,552 TEU leaving the site by road (imports) = (547,000 full import TEU x 74%)

356,552 TEU arriving at the site by road (exports) = (173,000 full export TEU x 74%) + 228,604 empty export TEU

1. It is assumed that the terminal would be operational 52 weeks per year.
   404,552 import TEU ÷ 52 = 7,780 TEU leaving the IMT by road per week

   356,552 export TEU ÷ 52 = 6,857 TEU arriving at the IMT by road per week

2. It was assumed that trucks moving containers in and out of Moorebank IMT will comprise 80% semi-trailers and 20% B-Doubles:

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

   7,780 TEU x 80% = 6,224 TEU out on a Semi

   6,857 TEU x 80% = 5,485 TEU in on a Semi

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

   7,780 TEU x 20% = 1,556 TEU out on a B-Double

   6,857 TEU x 20% = 1,371TEU in on a B-Double

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

6,224 TEU <u>out</u> on a Semi ÷ 1.6 TEU per Semi = 3,890 Semis out of terminal/per week

5,485 TEU <u>in</u> on a Semi ÷ 1.6 TEU per Semi = 3,428 Semis into terminal per week

1,556 TEU <u>out</u> on B-Double ÷ 2.4 TEU per B-Double = 648 B-Doubles out of terminal per week

1,371 TEU <u>in</u> on B-Double ÷ 2.4 TEU per B-Double = 571 B-Doubles into terminal per week

4. In addition, each outbound movements outlined above will also generate an inbound movement. It is assumed that some load matching would occur, i.e. rather than every truck having to do an empty return journey to its origin, a portion of the journeys could be loaded both ways. For example, some outbound full import movements could be matched with full export or empty containers inbound, the remainder of the trucks would arrive empty. It was assumed that this load matching would be limited to only 30% of loaded Semi Trailer truck movements (generated off the direction with the more significant volume). All other movements would generate an empty running leg into or out of the terminal.

   To generate the empty running trips for each truck type:

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

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

   Therefore:

   3,890 loaded semis outbound X (1 - 30% matched loads) = 2,723 semis running empty into terminal per week

   3,428 loaded semis inbound - (3,890 loaded semis outbound – 2,723 empty semis inbound) = 2,261 semis running empty out of terminal

   648 loaded B-Doubles outbound X (1 - 0% matched loads) = 648 B-Doubles running empty into terminal per week

   571 loaded B-Doubles inbound X (1 - 0% matched loads) = 571 B-Doubles empty out of terminal per week

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

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

Total B-Double movements	***= 648 loads out + 648 empty in + 571 loads in + 571 empty out***
	=1,220 trips out + 1,220 trips in
	= 2,439 trips
Total semi movements	***= 3,890 loads out + 2,723 empty in + 3,428 loads in + 2,261 empty out***
	= 6,151 trips out + 6,151 trips in
	= 12,303 trips

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

   (2,439 B-Double trips per week X 85%) ÷ 5 = 415 B-Double movements per weekday

   (12,303 semi trips per week X 85%) ÷ 5 = 2,091 Semi movements per weekday

   Total inbound and outbound moves per week and per weekday can be summarised in **Table 7** below.

Table 7 : Total inbound and outbound IMEX moves per week and per weekday (2030)

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	B-Double	648	110
		Semi	3,890	661
Empty	Inbound	B-Double	648	110
		Semi	2,723	463
Loaded	Inbound	B-Double	571	97
		Semi	3,428	583
Empty	Outbound	B-Double	571	97
		Semi	2,261	384
Total Truck movements	Outbound	B-Double	1,220	207
		Semi	6,151	1,046
	Inbound	B-Double	1,220	207
		Semi	6,151	1,046

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

Average trucks per weekday ÷ 2 (for each direction) x 7.7% = trucks on and off site per hour in AM peak

415 B-Double movements per weekday ÷ 2 x 7.7% = 16 B-Double truck movements in AM peak hour in each direction

2,091 Semi movements per weekday ÷ 2 x 7.7% = 81 Semi truck movements in AM peak hour in each direction

Average trucks per weekday ÷ 2 (for each direction) x 9.3% = trucks on and off site per hour in PM peak

415 B-Double movements per weekday ÷ 2 x 9.3% = 19 B-Double truck movements in PM peak hour in each direction

2,091 Semi movements per weekday ÷ 2 x 9.3% = 97 Semi truck movements in PM peak hour in each direction

Table 8 : Average weekday inbound and outbound IMEX Articulated truck movements

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	B-Double	207	16	19
		Semi	1,046	81	97
	Inbound	B-Double	207	16	19
		Semi	1,046	81	97

4.4.2 IMEX Market - 2050

The demand analysis has determined likely future demand for IMEX traffics through the terminal. This total demand has then been allocated to cargo moving in the container between the terminal and the customer directly or via the onsite warehouse for consolidation/deconsolidation. In addition, empty containers move between the terminal and offsite locations. A different transport profile has been assumed for containers (whether loaded or empty) moving directly from the terminal to an offsite location.

412,668 TEU leaving the site by road (imports) = (547,000 full import TEU x 75.4%)

364,668 TEU arriving at the site by road (exports) = (173,000 full export TEU x 75.4%) + 234,153 empty export TEU

7. It is assumed that the terminal would be operational 52 weeks per year.
412,668 import TEU ÷ 52 = 7,936 TEU leaving the IMT by road per week

364,668 export TEU ÷ 52 = 7,013 TEU arriving at the IMT by road per week

8. It was assumed that trucks moving containers in and out of Moorebank IMT will comprise 80% semi-trailers and 20% B-Doubles:

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

   7,936 TEU x 80% = 6,349 TEU out on a Semi

   7,013 TEU x 80% = 5,610 TEU in on a Semi

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

   7,936 TEU x 20% = 1,587 TEU out on a B-Double

   7,013 TEU x 20% = 1,403 TEU in on a B-Double

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

   6,349 TEU out on a Semi ÷ 1.6 TEU per Semi = 3.968 Semis out of terminal/per week

   5,610 TEU in on a Semi ÷ 1.6 TEU per Semi = 3,506 Semis into terminal per week

   1,587 TEU out on B-Double ÷ 2.4 TEU per B-Double = 661 B-Doubles out of terminal per week

   1,403 TEU in on B-Double ÷ 2.4 TEU per B-Double = 584 B-Doubles into terminal per week

10. In addition, each outbound movements outlined above will also generate an inbound movement. It is assumed that some load matching would occur, i.e. rather than every truck having to do an empty return journey to its origin, a portion of the journeys could be loaded both ways. For example, some outbound full import movements could be matched with full export or empty containers inbound, the remainder of the trucks would arrive empty. It was assumed that this load matching would be limited to only 30% of loaded Semi Trailer truck movements (generated off the direction with the more significant volume). All other movements would generate an empty running leg into or out of the terminal.

To generate the empty running trips for each truck type:

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

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

Therefore:

3,968 loaded semis outbound X (1 - 30% matched loads) = 2,778 semis running empty into terminal per week

3,506 loaded semis inbound - (3,968 loaded semis outbound – 2,778 empty semis inbound) = 2,316 semis running empty out of terminal

661 loaded B-Doubles outbound X (1 - 0% matched loads) = 661 B-Doubles running empty into terminal per week

584 loaded B-Doubles inbound X (1 - 0% matched loads) = 584 B-Doubles empty out of terminal per week

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

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

Total B-Double movements	***= 661 loads out + 661 empty in + 584 loads in + 584 empty out***
	= 1,246 trips out + 1,246 trips in
	= 2,491 trips
Total semi movements	***= 3,968 loads out + 2,778 empty in + 3,506 loads in + 2,316 empty out***
	= 6,284 trips out + 6,284 trips in
	= 12,568 trips

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

(2,491 B-Double trips per week X 85%) ÷ 5 = 424 B-Double movements per weekday

(12,568 semi trips per week X 85%) ÷ 5 = 2,137 Semi movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in Table 9.

Table 9: Total inbound and outbound IMEX moves per week and per weekday (2050)

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	B-Double	661	112
		Semi	3,968	675
Empty	Inbound	B-Double	661	112
		Semi	2,778	472
Loaded	Inbound	B-Double	584	99
		Semi	3,506	596
Empty	Outbound	B-Double	584	99
		Semi	2,316	394
Total Truck movements	Outbound	B-Double	1,246	212
		Semi	6,284	1,068
	Inbound	B-Double	1,246	212
		Semi	6,284	1,068

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

Average trucks per weekday ÷ 2 (for each direction) x 7.7% = trucks on and off site per hour in AM peak

424 B-Double movements per weekday ÷ 2 x 7.7% = 16 B-Double truck movements in AM peak hour in each direction

2,137 Semi movements per weekday ÷ 2 x 7.7% = 82 Semi truck movements in AM peak hour in each direction

Average trucks per weekday ÷ 2 (for each direction) x 9.3% = trucks on and off site per hour in PM peak

424 B-Double movements per weekday ÷ 2 x 9.3% = 20 B-Double truck movements in PM peak hour in each direction

2,137 Semi movements per weekday ÷ 2 x 9.3% = 99 Semi truck movements in PM peak hour in each direction

Table 10: Average weekday inbound and outbound IMEX Articulated truck movements

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	B-Double	212	16	20
		Semi	1,068	82	99
	Inbound	B-Double	212	16	20
		Semi	1,068	82	99

4.4.3 Interstate Market - 2030

The demand analysis also determined likely future demand for interstate traffic through the terminal. This total demand has then been allocated to cargo moving in the container between the terminal and the customer directly or via the onsite warehouse for consolidation/deconsolidation. In addition, empty containers move between the terminal and offsite locations. A different transport profile has been assumed for containers (whether loaded or empty) moving directly from the terminal to an offsite location. To align the terms used between the IMEX and Interstate traffics, inbound movements into Sydney have been referred to as imports to the terminal, movements out of the terminal by rail have been referred to as exports. The calculations for estimating the number of direct movements and associated truck trips is set out below.

132,750 TEU leaving the site by road (imports) = (120,000 full import TEU x 74%) + 44,000 empty import TEU

132,750 arriving at the site by road (exports) = (120,000 full export TEU x 74%) + 44,000 empty export TEU

1. It is assumed that the terminal would be operational 52 weeks per year.
   132,750 import TEU ÷ 52 = 2,553 TEU leaving the IMT by road per week

   132,750 export TEU ÷ 52 = 2,553 TEU arriving at the IMT by road per week

2. It was assumed that trucks moving containers in and out of Moorebank IMT will comprise 80% semi-trailers and 20% B-Doubles:

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

   2,553 TEUx 80% = 2,042 TEU out on a Semi
   2,553 TEU x 80% = 2,042 TEU in on a Semi

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

   2,553 TEU x 20% = 511 TEUs out on a B-Double
   2,553 TEU x 20% = 511 TEUs in on a B-Double

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

   2,042 TEU <u>out</u> on a Semi ÷ 1.6 TEU per Semi = 1,276 Semis out of terminal/per week

   2,042 TEU <u>in</u> on a Semi ÷ 1.6 TEU per Semi = 1,276 Semis into terminal per week

   511 TEU <u>out</u> on B-Double ÷ 2.4 TEU per B-Double = 213 B-Doubles out of terminal per week

   511 TEU <u>in</u> on B-Double ÷ 2.4 TEUs per B-Double = 213 B-Doubles into terminal per week

4. In addition, each outbound movements outlined above will also generate an inbound movement. It is assumed that some load matching would occur, i.e. rather than every truck having to do an empty return journey to its origin, a portion of the journeys could be loaded both ways. For example, some outbound full import movements could be matched with full export or empty containers inbound, the remainder of the trucks would arrive empty. It was assumed that this load matching would be limited to only 30% of loaded Semi Trailer truck movements (generated off the direction with the more significant volume). All other movements would generate an empty running leg into or out of the terminal.

   To generate the empty running trips for each truck type:

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

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

   Therefore:

   1,276 loaded semis outbound X (1 - 30% matched loads) = 894 semis running empty into terminal per week

   1,276 loaded semis inbound - (1,276 loaded semis outbound – 894 empty semis inbound) = 894 semis running empty out of terminal

   213 loaded B-Doubles outbound X (1 - 0% matched loads) = 213 B-Doubles running empty into terminal per week

   213 loaded B-Doubles inbound X (1 - 0% matched loads) = 213 B-Doubles empty out of terminal per week

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

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

Total B-Double movements	***= 213 loads out + 213 empty in + 213 loads in + 213 empty out***
	=425 trips out + 425 trips in
	= 851 trips
Total semi movements	***= 1,276 loads out + 894 empty in + 1,276 loads in + 894 empty out***
	= 2,170 trips out + 2,170 trips in
	= 4,340 trips

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

(851 B-Double trips per week X 85%) ÷ 5 = 145 B-Double movements per weekday

(4,340 semi trips per week X 85%) ÷ 5 = 738 Semi movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in **Table 11**.

Table 11 : Total inbound and outbound interstate moves per week and per weekday (2030)

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	B-Double	213	36
		Semi	1,276	217
Empty	Inbound	B-Double	213	36
		Semi	894	152
Loaded	Inbound	B-Double	213	36
		Semi	1,276	217
Empty	Outbound	B-Double	213	36
		Semi	894	152
Total Truck movements	Outbound	B-Double	425	72
		Semi	2,170	369
	Inbound	B-Double	425	72
		Semi	2,170	369

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

   Average trucks per weekday ÷ 2 (for each direction) x 7.7% = trucks on and off site per hour in AM peak

   145 B-Double movements per weekday ÷ 2 x 7.7% = 6 B-Double truck movements in AM peak hour in each direction

   738 Semi movements per weekday ÷ 2 x 7.7% = 28 Semi truck movements in AM peak hour in each direction
   Average trucks per weekday ÷ 2 (for each direction) x 9.3% = trucks on and off site per hour in PM peak

   145 B-Double movements per weekday ÷ 2 x 9.3% = 7 B-Double truck movements in PM peak hour in each direction

   738 Semi movements per weekday ÷ 2 x 9.3% = 34 Semi truck movements in PM peak hour in each direction

Table 12 : Average weekday interstate inbound and outbound articulated truck movements

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	B-Double	72	6	7
		Semi	369	28	34
	Inbound	B-Double	72	6	7
		Semi	369	28	34

4.4.4 Interstate Market - 2050

1. The calculations for estimating the number of direct movements and associated truck trips for the interstate market at 2050 is set out below.

   166,409 TEUs leaving the site by road (imports) = (149,000 full import TEU x 75.4%) + 54,000 empty import TEU

   166,409 arriving at the site by road (exports) = (149,000 full export TEU x 75.4%) + 54,000 empty export TEU

2. It is assumed that the terminal would be operational 52 weeks per year.
   166,409 import TEU ÷ 52 = 3,200 TEU leaving the IMT by road per week

   166,409 export TEU ÷ 52 = 3,200 TEU arriving at the IMT by road per week

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

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

3,200 TEU x 80% = 2,560 TEU out on a Semi

3,200 TEU x 80% = 2,560 TEU in on a Semi

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

3,200 TEU x 20% = 640 TEU out on a B-Double

3,200 TEU x 20% = 640 TEU in on a B-Double

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

2,560 TEU <u>out</u> on a Semi ÷ 1.6 TEU per Semi = 1,600 Semis out of terminal/per week

2,560 TEU <u>in</u> on a Semi ÷ 1.6 TEU per Semi = 1,600 Semis into terminal per week

640 TEU <u>out</u> on B-Double ÷ 2.4 TEU per B-Double = 267 B-Doubles out of terminal per week

640 TEU <u>in</u> on B-Double ÷ 2.4 TEU per B-Double = 267 B-Doubles into terminal per week

5. In addition, each outbound movements outlined above will also generate an inbound movement. It is assumed that some load matching would occur, i.e. rather than every truck having to do an empty return journey to its origin, a portion of the journeys could be loaded both ways. For example, some outbound full import movements could be matched with full export or empty containers inbound, the remainder of the trucks would arrive empty. It was assumed that this load matching would be limited to only 30% of loaded Semi Trailer truck movements (generated off the direction with the more significant volume). All other movements would generate an empty running leg into or out of the terminal.

To generate the empty running trips for each truck type:

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

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

Therefore:

1,600 loaded semis outbound X (1 - 30% matched loads) = 1,120 semis running empty into terminal per week

1,600 loaded semis inbound - (1,600 loaded semis outbound – 1,120 empty semis inbound) = 1,120 semis running empty out of terminal

267 loaded B-Doubles outbound X (1 - 0% matched loads) = 267 B-Doubles running empty into terminal per week

267 loaded B-Doubles inbound X (1 - 0% matched loads) = 267 B-Doubles empty out of terminal per week

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

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

Total B-Double movements	***= 267 loads out + 267 empty in + 267 loads in + 267 empty out***
	= 533 trips out + 533 trips in
	= 1,067 trips
Total semi movements	***= 1,600 loads out + 1,120 empty in + 1,600 loads in + 1,120 empty out***
	= 2,720 trips out + 2,720 trips in
	= 5,440 trips

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

(1,067 B-Double trips per week X 85%) ÷ 5 = 181 B-Double movements per weekday

(5,440 semi trips per week X 85%) ÷ 5 = 925 Semi movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in **Table 13**.

Table 13 : Total inbound and outbound interstate related moves per week and per weekday (2050)

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	B-Double	267	45
		Semi	1,600	272
Empty	Inbound	B-Double	267	45
		Semi	1,120	190
Loaded	Inbound	B-Double	267	45
		Semi	1,600	272
Empty	Outbound	B-Double	267	45
		Semi	1,120	190
Total Truck movements	Outbound	B-Double	533	91
		Semi	2,720	462
	Inbound	B-Double	533	91
		Semi	2,720	462

7. Daily truck volumes were multiplied by 7.7% and 9.3% to generate indicative AM and PM peak hourly truck volumes for each vehicle class both inbound and outbound. ***Average trucks per weekday ÷ 2 (for each direction) x 7.7% = trucks on and off site per hour in AM peak***

   181 B-Double movements per weekday ÷ 2 x 7.7% = 7 B-Double truck movements in AM peak hour in each direction

   925 Semi movements per weekday ÷ 2 x 7.7% = 36 Semi truck movements in AM peak hour in each direction

   Average trucks per weekday ÷ 2 (for each direction) x 9.3% = trucks on and off site per hour in PM peak

   181 B-Double movements per weekday ÷ 2 x 9.3% = 8 B-Double truck movements in PM peak hour in each direction

   925 Semi movements per weekday ÷ 2 x 9.3% = 43 Semi truck movements in PM peak hour in each direction

Table 14 : Average weekday interstate inbound and outbound articulated truck movements

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	B-Double	91	7	8
		Semi	462	36	43
	Inbound	B-Double	91	7	8
		Semi	462	36	43

4.4.5 Combined IMEX and Interstate movements at 2030

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

   537,302 TEU leaving the site by road (imports) = 493,302 full import TEU + 44,000 empty import TEU

   489,302 TEU arriving at the site by road (exports) = 216,698 full export TEU + 272,604 empty export TEU

2. It is assumed that the terminal would be operational 52 weeks per year.
   537,302 import TEU ÷ 52 = 10,333 TEU leaving the IMT by road per week

   489,302 export TEU ÷ 52 = 9,410 TEU arriving at the IMT by road per week

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

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

   10,333 TEUs x 80% = 8,266 TEU out on a Semi

   9,410 TEUs x 80% = 7,528 TEU in on a Semi

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

   10,333 TEUs x 20% = 2,067 TEUs out on a B-Double

   9,410 TEUs x 20% = 1,882 TEUs in on a B-Double

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

   8,266 TEU out on a Semi ÷ 1.6 TEU per Semi = 5,166 Semis out of terminal/per week

   7,528 TEU in on a Semi ÷ 1.6 TEU per Semi = 4,705 Semis into terminal per week

2,067 TEU <u>out</u> on B-Double ÷ 2.4 TEU per B-Double = 861 B-Doubles out of terminal per week

1,882 TEU <u>in</u> on B-Double ÷ 2.4 TEU per B-Double = 784 B-Doubles into terminal per week

5. In addition, each outbound movements outlined above will also generate an inbound movement. It is assumed that some load matching would occur, i.e. rather than every truck having to do an empty return journey to its origin, a portion of the journeys could be loaded both ways. For example, some outbound full import movements could be matched with full export or empty containers inbound, the remainder of the trucks would arrive empty. It was assumed that this load matching would be limited to only 30% of loaded Semi Trailer truck movements (generated off the direction with the more significant volume). All other movements would generate an empty running leg into or out of the terminal.

   To generate the empty running trips for each truck type:

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

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

   Therefore:

   5,166 loaded semis outbound X (1 - 30% matched loads) = 3,616 semis running empty into terminal per week

   4,705 loaded semis inbound - (5,166 loaded semis outbound – 3,616 empty semis inbound) = 3,155 semis running empty out of terminal

   861 loaded B-Doubles outbound X (1 - 0% matched loads) = 861 B-Doubles running empty into terminal per week

   784 loaded B-Doubles inbound X (1 - 0% matched loads) = 784 B-Doubles empty out of terminal per week

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

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

   Total B-Double movements = 861 loads out + 784 empty out + 784 loads in + 861 empty in

   = 1,645 trips out + 1,645 trips in

   = 3,290 trips

Total semi movements	***= 5,166 loads out + 3,155 empty out + 4,705 loads in + 3,616 empty in***
	= 8,321 trips out + 8,321 trips in
	= 16,643 trips

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

   (3,290 B-Double trips per week X 85%) ÷ 5 = 559 B-Double movements per weekday

   (16,643 semi trips per week X 85%) ÷ 5 = 2,829 Semi movements per weekday

   Total inbound and outbound moves per week and per weekday can be summarised in **Table 15** below.

Table 15 : Total combined inbound and outbound moves per week and per weekday (2030)

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	B-Double	861	146
		Semi	5,166	878
Empty	Inbound	B-Double	861	146
		Semi	3,616	615
Loaded	Inbound	B-Double	784	133
		Semi	4,705	800
Empty	Outbound	B-Double	784	133
		Semi	3,155	536
Total Truck movements	Outbound	B-Double	1,645	280
		Semi	8,321	1,415
	Inbound	B-Double	1,645	280
		Semi	8,321	1,415

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

   Average trucks per weekday ÷ 2 in each direction x 7.7% = trucks on and off site per hour in AM peak

   559 B-Double movements per weekday ÷ 2 x 7.7% = 22 B-Double truck movements in AM peak hour in each direction

   2,829 Semi movements per weekday ÷ 2 x 7.7% = 109 Semi truck movements in AM peak hour in each direction

Average trucks per weekday ÷ 2 in each direction x 9.3% = trucks on and off site per hour in PM peak

559 B-Double movements per weekday ÷ 2 x 9.3% = 26 B-Double truck movements in PM peak hour in each direction

2,829 Semi movements per weekday ÷ 2 x 9.3% = 132 Semi truck movements in PM peak hour in each direction

Table 16 : Combined average weekday inbound and outbound articulated truck movements

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	B-Double	280	22	26
		Semi	1,415	109	132
	Inbound	B-Double	280	22	26
		Semi	1,415	109	132

4.4.6 Combined IMEX and Interstate movements at 2050

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

   579,076 TEU leaving the site by road (imports) = 525,076 full import TEU + 54,000 empty import TEUs

   531,076 TEU arriving at the site by road (exports) = 242,923 full export TEU + 288,153 empty export TEU

2. It is assumed that the terminal would be operational 52 weeks per year.
   579,076 import TEU ÷ 52 = 11,136 TEUs leaving the IMT by road per week

   531,076 export TEU ÷ 52 = 10,213 TEUs arriving at the IMT by road per week

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

   Semi-Trailer TEUs (80% of TEU arriving at or leaving the terminal):
   11,136 TEUs x 80% = 8,909 TEU out on a Semi

   10,213 TEUs x 80% = 8,170 TEU in on a Semi

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

11,136 TEU x 20% = 2,227 TEU out on a B-Double

10,213 TEU x 20% = 2,043 TEU in on a B-Double

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

8,909 TEU <u>out</u> on a Semi ÷ 1.6 TEU per Semi = 5,568 Semis out of terminal/per week

8,170 TEU <u>in</u> on a Semi ÷ 1.6 TEU per Semi = 5,107 Semis into terminal per week

2,227 TEU <u>out</u> on B-Double ÷ 2.4 TEU per B-Double = 928 B-Doubles out of terminal per week

2,043 TEUs <u>in</u> on B-Double ÷ 2.4 TEU per B-Double = 851 B-Doubles into terminal per week

5. In addition, each outbound movements outlined above will also generate an inbound movement. It is assumed that some load matching would occur, i.e. rather than every truck having to do an empty return journey to its origin, a portion of the journeys could be loaded both ways. For example, some outbound full import movements could be matched with full export or empty containers inbound, the remainder of the trucks would arrive empty. It was assumed that this load matching would be limited to only 30% of loaded Semi Trailer truck movements (generated off the direction with the more significant volume). All other movements would generate an empty running leg into or out of the terminal.

   To generate the empty running trips for each truck type:

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

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

   Therefore:

   5,568 loaded semis outbound X (1 - 30% matched loads) = 3,898 semis running empty into terminal per week

5,107 loaded semis inbound - (5,568 loaded semis outbound – 3,898 empty semis inbound) = 3,436 semis running empty out of terminal

928 loaded B-Doubles outbound X (1 - 0% matched loads) = 928 B-Doubles running empty into terminal per week

851 loaded B-Doubles inbound X (1 - 0% matched loads) = 851 B-Doubles empty out of terminal per week

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

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

Total B-Double movements	***= 928 loads out + 851 empty out + 851 loads in + 928 empty in***
	= 1,779 trips out + 1,779 trips in
	= 3,558 trips
Total semi movements	***= 5,568 loads out + 3,436 empty out + 5,107 loads in + 3,898 empty in***
	= 9,004 trips out + 9,004 trips in
	= 18,008 trips

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

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

(19,045 semi trips per week X 85%) ÷ 5 = 3,238 Semi movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in

Table 17 below.

Table 17 : Total combined inbound and outbound moves per week and per weekday (2050)

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	B-Double	928	158
		Semi	5,568	947
Empty	Inbound	B-Double	928	158
		Semi	3,898	663
Loaded	Inbound	B-Double	851	145
		Semi	5,107	868
Empty	Outbound	B-Double	851	145
		Semi	3,436	584
Total Truck movements	Outbound	B-Double	1,779	302
		Semi	9,004	1,531
	Inbound	B-Double	1,779	302
		Semi	9,004	1,531

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

Average trucks per weekday ÷ 2 in each direction x 7.7% = trucks on and off site per hour in AM peak

605 B-Double movements per weekday ÷ 2 x 7.7% = 23 B-Double truck movements in AM peak hour in each direction

3,061 Semi movements per weekday ÷ 2 x 7.7% = 118 Semi truck movements in AM peak hour in each direction

Average trucks per weekday ÷ 2 in each direction x 9.3% = trucks on and off site per hour in PM peak

605 B-Double movements per weekday ÷ 2 x 9.3% = 28 B-Double truck movements in PM peak hour in each direction

3,061 Semi movements per weekday ÷ 2 x 9.3% = 142 Semi truck movements in PM peak hour in each direction

Table 18 : Average combined weekday inbound and outbound Articulated truck movements 2050

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	B-Double	302	23	28
		Semi	1,531	118	142
	Inbound	B-Double	302	23	28
		Semi	1,531	118	142

4.5 Movements to and from the Warehouses

4.5.1 IMEX Market - 2030

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

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

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

1. The Moorebank IMT will have enough on-site warehousing capacity to handle approximately 26% of all full TEUs. It is assumed that half of these will be held in inventory in onsite warehousing for a period of weeks with the rest being general cargo (FAK) which would be deconsolidated and distributed offsite within a few days or arrive onsite for consolidation and export.

   547,000 full inbound TEUs x 13% FAK = 71,224 TEU FAK for distribution from site

   547,000 full inbound TEUs x 13% Inventory = 71,224 TEU Inventory for distribution from site

   173,000 full outbound TEU x 13% FAK = 22,526 TEU FAK arriving at site for consolidation

   173,000 full outbound TEU x 13% Inventory = 22,526 TEU Inventory arriving at site for consolidation

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

   71,224 FAK + 71,224 Inventory TEU ÷ 52 = 2,739 TEU into warehouse and distributed off site each week

   22,526 FAK + 22,526 Inventory TEU ÷ 52 = 866 TEU arrive on-site and into warehouse each week

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

   2,739 TEU x 25 equivalent pallet loads per TEU = 68,485 equivalent pallet loads into warehouse and distributed off site by road each week

   866TEU x 25 equivalent pallet loads per TEU = 21,660 equivalent pallet loads into warehouse by road and railed offsite each week

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

   Deliveries from Moorebank warehouses:
   68,485 pallets per week x 34% = 23,285 pallets out on semi-trailer trucks

   68,485 pallets per week x 66% = 45,200 pallets out on rigid trucks

   Deliveries to Moorebank warehouses:
   21,660 pallets per week x 100% = 21,660 pallets in on rigid trucks

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

   Deliveries from Moorebank warehouses:
   23,285 pallets in semis per week ÷ 40 pallets per truck = 582 loaded semi-trailer truck movements out per week

   45,200 pallets in rigids per week ÷ 20 pallets per truck = 2,260 loaded rigid truck movements out per week

   Deliveries to Moorebank warehouses:
   21,660 pallets in rigids per week ÷ 20 pallets per truck = 1,083 loaded rigid truck movements in per week

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

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

   582 semis empty into terminal per week = 582 loaded semis outbound X (1 - 0% matched loads)

   2,260 empty rigids into terminal per week = 2,260 loaded rigids outbound X (1 - 0% matched loads)

   1,083 empty rigids out of terminal per week = 1,083 loaded rigids inbound X (1 - 0% matched loads)

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

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

Total semi movements	***= 582 loads out + 0 empty out + 0 loads in + 582 empty in***
	= 582 trips out + 582 trips in
	= 1,164 trips per week
Total rigid movements	***= 2,260 loads out + 1,083 empty out + 1,083 loads in + 2,260 empty in***
	= 3,343 trips out + 3,343 trips in
	= 6,686 trips per week

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

(1,164semi-truck movements per week X 95%) ÷ 5 = 221 semi-trailer movements per weekday

(6,686 rigid truck movements per week X 95%) ÷ 5 = 1,270 rigid truck movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in **Table 19** below.

Table 19: Average weekly inbound and outbound IMEX warehouse related road movements

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	Semi	582	111
		Rigid	2,260	429
Empty	Inbound	Semi	582	111
		Rigid	2,260	429
Loaded	Inbound	Semi	0	0
		Rigid	1,083	206
Empty	Outbound	Semi	0	0
		Rigid	1,083	206
Total Truck movements	Outbound	Semi	582	111
		Rigid	3,343	635
	Inbound	Semi	582	111
		Rigid	3,343	635

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

Average trucks per weekday ÷ 2 (in each direction) x 7.7% = trucks on and off-site per hour in AM peak in each direction

221 semi movements per weekday ÷ 2 x 7.7% = 9 semi-truck movements in AM peak hour in each direction

1,270 rigid movements per weekday ÷ 2 x 7.7% = 49 rigid truck movements in AM peak hour in each direction

Average trucks per weekday ÷ 2 (in each direction) x 9.3% = trucks on and off
-site per hour in PM peak in each direction

221 semi movements per weekday ÷ 2 x 9.3% = 10 semi-truck movements in PM peak hour in each direction

1,270 rigid movements per weekday ÷ 2 x 9.3% = 59 rigid truck movements in PM peak hour in each direction

Table 20 : Average IMEX warehouse related weekday inbound and outbound truck movements 2030

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	Semi	111	9	10
		Rigid	635	49	59
	Inbound	Semi	111	9	10
		Rigid	635	49	59

Note: Some truck numbers have been rounded to the nearest whole number

4.5.2 IMEX Market - 2050

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

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

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

1. The Moorebank IMT will have enough on-site warehousing capacity to handle approximately 24.6% of all full TEU. It is assumed that half of these will be held in inventory in onsite warehousing for a period of weeks with the rest

being general cargo (FAK) which would be deconsolidated and distributed offsite within a few days or arrive onsite for consolidation and export.

547,000 full inbound TEU x 12.3% FAK = 67,166 TEU FAK for distribution from site

547,000 full inbound TEU x 12.3% Inventory = 67,166 TEU Inventory for distribution from site

173,000 full outbound TEU x 12.3% FAK = 21,243 TEU's FAK arriving at site for consolidation

173,000 full outbound TEU x 12.3% Inventory = 21,243 TEU Inventory arriving at site for consolidation

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

   67,166 FAK + 67,166 Inventory TEU ÷ 52 = 2,583 TEU into warehouse and distributed off site each week

   21,243 FAK + 21,243 Inventory TEU ÷ 52 = 817 TEU arrive onto site and into warehouse each week

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

   2,583 TEU x 25 equivalent pallet loads per TEU = 64,583 equivalent pallet loads into warehouse and distributed off site by road each week

   817 x 25 equivalent pallet loads per TEU = 20,426 equivalent pallet loads into warehouse by road and railed offsite each week

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

   Deliveries from Moorebank warehouses:
   64,583 pallets per week x 34% = 21,958 pallets out on semi-trailer trucks

   64,583 pallets per week x 66% = 42,625 pallets out on rigid trucks

   Deliveries to Moorebank warehouses:
   20,426 pallets per week x 100% = 20,426 pallets in on rigid trucks

5. Semi-trailer trucks are likely to carry, on average 40 pallets per truck whilst rigid trucks have been assumed to carry, on average 20 pallets per load.

Dividing the number of pallets by each average load determines the average number of loaded truck movements per week into and out of the warehouses.

Deliveries from Moorebank warehouses:
21,958 pallets in semis per week ÷ 40 pallets per truck = 549 loaded semi-trailer truck movements out per week

42,625 pallets in rigids per week ÷ 20 pallets per truck = 2,131 loaded rigid truck movements out per week

Deliveries to Moorebank warehouses:
20,426 pallets in rigids per week ÷ 20 pallets per truck = 1,021 loaded rigid truck movements in per week

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

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

549 semis empty into terminal per week = 549 loaded semis outbound X (1 - 0% matched loads)

2,131 empty rigids into terminal per week = 2,131 loaded rigids outbound X (1 - 0% matched loads)

1,021 empty rigids out of terminal per week = 1,021 loaded rigids inbound X (1 - 0% matched loads)

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

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

Total semi movements ***= 549 loads out + 0 empty out + 0 loads in + 549 empty in***

= 549 trips out + 549 trips in

= 1,098 trips per week

Total rigid movements ***= 2,131 loads out + 1,021 empty out + 1,021 loads in + 2,131 empty in***

= 3,153 trips out + 3,153 trips in

= 6,305 trips per week

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

   (1,098 semi-truck movements per week X 95%) ÷ 5 = 209 semi-trailer movements per weekday

   (6,305 rigid truck movements per week X 95%) ÷ 5 = 1,198 rigid truck movements per weekday

   Total inbound and outbound moves per week and per weekday can be summarised in **Table 19** below.

Table 21: Average weekly inbound and outbound IMEX warehouse related road movements

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	Semi	549	104
		Rigid	2,131	405
Empty	Inbound	Semi	549	104
		Rigid	2,131	405
Loaded	Inbound	Semi	0	0
		Rigid	1,021	194
Empty	Outbound	Semi	0	0
		Rigid	1,021	194
Total Truck movements	Outbound	Semi	549	104
		Rigid	3,153	599
	Inbound	Semi	549	104
		Rigid	3,153	599

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

   Average trucks per weekday ÷ 2 (in each direction) x 7.7% = trucks on and off-site per hour in AM peak in each direction

   209 semi movements per weekday ÷ 2 x 7.7% = 8 semi-truck movements in AM peak hour in each direction

   1,198 rigid movements per weekday ÷ 2 x 7.7% = 46 rigid truck movements in AM peak hour in each direction

   Average trucks per weekday ÷ 2 (in each direction) x 9.3% = trucks on and off- site per hour in PM peak in each direction

209 semi movements per weekday ÷ 2 x 9.3% = 10 semi-truck movements in PM peak hour in each direction

1,198 rigid movements per weekday ÷ 2 x 9.3% = 56 rigid truck movements in PM peak hour in each direction

Table 22: Average IMEX warehouse related weekday inbound and outbound truck movements 2030

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	Semi	104	8	10
		Rigid	599	46	56
	Inbound	Semi	104	8	10
		Rigid	599	46	56

Note: Some truck numbers have been rounded to the nearest whole number

4.5.3 Interstate Containers 2030

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

1. As for the IMEX, the Moorebank IMT will have enough on-site warehousing capacity to handle approximately 26% of all full TEU. It is assumed that half of these will be held in inventory in onsite warehousing for a period of weeks with the rest being general cargo (FAK) which would be deconsolidated and distributed offsite within a few days or arrive onsite for consolidation and export.

   120,000 full inbound TEU x 13% FAK = 15,625 TEU FAK for distribution from site

   120,000 full inbound TEU x 13% Inventory = 15,625 TEU Inventory for distribution from site

   120,000 full outbound TEU x 13% FAK = 15,625 TEU FAK arriving at site for consolidation

   120,000 full outbound TEU x 13% Inventory = 15,625 TEU Inventory arriving at site for consolidation

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

   15,625 FAK + 15,625 Inventory TEU ÷ 52 = 601 TEU into warehouse and distributed off site each week

15,625 FAK + 15,625 Inventory TEU ÷ 52 = 601 TEU arrive onto site and into warehouse each week

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

   601 TEU x 25 equivalent pallet loads per TEU = 15,024 equivalent pallet loads into warehouse and distributed off site by road each week

   601 TEU x 25 equivalent pallet loads per TEU = 15,024 equivalent pallet loads into warehouse by road and railed offsite each week

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

   Deliveries from Moorebank warehouses:
   15,024 pallets per week x 34% = 5,108 pallets out on semi-trailer trucks

   15,024 pallets per week x 66% = 9,916 pallets out on rigid trucks

   Deliveries to Moorebank warehouses:
   15,024 pallets per week x 100% = 15,024 pallets in on rigid trucks

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

   Deliveries from Moorebank warehouses:
   5,108 pallets in semis per week ÷ 40 pallets per truck = 128 loaded semi-trailer truck movements out per week

   9,916 pallets in rigids per week ÷ 20 pallets per truck = 496 loaded rigid truck movements out per week

   Deliveries to Moorebank warehouses:
   15,024 pallets in rigids per week ÷ 20 pallets per truck = 751 loaded rigid truck movements in per week

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

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

128 semis empty into terminal per week = 128 loaded semis outbound X (1 - 0% matched loads)

496 empty rigids into terminal per week = 496 loaded rigids outbound X (1 - 0% matched loads)

751 empty rigids out of terminal per week = 751 loaded rigids inbound X (1 - 0% matched loads)

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

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

Total semi movements	***= 128 loads out + 0 empty out + 0 loads in + 128 empty in***
	= 128 trips out + 128 trips in
	= 255 trips per week
Total rigid movements	***= 496 loads out + 751 empty out + 751 loads in + 496 empty in***
	= 1,247 trips out + 1,247 trips in
	= 2,494 trips per week

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

(255 semi-truck movements per week X 95%) ÷ 5 = 49 semi-trailer movements per weekday

(2,494 rigid truck movements per week X 95%) ÷ 5 = 474 rigid truck movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in **Table 23** below.

Table 23 : Average weekly interstate inbound and outbound warehouse related road movements 2030

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	Semi	128	24
		Rigid	496	94
Empty	Inbound	Semi	128	24
		Rigid	496	94
Loaded	Inbound	Semi	0	0
		Rigid	751	143
Empty	Outbound	Semi	0	0
		Rigid	751	143
Total Truck movements	Outbound	Semi	128	24
		Rigid	1,247	237
	Inbound	Semi	128	24
		Rigid	1,247	237

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

   Average trucks per weekday ÷ 2 (in each direction) x 7.7% = trucks on and off- site per hour in AM peak in each direction

   49 semi movements per weekday ÷ 2 x 7.7% = 2 semi-truck movements in AM peak hour in each direction

   474 rigid movements per weekday ÷ 2 x 7.7% = 18 rigid truck movements in AM peak hour in each direction

   Average trucks per weekday ÷ 2 (in each direction) x 9.3% = trucks on and off -site per hour in PM peak in each direction

   49 semi movements per weekday ÷ 2 x 9.3% = 2 semi-truck movements in PM peak hour in each direction

   474 rigid movements per weekday ÷ 2 x 9.3% = 22 rigid truck movements in PM peak hour in each direction

Table 24 : Total average weekday interstate related warehouse truck movements

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	Semi	24	2	2
		Rigid	237	18	22
	Inbound	Semi	24	2	2
		Rigid	237	18	22

4.5.4 Interstate Containers 2050

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

1. As for the IMEX, the Moorebank IMT will have enough on-site warehousing capacity to handle approximately 24.6% of all full TEU. It is assumed that half of these will be held in inventory in onsite warehousing for a period of weeks with the rest being general cargo (FAK) which would be deconsolidated and distributed offsite within a few days or arrive onsite for consolidation and export.

   149,000 full inbound TEU x 12.3% FAK = 18,296 TEU FAK for distribution from site

   149,000 full inbound TEU x 12.3% Inventory = 18,296 TEU Inventory for distribution from site

   149,000 full outbound TEU x 12.3% FAK = 18,296 TEs FAK arriving at site for consolidation

   149,000 full outbound TEU x 12.3% Inventory = 18,296 TEU Inventory arriving at site for consolidation

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

   18,296 FAK + 18,296 Inventory TEU ÷ 52 = 704 TEU into warehouse and distributed off site each week

   18,296 FAK + 18,296 Inventory TEU ÷ 52 = 704 TEU arrive onto site and into warehouse each week

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

   704 TEU x 25 equivalent pallet loads per TEU = 17,592 equivalent pallet loads into warehouse and distributed off site by road each week

704 TEU x 25 equivalent pallet loads per TEU = 17,592 equivalent pallet loads into warehouse by road and railed offsite each week

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

   Deliveries from Moorebank warehouses:
   17,592 pallets per week x 34% = 5,981 pallets out on semi-trailer trucks

   17,592 pallets per week x 66% = 11,611 pallets out on rigid trucks

   Deliveries to Moorebank warehouses:
   17,592 pallets per week x 100% = 17,592 pallets in on rigid trucks

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

   Deliveries from Moorebank warehouses:
   5,981 pallets in semis per week ÷ 40 pallets per truck = 150 loaded semi-trailer truck movements out per week

   11,611 pallets in rigids per week ÷ 20 pallets per truck = 581 loaded rigid truck movements out per week

   Deliveries to Moorebank warehouses:
   17,592 pallets in rigids per week ÷ 20 pallets per truck = 880 loaded rigid truck movements in per week

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

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

   150 semis empty into terminal per week = 150 loaded semis outbound X (1 - 0% matched loads)

   581 empty rigids into terminal per week = 581 loaded rigids outbound X (1 - 0% matched loads)

   880 empty rigids out of terminal per week = 880 loaded rigids inbound X (1 - 0% matched loads)

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

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

Total semi movements	***= 150 loads out + 0 empty out + 0 loads in + 150 empty in***
	= 150 trips out + 150 trips in
	= 299 trips per week
Total rigid movements	***= 581 loads out + 880 empty out + 880 loads in + 581 empty in***
	= 1,460 trips out + 1,460 trips in
	= 2,920 trips per week

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

(299 semi-truck movements per week X 95%) ÷ 5 = 57 semi-trailer movements per weekday

(2,920 rigid truck movements per week X 95%) ÷ 5 = 555 rigid truck movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in **Table 25** below.

Table 25: Average weekly inbound and outbound warehouse related road movements

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	Semi	150	28
		Rigid	581	110
Empty	Inbound	Semi	150	28
		Rigid	581	110
Loaded	Inbound	Semi	0	0
		Rigid	880	167
Empty	Outbound	Semi	0	0
		Rigid	880	167
Total Truck movements	Outbound	Semi	150	28
		Rigid	1,460	277
	Inbound	Semi	150	28
		Rigid	1,460	277

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

Average trucks per weekday ÷ 2 (in each direction) x 7.7% = trucks on and off site per hour in AM peak in each direction

57 semi movements per weekday ÷ 2 x 7.7% = 2 semi-truck movements in AM peak hour in each direction

555 rigid movements per weekday ÷ 2 x 7.7% = 21 rigid truck movements in AM peak hour in each direction

Average trucks per weekday ÷ 2 (in each direction) x 9.3% = trucks on and off-site per hour in PM peak in each direction

57 semi movements per weekday ÷ 2 x 9.3% = 3 semi-truck movements in PM peak hour in each direction

555 rigid movements per weekday ÷ 2 x 9.3% = 26 rigid truck movements in PM peak hour in each direction

Table 26 : Average total weekday truck movements for interstate related warehouse activity at 2050

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	Semi	46	2	3
		Rigid	565	21	26
	Inbound	Semi	46	2	3
		Rigid	565	21	26

4.5.5 Combined IMEX and Interstate Containers 2030

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

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

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

1. The Moorebank IMT will have enough on-site warehousing capacity to handle approximately 26% of all full TEU. It is assumed that half of these will be held in inventory in onsite warehousing for a period of weeks with the rest being general cargo (FAK) which would be deconsolidated and distributed offsite within a few days or arrive onsite for consolidation and export.

667,000 full inbound TEU x 13% FAK = 86,849 TEU FAK for distribution from site

667,000 full inbound TEU x 13% Inventory = 86,849 TEU Inventory for distribution from site

293,000 full outbound TEU x 13% FAK = 38,151 TEU FAK arriving at site for consolidation

293,000 full outbound TEU x 13% Inventory = 38,151 TEU's Inventory arriving at site for consolidation

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

   86,849 FAK + 86,849 Inventory TEU ÷ 52 = 3,340 TEU into warehouse and distributed off site each week

   38,151 FAK + 38,151 Inventory TEU ÷ 52 = 1,467 TEU arrive onto site and into warehouse each week

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

   3,340 TEU x 25 equivalent pallet loads per TEU = 83,509 equivalent pallet loads into warehouse and distributed off site by road each week

   1.467 x 25 equivalent pallet loads per TEU = 36,684 equivalent pallet loads into warehouse by road and railed offsite each week

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

   Deliveries from Moorebank warehouses:
   83,509 pallets per week x 34% = 28,393 pallets out on semi-trailer trucks

   83,509 pallets per week x 66% = 55,116 pallets out on rigid trucks

   Deliveries to Moorebank warehouses:
   36.684 pallets per week x 100% = 36,684 pallets in on rigid trucks

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

Deliveries from Moorebank warehouses:
28,393 pallets in semis per week ÷ 40 pallets per truck = 710 loaded semi-trailer truck movements out per week

55,116 pallets in rigids per week ÷ 20 pallets per truck = 2,756 loaded rigid truck movements out per week

Deliveries to Moorebank warehouses:
36,684 pallets in rigids per week ÷ 20 pallets per truck = 1,834 loaded rigid truck movements in per week

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

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

710 semis empty into terminal per week = 710 loaded semis outbound X (1 - 0% matched loads)

2,756 empty rigids into terminal per week = 2,756 loaded rigids outbound X (1 - 0% matched loads)

1,834 empty rigids out of terminal per week = 1,834 loaded rigids inbound X (1 - 0% matched loads)

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

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

Total semi movements	***= 710 loads out + 0 empty out + 0 loads in + 710 empty in***
	= 710 trips out + 710 trips in
	= 1,420 trips per week
Total rigid movements	***= 2,756 loads out + 1,834 empty out + 1,834 loads in + 2,756 empty in***
	= 4,590 trips out + 4,590 trips in
	= 9,180 trips per week

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

(1,420 semi-truck movements per week X 95%) ÷ 5 = 270 semi-trailer movements per weekday

(9,180 rigid truck movements per week X 95%) ÷ 5 = 1,744 rigid truck movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in **Table 27** below.

Table 27 : Average weekly inbound and outbound warehouse related road movements 2030 for IMEX and Interstate combined

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	Semi	710	135
		Rigid	2,756	524
Empty	Inbound	Semi	710	135
		Rigid	2,756	524
Loaded	Inbound	Semi	0	0
		Rigid	1,834	348
Empty	Outbound	Semi	0	0
		Rigid	1,834	348
Total Truck movements	Outbound	Semi	710	135
		Rigid	4,590	872
	Inbound	Semi	710	135
		Rigid	4,590	872

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

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

270 semi movements in each direction per weekday x 7.7% = 10 semi-truck movements in AM peak hour in each direction

1,744 rigid movements in each direction per weekday x 7.7% = 67 rigid truck movements in AM peak hour in each direction

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

270 semi movements in each direction per weekday x 9.3% = 13 semi-truck movements in PM peak hour in each direction

1,744 rigid movements in each direction per weekday x 9.3% = 81 rigid truck movements in PM peak hour in each direction

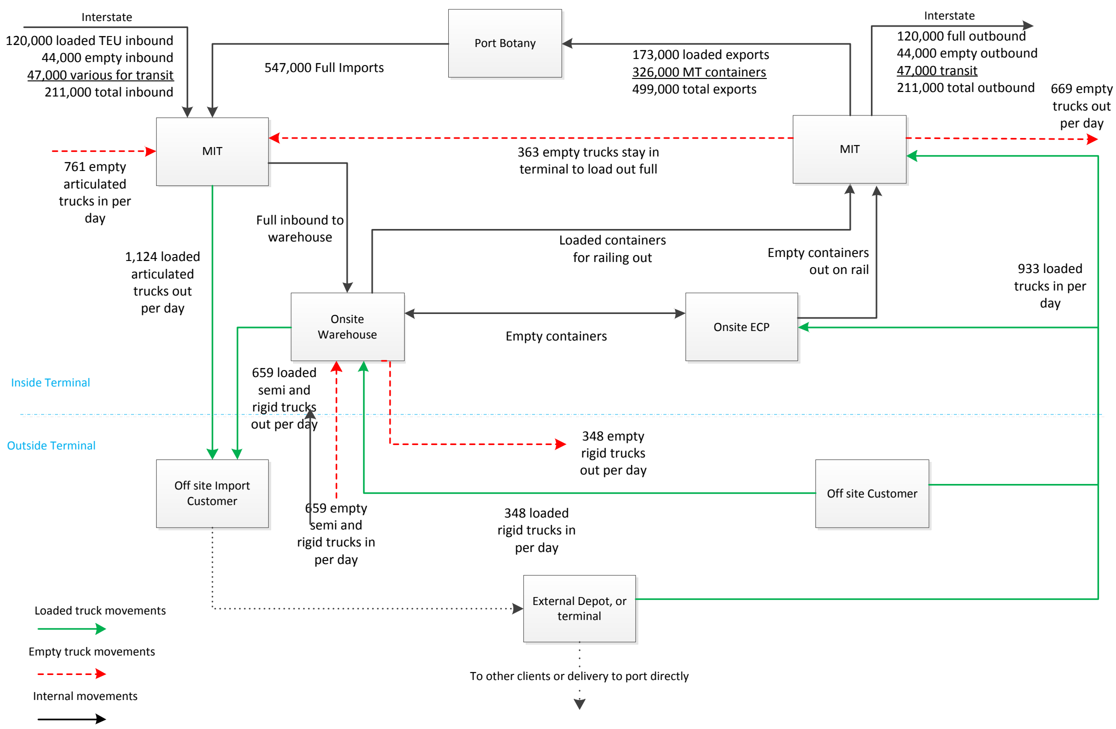
Table 28 : Total combined average weekday truck movements for warehousing activity at 2030

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	Semi	135	10	13
		Rigid	872	67	81
	Inbound	Semi	135	10	13
		Rigid	872	670	81

<u>**Note:**</u> Some truck numbers have been rounded to the nearest whole number

A consolidated flow diagram for movements of full container loads out of the terminal, warehouse generated loads out of the terminal and associated empty running truck trips are illustrated in the following flow diagram.

Figure 8 : **Total average weekday truck movements at 2030**



Note that there may be some minor differences in truck numbers between the flow diagram and the tables due to consolidation of figures and rounding. A full size diagram is included at **Appendix A.**

4.5.6 Combined IMEX and Interstate Containers 2050

As stated previously, warehouse generated truck traffic movements were estimated using a similar methodology to the derivation of container truck movements, with some variation to the underlying assumptions. The most significant changes to the assumptions were:

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

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

1. The Moorebank IMT will have enough on-site warehousing capacity to handle approximately 24.6% of all full TEU. It is assumed that half of these will be held in inventory in onsite warehousing for a period of weeks with the rest being general cargo (FAK) which would be deconsolidated and distributed offsite within a few days or arrive onsite for consolidation and export.

   696,000 full inbound TEU x 12.3% FAK = 85,462 TEU FAK for distribution from site

   696,000 full inbound TEU x 12.3% Inventory = 85,462 TEU Inventory for distribution from site

   322,000 full outbound TEU x 12.3% FAK = 39,538 TEU FAK arriving at site for consolidation

   322,000 full outbound TEU x 12.3% Inventory = 39,538 TEU Inventory arriving at site for consolidation

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

   85,462 FAK + 85,462 Inventory TEU ÷ 52 = 3,287 TEUs into warehouse and distributed off site each week

   39,538 FAK + 39,538 Inventory TEU ÷ 52 = 1,521 TEUs arrive onto site and into warehouse each week

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

   3,287 TEU x 25 equivalent pallet loads per TEU = 82,175 equivalent pallet loads into warehouse and distributed off site by road each week

1,521 x 25 equivalent pallet loads per TEU = 38,018 equivalent pallet loads into warehouse by road and railed offsite each week

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

   Deliveries from Moorebank warehouses:
   82,175 pallets per week x 34% = 27,939 pallets out on semi-trailer trucks

   82,175 pallets per week x 66% = 54,235 pallets out on rigid trucks

   Deliveries to Moorebank warehouses:
   38,018 pallets per week x 100% = 38,018 pallets in on rigid trucks

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

   Deliveries from Moorebank warehouses:
   27,939 pallets in semis per week ÷ 40 pallets per truck = 698 loaded semi-trailer truck movements out per week

   54,235 pallets in rigids per week ÷ 20 pallets per truck = 2,712 loaded rigid truck movements out per week

   Deliveries to Moorebank warehouses:
   38,018 pallets in rigids per week ÷ 20 pallets per truck = 1,901 loaded rigid truck movements in per week

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

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

   698 semis empty into terminal per week = 698 loaded semis outbound X (1 - 0% matched loads)

   2,712 empty rigids into terminal per week = 2,712 loaded rigids outbound X (1 - 0% matched loads)

   1,901 empty rigids out of terminal per week = 1,901 loaded rigids inbound X (1 - 0% matched loads)

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

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

Total semi movements	***= 698 loads out + 0 empty out + 0 loads in + 698 empty in***
	= 698 trips out + 698 trips in
	= 1,397 trips per week
Total rigid movements	***= 2,712 loads out + 1,901 empty out + 1,901 loads in + 2,712 empty in***
	= 4,613 trips out + 4,613 trips in
	= 9,225 trips per week

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

(1,397 semi-truck movements per week X 95%) ÷ 5 = 265 semi-trailer movements per weekday
(9,225 rigid truck movements per week X 95%) ÷ 5 = 1,753 rigid truck movements per weekday

Total inbound and outbound moves per week and per weekday can be summarised in **Table 29** below.

Table 29 : Average weekly inbound and outbound warehouse related road movements 2050 for IMEX and Interstate combined

Truck Status	Direction on road	Truck Type	Trucks per week (a)	Average trucks per Weekday (b)
Loaded	Outbound	Semi	698	133
		Rigid	2,712	515
Empty	Inbound	Semi	698	133
		Rigid	2,712	515
Loaded	Inbound	Semi	0	0
		Rigid	1,901	361
Empty	Outbound	Semi	0	0
		Rigid	1,901	361
Total Truck movements	Outbound	Semi	698	133
		Rigid	4,613	876
	Inbound	Semi	698	133
		Rigid	4,613	876

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

   Average trucks per weekday ÷ 2 (in each direction) x 7.7% = trucks on and off site per hour in AM peak in each direction

   265 semi movements ÷ 2 in each direction per weekday x 7.7% = 10 semi-truck movements in AM peak hour in each direction

   1,753 rigid movements ÷ 2 in each direction per weekday x 7.7% = 67 rigid truck movements in AM peak hour in each direction

   Average trucks per weekday ÷ 2 (in each direction) x 9.3% = trucks on and off site per hour in PM peak in each direction

   265 semi movements ÷ 2 in each direction per weekday x 9.3% = 12 semi-truck movements in PM peak hour in each direction

   1,753 rigid movements ÷ 2 in each direction per weekday x 9.3% = 82 rigid truck movements in PM peak hour in each direction

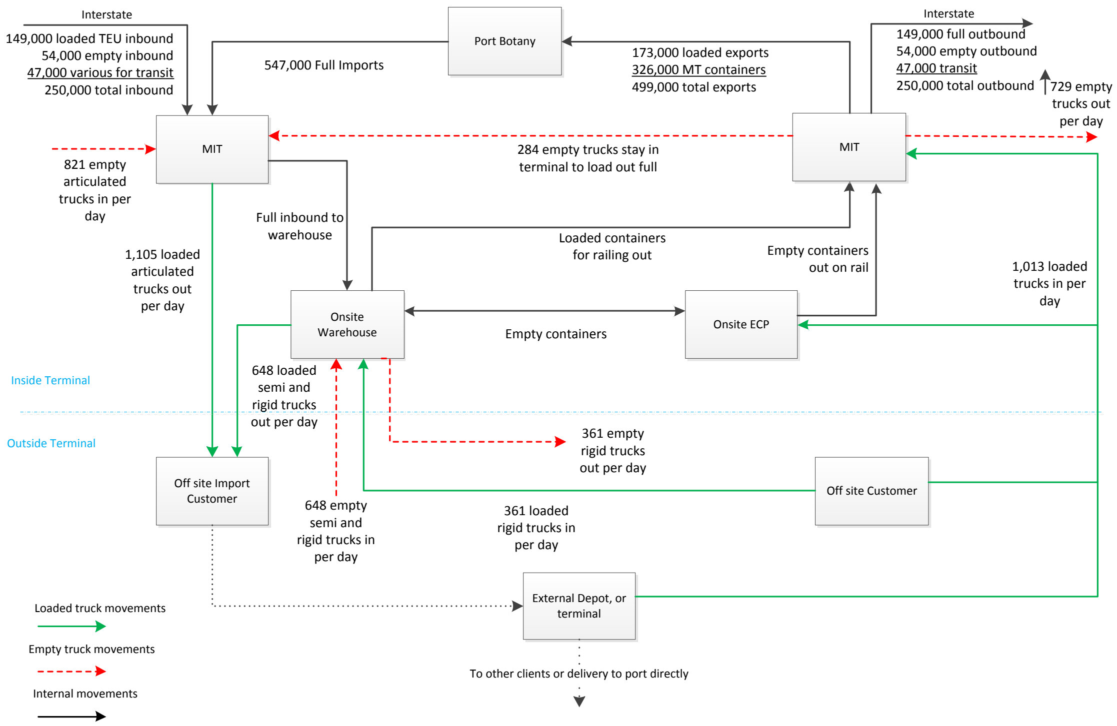
Table 30 : Total combined average weekday truck movements for warehousing activity at 2050

Truck Status	Direction on road	Truck Type	Average trucks per Weekday	Trucks per hour AM Peak	Trucks per hour PM Peak
Total Truck movements	Outbound	Semi	133	10	12
		Rigid	876	67	82
	Inbound	Semi	133	10	12
		Rigid	876	67	82

<u>Note:</u> Some truck numbers have been rounded to the nearest whole number

A consolidated flow diagram for movements of full container loads out of the terminal, warehouse generated loads out of the terminal and associated empty running truck trips are illustrated in the following flow diagram.

Figure 9 : Total average weekday truck movements at 2050



Note that there may be some minor differences between the flow diagram and the tables due to consolidation of figures and rounding. A full size diagram is included at **Appendix A.**

5 Limitation of our work

General use restriction

This report is prepared solely for the use of Moorebank Intermodal Company. This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. The report has been prepared for the purpose set out in Section 1 of this document. You should not refer to or use our name or the advice for any other purpose.

Appendix A

Figure 10 : IMEX Flows through the terminal – 2030

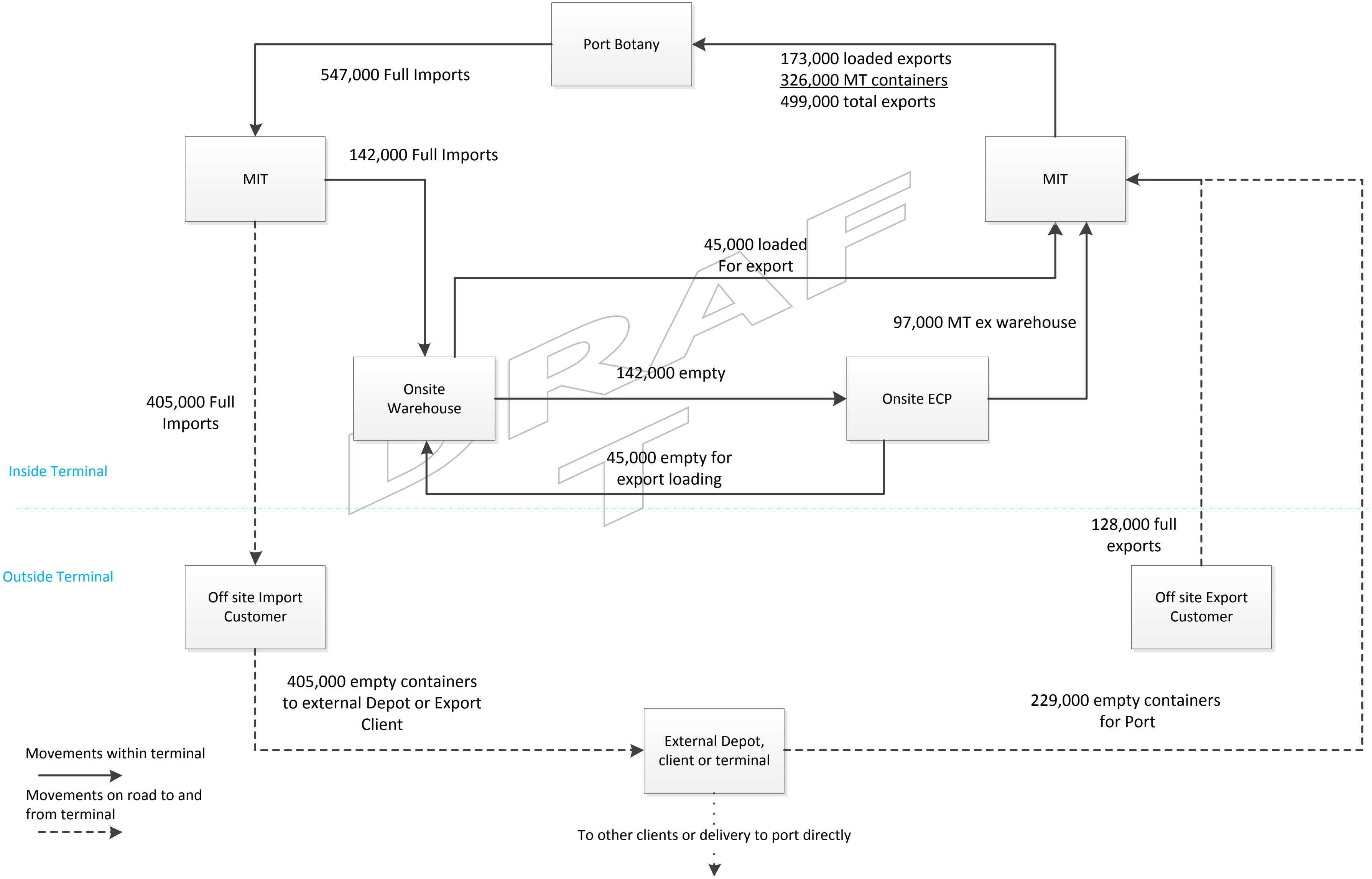


Figure 11 : IMEX Flows through the terminal – 2050

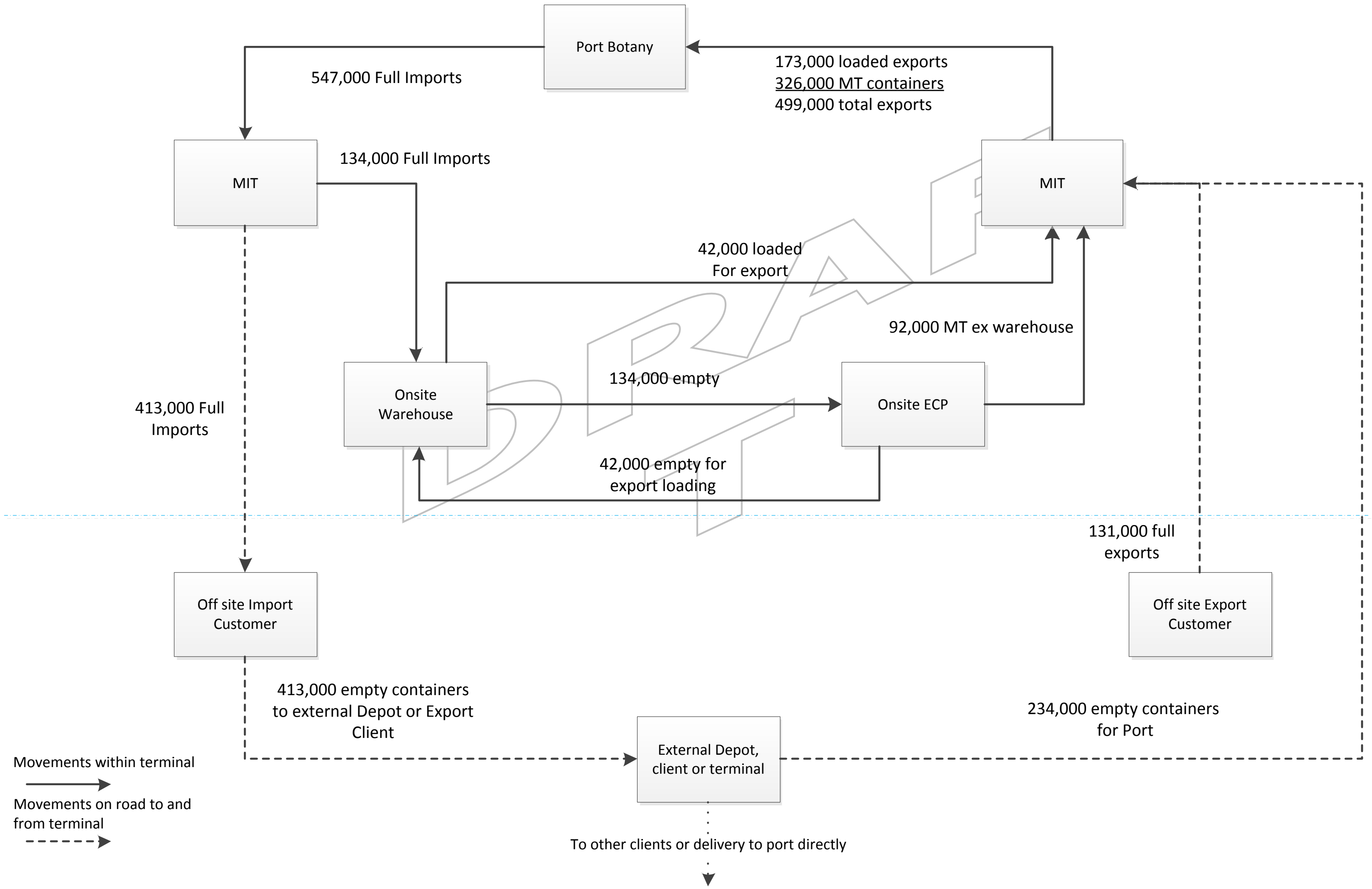


Figure 12 : Interstate flows through the terminal – 2030

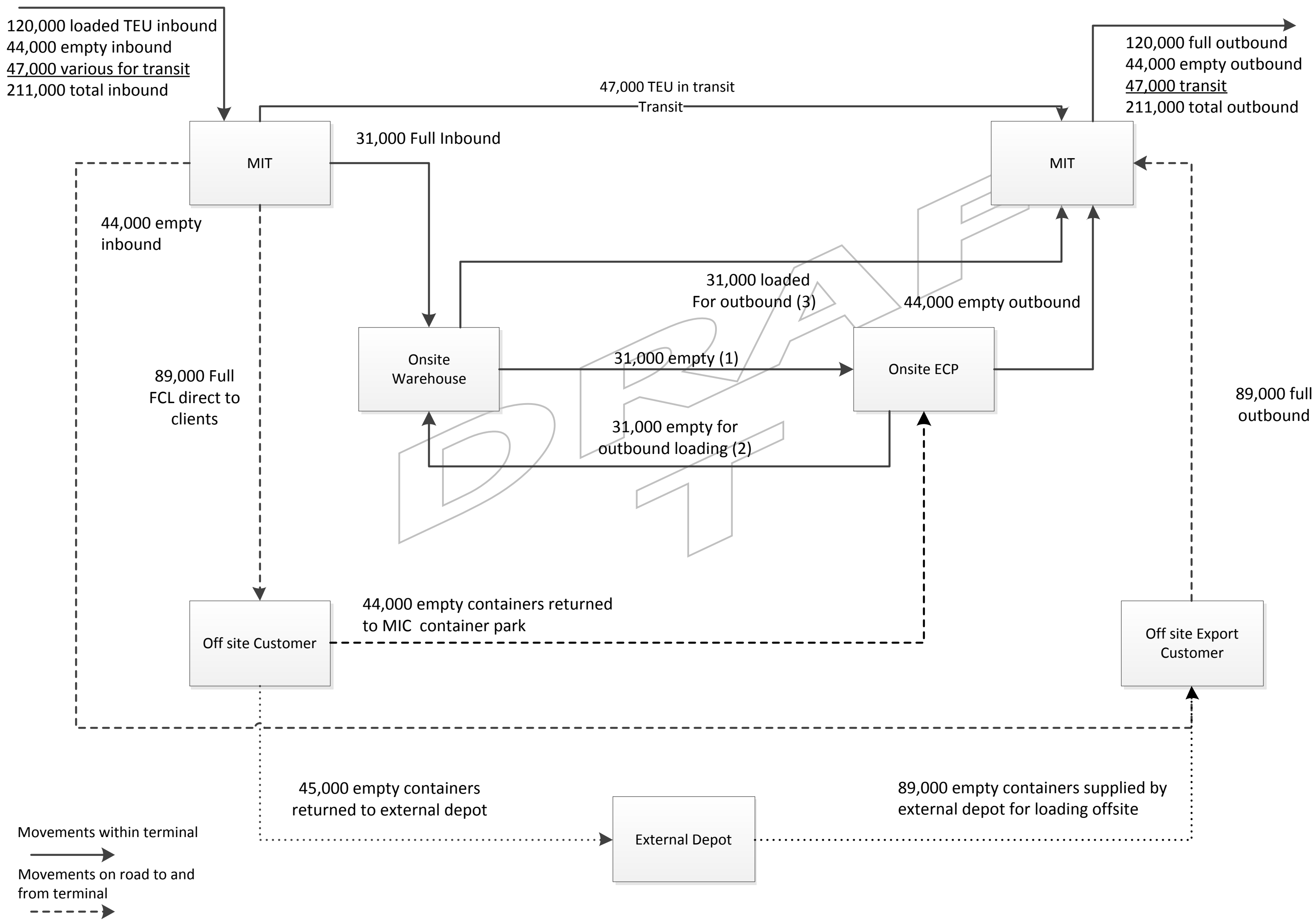


Figure 13 : Interstate flows through the terminal – 2050

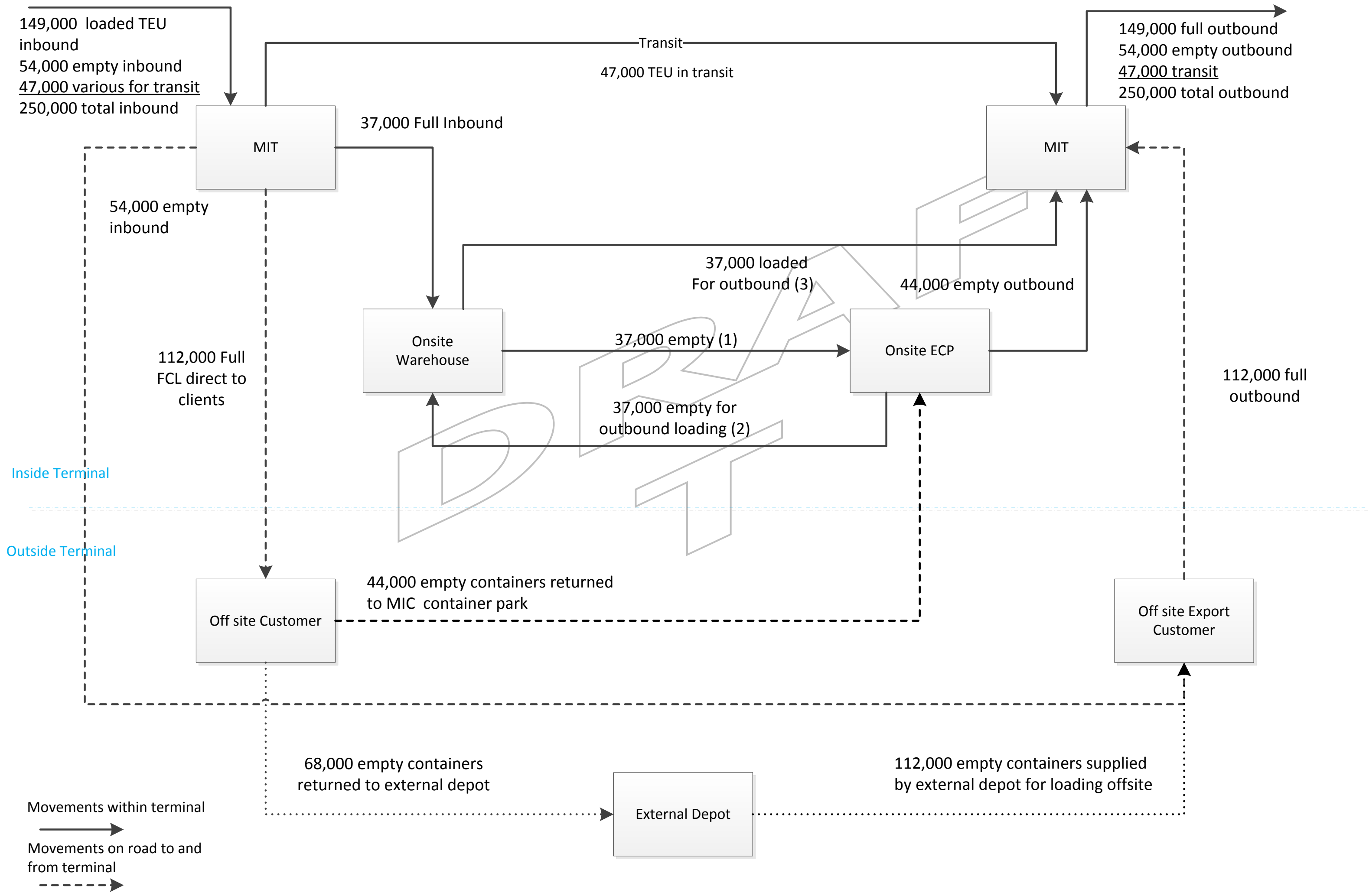


Figure 14 : IMEX and Interstate generated truck movements onto and off the terminal: 2030

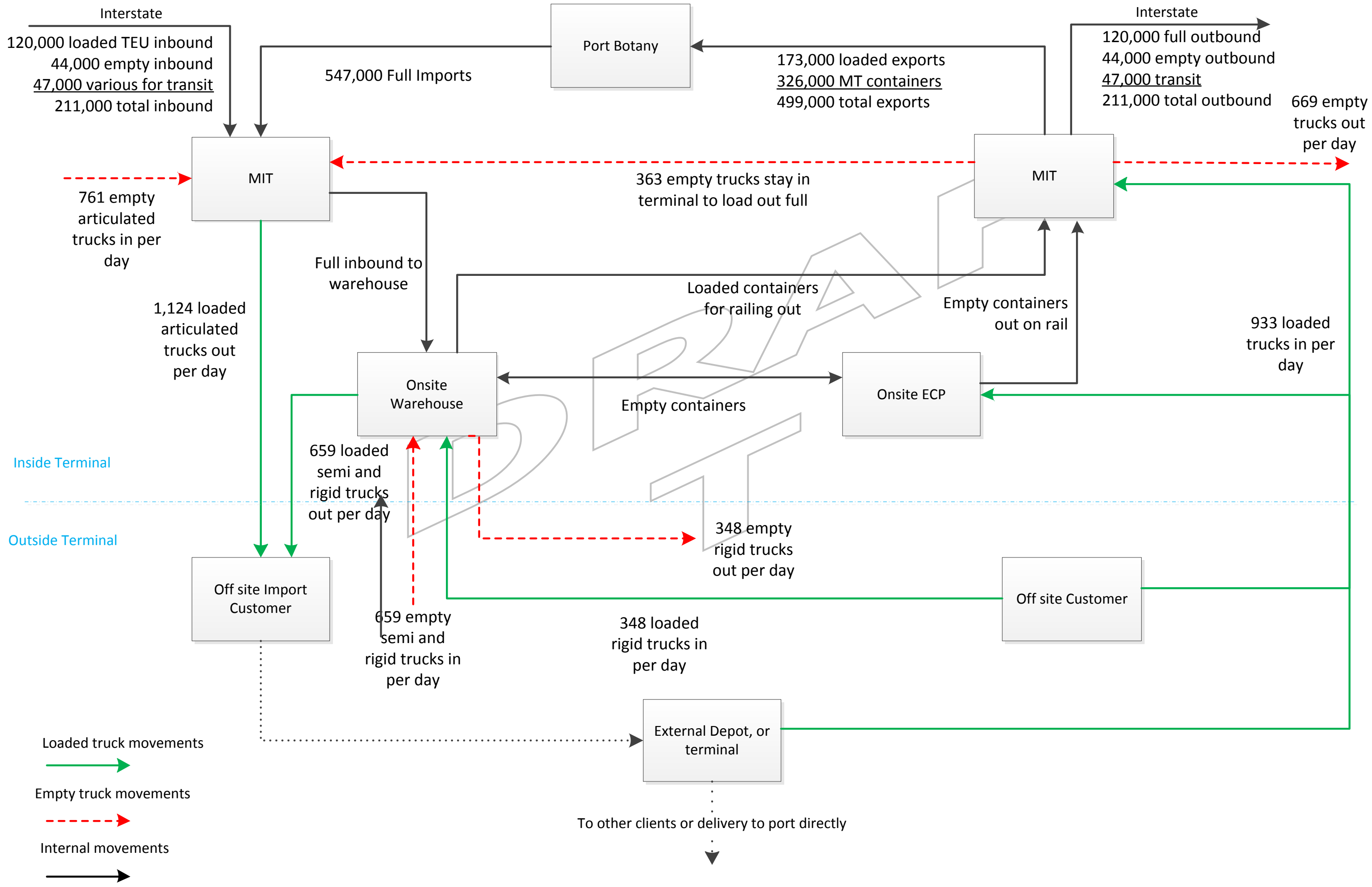


Figure 15 : IMEX and Interstate generated truck movements onto and off the terminal: 2050