

Figure 5-4: AM Peak TLD (LV)

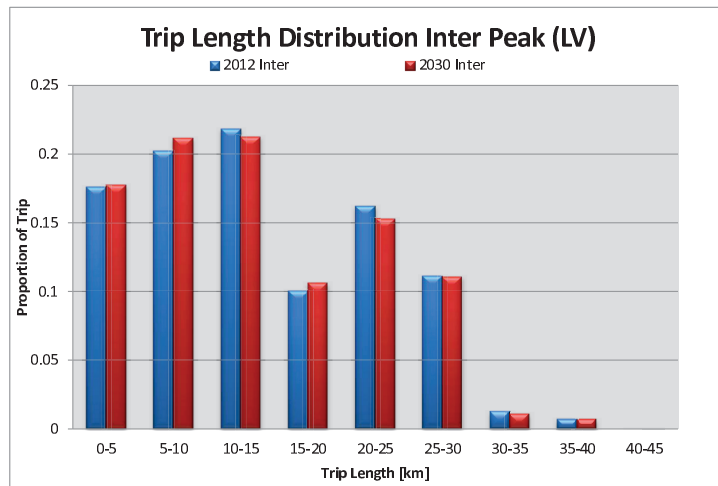


Figure 5-5: Inter Peak TLD (LV)

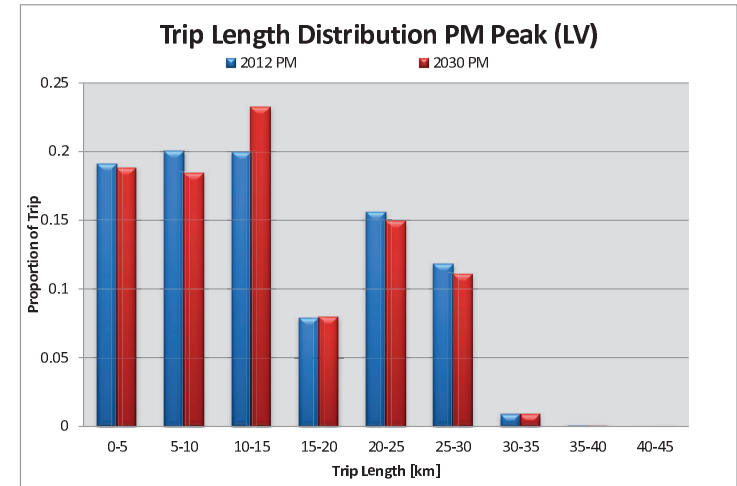


Figure 5-6: PM Peak TLD (LV)

5.3.2 Trip End Growth

An assessment of the Trip End Growth (TEG) between the Base and Design Year demand in the AM Peak, Inter Peak and PM Peak was undertaken to assess if there were any significant changes in demand at trip end level when compared to the overall growth between the Base and Design Year demand.

The assessment indicated that the percentage increase between several trip ends in the Base and Design Year demand was significant but that the actual increase in the number of trips was only minor. In order to assess the true magnitude of TEG, the GEH statistic was applied to the Base and Design Year trip ends in order to take account of not only the difference between the Base and Design Year demand, but also the magnitude of the difference.

Figure 5-7 to Figure 5-9 illustrate the GEH (>10) between the Base and Design Year demand in the AM Peak, Inter Peak and PM Peak, respectively. The PAG guidance on the GEH statistic indicates that any GEH statistic above 10 warrants further investigation. The figures show that there are a number of both origin and destination zones with a GEH statistic above 10 in each time period.

A review was undertaken to assess the origin and destination trips end growth whereby a GEH of 10 or more was calculated. As expected the review indicated that the zones with a GEH over 10 were greenfield sites or zones with little development in the Base Year model (in the Naas Town area) which were seeded and assigned a significant demand in the future year model as per the forecasting process set out in Section 5.0 of this report.

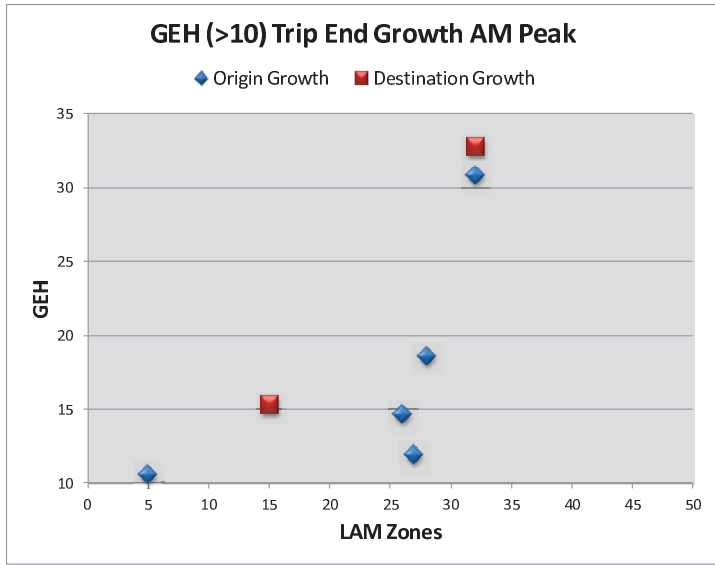


Figure 5-7: AM Peak TEG (LV)

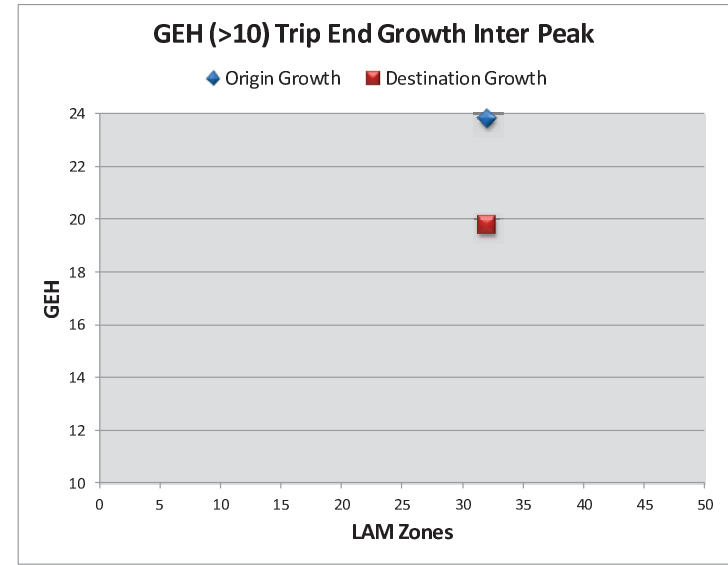


Figure 5-8: Inter Peak TEG (LV)

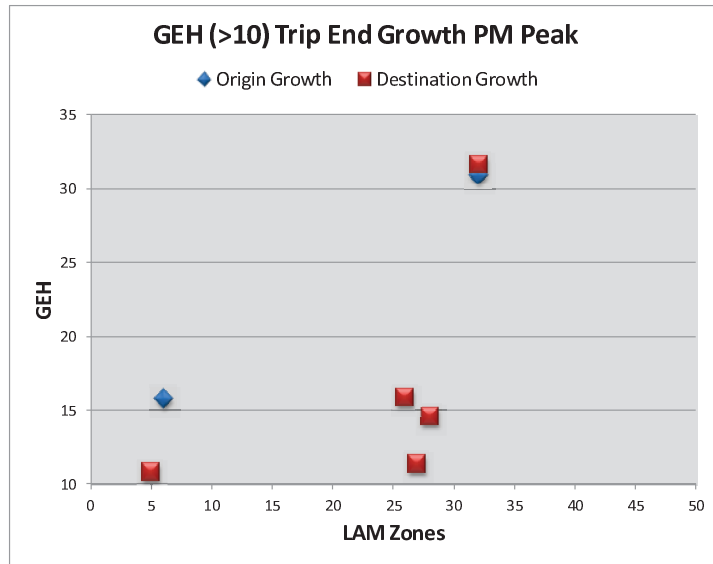


Figure 5-9: PM Peak TEG (LV)

5.3.3 Zone to Zone Growth

The same procedure for TEG was also undertaken for zone to zone growth. The GEH statistic for each origin-destination pair was assessed to show any significant outliers or issues in the AM Peak, Inter Peak and PM Peak demand.

The GEH statistic on a zone to zone basis for each period is shown in Figures 5-10 to 5-12. The figures show that there is only one GEH statistics greater than 10 in the AM Peak and two in the PM Peak. Once again a review was undertaken to assess the origin and destination zones with a GEH greater than 10. The review, as per the trip end growth review, illustrated that the zones with a high GEH statistic, were undeveloped/greenfield sites in the Base year model which were seeded and assigned a significant demand in the future year model as per the forecasting process set out in Section 5.0 of this report. There was no GEH above 10 in Inter Peak.

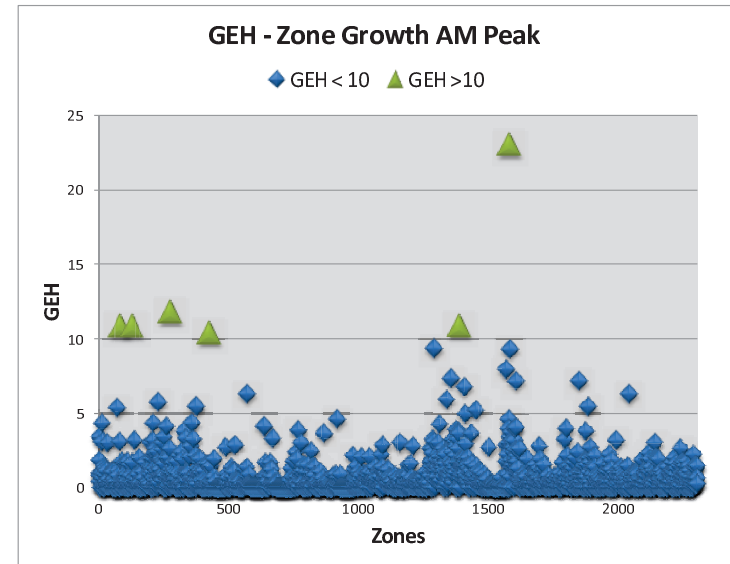


Figure 5-10: AM Peak Zone to Zone Growth (LV)

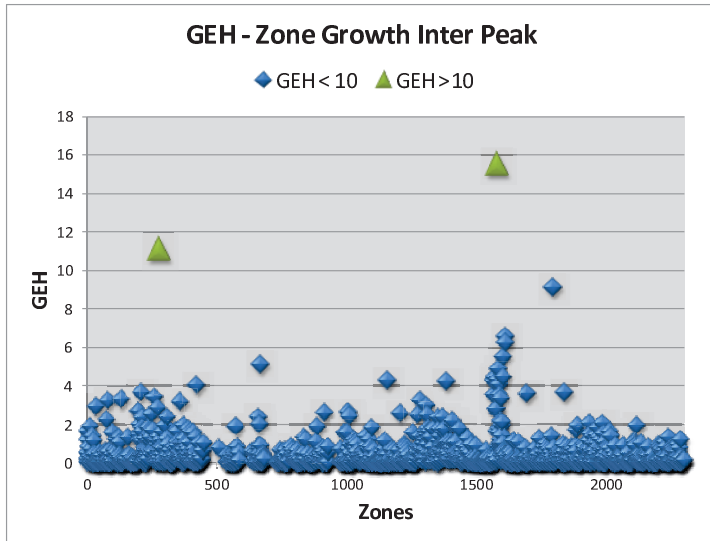


Figure 5-11: Inter Peak Zone to Zone Growth (LV)

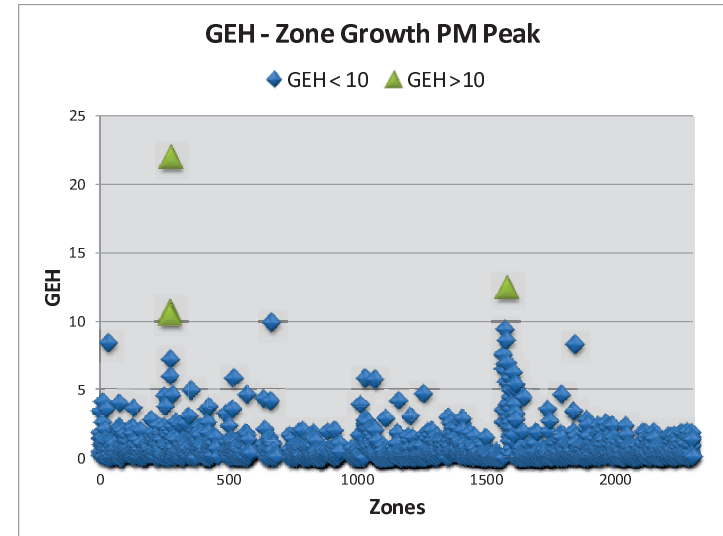


Figure 5-12: PM Peak Zone to Zone Growth (LV)

5.4 Estimation of Annual Average Daily Traffic (AADT)

To estimate Annual Average Daily Traffic (AADT) a relationship was developed based on regression analysis of local area traffic data to allow the AM Peak hour, average Inter Peak hour and PM Peak hour flows to be converted into AADT values. The AM, PM and Inter Peak Period flows were converted to AADT values using the following formula:

$$(3.2 * x) + (6.5 * y) + (3.2 * z) = AADT$$

Where:

x = AM Peak Hour Flow

y = Average Inter Peak Hour Flow

z = PM Peak Hour Flow

The local traffic data that was used to develop this formula was taken from the 7 ATC sites undertaken as part of this study. In order to assess the accuracy of the AM, Inter Peak and PM Peak hour expansion factors to AADT, a comparison of observed and modelled 2012 Base Year AADT has been undertaken in Table 5-10 below.

Table 5-7: Accuracy of Peak Hour Expansion Factors to AADT

ATC	ATC Location	AM	Inter	PM	Observed AADT	Modelled AADT	Accuracy
1	Monread Rd	1,207	1,182	1,362	16,390	15,902	-3.00%
2	R407 Sallins Rd – Link Rd	1,102	758	1,139	10,775	12,101	12.30%
3	R407 Sallins Rd	1,001	929	1,020	13,036	12,507	-4.10%
4	R445 Littleconnell	1,104	986	1,190	13,713	13,752	0.30%
5	NRA ATC M9-02	1,477	1,072	1,775	18,350	17,374	-5.30%
6	NRA ATC M7-31	2,995	2,198	3,241	37,946	34,242	-9.80%
7	R445 Newbridge Rd	1,235	1,163	1,011	14,050	14,748	5.00%

The table above shows that the conversion factors used to estimate AADT from the AM, PM and Inter peak hour models leads to accurately estimated Base Year AADT forecasts.

5.5 Results

Figure 5-13 to 5-14 highlight the road network and locations where AADT and percentage of heavy vehicles is reported. Results for the NRA Medium Growth scenario are outlined in Table 5-8 and 5-9 for the Opening Year (2015) and Design Year (2030) respectively.

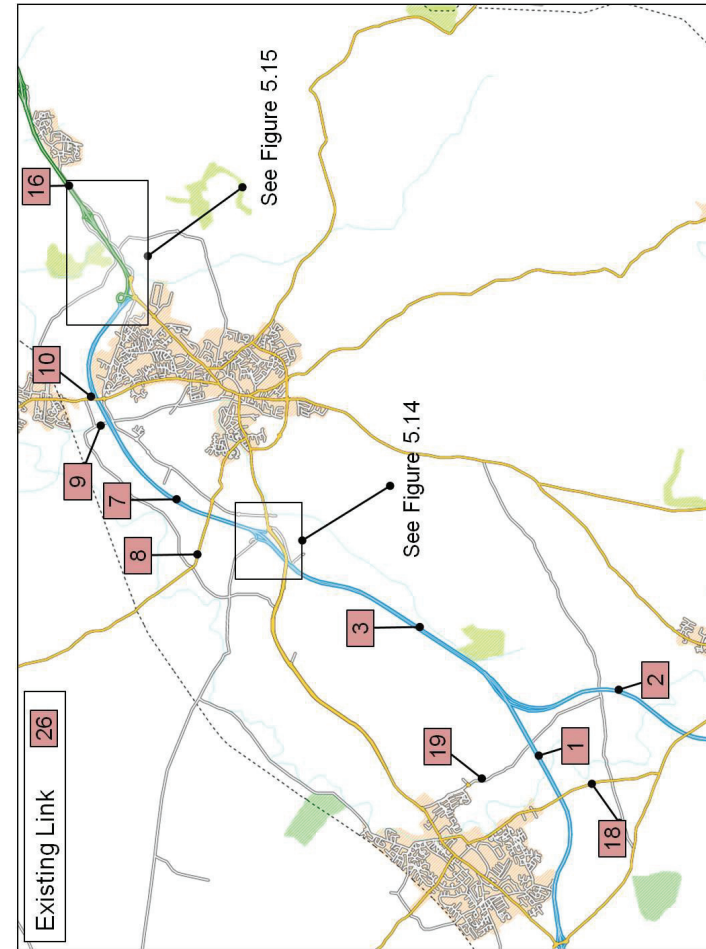


Figure 5-13: M7 LAM AADT Locations

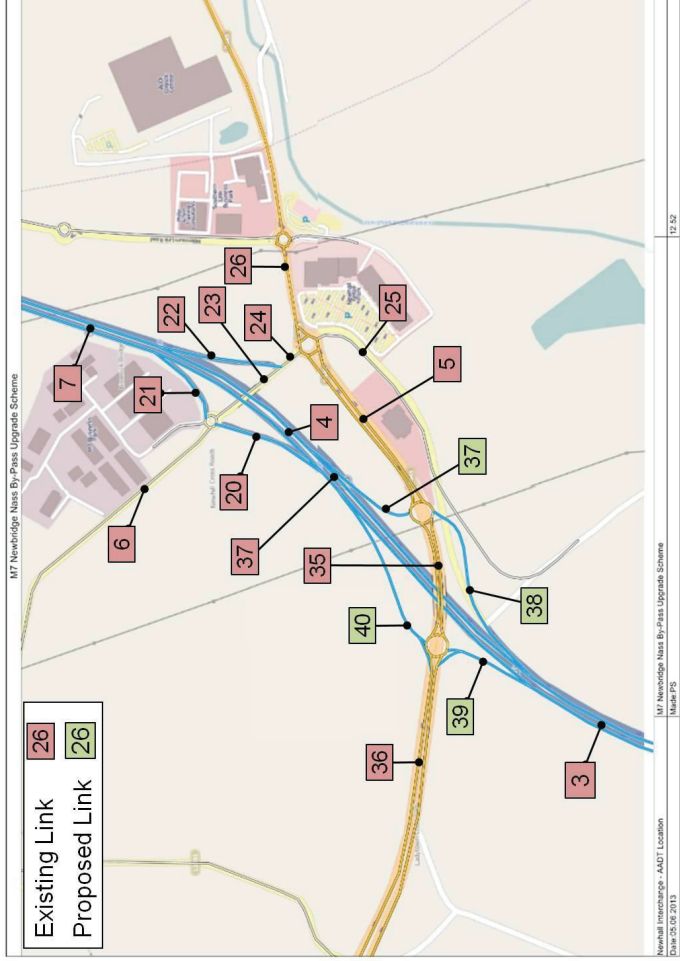


Figure 5-14: M7 LAM AADT Locations (Newhall Interchange)

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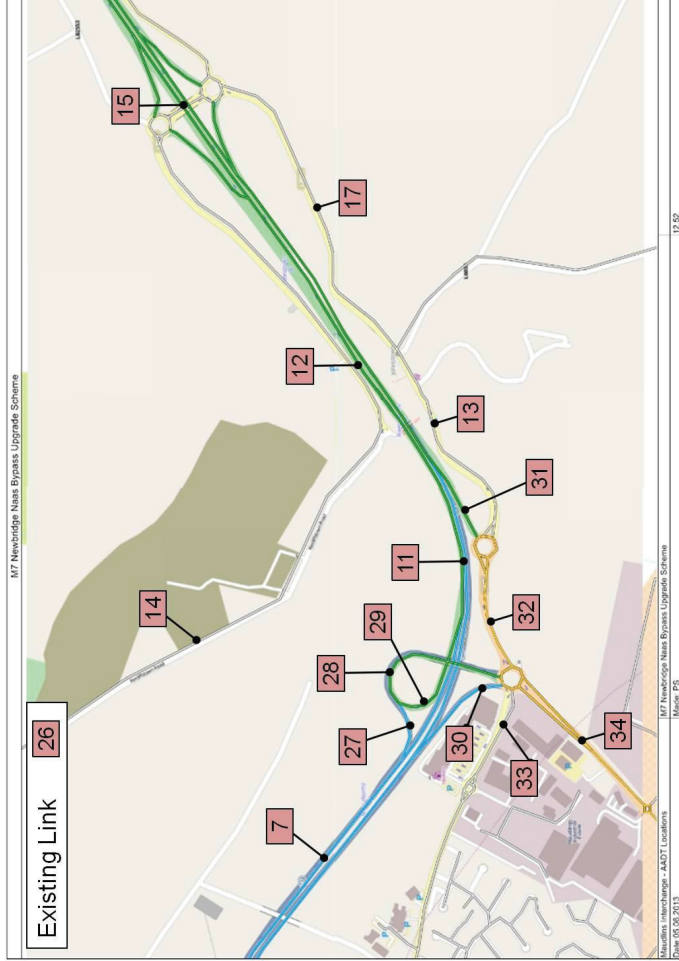


Figure 5-15: M7 LAM AADT Locations (Maudslins Interchange)

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Table 5-8: 2012 and 2015 Forecast AADT Values – NRA Medium Growth

Link No.	Location	AADT - Medium Growth Scenario				% of HGV - Medium Growth Scenario			
		Base Year 2012		Design Year 2015		Base Year 2012		Design Year 2015	
		Do-Min	Do-Some	Do-Min	Do-Some	Do-Min	Do-Some	Do-Min	Do-Some
1	M7 Mainline West of M7/M9 Junction	34,000	33,900	9%	9%				
2	M9 Mainline South of M7/M9 Junction	20,950	21,900	7%	7%				
3	M7 Mainline East of M7/M9 Junction	54,950	55,800	8%	8%				
4	M7 Mainline at Naas Newhall Interchange	43,400	44,200	58,250	9%	8%			
5	R445 West of Newhall Interchange (Newbridge Road)	17,050	17,550	21,800	7%	6%			
6	L2030 North of the Newhall Interchange	6,650	6,400	5,000	8%	8%			
7	M7 Mainline East of Newhall Interchange	56,400	56,850	58,250	9%	8%			
8	R409 - Caragh Road	6,450	6,800	7,200	8%	7%			
9	L2006 - Osberstown Road	1,100	2,150	2,450	3%	3%			
10	R407 - Sallins Road	18,050	17,850	16,700	5%	5%			
11	M7 Mainline East of Maudlins Interchange	59,350	60,800	60,900	9%	8%			
12	N7 Mainline West of Johnstown Interchange	68,600	71,000	70,750	8%	8%			
13	L2014 - West of Johnstown	3,750	4,000	3,950	7%	10%			
14	L2005 - Kerdiffstown Road	2,350	2,400	2,650	1%	2%			
15	N7 Mainline at Johnstown Interchange	65,850	66,050	68,000	8%	8%			
16	N7 Mainline East of Johnstown Interchange	69,600	72,000	72,000	8%	8%			
17	L2014 - East of Johnstown	3,350	3,500	3,450	4%	7%			
18	R416 - Athgarvan Road	5,550	6,050	6,050	3%	6%			
19	Great Connell Road	2,100	2,300	2,600	6%	3%			
20	M7 Eastbound Off-Slip (Newhall Interchange)	5,650	5,800	-	8%	7%			
21	M7 Eastbound On-Slip (Newhall Interchange)	6,300	6,150	-	11%	0%			
22	M7 Westbound Off-Slip (Newhall Interchange)	6,750	6,500	-	12%	9%			
23	L2030 at Newhall Interchange	14,250	14,950	7,850	8%	6%			
24	L2030 between M7 Off-Slip and R445	17,400	17,800	7,850	10%	6%			
25	M7 Westbound On-Slip (Newhall Interchange)	6,400	6,750	750	6%	8%			
26	R445 Newbridge Road	20,850	21,450	20,500	6%	6%			
27	M7 Eastbound Off-Slip (Maudlins Interchange)	3,100	3,200	3,650	8%	4%			
28	On/Off Slip (Maudlins Interchange)	12,500	13,350	13,800	6%	4%			

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29	N7 Eastbound On-Slip (Maudlins Interchange)	9,400	10,150	10,150	5%	4%	5%
30	M7 Westbound On-Slip (Maudlins Interchange)	3,400	3,050	3,850	7%	4%	4%
31	N7 Westbound Off-Slip (Maudlins Interchange)	9,300	10,250	9,900	5%	7%	7%
32	R445 (Maudlins Interchange)	13,050	14,250	13,850	6%	8%	12%
33	L2012 - Monread Road	15,550	17,750	18,050	7%	6%	6%
34	R445 - Dublin Road	15,650	14,050	14,650	5%	4%	4%
35	R445 - Dublin Road (East of Newhall Interchange)	-	-	18,850	0%	0%	6%
36	R445 - Dublin Road (West of Newhall Interchange)	-	-	20,550	0%	0%	6%
37	M7 Eastbound Off-Slip (Newhall Interchange)	-	-	7,600	0%	0%	7%
38	M7 Eastbound On-Slip (Newhall Interchange)	-	-	6,350	0%	0%	9%
39	M7 Westbound Off-Slip (Newhall Interchange)	-	-	6,000	0%	0%	8%
40	M7 Westbound On-Slip (Newhall Interchange)	-	-	7,150	0%	0%	9%

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Table 5-9: 2012 and 2030 Forecast AADT Values – NRA Medium Growth

Link No.	Location	AADT - Medium Growth Scenario				% of HGV - Medium Growth Scenario			
		Base Year 2012		Design Year 2030		Base Year 2012		Design Year 2030	
		Do-Min	Do-Some	Do-Min	Do-Some	Do-Min	Do-Some	Do-Min	Do-Some
1	M7 Mainline West of M7/M9 Junction	34,000	38,300	38,300	38,300	9%	8%	8%	8%
2	M9 Mainline South of M7/M9 Junction	20,950	24,900	24,900	25,200	7%	7%	7%	7%
3	M7 Mainline East of M7/M9 Junction	54,950	63,200	63,200	63,500	8%	8%	8%	8%
4	M7 Mainline at Newhall Interchange	43,400	49,600	49,600	68,100	9%	8%	8%	8%
5	R445 West of Newhall Interchange (Newbridge Road)	17,050	19,650	19,650	25,000	7%	6%	6%	6%
6	L2030 North of the Newhall Interchange	6,650	7,700	7,700	5,950	8%	8%	8%	5%
7	M7 Mainline East of Newhall Interchange	96,400	64,950	68,100	68,100	9%	8%	8%	8%
8	R409 - Caragh Road	6,450	9,100	9,150	9,150	8%	5%	5%	6%
9	L2006 - Osberstown Road	1,100	3,400	3,650	3,650	3%	2%	2%	4%
10	R407 - Sallins Road	18,050	19,500	17,150	17,150	5%	5%	5%	5%
11	M7 Mainline East of Maudlins Interchange	59,350	69,650	70,200	70,200	9%	8%	8%	8%
12	N7 Mainline West of Johnstown Interchange	66,600	81,450	81,300	81,300	8%	8%	8%	8%
13	L2014 - West of Johnstown	3,750	5,700	5,250	5,250	7%	6%	6%	8%
14	L2005 - Kerdiffstown Road	2,350	3,550	4,250	4,250	1%	3%	3%	3%
15	N7 Mainline at Johnstown Interchange	65,850	78,950	78,700	78,700	8%	8%	8%	8%
16	N7 Mainline East of Johnstown Interchange	69,600	84,500	84,550	84,550	8%	7%	7%	7%
17	L2014 - East of Johnstown	3,350	5,150	4,700	4,700	4%	4%	4%	5%
18	R416 - Athgarvan Road	5,550	7,800	8,000	8,000	3%	3%	5%	5%
19	Great Connell Road	2,100	3,400	3,850	3,850	6%	2%	2%	3%
20	M7 Eastbound Off-Slip (Newhall Interchange)	5,650	6,700	-	-	8%	6%	6%	0%
21	M7 Eastbound On-Slip (Newhall Interchange)	6,300	7,500	-	-	11%	10%	10%	0%
22	M7 Westbound Off-Slip (Newhall Interchange)	6,750	7,850	-	-	12%	8%	8%	0%
23	L2030 at Newhall Interchange	14,250	16,650	9,250	9,250	8%	7%	7%	6%
24	L2030 between M7 Off-Slip and R445	17,400	20,750	9,250	9,250	10%	8%	8%	6%
25	M7 Westbound On-Slip (Newhall Interchange)	6,400	7,500	900	900	6%	8%	8%	5%
26	R445 Newbridge Road	20,850	24,000	23,050	23,050	6%	5%	5%	6%
27	M7 Eastbound Off-Slip (Maudlins Interchange)	3,100	3,500	4,600	4,600	8%	4%	4%	4%
28	On/Off Slip (Maudlins Interchange)	12,500	15,000	15,850	15,850	6%	6%	4%	4%

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29	N7 Eastbound On-Slip (Maudlins Interchange)	9,400	11,500	11,300	11,300	5%	4%	5%	5%
30	M7 Westbound On-Slip (Maudlins Interchange)	3,400	3,250	4,600	4,600	7%	5%	4%	4%
31	N7 Westbound Off-Slip (Maudlins Interchange)	9,300	11,800	11,150	11,150	5%	6%	7%	7%
32	R445 (Maudlins Interchange)	13,050	17,500	16,350	16,350	6%	6%	7%	7%
33	L2012 - Monread Road	15,550	20,650	20,700	20,700	7%	5%	5%	5%
34	R445 - Dublin Road	15,650	16,050	16,850	16,850	5%	4%	4%	4%
35	R445 - Dublin Road (East of Newhall Interchange)	-	-	20,600	20,600	0%	0%	0%	6%
36	R445 - Dublin Road (West of Newhall Interchange)	-	-	22,700	22,700	0%	0%	0%	6%
37	M7 Eastbound Off-Slip (Newhall Interchange)	-	-	9,000	9,000	0%	0%	0%	7%
38	M7 Eastbound On-Slip (Newhall Interchange)	-	-	7,000	7,000	0%	0%	0%	9%
39	M7 Westbound Off-Slip (Newhall Interchange)	-	-	6,700	6,700	0%	0%	0%	7%
40	M7 Westbound On-Slip (Newhall Interchange)	-	-	9,250	9,250	0%	0%	0%	8%

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5.6 Network Statistics

Network statistics were extracted from the AM Peak, Inter Peak and PM Peak hour traffic models for the Opening Year 2015 and Design Year 2030 and a comparison was made against the Base Year model. The key network statistics comprise the following:

- Total Vehicle km;
- Total Network Travel Time (hrs);
- Average Vehicle Speed (kph); and
- Average Trip Length (km).

Table 5-10 to Table 5-12 outline the key network statistics for the NRA medium growth scenario for the AM Peak, Inter Peak and PM Peak Periods respectively.

Table 5-10: AM Peak Network Statistics (All Vehicles)

Scenario	Total Vehicle km	Total Network Travel Time (hrs)	Average Network Speed (kph)	Average Trip Length (Km)
2012 Base Year	280,004	4,506	62.1	13.2
2015 Opening Year Do-Min	290,377	4,794	60.6	14.4
2015 Opening Year Do-Some	291,446	4,661	62.5	13.2
2030 Design Year Do-Min	343,174	6,710	51.1	13.0
2030 Design Year Do-Some	345,547	6,358	54.4	13.1

Table 5-11: Inter Peak Network Statistics (All Vehicles)

Scenario	Total Vehicle km	Total Network Travel Time (hrs)	Average Network Speed (kph)	Average Trip Length (Km)
2012 Base Year	175,968	2,483	70.9	14.5
2015 Opening Year Do-Min	181,513	2,602	69.7	14.4
2015 Opening Year Do-Some	181,202	2,612	69.4	14.4
2030 Design Year Do-Min	210,882	3,146	67.0	14.3
2030 Design Year Do-Some	211,641	3,165	66.9	14.3

Table 5-12: PM Peak Network Statistics (All Vehicles)

Scenario	Total Vehicle km	Total Network Travel Time (hrs)	Average Network Speed (kph)	Average Trip Length (Km)
2012 Base Year	279,560	4,424	63.2	13.1
2015 Opening Year Do-Min	294,238	4,627	63.6	13.3
2015 Opening Year Do-Some	296,372	4,403	67.3	13.4
2030 Design Year Do-Min	347,770	6,661	52.2	13.0
2030 Design Year Do-Some	351,862	6,007	58.6	13.2

The statistics show that there is an increase in total network travel time and total network delay and a subsequent reduction in average vehicle speed between the Base Year and Future Year Do-Minimum scenarios. This reflects the expected increase in traffic congestion on the network with demographic and employment growth, with no supporting infrastructure. The tables show also that the Do-something scenario will provide benefits for the entire network.

5.7 Micro-Simulation Modelling

A micro-simulation traffic model was also developed to assess the capacity and operation of the M7 mainline carriageway and interchanges. This model was developed using the micro-simulation software VISSIM and was primarily used to assess the various options for upgrading the Newhall Interchange. A report on the development, calibration and validation of the micro-simulation models is included in Appendix H.

5.8 Summary

Base year (2012) traffic models were developed to represent traffic flows and patterns during the AM Peak hour (08:00 – 09:00), average Inter Peak hour (between 12:00 – 14:00) and PM Peak hour (17:00-18:00). These models were developed, calibrated and validated in accordance with the NRA PAG. Future Year traffic forecasts were generated for the scheme Opening Year (2015) and Design Year (2030) in accordance with the NRA PAG. Outputs from these models were used to inform the economic and environmental assessment of the proposed scheme.

The additional road capacity delivered by upgrading the existing carriageway from a wide 2 lane motorway (D2M) to a 3 lane motorway (D3M) and increasing capacity of the Newhall Interchange significantly reduces congestion along this section of the M7 corridor particularly during the morning and evening peak hours.