Bureau of Transport Statistics

BTS Heavy Vehicle Forecasts

February 2014 Release

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Contents

1 Introduction

This report provides information on the estimation methodology used to produce the Bureau of Transport Statistics (BTS) February 2014 Release Heavy Commercial Vehicle (HCV) Forecasts for the Sydney Greater Metropolitan Area (GMA). The previous official HCV forecasts were released by BTS in February 2010. The heavy vehicle forecasts apply to rigid and articulated trucks, but exclude light commercial vehicles. The methodology and output of the BTS February 2014 Release Light commercial Vehicle (LCV) Forecasts are documented in a separate report (BTS, 2014).

2 Methodology

The BTS February 2014 release HCV forecasts are produced from the updated Sydney Freight Movement Model (FMM). The base year is 2011 based on the classified traffic counts used to calibrate and validate the model. The 2006 year estimates are back-casted from the 2011 data. The zonal system used is the BTS 2006 travel zones. The land use forecast inputs are BTS August 2012 release. The FMM estimates truck movements with an origin or destination in the GMA, excluding through traffic.

The FMM was previously updated in 2009, and the subsequent 2010 release used the same base year estimates and forecasts from this updated version of the FMM. The 2014 release also draws on the 2009 updated FMM with a number of improvements included for the current release:

- Revised land use forecasts from the BTS August 2012 Release Population and Employment forecasts based on the Department Planning & Infrastructure's 2010 Interim Population Projections.
- Additional production rate data collected from other states is applied to the Sydney FMM. FMM has been implemented in Melbourne, Sydney, Brisbane, Adelaide, Perth and South East Queensland. When the Sydney FMM was first updated, industry survey data was only available for Brisbane, Melbourne and Sydney. This release takes into account the entire available production rate data from all states where the FMM has been developed, increasing the total number of surveys used from 375 to 603. Production parameters by industry class are used to estimate production tonnage. It is expected that the increased sample size will improve the precision of the mean estimates.
- The Australian Bureau of Statistics (ABS) 'Use' table[1] 2005-06 final is used to estimate the matrices of proportions of freight from industry class to industry class. The 2009 release is based on ABS's 2001-02 Use Table.
- The FMM is calibrated and validated based on updated 2011 classified traffic counts. The traffic counts are collected from Weigh in Motion (WIM) sites within the GMA in 2011(full year). Traffic volume data from tube counters collected by Road and Maritime Services are also incorporated in the process.

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[1] ABS Publication 5209.0.55.001 Australian National Accounts: Input-Output Tables, Table 2: Use Table, Input by Industry and Final Use Category and Supply by Product Group. This table provides a total value ($ million) supply-use matrix by industry for Australia.

- Updated travel time skims from the Sydney Transport Model (STM) standard runs are used to calculate the accessibility measure between freight areas.
- Port Botany and Sydney Airport FMM (PB-SA-FMM) is developed separately to estimate the truck movements to/from:
- Port Botany
- Sydney Airport
- Intermodal terminals
- Empty container parks
- The model PB-SA-FMM process is described in Section 5.
- Models are not separately calibrated by time period in this release. Average weekday traffic counts are used in the calibration/validation of the weekday HCV matrices due to the lack of reliable traffic counts by time of day. Separate time of day factors for rigid and articulated trucks from previous traffic count study and WIM data are then applied to the weekday matrix to derive trip matrices for each of the four time periods.
- The new HCV forecast years have been extended through to 2046 in five yearly increments as a result of the extended land use forecast.

3 FMM Framework

The FMM model consists of a number of sub-models:

- Production (and consumption) models which estimate the quantity of freight produced (and consumed) based on employment and other data;
- A two stage distribution model which first 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 the freight distribution, and
- Vehicle assignment models, which provide the volume of freight vehicles on individual sections of road, given the freight vehicle trip distribution.

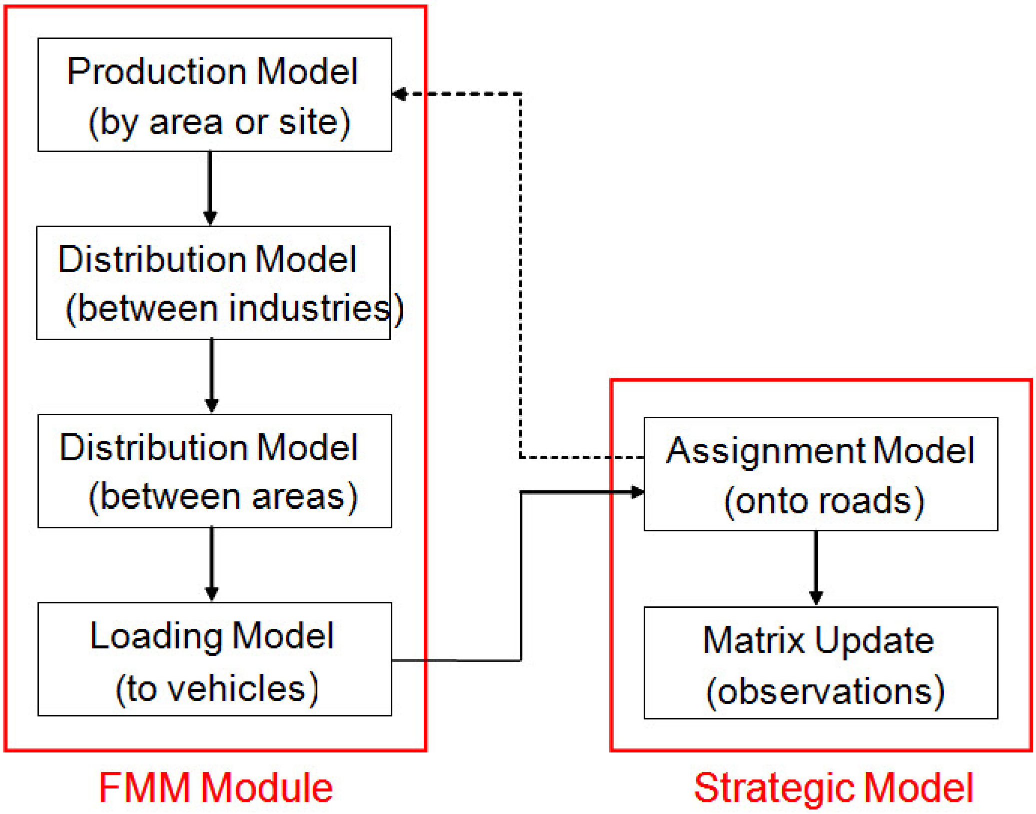


Figure 3.1 Primary models in the FMM

Figure 3.1 shows the primary models associated with the FMM framework used for the updated Sydney FMM. A key input to the FMM is employment data by industry type. The ‘Production Model’ uses production parameters for employment by industry, derived from business surveys, to estimate production tonnages. Using BTS employment forecasts, and any applicable changes to other parameters, such as business productivity, the FMM is then able to estimate production tonnages for future years.

The ‘Distribution Model’ uses modified ABS ‘Use’ tables to estimate the distribution of these freight tonnages across industry classes and freight areas. The geographical distribution is based on the level of attraction of a particular freight area for a particular industry class, based on travel time and level of employment within the freight area.

The ‘Loading Model’ uses mode share, vehicle loading, trip chaining and dead running parameters, also derived from business surveys, to estimate the trips to and from each freight area by industry class. The same process is applied for future years, taking into account employment growth and any other factors that change over time.

This process yields freight tonnage and trip end estimates for each industry class. The ‘Assignment Model’ then allocates the trips to the road network to produce an initial origin-destination trip matrix. This initial matrix is then refined by using the ‘Matrix Update’ process, which compares the initial matrix with actual counts on a specific number of sections of road. For future years, the process is repeated, with the exception that the STM network takes into account network changes that are expected to occur in the future.

A ‘trip’ for the purposes of the Sydney FMM is defined as a movement made by a vehicle from one location to another location, where the vehicle loads and/or unloads freight. A ‘tour’ for the purposes of the Sydney FMM is defined as a movement made by a vehicle from its home location via one or several pickup and/or drop-off points, and then back to its home location. Therefore, a ‘tour’ is made up of 2 or more ‘trips’ as shown in the example in Figure 3.2. The trips estimated for a tour are based on the trip chaining and dead running parameters for each industry class referred to earlier.

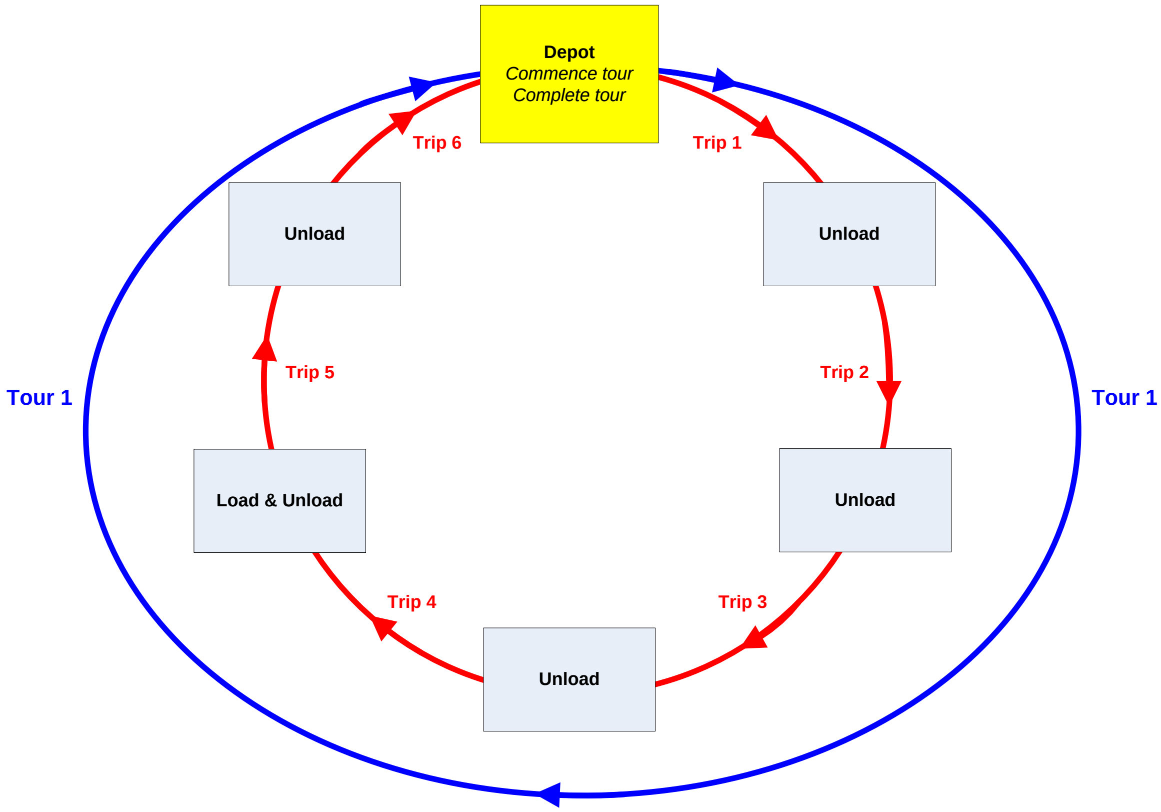


Figure 3.2 Sydney FMM commercial vehicle tour example

During calibration of the FMM, the parameters of each sub-model are optimized to minimize the differences between estimated and observed classified traffic counts and trip length data.

The FMM produces origin-destination matrices of tonnage at a ‘Freight Area’ level, and trips at the Travel Zone level.

4 FMM Classifications and Input Data

The classifications and data used in the Sydney FMM are as follows.

4.1 Industry Classes

The current release uses industry classes based on ANZSIC 2006 Level 1 classifications, with the exception of 'Manufacturing', where Level 2 classifications are used. The entire classification can be found in the ABS publication '1292.0 – Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006 (Revision 1.0)'. The FMM industry classes are shown in Appendix 1.

4.2 Freight Areas

The 'Freight Areas' used for the Sydney FMM consist of all 2006 ABS Statistical Local Areas (SLAs) within the GMA, 'Special Generator' areas (such as air, rail and port terminals), and areas external to the GMA (regional NSW and interstate). Each BTS Travel Zone is mapped to a Special Generator area or SLA within the GMA. A Special Generator Area is processed separately to the remainder of the SLA of which it is part. The FMM Freight Areas are shown in Appendix 2. Four more special generators are included for this release:

- MCS Banksmeadow empty container park (TZ 424)
- MCS Cooks River empty container park (TZ 386)
- Tyne – St Peters empty container park (TZ 393)
- Tyne – Punchbowl empty container park (TZ 854)

There are 80 freight areas, 16 special generators and 16 external zones in the base year model. Enfield Intermodal Terminal, Moorebank Intermodal Terminal and Eastern Creek Intermodal Terminal are included in the model from 2016, 2026 and 2031, respectively.

In this release, the FMM forecasts for some special generators are replaced by the PB-SA-FMM forecasts

4.3 Employment and Occupation Data

The key initial input to the FMM is BTS's employment data by industry type. Production parameters for employment by industry, derived from business surveys, are then used to estimate production tonnages.

A critical refinement to the use of the employment data in the FMM is that only 'blue collar' employment data is used. This is because using total employment as a proxy for production at a location can lead to misleading results (e.g. the administrative head office of a manufacturing company will have employment, but may have no production activities). For the purposes of the FMM, 'blue collar' and 'white collar' are based on the ABS publication '1222.0 – Australian and New Zealand Standard Classification of Occupations (ANZSCO), First Edition 2006'. The FMM Blue Collar/White Collar classification is shown in Appendix 3.

4.4 Production Parameters

FMM Production rates (by employment by industry) are based on business surveys designed specifically for the purpose of gathering this data. The results of surveys conducted in Melbourne, Sydney, Brisbane, Adelaide, Perth and South East

Queensland were applied to the Sydney FMM, with greater weight being given to Sydney-based survey, where applicable.

Table 4.1 Business surveys conducted by states

Survey Location	Count	Percentage
Adelaide	118	19.6%
Brisbane	181	30%
Melbourne	184	30.5%
Perth	54	9.0%
South East Queesland	23	3.8%
Sydney	43	7.1%
Sum	603	100%

While only 7% of the 603 business survey observations were conducted in Sydney, variability analysis shows that production rate differences between states are not statistically significant.

4.5 Distribution Parameters

Production Distribution - The Sydney FMM uses a distribution matrix to estimate the distribution of freight between industry classes. This matrix is based on the ABS Australian National Accounts: Input-Output Tables.

Trip Distribution - The Sydney FMM uses impedance parameters to control the impact of travel time on attraction, and therefore on how far freight is moved. A large impedance parameter, means that travel time is critical for attraction (resulting in shorter trips being forecast), while a small impedance parameter indicates that travel time is not as important for attraction (resulting in longer trips being forecast).

Different impedance parameters are used for different industry classes, and for freight to and from special generators and regional freight areas. The parameters used for the updated FMM include specific parameters for calibration of movements to and from Newcastle and Wollongong freight areas to match observed traffic counts and published commodity data. For intra-Sydney movements, the impedance parameters take into account GPS data collected as part of FMM development.

4.6 Traffic Counts

A fundamental data need for commercial vehicle modeling is the number of commercial vehicles that are actually travelling on the key network links/core routes. A classified traffic counts study was conducted in 2008 using pneumatic tube counters for the 2009 HCV release.

BTS has obtained full year WIM data for 2011.The WIM system is a highly accurate data collection method with the capability to collect almost a 100% sample. There are ten WIM sites on the major freight routes within the Sydney GMA. RMS 2011 counter data has also been accessed. Unfortunately, only daily traffic counts were made available by RMS when the FMM was calibrated for the February 2014 release.

A complication in obtaining accurate traffic counts of heavy vehicles using pneumatic tube counters is that the counters cannot automatically distinguish between trucks and buses. Consequently, if buses pass a count site it may result in an over-enumeration of the number of trucks. In many cases, this is not a significant problem, as the number of buses involved will be very small in some locations. However, on some parts of the network (e.g. Military Road in Cremorne) buses comprise a high proportion of traffic, so it is necessary to estimate the number of buses, and exclude them from the count of rigid trucks. BTS excluded estimated bus counts from the truck counts based on analysis of bus timetables for major bus routes also taking into account dead running.'

5 Port Botany–Sydney Airport Freight Movement Model (PB-SA-FMM)

The Port Botany – Sydney Airport Freight Movement Model (PB-SA-FMM) was developed separately to describe in more detail the landside movement of containers within the Sydney GMA by TfNSW Freight & Regional Development Division. The model represents both road and rail movements of containerized freight to/from Port Botany and road Freight Movements to/from Sydney Airport. The model also represents inter-modal terminals (IMT) used in the interchange of freight between rail and road and empty container parks (ECP).

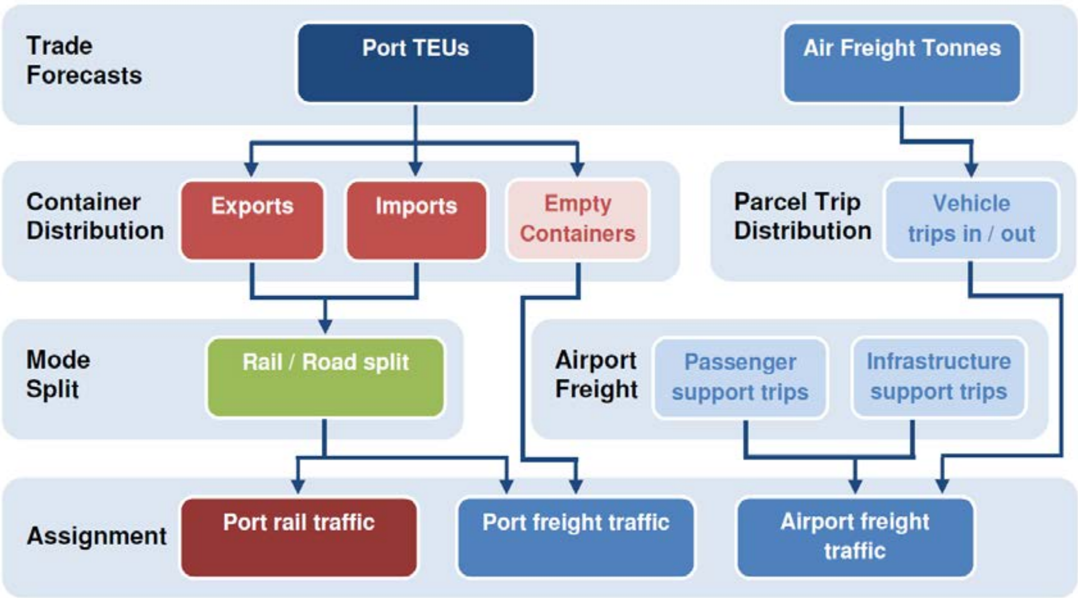


Figure 5.1 The PB-SA-FMM model components

5.1 Port Botany Freight sub-model

5.1.1 Trade Forecasts

The Freight &Regional Development (FRD) produced the import forecasts based on anticipated increases in two independent variables: NSW State Final Demand (SFD) and National Relative Prices. Data published by industry experts was used for export forecasting. Table 5.1 shows the container trade forecasts estimated by FRD.

Table 5.1 Annual Container Forecasts (TEUs)

	Full Imports	Full Exports	Empty Exports	Total
2011	917,800	357,900	556,000	1,835,600
2016	1,178,600	435,400	743,100	2,357,100
2021	1,521,600	521,800	999,800	3,043,200
2026	1,962,000	633,200	1,328,800	3,923,900
2031	2,530,000	774,200	1,755,700	5,059,800
2036	3,262,500	940,900	2,321,600	6,525,000
2041	4,207,300	1,143,500	3,063,800	8,414,600
2046	5,425,700	1,389,800	4,035,900	10,851,400

Source: FRD

5.1.2 Imported Container Movement Distribution sub-model:

The base year container distribution uses the observed container movements through Port Botany (PB) by destination post code. The TEU attraction rate is calculated by SLA and land use type. The forecast distribution of container movements is estimated based on the base year attraction rate and forecast employment.

The model factors up the container movements to match the forecast throughput of containers through PB. A capacity limitation on container movements is applied at the postcode level to prevent the estimation of unrealistic container movements. Any excess containers are redistributed to other post codes.

5.1.3 Exported Container Movement Distribution sub-model:

The base year container distribution uses observed container movements to PB by origin post code. These equal around 50% of all exported full containers. The import distribution is then taken as a proxy to in-fill the remaining movements. The forecast distribution of container movements is generated using the calculated container production rates and forecast employment. Like the imported container movement distribution sub-model, the model factors up the container movements to match forecast throughput of containers through PB. A capacity limitation on container movements is also applied at the postcode level to prevent the estimation of unrealistic container movements. Any excess containers are redistributed to across post codes.

5.1.4 Mode split sub-model

The mode split sub-model determines the mode of container transport between the origin and destination. A nested multinomial logit choice model is developed for mode choice. The relative attractiveness of competing options is assessed based on the total perceived or generalized travel time. It is assumed that base year rail travel times remain consistent in future year. For regional and interstate trips, a static rail mode split is applied to import and export container movements, respectively. Each

IMT has a finite capacity in terms of container TEUs that can be accommodated. Demand in excess of IMT capacity is reallocated to other destinations. The IMT capacity assumptions are summarized in Table 5.2.

Table 5.2 IMT capacity assumptions

IMT Location	2011	2016	2021	2026	2031	2036	2041	2046
Yennora	120,000	160,000	200,000					
MInto	120,000	160,000	200,000					
Villawood	Closed							
Enfield		300,000	380,000	480,000	500,000			
Moorebank			600,000	900,000	1200,000			
Eastern Creek					600,000	900,000		
Total	240,000	620,000	1,380,000	1,780,000	27,000,000	3,000,000	3,300,000	3,300,000

Source: FRD

Rail-road mode splits for port Botany in future years are showed in Table 5.3

Table 5.3 Rail-road Mode Split for Port Botany

	2011	2016	2021	2026	2031	2036	2041	2046
Rail	14%	21%	28%	29%	32%	34%	35%	36%
Road	86%	79%	72%	71%	68%	66%	65%	64%

5.1.5 Empty Container Movements

Imported empty containers are not modeled given their low volume. The exported empty container volume is assumed to be the difference between full imports and exports. A logit model is used to spread the residual empty containers across the various ECPs based on the relative travel time from post code to ECP. The attraction between locations is assumed to be inversely proportional to travel time. The movement of empty containers to/from ECPs was scaled to match the relative market share of existing ECP throughput. It is assumed that the relative ECP market share is maintained into the future. It is also assumed that, in the future IMTs will be used to rail empty containers back to PB, with empty container movement volumes balancing the full container import/export task. These empty containers would be stored at ECPs co-located at IMTs. Existing empty container park market share is showed in Table 5.4.

Table 5.4 Existing Empty Container Park Market Share

	Port Precinct	Banks-meadow	Cooks River / St Peters	Punchbowl	Strathfield	Total
Market share	22%	39%	31%	1%	7%	100%

5.2 Sydney Airport freight sub-model

A video camera study was conducted around Sydney Airport precinct on two consecutive workdays in 2013. Classified traffic counts were obtained on International Terminal and Domestic Terminal access roads via cameras installed at 6 sites. The counts were cross-checked against RMS. A mathematical relationship between airport activity and existing freight generation was then derived based on:

- Terminal passenger volume
- Terminal visitor volume
- Airport employee number
- Air freight volume

It is assumed that this relationship will remain broadly unchanged in the future. This means that an increase in freight generating activity at the airport would result in a directly proportional increase in traffic generation. Existing FMM matrix distribution is used to estimate the origin and destination of trips travelling to and from SA. It should be noted that the distribution of Sydney Airport trips in the current FMM is determined by a gravity model based solely on air freight movements. It does not take into account the activities such as deliveries for service airport shopping, landside food and beverage services, and food and beverages for flights. The forecast average weekday truck movements to/from Sydney Airport terminals are summarized in Table 5.5.

Table 5.5 Average weekday truck movements to/from Sydney Airport terminals

Model Year	HCV
2006	2,350
2011	2,800
2016	3,570
2021	4,240
2026	4,980
2031	5,850
2036	6,790
2041	7,870
2046	9,150

6 Base Year Validation and FMM Forecasts

The FMM produces estimated movements of rigid and articulated trucks at the BTS 2006 Travel Zone level. The estimates are produced for an average weekday, and for four time-periods across the day:

- AM Peak (AM) 7:00am - 9:00am
- Inter Peak (IP) 9:00am - 3:00pm
- PM Peak (PM) 3:00pm - 6:00pm
- Night (NT) 6:00pm - 7:00am

As indicated in the preceding section, data constraint resulted in calibration methods only being applied to the whole day (average weekday). Time of day factors derived from BTS previous traffic counts study and WIM data are applied to estimate forecasts for each time-period. The factors are assumed to be fixed in the future years.

Table 6.1 compares the model performance prior and post the matrix estimation (ME) process using GEH statistics, a widely used measure of the goodness of fit between two estimates of hourly traffic volumes on a link. The results show that the prior ME matrix matches the measured traffic counts quite well, but is further improved by the ME process in terms of the accuracy.

Table 6.1 GEH statistics of prior and post ME matrices

2011 average weekday		Prior	Post
GEH	<=5 (60% or more of the links)	78.6%	86.7%
	<=10 (more than 90% of links)	96.5%	100%
	<=12 (all links)	99.1%	100%

One of the comments received when Perth FMM was reviewed by experts is that the model has strong reliance on matrix updating. Whilst this technique a useful tool for fine tuning of trip matrices, its widespread use can lead to distortion of the behavioral aspects of the models that produced the original trip tables. It is recommended that future applications and developments of the model should seek to minimize (where possible) the use of matrix updating.

The comparison of the total number of the rigid and articulated truck numbers in 2011 average weekday prior and post the ME process shows that ME process only adjusted HCV matrices slightly. The difference between Prior and Post ME matrix is 0.15% and 2.10% for rigid and articulated trucks, respectively.

Table 6.2 shows the average trip length prior and post the ME process. It can be seen that average trip length remains unchanged or slightly changes after ME.

Table 6.2 Prior and Post ME matrices, average trip length

Sydney GMA	Rigid	Articulated
Prior	20.3	26.0
Post	20.3	26.4

6.1 Base Year Comparison of BTS 2010 and 2014 Release

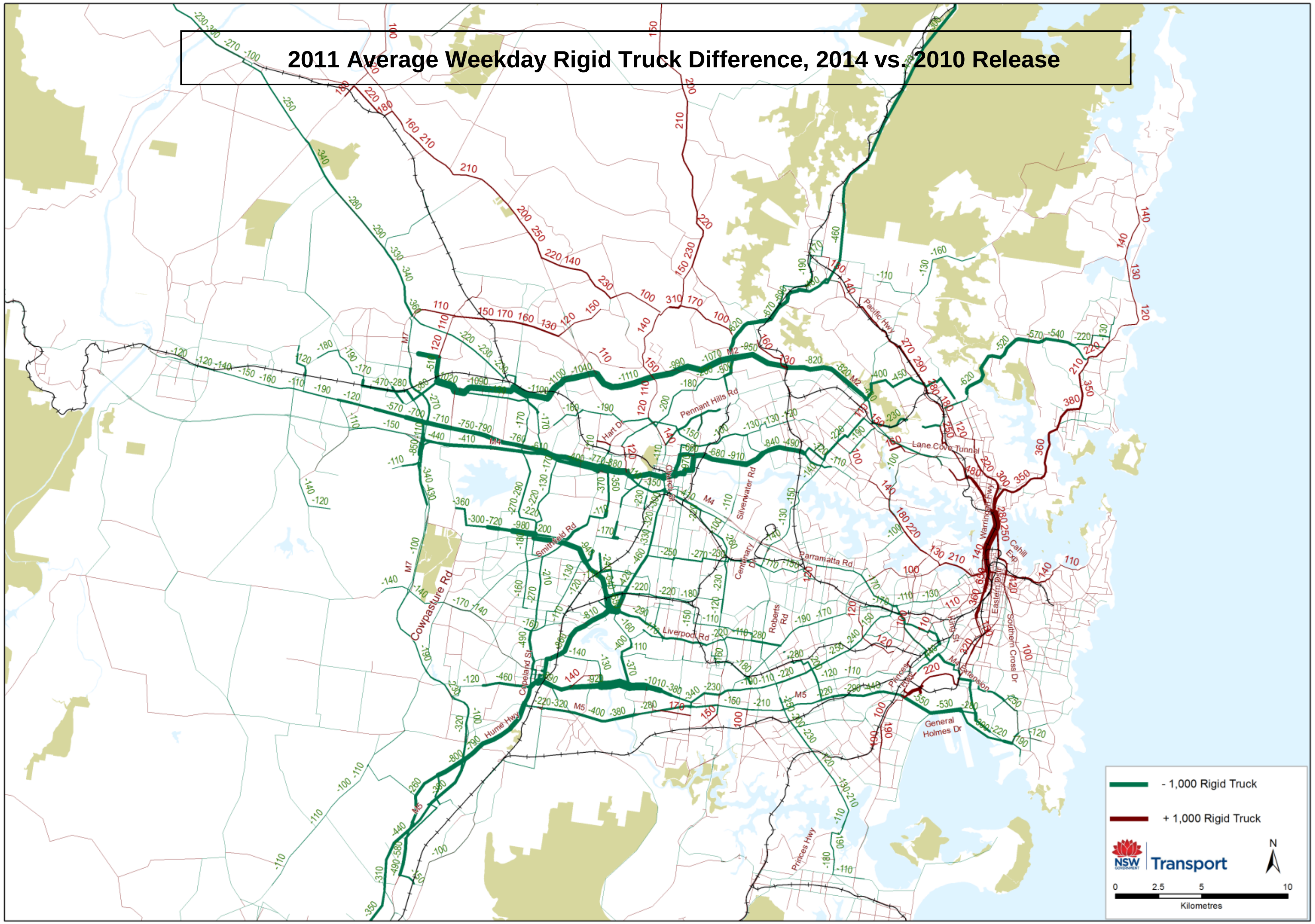
The comparison of 2010 and 2014 BTS estimates for 2011 in Table 6.3 shows that the two releases produced similar total truck number but the share of articulated trucks is higher for the 2014 release.

Table 6.3 2010 and 2014 BTS Average weekday heavy vehicle 2011 trip estimates

	Rigid	Artic	Total
2010 release	254,716	67,745	322,461
2014 release	243,400	89,100	332,500
Difference	-4%	32%	3%

Figure 6.1 shows the 2010 and 2014 versions of the BTS heavy vehicle trip estimates for 2011 all-or-Nothing assignment results (average weekday). It can be seen that the 2014 release generally follows the distribution patterns of the 2010 release.

2011 Average Weekday Rigid Truck Difference, 2014 vs. 2010 Release



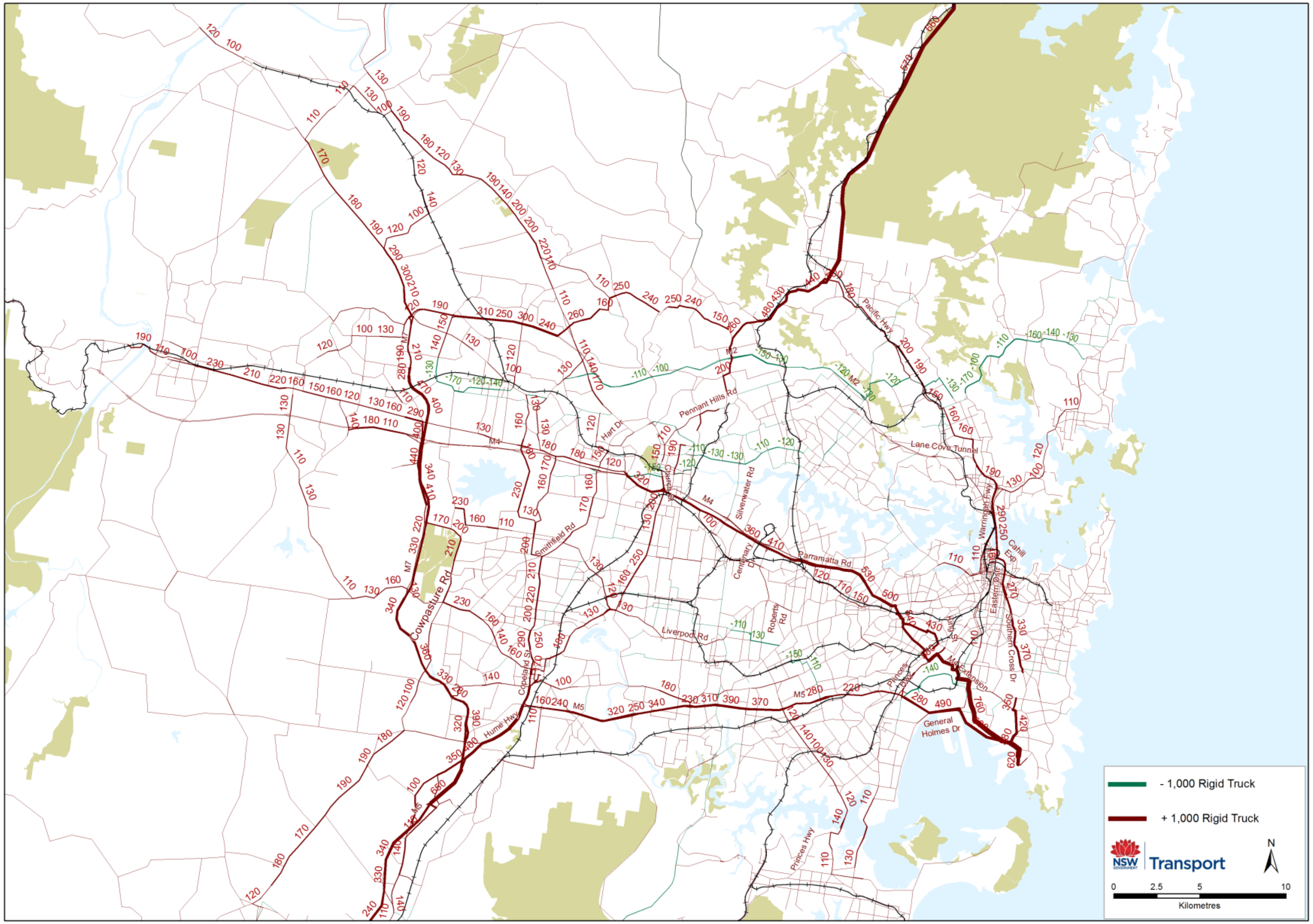


Figure 6.1 2010 and 2014 BTS heavy vehicle 2011 estimates all-or-nothing assignment results (average weekday)

6.2 Comparison with External Data

The VKT (Vehicle Kilometers Travelled) estimates from the BTS Heavy Vehicle Estimates for 2011 can be compared with the ABS Survey of Motor Vehicle Use VKT estimates, as shown in Table 6.4 below. Annualization factor of 303 is used to convert average weekday VKT to annual VKT.

Table 6.4 Annual business kilometers ('000) travelled by commercial vehicles (Sydney SD)[2]

Source	Rigid trucks ('000)	Articulated trucks ('000)	All Trucks
SMVU	1,324	422	1,746
FMM	1,143	391	1,534
Difference FMM-SMVU (%)	-13.6%	-7.3%	-12.1%
RSE of SMVU	6.03%	4.65%	

The results show that SMVU estimates are higher than BTS estimates for both rigid and articulated trucks. Light commercial vehicles have a similar level of underestimation when compared with SMVU as outlined in the LCV report. A comparison of SMVU VKT 2011 car trip estimates with those from the BTS Household Travel Survey (HTS), is shown in the Table 6.5 below.

Table 6.5 Total annual kilometers travelled by car driver (Sydney SD)

Data source	Vehicle Driver kilometres (million)
SMVU	25,892
HTS	24,539
Difference (SMVU - FMM %)	-5.2%

It can be seen that the result for car travel is similar to that obtained from heavy vehicles i.e. the SMVU is in the order of 5% higher than comparable BTS data. While it is not possible to make a definitive conclusion regarding the relative accuracy of the SMVU and BTS datasets, the result suggests consistently higher estimate from the SMVU when compared with BTS estimates of commercial and personal VKT.

[2] The SMVU figure is calculated as the SMVU total VKT for 'Capital City' multiplied by the SMVU ratio of business VKT to total VKT for NSW. BTS Heavy Vehicle estimates should be compared with SMVU business kilometres, not total kilometres, since BTS's estimates do not include trips made for personal reasons.

6.3 Forecast Results

The key inputs to the FMM forecasts of heavy vehicle movements are:

- Forecasts of blue-collar employment by industry class and freight area.
- Forecasts of changes in productivity for each industry class.

The BTS 2012 Release Employment Forecasts were used for the 2014 Release Heavy Vehicle Forecasts. The productivity forecasts were based on historical trends in productivity growth, derived from Department of Communications, Information Technology and the Arts and ABS National Accounts data. Forecast estimates of rigid and articulated truck shares, average loads, trip chaining and dead running parameters were assumed to be constant for the base and future years. The future year HCV and VKT forecasts for Sydney SD are summarized in Table 6.6.

Table 6.6 FMM forecast results Total Annual VKT, Sydney SD

Model Year	Rigid	Artic	Rigid VKT	Artic VKT
2006	202,600	52,200	3,538,300	1,054,000
2011	214,600	63,000	3,757,400	1,314,900
2016	231,900	74,400	4,087,300	1,579,500
2021	247,900	84,200	4,426,500	1,821,000
2026	271,800	96,800	4,910,500	2,111,900
2031	288,700	108,100	5,248,900	2,387,400
2036	319,300	122,600	5,843,300	2,721,300
2041	352,000	138,500	6,466,000	3,082,400
2046	383,100	153,800	7,039,100	3,429,300

ACRONYMS

ABS	Australian Bureau of Statistics
AM	AM Peak
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ANZSIC	Australian and New Zealand Standard Industry Classification
BTS	Bureau of Transport Statistics
ECP	Empty Container Parks
FMM	Freight Movements Model
GMA	Greater Metropolitan Area
GPS	Geographic Positioning System
HCV	Heavy Commercial Vehicle
IMT	Intermodal Terminal
IP	Inter Peak
LCV	Light Commercial Vehicle
ME	Matrix Estimation
NT	Night
PB	Port Botany
PM	PM Peak
RSE	Relative Standard Error
SA	Sydney Airport
SFD	State Final Demand
SD	Statistical Division
SLA	Statistical Local Area
SMVU	Survey of Motor Vehicle use
TZ	Travel Zone
VKT	Vehicle Kilometres Travelled
WIM	Weight in Motion

References

ABS (2005-2006) Australian National Accounts: Input-Output Tables (5209.0.55.001) Table 2: Use Table.

ABS (2006) Australian and New Zealand Standard Classification of Occupations First Edition (1222.0).

ABS (2006) Australian and New Zealand Standard Industrial Classification Revision 1.0 (1292.0).

Bureau of Transport Statistics, BTS Light Commercial Vehicle Forecasts February 2014 Release, 2014.

Department of Communication, Information Technology and the Arts, Forecasting Productivity Growth 2004 to 2024, 2006.

APPENDIX 1

Sydney FMM Industry Classes

Industry Class	*Classification*
A Agriculture, Forestry and Fishing	Production
B Mining	Production
C1 Food Product Manufacturing	Production
C2 Beverage and Tobacco Product Manufacturing	Production
C3 Textile, Leather, Clothing and Footwear Manufacturing	Production
C4 Wood Product Manufacturing	Production
C5 Pulp, Paper and Converted Paper Product Manufacturing	Production
C6 Printing (including the Reproduction of Recorded Media)	Production
C7 Petroleum and Coal Product Manufacturing	Production
C8 Basic Chemical and Chemical Product Manufacturing	Production
C9 Polymer Product and Rubber Product Manufacturing	Production
C10 Non-Metallic Mineral Product Manufacturing	Production
C11 Primary Metal and Metal Product Manufacturing	Production
C12 Fabricated Metal Product Manufacturing	Production
C13 Transport Equipment Manufacturing	Production
C14 Machinery and Equipment Manufacturing	Production
C15 Furniture and Other Manufacturing	Production
D Electricity, Gas, Water and Waste Services	Consumption
E Construction	Consumption
F Wholesale Trade	Redistribution
G Retail Trade	Redistribution
H Accomodation and Food Services	Consumption
I Transport, Postal and Warehousing	Redistribution
J Information Media and Telecommunications	Consumption
K Financial and Insurance Services	Consumption
L Rental, Hiring and Real Estate Services	Consumption
M Professional, Scientific and Technical Services	Consumption
N Administration and Support Services	Consumption
O Public Administration and Safety	Consumption
P Education and Training	Consumption
Q Health Care and Social Assistance	Consumption
R Arts and Recreation Services	Consumption
S Other Services	Consumption

APPENDIX 2

Sydney FMM Freight Areas

Sydney FMM internal freight areas (2006 SLAs)

SLA Freight Areas	*SLA Freight Areas*
Ashfield (A)	Liverpool (C) - West
Auburn (A)	Maitland (C)
Bankstown (C) - North-East	Manly (A)
Bankstown (C) - North-West	Marrickville (A)
Bankstown (C) - South	Mosman (A)
Baulkham Hills (A) - Central	Newcastle (C) - Inner City
Baulkham Hills (A) - North	Newcastle (C) - Outer West
Baulkham Hills (A) - South	Newcastle (C) - Throsby
Blacktown (C) - North	North Sydney (A)
Blacktown (C) - South-East	Parramatta (C) - Inner
Blacktown (C) - South-West	Parramatta (C) - North-East
Blue Mountains (C)	Parramatta (C) - North-West
Botany Bay (C)	Parramatta (C) - South
Burwood (A)	Penrith (C) - East
Camden (A)	Penrith (C) - West
Campbelltown (C) - North	Pittwater (A)
Campbelltown (C) - South	Port Stephens (A)
Canada Bay (A) - Concord	Randwick (C)
Canada Bay (A) - Drummoy	Rockdale (C)
Canterbury (C)	Ryde (C)
Cessnock (C)	Shellharbour (C)
Fairfield (C) - East	Shoalhaven (C) - Pt A
Fairfield (C) - West	Shoalhaven (C) - Pt B
Gosford (C) - East	Strathfield (A)
Gosford (C) - West	Sutherland Shire (A) - East
Hawkesbury (C)	Sutherland Shire (A) - West
Holroyd (C)	Sydney (C) - East
Hornsby (A) - North	Sydney (C) - Inner
Hornsby (A) - South	Sydney (C) - South
Hunter's Hill (A)	Sydney (C) - West
Hurstville (C)	Warringah (A)
Kiama (A)	Waverley (A)
Kogarah (A)	Willoughby (C)
Ku-ring-gai (A)	Wingecarribee (A)
Lake Macquarie (C) - East	Wollondilly (A)
Lake Macquarie (C) - North	Wollongong (C) - Inner
Lake Macquarie (C) - West	Wollongong (C) Bal
Lane Cove (A)	Woollahra (A)
Leichhardt (A)	Wyong (A) - North-East
Liverpool (C) - East	Wyong (A) - South and West

Sydney FMM External Freight Areas

External Statistical Divisions	*Other States*
Far West NSW	WA
North Western NSW	VIC
Northern NSW	QLD
Richmond-Tweed NSW	SA
Mid-North Coast NSW	NT
Hunter NSW	ACT
Central West NSW	
South Eastern NSW	
Murrumbidgee NSW	
Murray NSW	

Sydney FMM Special Generators

Sydney FMM Special Generators

Port Botany
Sydney Airport – International
Newcastle Port – Grain
Newcastle Port – Coal
Newcastle Port – General
Port Kembla – Coal
Port Kembla – General
Port Kembla – Steel
Port Kembla – Other
Sydney Rail Terminal
Minto Intermodal Terminal
Yennora Intermodal Terminal
MSC Banksmeadow Empty Container
MCS Cooks River Empty Container Park
Tyne – St Peters Empty Container Park
Tyne - Punchbowl Empty Container Park
Enfield Intermodal Terminal (2016)
Moorebank Intermodal Terminal (2021)
Eastern Creek Intermodal Terminal

APPENDIX 3

Sydney FMM Blue Collar/White Collar Classification

ANZSCO 1-Digit Code	Description	FMM Classification
01	Managers	White Collar
02	Professionals	White Collar
03	Technicians and Trades Workers	Blue Collar
04	Community and Personal Service Workers	White Collar
05	Clerical and Administrative Workers	White Collar
06	Sales Workers	White Collar
07	Machinery Operators and Drivers	Blue Collar
08	Labourers	Blue Collar
09	Inadequately Described	Other
10	Not Stated	Other