Report HFAS Report 1672

Client Wigan Borough Council

Project Wigan Local Development Framework

Subject Core Strategy Transport Study

This Report	**M:\mods\dca\Wigan\2043-2 Wigan LDF Phase 2 modelling\A Project Management\3 Documentation\Study Report\Rep1672 Wigan LDF EIP Traffic Study v2.1.doc**		
Originator	David Affleck / Ed Atkinson / A Tomkinson		
Version	Comments	Date	Check / Approve
V0.5	Results summary updated. Executive Summary completed.	07.07.11	DA
V1.0	Issued report	08.07.11	DA
V1.1	Updates / corrections to chapters 2,6 and 10	15.07.11	DA
V2.0	Incorporates Wigan BC changes / corrections / update diagrams	26.07.11	DA

Contact	GMTU:	E-mail	Tel: (70 internal)
	David Affleck	david.affleck@tfgm.com	0161-244 1698
	Ed Atkinson	edward.atkinson@tfgm.com	0161-244 1419

Issued	Organisation	FAO
26.07.11	Wigan BC	Emma Barton, Damian Garner, Nick Clarke

CONTENTS

Executive Summary

1. In January 2011, Wigan Borough Council commissioned the Greater Manchester Transportation Unit (GMTU) and Greater Manchester Passenger Transport Executive (GMPTE)[1] to undertake transport modelling to inform development of its Local Development Framework and upcoming Core Strategy Examination in Public. This followed on from an earlier comprehensive examination into the impacts of LDF development options and potential complementary transport infrastructure proposals, carried out by Wigan Borough Council and GMTU to understand the potential impacts of various scenarios and to determine their viability.

2. The latest work reported here involved the modelling of LDF development sites across the Wigan Borough, with the anticipated development on the designated Key Strategic Site, LDF Broad Locations and adopted UDP sites (Parsonage, Northleigh, Bickershaw, Pemberton Colliery, South of Wigan and East Lancashire Road Corridor housing) explicitly represented, alongside committed transport schemes. A primary aim of the work was to identify first-order highway impacts, but also to identify locational influences on mode split. The LDF period is 2011-2026, but given prevailing economic uncertainties, Wigan Council (in agreement with the Highways Agency) specified that this work should look initially at the period up to 2016.

Core Strategy Transport Modelling

3. The 2009 validation of the Greater Manchester SATURN Model carried out as part of the scheme appraisal for the Wigan Inner Relief Route (WIRR) scheme was used as a starting point for the Wigan LDF modelling. Analysis of modelled and observed flows on local roads crossing screenlines and cordons passing through Wigan indicated that the model replicated observed flows with a good level of accuracy. On the all-purpose network, the level of flow difference was small and the number of well-validated links was acceptable. The validation of the WIRR model is reported fully in GMTU Report 1630 (August 2010).

4. Given that the Highways Agency is a key stakeholder in the development of a robust examination into the impacts of the draft LDF Core Strategy, it was considered important that the model also reflected traffic flows and journey times on the local motorways with a good degree of accuracy. The primary concern of the Highways Agency would be any potential impact that the LDF proposals could have on the motorway network, particularly the M6 as it passes through the Wigan borough.

5. To address any concerns about the ability of the model to reflect motorway flows and journey times, we updated the model demand matrices with a further round of matrix estimation, particularly concentrating on the validation of traffic flows and journey times on M6 and M61.

6. Detailed results from the updated model validation are contained in Appendix 1 of this report. However, it must be stressed that this information should be considered as a supplement to the information contained in the full model development and validation report (GMTU Report 1630).

[1] GMTU and GMPTE were amalgamated on the 1st April 2011 within the newly formed Transport for Greater Manchester. Within TfGM, GMTU is now known as Highway Forecasting and Analytical Services (HFAS).

7. Following discussions with Wigan Borough Council and the Highways Agency, all parties agreed that the updated version of the 2009 WIRR SATURN model was a robust and reliable tool for this stage of the examination into the potential impacts of the Wigan LDF Core Strategy study.

8. Traffic growth to the forecast year of 2016 was estimated using forecasts from the Greater Manchester Forecasting Model (GMFM) released in September 2010. While this is often estimated using growth derived from the National Trip End Model (NTEM) projections, NTEM was the subject of review by the Department for Transport during the forecasting stage of this work. In light of the uncertainty regarding NTEM and given that the then definitive set of forecasts (v5.4) predated the worst of the economic downturn, it was agreed that the GMFM projections should be adopted.

9. Traffic growth for trips in the Wigan district was estimated by using GMFM forecasts of housing and employment for the district as alternative planning data in Tempro. GMFM data is only available at the district level, so this was used as a control total, split between standard Tempro areas weighted by the standard Tempro housing and employment totals for each area. The resulting growth up to 2016 was averaged over origins and destinations and adjusted to reflect fuel price and income adjustments.

10. Traffic growth for trips to/from other districts within Greater Manchester was derived in the same way using GMFM estimates of housing and employment as alternative planning data within TEMPRO, but applied at a district level.

11. For goods vehicles, growth to 2016 was estimated using rates from the National Transport Model (NTM).

Development Site Public Transport and Highway Trips

12. Traffic generation for the LDF development sites was estimated using trip rates from the TRICS trip generation database. It was agreed with Wigan Borough Council and the Highways Agency that it would not be practical to tailor the selection of TRICS sites used to estimate the trip rate at this early stage in the development of the sites, so all available sites for a particular land use were selected irrespective of location. This produced a set of standard trip rates for different land-uses that were agreed with the Highways Agency and applied for the examination of LDF proposals in all Greater Manchester Authority areas, including for this study. This ensured a consistent assessment approach was applied across Greater Manchester.

13. In accordance with the methodology agreed with Wigan Borough Council and the Highways Agency, GMTU also interrogated the TRICS database to determine the modal splits for a variety of land uses and site locations. The impact of location on mode choice was explored and a recommended set of mode choice splits was determined and agreed.

14. All trip rates and mode choice splits used for this analysis were reviewed and approved by the Highways Agency and their consultant, JMP Consultants Ltd.

15. The agreed person trip generation estimates by mode of travel are shown in Table 1.

16. It is clear from this table that there is considerable variation in the proportion of public transport trips generated by each of the sites. For instance, just over 22% of the person trip generation of

the Parsonage site is expected to use public transport during the morning peak hour, whereas only 4% of trips generated by the Pemberton Colliery site would be made by public transport.

17. It is important to stress that the mode choices shown in Table 1 are based on observations (from the TRICS database) at similar sites throughout the UK. Clearly, these mode choices could be influenced and improved by Travel Plan measures designed to encourage wider use of public transport, brought forward as part of the development of the sites.

Table 1 Draft Core Strategy Site Trip Generation Summary – 2016 Two Way Person Trips

Site / Location	Total Person Trips		PT Trips		Walk / Cycle Trips		Vehicle Trips	
	AM	PM	AM	PM	AM	PM	AM	PM
Chaddock Ln/Garret Hall (EM1A 9 / SP4.3)	157	143	28	24	15	14	114	105
Northleigh (SP3)	590	527	21	13	119	79	450	435
Parsonage (EM1A 6)	493	446	112	102	90	83	291	261
Bickershaw South (EM1G)	212	189	8	5	43	28	161	156
Pemberton Colliery (EM1A 30)	306	274	11	7	62	41	233	226
Pocket Nook (E Lancs Rd Corridor) (SP4.6)	111	100	4	2	23	15	84	83
Rothwell's Farm (E Lancs Rd Corridor) (SP4.6)	67	60	2	1	14	9	51	50
Stirrup's Farm (E Lancs Rd Corridor) (SP4.6)	100	90	4	2	20	13	76	75
South Wigan M6 J25 (SP4.5)	204	201	39	35	30	24	135	142

18. The distribution of trips generated by the LDF development sites in Wigan was estimated using the GMTU DEVTRIPS programme for highway trips. Public transport trips were distributed using a new PT-DEVTRIPS programme developed by GMTU in cooperation with GMPTE.

19. Following consultation with Wigan Borough Council, the following site access arrangements were assumed for each of the LDF development sites:

- **Chaddock Lane/ Garret Hall (EM1A 9 / SP4.3)** - Access from A572 Chaddock Lane in the vicinity of Chaddock Lane farm
- **Northleigh (SP3)** - Access from A578 Leigh Road midway between junctions with B5237 Smiths Lane and A577 Atherton Road
- **Parsonage (EM1A 6)** - Access from the A579 Atherleigh – A578 Wigan Road link (i.e. Parsonage Link Road)
- **Bickershaw South (EM1G)** - Access from Plank Lane (south side) in the vicinity of Bickershaw Lane

- **Pemberton Colliery (EM1A 30)** - Access from Smithy Brook Road and Little Lane
- **Pocket Nook (SP4.6)** - Access from A572 Newton Road (south side) via Pocket Nook Lane
- **Rothwell's Farm (SP4.6)** - Access from B5207 Lowton Road (north side) to the south of its junction with A573 in the vicinity of Rothwell's Farm
- **Stirrups Farm (SP4.6)** - Access from Stone Cross Lane (east side) to the south of its junction with Stone Cross Lane North
- **South Wigan M6 Junction 25 (SP4.5)** - Access (in only) from western side of A49 Warrington Road midway between M6 Junction 25 roundabout and Worthington Way; exit only via Wheatlea Road / Forton Road / Worthington Way junction.

Transport Impacts

20. Examination of network wide summary statistics showed that the step-change in network performance is from the 2009 base to the 2016 baseline (without the LDF development sites). The anticipated growth in traffic over the five-year period is expected to increase total travel time by all vehicles on the road network by between 19 and 23%, and total travel distance by between 12 and 15%.

21. Adding the Wigan LDF development sites has a small additional impact, further increasing total travel time and total travel distance by up to 0.5%. The amount of time spent by vehicles in transient and over-capacity queues is also expected to increase, but only by a small amount.

22. The highway traffic to/from each of the sites is expected to use the highway network as follows.

23. **Northleigh**: During the morning peak hour, the majority of the development traffic uses A578 Leigh Road to the north of the site (58% outbound and 68% inbound) while 14% uses Bickershaw Lane. The remainder goes towards Leigh via A578 and Nel Pan Lane. Similarly, in the evening peak hour, the majority of the site traffic again goes to/from the north on A578 Leigh Road (58% outbound and 60% inbound). Around 10% of traffic uses Bickershaw Lane, with the remainder going to/from Leigh using A578 and Nel Pan Lane.

24. **Bickershaw South**: During the morning peak hour, the majority of traffic generated by Bickershaw South goes to/from the east on Plank Lane towards Leigh (65%) while the remaining traffic (35%) goes to the west to/from Golborne and Lowton. The distribution of evening peak hour traffic is very similar, although a higher proportion of the traffic comes from / goes to the west (about 75%).

25. **Pemberton Colliery**: During the morning peak hour about 55% of the Pemberton Colliery traffic uses A571 Billinge Road with 35% heading to/from Wigan town centre. The remaining traffic uses A49 Warrington Road mostly heading south. In the evening peak hour, the majority of traffic (77%) enters the site from Warrington Road.

26. **Pocket Nook**: During the morning peak hour, about 70% of the traffic generated by this site goes to/from the northeast on A572 Newton Road, with the remainder travelling southwest on the A580 East Lancashire Road. During the evening peak hour, the split is roughly the same with about 65% and 35% of traffic going to/from the northeast and southwest respectively.

27. **Rothwell's Farm**: During the morning peak hour, about 60% of the traffic generated by the Rothwell's Farm site goes to/from the south on B5207 Golborne Road, with 40% going to/from A580 East Lancashire Road via its junction with Stone Cross Lane. About 30% of traffic goes to/from the north using Lowton Road. During the evening peak hour, about 45% of traffic goes to/from the south, with about 30% using the A580 East Lancashire Road and the remainder using A573 Church Street, Ashton Road and Wigan Road.

28. **Stirrup's Farm**: During the morning peak hour, 56% of the traffic generated by this site uses Stone Cross Lane North and the A580 East Lancashire Road, with the remainder going west and north via Nook Lane (33%) and Cross Lane (12%). The evening peak hour distribution of Stirrup's Farm traffic is much the same as the morning peak hour distribution.

29. **South of Wigan (M6 Junction 25)**: During the morning peak hour, about 55% of the development site traffic goes to/from the south, mostly using the M6. The remaining 45% of the traffic goes to/from the north via B5238 Poolstock Lane and A49 Warrington Road. During the evening peak hour, the distribution of traffic entering/leaving this site is much the same as the morning peak hour distribution.

30. **Chaddock Lane / Garret Hall**: During the morning peak hour, about 65% of the traffic enters/departs the site using the A580 East Lancashire Road, mostly to/from the east. The remaining traffic arrives/departs from the east (about 15%) and west (about 15%) using A572 and Prince's Avenue. During the evening peak hour, about 60% of the development traffic arrives/departs from the east and west using A572, while about 40% uses the East Lancashire Road (mostly to/from the east).

31. **Parsonage**: During the morning peak hour the majority of the development traffic uses A579 Atherleigh Way, with about 10% to/from the south, and 56% (outbound) and 44% (inbound) to/from the north. About 20% of the traffic goes to/from the site from Leigh using A572 Twist Lane, while 17% is from the north, using A578 Wigan Road. The evening peak hour distribution is similar to the morning peak hour distribution.

32. A number of junctions operate over-capacity in the 2009 base year and there would be a modest increase in the number of junctions affected by increased congestion by 2016. However, comparing the distribution of the LDF development site traffic with the over-capacity junctions demonstrated that only a few of them were materially affected by development site traffic.

33. Overall, the growth in background traffic to 2016 is likely to have a greater impact on junction performance than the additional traffic generated by the LDF development sites. Nevertheless, the traffic generated by the sites is forecast to have a modest detrimental impact on a number of junctions, in particular:

- **Northleigh and Parsonage** account for increased traffic volumes on A578 Leigh Road/Wigan Road and B5237 Bickershaw Lane resulting in a degradation in performance at the Leigh Road / Atherton Road signalised junction, Atherleigh Way / Twist Lane roundabout (evening peak hour) and A573 Warrington Road junctions with Bickershaw Lane and A58 Lily Lane.

- **Bickershaw South** increases traffic flow on Plank Lane which impacts on the B5207 Golborne Road / Slag Lane junction (morning peak hour).

- Traffic generated by the **Chaddock Lane / Garret Hall** site is likely to have some impact on the A580 East Lancashire Road particularly at its junction with Chaddock Lane. There is also degradation in performance at the East Lancashire Road junctions with the A577 Common Road and B5258 Newearth Road, though increases in the background traffic flow are likely to have a greater impact at these junctions.

- **Pocket Nook, Stirrups Farm** and **Rothwell's Farm** housing sites are not likely to have a significant impact on the highway network given their relatively low trip generation. However, the combined traffic from these sites may have a detrimental impact on the A580 East Lancashire Road junctions with A572 Newton Road and B5207 Church Lane.

- The impact of traffic generated by the **M6 Junction 25 (South of Wigan)** site is primarily on the A49 Warrington Road / Worthington Way junction, which is forecast to experience some increase in delay in both peak hours. This traffic is also likely to have some impact on the Warrington Road / B5238 Poolstock Lane roundabout.

- The **Pemberton Colliery** site is forecast to significantly increase traffic on Little Lane and is likely to have some impact at junctions on the A49 Warrington Road.

34. There is further potential to examine the operation of particularly problematic junctions in more detail to identify the scale of improvements required to mitigate for the effects of the additional traffic. Mitigation measures could include introducing signal optimisation measures (i.e. MOVA or SCOOT control) at signalised junctions currently using fixed times. Where feasible, additional approach lanes may also be considered to improve capacity.

35. In some cases, the capacity problems may be such that only an unacceptable or unachievable junction improvement would be sufficient to resolve the capacity problems. In these cases, it would be possible to identify the particular sites generating the development traffic that is causing the problem and then determine suitable Travel Plan measures and additional PT provision to reduce the impact of vehicle trips generated by the site.

Emissions Modelling

36. Emissions were estimated using the EMIGMA Greater Manchester emissions database for the following pollutants:

- CO_2
- NO_X
- PM_{10}

37. Carbon dioxide emissions tend to rise over time as they are closely related to increases in vehicle kilometres. The 2016 carbon dioxide forecast suggested that the largest CO_2 emission increases (increases of between 15 and 20%) are forecast to be in the Abram, Wigan Central, Wigan West and Douglas wards.

38. Emissions of Nitrogen oxides (NO_x) tend to fall over time, reflecting improvements in engine efficiency. This was confirmed in the 2016 forecasts, which identified NO_X reductions of between 20 and 40% over large parts of the Wigan borough.

39. Emissions of PM_{10} particulates are affected both by increases in vehicle kilometres travelled and improvements in vehicle efficiency. PM_{10} emissions fall in the less built-up parts of the borough, but that they increase in Wigan town centre wards and along an east-west corridor running through the central part of the borough between Wigan and Leigh.

40. For the borough as a whole, carbon dioxide emissions are forecast to increase by just over 10% between 2009 and 2016, while both nitrogen oxides and PM_{10} particulates are anticipated to fall by 30% and just under 2% respectively.

Public Transport Trip Distribution

41. The public transport trips forecast to be generated by each of the LDF development sites were distributed using the newly developed PT-DEVTRIPS program. While this may provide a useful indication of what is possible in terms of PT trips, the model does not provide any indication of where people might wish to travel by public transport and therefore where there might be gaps in current/planned PT supply.

42. In order to establish a picture of what might be regarded as "suppressed" demand, the PT trips were also input to the standard highway-based DEVTRIPS program. The outputs from this can be regarded as providing an indication of where people would travel if PT services were provided.

43. The outputs from the PT and highway-DEVTRIPS runs for each of the LDF development sites are summarised below. For simplicity, we refer to areas which are groups of wards as follows:

Wigan Town Centre	Wigan Central, Wigan West and Douglas
Leigh	Leigh East, Leigh South and Leigh West
Atherton	Atherton and Atherleigh
Hindley	Hindley and Hindley Green

Site Public Transport Trip Distribution Summary

Bickershaw South (EM1G)

44. The Bickershaw South site is allocated for employment and housing uses, but it is anticipated that only some of the housing elements will be delivered by the 2016 forecast year. Based on the TRICS mode choice estimates described earlier, the Bickershaw site is expected to generate only 8 public transport trips during the morning peak hour. This is an exceptionally low figure, based as it is on the mode choice characteristics of other sites with similar land-uses and in similar locations. It suggests that very careful consideration should be given to suitable travel plan measures to encourage the use of more sustainable modes of transport as the site is brought forward.

45. Not surprisingly the majority of these trips are forecast to be to/from Leigh, which accounts for 52% and 43% of PT trips during the morning and evening peak hours respectively. Wigan Town Centre accounts for 6% and 12% of PT trips during the morning and evening peak hours respectively, which is probably indicative of poor public transport links between the site and Wigan Town Centre. Within the Wigan district the only other significant public transport origin/destination is Atherton, which accounts for 8% of trips during both the morning and evening peak hours.

Chaddock Lane / Garret Hall (EM1A 9 / SP4.3)

46. The Chaddock Lane / Garret Hall sites are proposed for housing and employment uses and are anticipated to generate 28 and 24 public transport trips during the morning and evening peak hours respectively. The site is located on the A572 with access to relatively high frequency bus services operating along this route.

47. During the morning peak hour, 51% of the public transport trips are anticipated to be to/from Wigan Town Centre, with much of the remainder (33%) accounted for by trips to/from outside the Wigan district. The site is particularly accessible from the districts of Salford and Manchester, which account for 17% and 10% respectively of the trips to/from the site during the morning peak hour. It is also interesting to note that 13% of public transport trips generated by the site would be to/from the Astley Mosley Common ward, which is the ward that the site is located in. However, given the relatively large size of this ward, this is to be expected.

48. During the evening peak hour there are far fewer public transport trips (only 2%) to/from Wigan Town Centre, suggesting that public transport linkages between the site and Wigan Town Centre may be poorer during this time period. The Manchester (33%), Salford (26%) and Bolton (8%) districts account for most of the public transport trips during the evening peak hour, which is a reflection of the site’s close proximity to districts to the east of the Wigan. As was noted during the morning peak hour, 9% of public transport trips are expected to be within the Astley Mosley Common ward.

49. Although the Chaddock Lane / Garret Hall site is relatively close to Leigh, there are very few public transport trips between the site and Leigh (especially during the morning peak hour).

East Lancashire Road Corridor Housing Sites (SP4.6)

50. The location of the East Lancashire Road Corridor housing sites is as yet not fully determined, but could include development on Pocket Nook, Rothwell’s Farm or Stirrup’s Farm. For modelling purposes, we treated them as a single public transport origin/destination given their close proximity to each other and the uncertainty about which site would be brought forward.

51. The combined public transport trip generation from the three sites is low, with just 11 and 6 trips during the morning and evening peak hours respectively. The public transport provision along the East Lancashire Road corridor is currently relatively poor with no local bus services operating on the section of A580 through the Wigan borough. Even with a higher public transport demand at the sites, there would be very few public transport trips to/from districts outside Wigan. It suggests that very careful consideration should be given to suitable travel plan

measures to encourage the use of more sustainable modes of transport as the site is brought forward.

52. Wigan and Leigh account for the majority of the public transport demand generated by the site during both peak hours suggesting that current service provision is adequate between the sites and Wigan and Leigh Town Centres.

Northleigh (SP3)

53. The Northleigh site is proposed for a mixture of housing and employment uses, but it is anticipated that only a portion of the housing allocation will be brought forward by 2016. Based on this land use and the site location, the site is only forecast to generate between 13 and 22 two-way peak hour public transport trips. This is a very low figure, given the scale of the development. It suggests that very careful consideration should be given to suitable travel plan measures to encourage the use of more sustainable modes of transport as the site is brought forward.

54. As would be expected, the majority of the public transport trips generated by the site would be to/from Leigh and Wigan Town Centre, which would account for between 56 and 60% of the site public transport trips.

Parsonage (EM1A 6)

55. The Parsonage site is proposed for a mixture of uses, but with an emphasis on employment uses. From the trip generation work described earlier in this report, it is anticipated that the site would generate more significant volumes of public transport trips.

56. The site is located relatively close to the centre of Leigh town centre and benefits from the regular bus services that radiate from town centre. As would be expected, the most important origin / destination for the site's public transport trips is to/from the Leigh wards, which account for approximately 45% of the peak hour public transport trips. Approximately 18% of the site's public transport trips are expected to go to/from Wigan town centre, while a further 8% are expected to go to/from Atherton. As many as 10-12% of the site's public transport trips are expected to go to/from areas outside the Wigan borough.

57. The higher volumes of public transport trips generated by the Parsonage development could put some stress on the local public transport network, particularly on services within the Leigh wards, but also between the site and Wigan town centre. These impacts would have to be examined in more detail as the development of the site is progressed.

Pemberton Colliery (EM1A 30)

58. The Pemberton Colliery site is proposed for employment and housing uses, but it is anticipated that only some of the housing elements will be delivered by the 2016 forecast year. Based on the public transport trip generation estimates detailed earlier in this report, the site will only generate a very small number of public transport trips by 2016. However, given that the site is adjacent to A49 Warrington Road, which has high frequency bus services serving a variety of

destinations and it is also close to Pemberton rail station, the site has the potential for public transport to take a higher share of the total trips generated by the site.

59. Unsurprisingly, the majority of the public transport trips generated by the site would be to/from Wigan town centre wards (53 to 62%). Approximately 9% would go to/from the Pemberton ward and a further 9 to 12% to/from the Worsley Mesnes ward.

South of Wigan, M6 Junction 25 (SP4.5)

60. This site is proposed for employment uses, particularly warehousing and distribution. It is expected to generate between 35 and 39 peak hour two-way public transport trips in 2016. Approximately 30% of these trips would be to/from Wigan town centre, while a further 11-20% would be to/from the Winstanley and Worsley Mesnes wards. Perhaps surprisingly, only between 5 and 12 % of the public transport trips would be to/from the Ashton and Bryn wards.

Summary

61. This study examined the potential transport impacts of development on LDF sites up to 2016. Given that this is only a forecast for the next five years, the amount of development anticipated on the sites is relatively restricted. The analysis demonstrated that the traffic generated by these sites would cause some deterioration in the operation of a number of junctions in the vicinity of the sites, but that the volumes of traffic generated were not sufficient to cause wider congestion and capacity problems.

62. The majority of the sites identified in the draft Core Strategy are reliant on the bus services that radiate on routes out of Wigan and Leigh town centres. The only exception to this is the Pemberton Colliery site, which is also served by Pemberton rail station, giving access to rail services between Wigan and Kirby (plus connections to Liverpool). Although there is a relatively good network of bus services operating on the main routes across the Wigan borough, some of the sites have poor public transport linkages to the borough's town centres.

63. With the exception of the Parsonage site, the remaining sites are expected to generate low numbers of public transport trips. The Parsonage site is expected to generate approximately 100 peak hour two-way public transport trips, which may require some limited improvements to capacity on nearby public transport routes.

64. The public transport catchment areas for the sites are largely restricted to the Wigan borough and the analysis demonstrates that there would be few new public transport trips to/from areas outside the district. The only real exception to this is the Chaddock Lane / Garret Hall site, which due to its location close to the borough boundary would generate some new public transport trips to/from surrounding districts.

65. Measures to encourage greater public transport usage at these sites and a detailed examination of any potential capacity issues related to increased passenger numbers should be addressed as part of the site specific travel plans developed as the sites are brought forward.

1. Introduction

1.1 In January 2011, Wigan Council commissioned Greater Manchester Transportation Unit (GMTU) and Greater Manchester Passenger Transport Executive (GMPTE) to undertake transport modelling to inform development of its Local Development Framework and upcoming Core Strategy Examination in Public.

1.2 This report describes the assumptions made in the modelling process and its outcomes. This work is the result of collaboration between Wigan Borough Council and the Highways Agency. Key assumptions and inputs were discussed and agreed by all parties as the study progressed.

1.3 The report is divided into eight sections, as follows:

- Chapter 1 introduces the report
- Chapter 2 describes the background to the study
- Chapter 3 describes the development assumptions
- Chapter 4 describes the 2009 base model and its validation
- Chapter 5 describes how traffic growth to the forecast year was estimated
- Chapter 6 summarises the trip generation and mode split of the Key Strategic Sites
- Chapter 7 deals with trip distribution
- Chapter 8 describes the highway and public transport schemes added at 2016
- Chapter 9 summarises the highway modelling results
- Chapter 10 summarises the results of EMIGMA emissions modelling.
- Chapter 11 outlines the results of public transport modelling.

1.4 This report was originally drafted by GMTU, which has now become Transport for Greater Manchester (TfGM) Highways Forecasting and Analytical Services. The GMPTE, which has provided inputs on the examination of public transport impacts, is also now part of TfGM. The name of GMTU has been retained in this report as most of the study was completed under the auspices of that Unit.

2. Background

The Purpose of the Local Development Framework Core Strategy

2.1 The Wigan Local Development Framework (LDF) is made up of a number of documents that in combination deal with the spatial planning issues that will affect the Borough over the next 15 years. It will address issues such as where new houses should be built; where new businesses and jobs should be located and developed; what improvements should be made to transport and community infrastructure to service this new development; and the areas that should be safeguarded from development and improved for recreation and environmental reasons.

2.2 The core strategy provides the strategic framework against which decisions about the use of land can be planned. It does not restate national planning guidance, but instead provides the local expression of the higher-level strategies. It also sets a monitoring and implementation framework that will be kept up to date. This will measure the effectiveness of the policies in the LDF, and will signal if any changes need to be made to any of the policies to enable the vision to be delivered.

The LDF Phase 1 Transport Study

2.3 In 2009, the MVA Consultancy and GMTU were commissioned by the Greater Manchester LDF Steering Group to undertake a study to investigate the potential impacts on transport networks of the LDF core spatial strategies for each of the districts in Greater Manchester.

2.4 The approach adopted for the study involved using the land use and transport forecasting models that have been developed for the Greater Manchester area, namely:

- The Greater Manchester Strategy Planning Model (GMSPM2) and its associated Delta Land-Use Model
- The Greater Manchester Public Transport Model (GMSPM2-PT); and
- The Greater Manchester SATURN traffic model.

2.5 The models assumed levels of economic growth consistent with the Association of Greater Manchester Authorities' (AGMA) Accelerated Growth Scenario (AGS), along with development of the sites and allocations contained within the emerging Local Development Frameworks.

2.6 The outputs from this study were used to inform the further development of the LDF strategies by showing how the resulting travel demand changes imposed stresses on the transport network. The outputs considered the impacts both locally and in neighbouring areas, and highlighted where investment in the transport network would be required to achieve the core strategy or where a revision to that strategy would be required.

Wigan Transport Infrastructure Options Sifting

2.7 The LDF Phase 1 Study looked at combined impacts of proposals across Greater Manchester, individual developments being incorporated in general growth projections. In parallel with the Phase 1 work and in preparation for the Phase 2 study reported here, Wigan Council and GMTU carried out extensive detailed traffic modelling of LDF development options and complementary transport infrastructure proposals to understand the potential impacts of various scenarios and to determine their viability.

2.8 This work concentrated on an examination of new highway infrastructure schemes that could mitigate the potential detrimental effect of future development proposed within the Core Strategy, in particular on the Key Strategic Site and the Broad Locations. This included an assessment of the potential costs of the schemes and any constraints on their delivery.

2.9 Transport modelling, carried out by GMTU, highlighted the parts of the borough's transport network that would suffer from unacceptable levels of congestion by 2026 if all the development proposed in the Core Strategy and by adjacent districts were to be implemented.

2.10 Numerous combinations of new highway infrastructure packages were examined to assess what positive impact they would have on the borough's transport network. After an extensive sifting process, three packages of improvements were identified, referred to as options 3, 3A and 3B. Table 2.1 shows the schemes included in each of these scenarios, along with their estimated construction costs.

2.11 The impact of these packages was examined by comparing scenarios with and without the infrastructure packages assuming 2026 traffic levels, including traffic generated by the LDF development sites. This work demonstrated that:

- Option 3 would reduce network-wide travel time by 6.8% during the morning peak hour and by 6.2% during the evening peak hour
- Option 3A would reduce network-wide travel time by 3.8% during the morning peak hour and by 3.3% during the evening peak hour
- Option 3B would reduce network-wide travel time by 5.0% during the morning peak hour and by 3.8% during the evening peak hour.

2.12 This work concluded that while Option 3 is the most extensive and highest cost package, it would offer only marginally better benefits than either of the other two options, which themselves would only offer modest reductions in overall travel time. Additionally, none of these options would restore network performance back to 2011 levels.

2.13 Whilst the building of some new roads to deal with specific issues in certain parts of the borough may be desirable, evidence from this option sifting indicated that a major road building programme across the whole borough (akin to Option 3) would not deliver the required improvements to mitigate potential detrimental impacts of future development proposals. It was also noted that there would be little prospect of obtaining the funding to deliver such a strategy within the lifetime of the Core Strategy.

Table 2.1 Complementary Transport Infrastructure Scheme Cost Estimates and Option Combinations

Ref	Scheme Description	Estimated Cost (£m)	Option 3	Option 3A	Option 3B
1	A577 Ormskirk Road – Spring Road Link	5.692	Y	Y	Y
2	Spring Road, Walthew House Lane, Challenge Way & Stadium Way Improvement	1.724	Y	Y	Y
3	Wigan Inner Relief Route	25.661	Y	Y	Y
4	A49 Wallgate / Pottery Road Gyratory Diversion (Saddle Link Road)	10.705	Y	Y	Y
5	M6 Junction 26 – A571 Billinge Road Link (Wigan South Central Link Road)	8.445			
6	A571 Billinge Road – A49 Warrington Road Link (Pemberton Colliery Link Road)	1.385	Y	Y	Y
7	A49 Warrington Road – Chapel Lane Link (A49 Diversion, including Wigan Town Centre Link Road)	23.270	Y	Y	Y
8	Wigan Town Centre Link Road – A573 Warrington Road Link	13.333	Y		
9	A573 Warrington Road Diversion	2.065	Y		
10	A573 Warrington Road – A58 Liverpool Road Link	10.859	Y		
11	A58 Liverpool Road – A578 Leigh Road Link	8.984	Y	Y	Y
12	A578 Leigh Road – A579 Atherleigh Way	7.228	Y		Y
13	A58 Liverpool Road – Bickershaw Link	5.818			
14	Bickershaw Link – A578 Leigh Road Link	5.364			
15	A578 Leigh Road – A577 Corner Lane Link	2.905		Y	
17	A579 Atherleigh Way – A578 Twist Lane Link	5.102	Y		
18	A579 Atherleigh Way – A578 Wigan Road Link (Parsonage Link Road)	5.126	Y	Y	Y
19	A579 Bolton Road – A577 Tyldesley Road Link	5.203	Y	Y	Y
20	A572 Chaddock Lane – A577 Mosley Common Road Link	3.798	Y	Y	Y
21	A49 Wigan Road – A58 Bolton Road Link (Southern Alignment)	6.550	Y	Y	Y
22	A49 Wigan Road (M6 Jn-25) – A58 Bolton Road Link (Northern Alignment)	12.588			
	Total Cost of Option (£m)		**136.685**	**101.003**	**105.326**

Note: Some schemes shown above were considered in options 1 and 2. In a number of cases they were found to have limited benefits and excluded from Options 3, 3A and 3B.

2.14 Since this work was carried out, there have been a number of changes to the Core Strategy, including the removal of a potential development site at The Bell and its replacement with an employment site south of Wigan at M6 Junction 25. There has also been a refocusing of housing development, with a new broad location identified along the East Lancashire Road corridor.

2.15 These changes necessitated the further phase of transport modelling described in this report as the LDF Phase 2 study. This work was also to consider multi-modal impacts of the development proposals and any opportunities to reduce the impact of the sites in terms of their car traffic trip generation.

The LDF Phase 2 Transport Study

2.16 To develop the Core Strategy further and in preparation for the Examination in Public and the site allocation stage of LDF development, a more detailed transport assessment was required to identify in more detail the impacts of the draft strategy.

2.17 The Phase 2 Study (the subject of this report) involved a more detailed examination of the LDF land-use proposals with the Key Strategic Sites represented explicitly, alongside committed transport schemes. A primary aim of this phase of work was to identify locational influences on mode split and land use density and the consequent first-order highways impacts. The LDF period is 2011-2026 but given prevailing economic uncertainties, Wigan Council specified that the Phase 2 Study should look initially at the period up to 2016.

2.18 The Phase 2 Study uses the highways and public transport components from the GM models suite. Given reduced economic activity and proximity to the LDF start in FY 2011/12, available base year models provided an adequate reference case. For highways analysis for example, the recently developed 2009 Wigan version of the Greater Manchester Saturn Model as a proxy for 2011 avoided the need to identify (likely small) development changes between the model validation year and 2011. Therefore, the study concentrated on changes between 2011 and 2016 as a result of implementation of the LDF Core Strategy and supporting highway infrastructure changes.

3. Draft Core Strategy Housing and Employment Development

3.1 Wigan's LDF Core Strategy tabulates new housing and employment development proposals for 2008/9 to 2010/11 and then in five-year increments for the LDF period up to 2026. Following discussions between Wigan Borough Council and the Highways Agency, it was agreed that this work should concentrate on examination into the potential impacts of development proposals in the period up to 2016. Impacts in later years will be considered at the Land Allocations stage of the LDF development process.

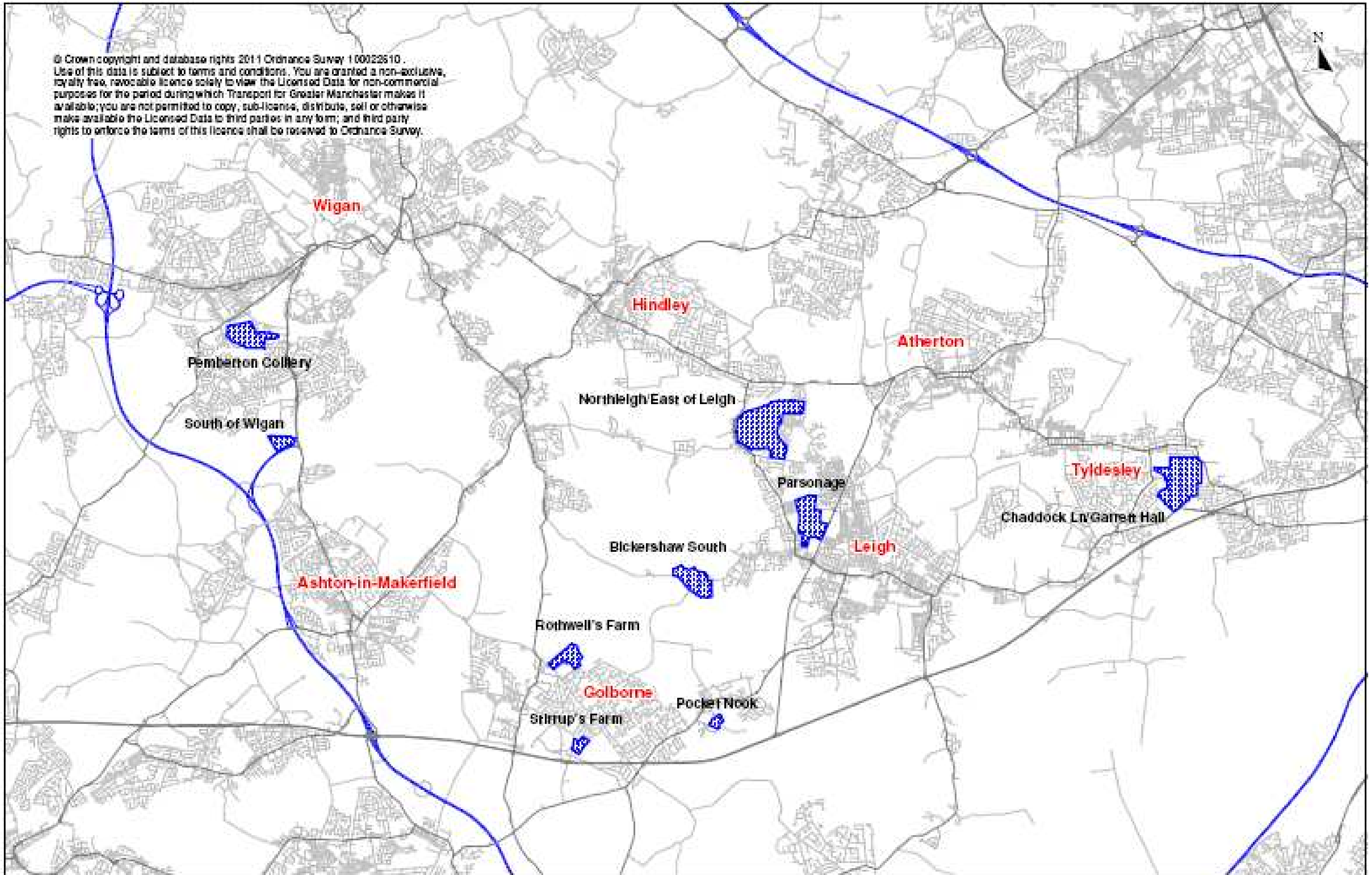
3.2 Table 3.1 shows the housing and employment sites included in the analysis along with the anticipated level of development by 2016.

Table 3.1 Draft Core Strategy – Assumed 2016 Site Development Schedule

Site Description	Development Description	TRICS Category	GFA (m^2) / Number of Units
Chaddock Lane / Garret Hall (EM1A 9 / SP4.3)	Offices	02/A	5,550
	Industrial Units	02/C	1,720
	Warehousing (Commercial)	02/F	2,580
Northleigh (SP3)	Housing – Privately Owned	03/A	530
Parsonage (EM1A 6)	Offices	02/A	13,750
	Industrial Units	02/C	8,850
	Warehousing (Commercial)	02/F	4,200
	Housing – Privately Owned	03/A	80
Bickershaw South (EM1G)	Housing	03/A	190
Pemberton Colliery (EM1A 30)	Housing	03/A	275
Pocket Nook (SP4.6)	Housing	03/A	100
Rothwell's Farm (SP4.6)	Housing	03/A	60
Stirrup's Farm (SP4.6)	Housing	03/A	90
South of Wigan M6 J25 (SP4.5)	Offices	02/A	5,000
	Warehousing (Commercial)	02/F	25,000

3.3 A number of sites included in the analysis, at Parsonage, Bickershaw South, Chaddock Lane and Pemberton Colliery, are sites designated in the adopted UDP. The only site in the draft LDF Core Strategy is the Northleigh site. The remaining developments are all broad locations for new development. In particular, the schedule of development in Table 3.1 includes development on three housing sites in the East Lancashire Road corridor. It is anticipated that the site(s) for housing development in this corridor will be selected from one or more of these three site options following further detailed examination into their suitability. For brevity, all are referred to as sites in the remainder of this report.

3.4 The locations of the sites are shown in Figure 3.1.



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Wigan LDF Core Strategy: 2016 Development Site Locations			
	Drawn By : E Atkinson	Scale : NTS	Date : July 2011	Figure 3.1

4. Wigan LDF Draft Core Strategy Transport Modelling

Overview

4.1 The modelling work undertaken for the Phase 2 Study was carried out to provide robust "first order" indications of the likely transport impacts of the traffic generated by the LDF development sites in 2016.

4.2 For highways, the process consisted of:

- Reviewing and improving the validation of motorway flows and journey times of the 2009 Wigan Inner Relief Route SATURN traffic model and reporting the findings
- Applying growth to create 2016 trip matrices based primarily on GMFM projections
- Estimating the trip generation and modal split of the LDF development sites using TRICS data
- Estimating the distribution of generated vehicle trips using the GMTU DEVTRIPS programme
- Updating the highway networks to 2016 by adding committed schemes
- Converging the models and reporting the results.

4.3 For public transport the process consisted of:

- Writing a public transport version of the DEVTRIPS programme, using generalised cost and distribution information from the GMPTE's GMSPM2-PT model
- Estimating LDF development site public transport demands using TRICS data
- Distributing the forecast trips using PT-DEVTRIPS
- Examining and reporting the site related public transport desire lines.

Highway Modelling

4.4 The development and calibration of the 2009 Wigan version of the Greater Manchester SATURN Model was completed in August 2010. The Wigan SATURN model is a variant of the Greater Manchester SATURN Model (GMSM) with network and zonal alterations to improve the representation of travel patterns in the Wigan area. It includes new origin-destination data collected at roadside interview survey sites in and around Wigan town centre during March 2010.

4.5 What follows provides an overview of the model and a summary of the key elements in its development. The development of the 2009 Wigan SATURN Model is fully documented in the Data Collection and Surveys Report (GMTU Report 1635, August 2010) and the Model Development and Validation Report (GMTU Report 1630, August 2010).

Model History

4.6 The Greater Manchester SATURN Model was originally developed in Summer 2006 as part of a suite of inter-connected models to support the Greater Manchester Transport Innovation Fund (TIF) bid. These models comprised:

- The Greater Manchester Strategy Planning Model, (GMSPM), which was developed by MVA and David Symonds Consultancy, and which provides forecast year travel demand matrices for the GMPT and SATURN models
- The Greater Manchester Public Transport model, (GMPT), which was developed by MVA and GMPTE, and which provides PT travel cost data for input to the GMSPM
- The Greater Manchester SATURN Model, (GMSM), which was developed by GMTU and MVA, and which provides highway travel costs for input to the GMSPM and link speeds for input to the GMPT model.

4.7 In addition to its role as a detailed traffic assignment model for the GMSPM, the GMSM is a source of traffic speed and flow data for input to the Atmospheric Emissions Inventory for Greater Manchester (EMIGMA). The model also forms the basis of the Unit's Development Trip Distribution model DEVTRIPS and provides inputs to the Accessibility Planning Model ACCESSION.

Model Coverage

4.8 Separate versions of the model are maintained for the morning peak hour 0800-0900, the evening peak hour 1700-1800 and an average inter-peak hour for the time period 1000-1530. Geographically, the model is focussed on Greater Manchester, although it does extend to cover all of Great Britain, albeit in less detail with increasing distance from the county boundary.

4.9 The modelled area for the standard GM Saturn Model is split into 993 zones, comprising 864 zones inside Greater Manchester, 84 of which lie within Wigan, and 129 zones outside the county. The zones inside the county are the most detailed, formed by splitting local authority wards into areas with similar trip making characteristics. The zones outside the county are generally larger, becoming increasingly large with increasing distance from the county boundary.

4.10 For the WIRR version of this model, zones within the Wigan Borough were checked and existing zones were disaggregated to better represent key traffic generators, such as town centre car parks and individual large retail / employment developments.

4.11 The additional zoning within the area of interest resulted in an increase in the number of zones in the WIRR SATURN model to 1083 analysis zones.

Model Components

4.12 The model has two main components comprising:

- highway networks, which represent the roads and junctions used by traffic and bus services
- trip matrices, which represent the demand for travel and the flow of vehicles between the zones in the model.

4.13 The **highway networks** that are used with the model represent all roads of traffic significance within Greater Manchester, including all motorways, A-roads and B-roads. The networks also include all of the yellow coloured roads on the Ordnance Survey's Landranger maps of the area, and all roads carrying known bus services. The network outside the county is represented in much less detail, and becomes increasingly less dense with increasing distance from the county boundary.

4.14 The **GMSM trip matrices** contain representations of all vehicle trips with an origin or destination inside Greater Manchester, and all external-to-external trips that cross the county boundary. The matrices also include partial representations of other external-to-external trips that do not enter Greater Manchester, but which are required by the GMSPM to produce generalised cost responses in the buffer network.

4.15 Separate matrices are maintained for car, Light Goods Vehicle (LGV) and Other Goods Vehicle (OGV) trips, for the morning peak hour (0800-0900), the evening peak hour (1700-1800) and an average inter-peak hour for the period 1000-1530.

LDF Modelling Validation Update

4.16 As a result of the model development work that took place during the spring and summer of 2010, the WIRR model already validated well on the all-purpose highway network in the Wigan borough. However, given that the Highways Agency is a key stakeholder in the development of a robust examination into the impacts of the draft LDF Core Strategy, it was considered important that the model also reflected traffic flows and journey times on the local motorways with a good degree of accuracy. The primary concern of the Highways Agency would be any potential impact that the LDF proposals could have on the motorway network, particularly the M6 as it passes through the Wigan borough.

4.17 To address any concerns about the ability of the model to reflect motorway flows and journey times, we updated the model demand matrices with a further round of matrix estimation, particularly concentrating on the validation of traffic flows and journey times on:

- Sections of the M6 lying in the Wigan borough between Junctions 24 and 27

- Sections of the M61 running close to and parallel with the Wigan borough boundary between Junctions 4 and 6.

4.18 Recent (2008 and 2009) ATC count data (split into the individual vehicle classes; car, LGV, OGV) from these sections of motorway was used for the updated matrix estimation exercise. Matrix estimation was run for the inter-peak, morning and evening peak-hour modelled time periods.

4.19 Detailed results from the updated model validation are contained in Appendix 1. However, it must be stressed that this information should be considered as a supplement to the information contained in the full model development and validation report (GMTU Report 1630, August 2010).

4.20 The additional run of matrix estimation using observed flow data on both the M6 and M61 motorways considerably improved the validation of motorway flows compared to the original Wigan model, while overall validation across Wigan generally remained unaffected and in some instances, actually improved.

4.21 The resulting journey time validation on both the M6 and M61 was good, with the majority of modelled journey times closely matching observed times in each of the three modelled time periods.

4.22 Following discussions with Wigan Borough Council and the Highways Agency, all parties agreed that the updated version of the 2009 Wigan SATURN model was a robust and reliable tool for this stage of the examination into the potential impacts of the Wigan LDF Core Strategy study.

5. Forecast Traffic Growth

Overview

5.1 For highway modelling, the convention is to use growth derived from the National Trip End Model (NTEM) projections via the TEMPRO programme. However, at the time that this work started, NTEM was under review by the Department for Transport's ITEA Division. NTEM dataset version 5.4, which was released in November 2008, was expected to remain the definitive version until at least April 2011.

5.2 In light of the uncertainty regarding NTEM and given that the then definitive set of forecasts (v5.4) predated the worst of the economic downturn, it was agreed that the GMFM projections should be adopted to estimate traffic growth.

Growth in Car Trips to/from Wigan

5.3 Traffic growth for trips in the Wigan district was estimated by using GMFM forecasts of housing and employment for the district as alternative planning data in Tempro. GMFM data is only available at the district level, so this was used as a control total, split between standard Tempro areas weighted by the standard Tempro housing and employment totals for each area. The resulting growth up to 2016 was averaged over origins and destinations and adjusted to reflect fuel price and income adjustments. The resulting growth factors are shown in Table 5.1.

Table 5.1 Wigan LDF (Phase 2b): GMFM Based Percentage Growth from 2009 to 2016 Within the Wigan District (By TEMPRO Zones)

TEMPRO Area	Morning Peak	Inter Peak	Evening Peak
Rural	15.6%	17.0%	16.0%
Leigh	15.7%	17.2%	15.9%
Abram	15.7%	16.6%	15.6%
Ashton-in-Makerfield	14.1%	15.4%	14.2%
Golborne	14.0%	15.3%	14.2%
Appley Bridge	13.5%	14.3%	13.3%
Shevington	15.2%	16.2%	15.2%
Aspull	13.4%	14.5%	13.3%
Tyldesley	14.0%	15.1%	14.0%
Hindley	15.4%	16.8%	15.6%
Atherton	16.3%	17.7%	16.5%
Wigan	13.6%	15.2%	13.9%
Standish	14.1%	15.4%	14.3%
Ince-in-Makerfield	13.5%	14.7%	13.6%
Orrell	14.3%	15.8%	14.5%

Growth in Car Trips For Trips to/from Other Districts within GM

5.4 Traffic growth for trips to/from other districts within Greater Manchester was again derived using GMFM estimates of housing and employment as alternative planning data within TEMPRO, but applied at a district level (Table 5.2).

Table 5.2 GMFM Housing & Employment Forecasts (2009 to 2016) by GM District

TEMPRO Area	Housing			Employment		
	2009	2016	Increase from 2009 to 2016	2009	2016	Increase from 2009 to 2016
Bolton	112,813	118,087	5,274	119,170	121,813	2,643
Bury	77,393	81,663	4,270	72,326	74,326	2,000
Manchester	209,186	230,759	21,574	323,943	361,260	37,318
Oldham	90,448	94,393	3,945	85,825	87,143	1,318
Rochdale	86,140	90,439	4,299	82,291	84,402	2,111
Salford	99,483	105,205	5,722	126,823	134,883	8,060
Stockport	124,281	131,041	6,760	149,302	154,788	5,487
Tameside	94,452	101,021	6,569	78,163	77,897	-266
Trafford	94,627	101,045	6,418	131,178	141,105	9,926
Wigan	132,718	141,036	8,318	111,191	114,159	2,969
Total	1,121,541	1,194,689	73,148	1,280,211	1,351,776	71,565

5.5 The growth factors for origins and destinations were averaged and subsequently adjusted to reflect fuel price and income adjustments to 2016. The final growth factors applied for each district (excluding Wigan) within Greater Manchester are shown in Table 5.3.

Table 5.3 GMFM Based Percentage Traffic Growth (to 2016) in Other GM Districts			
District	**AM**	**IP**	**PM**
Bolton	13.0%	13.5%	13.0%
Bury	13.5%	14.0%	13.4%
Manchester	22.6%	20.8%	21.6%
Oldham	14.2%	14.9%	14.4%
Rochdale	15.0%	16.1%	15.3%
Salford	16.2%	16.2%	16.0%
Stockport	14.7%	15.5%	14.9%
Tameside	13.5%	14.5%	13.9%
Trafford	16.3%	15.6%	15.9%

Growth in Car Through-Trips

5.6 While the GMFM provides a good estimate of growth in trips to, from and within Greater Manchester and the wider City Region, it would not be appropriate to apply the same growth to trips (specifically road traffic) passing through Greater Manchester on, for example, the motorway network.

5.7 For trips between origins and destinations outside of Greater Manchester, NTEM-based trip rates for the Northwest region were generated using TEMPRO and were adjusted for forecast changes in fuel prices and income up to 2016. This resulted in growth rates to 2016 of 14.6% for the morning peak hour, 15.4% for the inter-peak hour and 14.7% for the evening peak hour.

Growth in Goods Vehicle Traffic

5.8 As neither GMFM nor TEMPRO produce growth rates for goods vehicles, National Transport Model (NTM) growth rates were applied to estimate growth to 2016.

5.9 The growth for rigid goods vehicles from 2009 to 2016 is approximately 4%, whilst the growth in articulated good vehicle traffic is significantly lower at 0.5%.

5.10 The NTM does not detail growth in Light Goods Vehicle traffic. The level of growth for Light Goods Vehicles was approximated from modelling work undertaken for the latest Greater Manchester Local Transport Plan (LTP3). The level of LGV growth within GM was derived using the Greater Manchester Strategy Planning Model and approximated to 15% in all time periods.

Final 2016 Matrices

5.11 The final 2016 matrices were created by adjusting the growth in general traffic downwards, such that when the traffic generated by the LDF development sites was added into the matrices, growth remained as forecast by the processes outlined above. This is a standard technique applied by GMTU and it avoids potential double-counting of the impact of traffic growth related to specific development sites. Table 5.4 shows total trips by vehicle type in the 2009 matrices, in the downward adjusted 2016 matrices (referred to as Baseline) and the final 2016 matrices including all traffic generate by the LDF development sites.

Table 5.4 Baseline and With-Strategic Locations Total Trips (3 user Classes)

Time Period	Scenario	Car	LGV	OGV	Total
AM	2009 Base	1219875	39831	31384	1291090
	2016 Baseline	1395689	45737	32201	1473627
	2016 With Strategic locations	1396835	45795	32272	1474902
PM	2009 Base	1119367	34618	15940	1169925
	2016 Baseline	1281879	39745	16331	1337955
	2016 With Strategic locations	1282998	39799	16370	1339167

6. LDF Development Site Trip Generation and Mode Choice

Person Trip Rates and Trip Generation

6.1 Following the methodology agreed with Wigan Borough Council and the Highways Agency, GMTU calculated the person trip generation of each of the LDF Development Sites using trip rates consistent with rates agreed for wider application in the examination of draft Core Strategy proposals across Greater Manchester.

6.2 These trip rates were derived from data in the TRICS Database. TRICS is the standard system of trip generation and analysis used in the UK. It is a database system that allows users to establish potential levels of trip generation for a wide range of development and location scenarios, and is widely used as part of the planning application process by both developers' consultants and local authorities.

6.3 Following the agreements reached as part of the development of LDF proposals for other Greater Manchester districts, the TRICS analysis consisted of a "blanket" assessment, selecting all available sites for a particular land use regardless of location. This approach was intended to provide a set of statistically robust trip rates and to ensure that a consistent assessment approach was applied to all developments.

6.4 For Wigan's Development Sites, trip rates were required for the following four land use categories (the number of sites used in the TRICS assessment is shown in brackets):

- Housing - Privately Owned (81 sites)
- B1 Office Development (58 sites)
- B2 Industrial Units (16 sites)
- B8 Warehousing (5 sites).

6.5 The agreed generic trip rates applied to the Wigan LDF Development Sites are summarised in Table 6.1 below.

Table 6.1 GM Agreed LDF Core Strategy Person Trip Generation Rates by Land-Use

Use Class	Land Use	TRICS Category	Morning Peak		Evening Peak	
			In	Out	In	Out
C3	Housing –Privately Owned	03/A	0.243	0.871	0.616	0.379
B1	Office	02/A	2.269	0.250	0.263	2.023
B2	Industrial Units	02/C	0.412	0.090	0.055	0.365
B8	Warehousing (commercial)	02/F	0.244	0.069	0.088	0.259

Note: Rates are person trip rates per 100 m^2 GFA for employment uses and per Unit for residential uses

Mode Choice Estimates

6.6 These trip rates were used to calculate the total number of person trips that would be generated by each of the development sites. However, a critical element in the forecasting was the determination of the modal split of trips generated by anticipated development on the sites.

6.7 Again, following a method agreed with Wigan Borough Council and the Highways Agency, GMTU used the TRICS trip generation database to determine the modal splits for a variety of land-use types. In this case, the impact of location on mode choice was explored and incorporated into the mode choice estimate.

6.8 We estimated the likely split between transport modes of new trips generated by the land-uses proposed for the LDF Development Sites to determine the proportion of the total site person trip generation arriving/departing:

- By public transport (bus, rail, Metrolink)
- As pedestrians or cyclists
- As occupants of a private vehicle.

6.9 Differentiating between modes required the use of TRICS multi-modal surveys. While the number of such surveys available on TRICS is increasing, poor sample size can be a problem, particularly when trying to subdivide land use types using locational characteristics.

6.10 Due to the small number of multi-modal sites in some land use categories and in order to minimise the number of sub divisions between categories, where possible we combined sites with different locational characteristics. However, this was only done where the modal split characteristics were found to be similar.

6.11 For each land-use, the split of all vehicles between heavy goods/ public service vehicles and cars/light goods vehicles was also estimated.

6.12 Table 6.2 shows the estimated percentage mode split of person trips for the land-uses types shown above and for a variety of site location categories (based on TRICS standard site location categories).

Table 6.2 Draft Core Strategy Development Mode Split Assumptions by Land Use / Location

Time Period	Land Use		Location	PT	Walk / Cycle	Vehicles	Total
Morning Peak	C3 Housing – Privately Owned	03/A	Town Centre	7.2	19.1	73.7	100.0
			Edge of Town Centre	7.2	19.1	73.7	100.0
			Suburban Area	3.6	20.2	76.2	100.0
			Edge of Town	3.6	20.2	76.2	100.0
	B1 Office	02/A	Town Centre	48.2	20.4	31.4	100.0
			Edge of Town Centre	30.3	19.3	50.4	100.0
			Suburban Area	20.0	9.2	70.8	100.0
			Edge of Town	7.0	7.1	85.9	100.0
	B2 Industrial Units	02/C	Town Centre	1.2	12.1	86.7	100.0
			Edge of Town Centre	1.2	12.1	86.7	100.0
			Suburban Area	1.0	12.1	86.9	100.0
			Edge of Town	0.6	5.5	93.9	100.0
	B8 Warehousing commercial	02/F	Town Centre	1.9	8.1	90.0	100.0
			Edge of Town Centre	1.9	8.1	90.0	100.0
			Suburban Area	1.9	8.1	90.0	100.0
			Edge of Town	1.9	8.1	90.0	100.0
Evening Peak	C3 Housing – Privately Owned	03/A	Town Centre	4.8	24.3	70.9	100.0
			Edge of Town Centre	4.8	24.3	70.9	100.0
			Suburban Area	2.4	14.9	82.7	100.0
			Edge of Town	2.4	14.9	82.7	100.0
	B1 Office	02/A	Town Centre	51.1	22.4	26.5	100.0
			Edge of Town Centre	30.3	18.8	50.9	100.0
			Suburban Area	18.8	9.9	71.3	100.0
			Edge of Town	7.0	8.0	85.0	100.0
	B2 Industrial Units	02/C	Town Centre	8.0	11.6	80.4	100.0
			Edge of Town Centre	8.0	11.6	80.4	100.0
			Suburban Area	0.8	10.1	89.1	100.0
			Edge of Town	1.8	7.5	90.7	100.0
	B8 Warehousing commercial	02/F	Town Centre	0.3	4.0	95.7	100.0
			Edge of Town Centre	0.3	4.0	95.7	100.0
			Suburban Area	0.3	4.0	95.7	100.0
			Edge of Town	0.3	4.0	95.7	100.0

6.13 Each site's location was classified as follows (using standard TRICS location categories, Table 6.3) to determine the mode choice split applied and the resulting site person trip generations by access mode are shown in Table 6.4.

- Chaddock Ln/Garret Hall (EM1A 9 / SP4.3) – Suburban Area
- Northleigh (SP3) – Suburban
- Parsonage (EM1A 6) – Edge of Town Centre
- Bickershaw South (EM1G) – Edge of Town
- Pemberton Colliery (EM1A 30) – Suburban Area
- Pocket Nook (SP4.6) – Edge of Town
- Rothwell's Farm (SP4.6) – Edge of Town
- Stirrup's Farm (SP4.6) – Edge of Town
- South Wigan M6 J25 (SP4.5) – Edge of Town.

Table 6.3 TRICS Location Definitions	
Town Centre	Within the central core area of the heart of the town/city (e.g. the primary shopping area), as defined in the local development plan (if appropriate).
Edge of Town Centre	For retail, a location within easy walking distance (i.e. up to 300 metres) of the central primary shopping area, often providing parking facilities that serve the centre as well as the site, thus enabling one trip to serve several purposes. For other uses, the edge-of-centre radius from the town/city centre may be more extensive, based on how far people would be prepared to walk. For offices this may be outside the town centre but in the urban area within 500m of a public transport interchange. Local topography and barriers will affect pedestrians' perceptions of easy walking distance. Examples of barriers include crossing major roads and car parks. The perceived safety of the route and strength of the attraction of the town centre are also relevant.
Suburban Area	An area outside the edge of the town/city centre, but not at the town/city's physical edge. This can encompass a wide range of physical locations within a town/city. Suburban Area sites can range from busy built-up areas near the centre of town (but outside of the Edge of Town Centre radius), to leafy suburbs far from the centre. Due to their range, Suburban Area sites can also have a wide range of location sub-categories.
Edge of Town	At the physical edge of the town/city, where the town/city meets the countryside. The actual physical distance from the site to the beginning of the countryside can vary proportionately to the size of the town/city.

Table 6.4 Draft Core Strategy Site Trip Generation Summary – 2016 Two Way Person Trips

Site / Location	Total Person Trips		PT Trips		Walk / Cycle Trips		Vehicle Trips	
	AM	PM	AM	PM	AM	PM	AM	PM
Chaddock Ln/Garret Hall (EM1A 9 / SP4.3)	157	143	28	24	15	14	114	105
Northleigh (SP3)	590	527	21	13	119	79	450	435
Parsonage (EM1A 6)	493	446	112	102	90	83	291	261
Bickershaw South (EM1G)	212	189	8	5	43	28	161	156
Pemberton Colliery (EM1A 30)	306	274	11	7	62	41	233	226
Pocket Nook (SP4.6)	111	100	4	2	23	15	84	83
Rothwell's Farm (SP4.6)	67	60	2	1	14	9	51	50
Stirrup's Farm (SP4.6)	100	90	4	2	20	13	76	75
South Wigan M6 Junction 25 (SP4.5)	204	201	39	35	30	24	135	142

6.14 All trip rates and mode choice splits used for this analysis were reviewed and approved by the Highways Agency and their consultant, JMP Consultants Ltd.

6.15 It is clear from this table that there is considerable variation in the proportion of public transport trips generated by each of the sites. For instance, just over 22% of the person trip generation of the Parsonage site is expected to use public transport during the morning peak hour, whereas only 4% of trips generated by the Pemberton Colliery site would be made by public transport.

6.16 It is important to stress that the mode choices shown in Table 6.4 are based on observations (from the TRICS database) at similar sites throughout the UK. Clearly, these mode choices could be influenced and improved by Travel Plan measures designed to encourage wider use of public transport, brought forward as part of the development of the sites.

7. LDF Development Site Trip Distribution

7.1 The distribution of trips generated by the Wigan LDF Development Sites was estimated using GMTU's DEVTRIPS programme for highway trips and a new PT-DEVTRIPS program for public transport trips.

Highway Trips – DEVTRIPS

7.2 Given estimates of the numbers of vehicles entering and leaving a planned development, DEVTRIPS estimates their origins and destinations, the modelled trip lengths and modelled turning movements at selected junctions in the highway network.

7.3 The program can be used to model car and commercial vehicle trips made during the morning and evening peak hours (and an average inter-peak hour) for six development types:

- Retail
- Office/'High Tech' Business
- Industrial
- Education
- Leisure
- Residential.

7.4 DEVTRIPS uses user-supplied estimates of the numbers of trips entering and leaving the development to create synthetic matrices of generated trips. These matrices are 994 zone vehicle trip matrices, based on the zoning system developed for the Greater Manchester Saturn Model (but as the WIRR model used for this study is a derivative of that model, the results can be readily adjusted to the 1083 zoning system). Within the matrices, zones 1 to 993 correspond to zones in the GMSM, whilst zone 994 represents the development site.

7.5 The matrices are built using a catchment area technique. Briefly, this is a two- stage process that involves coding a representation of the site into the present day highway network and using the assignment model to allocate zones to a series of five-minute travel bands from the site.

7.6 Trips are split between the zones in the travel bands using zone based demographic data from two sources:

- 2001 Census of Population
- 2005 GMSM trip matrices.

7.7 The type of data that is used in this procedure depends on the type of development and the time period that is being modelled, but includes information such as the number of car owning households in each zone and the number of car driver journey to work trips beginning in each zone.

7.8 Trips are split pro-rata to the attribute value of each zone expressed as a fraction of the total attribute value of the travel band in which the zone lies.

Public Transport Trips – PT-DEVTRIPS

7.9 PT Devtrips was developed by GMTU to model the distribution of public transport trips generated by new development proposals within Greater Manchester. The application was written to assist with modelling public transport trips for the Greater Manchester Local Development Framework (LDF) core strategies, and the impacts of the newly generated trips on the local transport network.

7.10 Given estimates of the numbers of trips to and from a planned development site, PT Devtrips can be used to model the origin and destination zones of the generated trips.

7.11 The public transport version of the Devtrips program can be used to model the spatial distribution of public transport generated trips for the same land-use types and time periods as the highway version of the program.

7.12 The program uses user-supplied estimates of the numbers of trips to and from the development site to create synthetic matrices of generated trips. The output matrices are saved as 1141 zone person trip matrices, compatible with GMPTE's public transport model zoning system. Within the matrices, zones 1 to 1140 correspond to zones in the public transport model, whilst zone 1141 is used to represent the new development site.

7.13 The matrices are built using a catchment area technique with the following four-stage process that involves:

- Using generalised cost data from GMPTE's PT model to determine the travel cost from the new development to each of the zones in the modelled area
- Allocating the zones to a series of 10 minute travel bands from the site
- Estimating the proportion of trips to and from each of the travel bands using calculated trip cost distributions for associated 'parent zones'
- Distributing the trips to and from each of the travel bands amongst their constituent zones using zonal attribute data that reflects the level of activity in each zone.

8. Infrastructure Assumptions

Committed Schemes

8.1 For the modelled area as a whole, there is a need to represent in the highway network those highway schemes assumed open to traffic by 2016.

8.2 The Government's Comprehensive Spending Review, which reported in October 2010, identified a number of major highway and public transport schemes likely to be progressed over the next four years. In addition, there are a number of local highway schemes that are also likely to be completed during this period.

8.3 Following consideration of the CSR and other documents, the following highway schemes were assumed to be "committed" at 2016:

- M60 J12-15 widening
- M60 J8-J12 MMS
- M62 J18-20 MMS
- A556 realignment/improvement
- Alderley Edge Bypass (opened 2010)
- Blue (M56 J6) and Yellow Works (Runger Lane/Thorley Lane realignment/improvement) (Manchester Airport Western Approach Roads).

8.4 It is worth noting that none of these schemes are likely to have any material impact on the Wigan Borough so the composition of this list would not be expected to have any impact on the results of the analysis described later in this report.

8.5 On the local network within Wigan, Wigan Borough Council specified two schemes that they expected to be completed by the 2016 forecast year; the Wallgate – Pottery Road Diversion (Saddle Junction Link Road); and the A579 Atherleigh Way – A578 Wigan Road Parsonage Link.

8.6 Within the PT model, the public transport schemes to be included at 2016 included:

- Metrolink to Chorlton and to East Didsbury
- Metrolink to Droylsden and Ashton
- Metrolink to Rochdale and Oldham
- Metrolink to Manchester Airport
- Rochdale Bus Station
- Altrincham Interchange

- Bolton Interchange.

Development Access Arrangements

8.7 For the purposes of this study, each key strategic site was represented by a single development "zone", with a limited number of loading points for traffic entering and leaving the zone from the adjacent road network.

8.8 Following consultation with Wigan Borough Council, the following loading points were assumed for each of the Key Strategic Sites:

- **Chaddock Lane/ Garret Hall (EM1A 9 / SP4.3)** - Access from A572 Chaddock Lane in the vicinity of Chaddock Lane farm
- **Northleigh (SP3)** - Access from A578 Leigh Road midway between junctions with B5237 Smiths Lane and A577 Atherton Road
- **Parsonage (EM1A 6)** - Access from the A579 Atherleigh – A578 Wigan Road link (i.e. Parsonage Link Road)
- **Bickershaw South (EM1G)** - Access from Plank Lane (south side) in the vicinity of Bickershaw Lane
- **Pemberton Colliery (EM1A 30)** - Access from Smithy Brook Road and Little Lane
- **Pocket Nook (SP4.6)** - Access from A572 Newton Road (south side) via Pocket Nook Lane
- **Rothwell's Farm (SP4.6)** - Access from B5207 Lowton Road (north side) to the south of its junction with A573 in the vicinity of Rothwell's Farm
- **Stirrups Farm (SP4.6)** - Access from Stone Cross Lane (east side) to the south of its junction with Stone Cross Lane North
- **South Wigan M6 Junction 25 (SP4.5)** - Access (in only) from western side of A49 Warrington Road midway between M6 Junction 25 roundabout and Worthington Way; exit only via Wheatlea Road / Forton Road / Worthington Way junction.

9. Anticipated Network Performance

Overall Network Performance

9.1 Table 9.1 summarises network wide summary statistics for the 2009 Base and 2016 Wigan LDF scenarios for the morning and evening peak hours. The statistics relate to the whole of the SATURN model simulation area i.e. the whole of Greater Manchester.

9.2 The anticipated growth in traffic over the five-year period is anticipated to increase total travel time by all vehicles on the road network by 22 to 23%, and total travel distance by 12%.

Table 9.1 Wigan LDF Draft Core Strategy – 2016 Network-wide Summary Statistics

Peak Hour	Scenario	Transient Queues (A)		Over Capacity Queues (B)		Cruise Time (C)		Travel Time (A+B+C)		Travel Distance		Average Speed	
		(pcu.hrs)	% Change	(pcu.hrs)	% Change	(pcu.hrs)	% Change	(pcu.hrs)	% Change	(pcu.km)	% Change	(kph)	% Change
AM	2009 Base	31,277	-	6,806	-	75,067	-	113,150	-	4,049,960	-	35.8	-
	2016 LDF	39,155	25.2%	12,224	79.6%	86,698	15.5%	138,077	22.0%	4,535,946	12.0%	32.9	-8.1%
PM	2009 Base	30,881	-	7,936	-	72,724	-	111,542	-	4,097,127	-	36.7	-
	2016 LDF	39,719	28.6%	14,371	81.1%	83,915	15.4%	138,006	23.7%	4,592,323	12.1%	33.3	-9.3%

Traffic Flows Impacts - Overview

9.3 The following section describes the distribution of highway traffic to/from each of the sites onto the highway network for each site in turn. This is based on the distribution of traffic estimated using DEVTRIPS (described earlier in this report). Figures 9.1 – 9.18 in Appendix 2 show the percentage traffic distribution for each development site during the morning and evening peak hours.

9.4 **Northleigh** (Figures 9.1 – 9.2): During the morning peak hour, the majority of the development traffic uses A578 Leigh Road to the north of the site (58% outbound and 68% inbound) while 14% uses Bickershaw Lane. The remainder goes towards Leigh via A578 and Nel Pan Lane. Similarly, in the evening peak hour, the majority of the site traffic again goes to/from the north on A578 Leigh Road (58% outbound and 60% inbound). Around 10% of traffic uses Bickershaw Lane, with the remainder going to/from Leigh using A578 and Nel Pan Lane.

9.5 **Bickershaw South** (Figures 9.3 – 9.4): During the morning peak hour, the majority of traffic generated by Bickershaw South goes to/from the east on Plank Lane towards Leigh (65%) while the remaining traffic (35%) goes to the west to/from Golborne and Lowton. The distribution of evening peak hour traffic is very similar, although a higher proportion of the traffic comes from / goes to the west (about 75%).

9.6 **Pemberton Colliery** (Figures 9.5 – 9.6): During the morning peak hour about 55% of the Pemberton Colliery traffic uses A571 Billinge Road with 35% heading to/from Wigan town centre. The remaining traffic uses A49 Warrington Road mostly heading south. In the evening peak hour, the majority of traffic (77%) enters the site from Warrington Road.

9.7 **Pocket Nook** (Figures 9.7 – 9.8): During the morning peak hour, about 70% of the traffic generated by this site goes to/from the northeast on A572 Newton Road, with the remainder travelling southwest on the A580 East Lancashire Road. During the evening peak hour, the split is roughly the same with about 65% and 35% of traffic going to/from the northeast and southwest respectively.

9.8 **Rothwell's Farm** (Figures 9.9 – 9.10): During the morning peak hour, about 60% of the traffic generated by the Rothwell's Farm site goes to/from the south on B5207 Golborne Road, with 40% going to/from A580 East Lancashire Road via its junction with Stone Cross Lane. About 30% of traffic goes to/from the north using Lowton Road. During the evening peak hour, about 45% of traffic goes to/from the south, with about 30% using the A580 East Lancashire Road and the remainder using A573 Church Street, Ashton Road and Wigan Road.

9.9 **Stirrups Farm** (Figures 9.11 – 9.12): During the morning peak hour, 56% of the traffic generated by this site uses Stone Cross Lane North and the A580 East Lancashire Road, with the remainder going west and north via Nook Lane (33%) and Cross Lane (12%). The evening peak hour distribution of Stirrups Farm traffic is much the same as the morning peak hour distribution.

9.10 **South of Wigan (M6 Junction 25)** (Figures 9.13-9.14): During the morning peak hour, about 55% of the development site traffic goes to/from the south, mostly using the M6. The remaining 45% of the traffic goes to/from the north via B5238 Poolstock Lane or A49 Warrington Road. During the evening peak hour, the distribution of traffic entering/leaving this site is much the same as the morning peak hour distribution.

9.11 **Chaddock Lane / Garret Hall** (Figures 9.15-9.16): During the morning peak hour, about 65% of the traffic enters/departs the site using the A580 East Lancashire Road, mostly to/from the east. The remaining traffic arrives/departs from the east (about 15%) and west (about 15%) using A572 and Prince's Avenue. During the evening peak hour, about 60% of the development traffic arrives/departs from the east and west using A572, while about 40% uses the East Lancashire Road (mostly to/from the east).

9.12 **Parsonage** (Figures 9.17 – 9.18): During the morning peak hour the majority of the development traffic uses A579 Atherleigh Way, with about 10% to/from the south, and 56% (outbound) and 44% (inbound) to/from the north. About 20% of the traffic goes to/from the site from Leigh using A572 Twist Lane, while 17% is from the north, using A578 Wigan Road. The evening peak hour distribution is similar to the morning peak hour distribution.

Junction Performance

9.13 The worst performing signal controlled and roundabout junctions (or severely overcapacity) junctions in the 2009 Base and 2016 scenarios were identified using the following criteria:

- Approaching capacity (shown on diagrams in blue) – V/C between 85% and 100%
- Over capacity (shown on diagrams in red) – V/C over 100%

9.14 The V/C percentage is the ratio of the actual volume of traffic divided by the maximum capacity for individual turning movements at a junction. A turning movement is considered to be approaching capacity when the V/C exceeds 85% and is over capacity when the V/C exceeds 100%, resulting in permanent queuing and delay.

9.15 **2009 Base** (Figures 9.19 – 9.20): There are 30 overcapacity signalised junctions and 5 overcapacity roundabouts in the morning peak hour, while during the evening peak hour there are 27 over capacity signalised junctions and 10 overcapacity roundabouts. In both cases these junctions are spread across the Wigan borough with clusters in the main urban centres such as Wigan town centre, Leigh and Atherton. A number of the over-capacity junctions are common to both the morning and evening peak hours, including:

- A580 East Lancashire Road junctions with A577 Mosley Common Road, A572 Chaddock Lane, A574 Warrington Road, B5207 Church Lane and A573 Warrington Road
- A577 Manchester Road / A5082 Hough Lane, Tyldesley
- A6 Manchester Road / A5082 Armitage Avenue, Little Hulton
- A577 Tyldesley Road / Hamilton Street
- A579 Atherleigh Way / B5235 Lovers Lane
- A577 Wigan Road / B5235 Lovers Lane
- A577 Atherton Road / A578 Leigh Road
- A577 Atherton road / A58 Liverpool Road

- A49 Warrington Road / Worthington Way
- A49 Warrington Road / B5238 Poolstock Lane
- B5238 Poolstock Lane / St Paul's Avenue / Carr Lane
- A49 Wallgate / Pottery Road
- A49 Central Park Way / Greenough Street
- A49 Preston Road /A5209 School Lane / B5239 Rectory Lane.

9.16 Some of the above junctions are only over capacity on a single turning movement, whereas others are over capacity on one or more arms. The majority of the capacity issues appear to be on the main highway links through the Wigan district including the A580, A49 and A577.

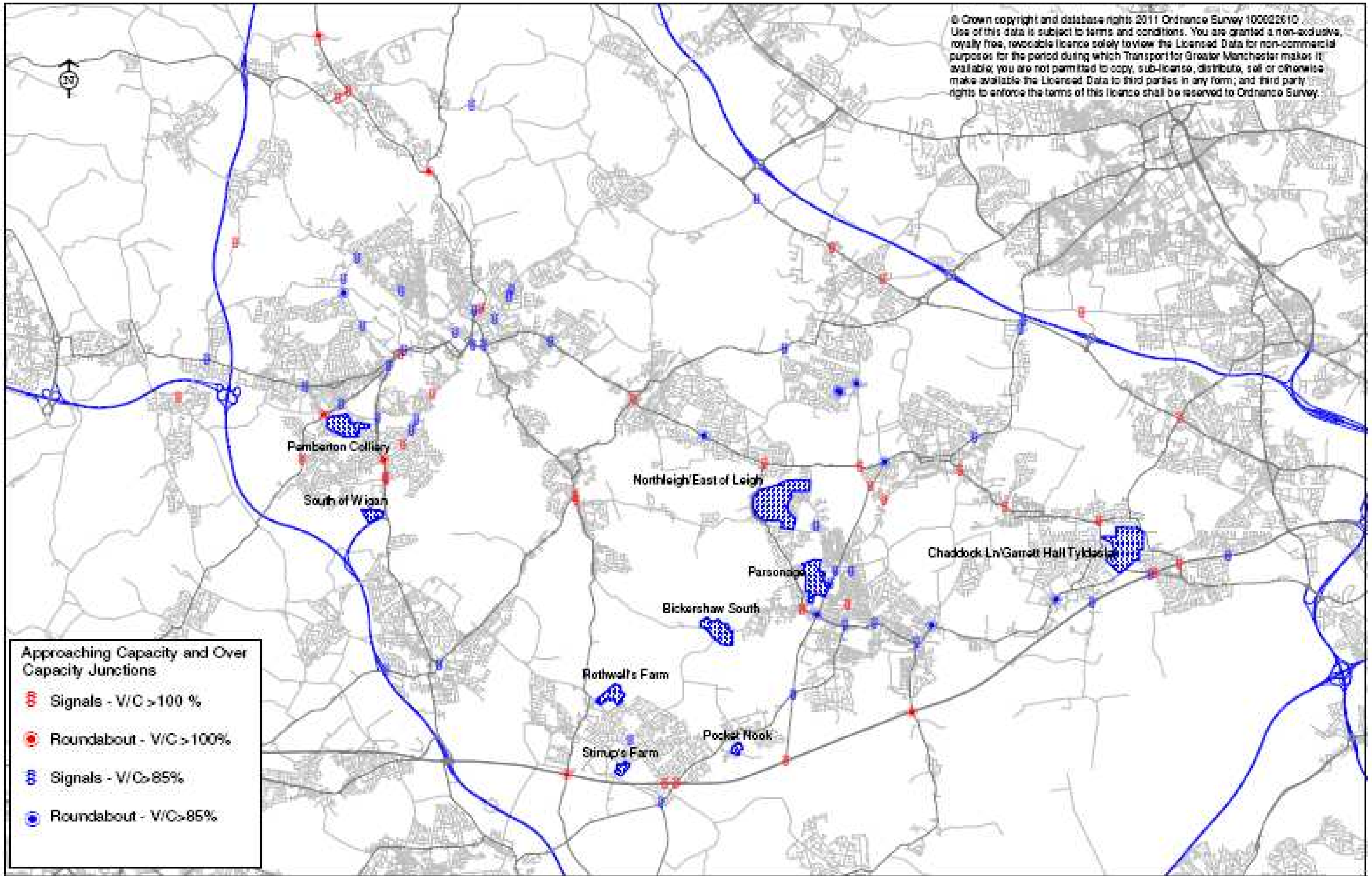
9.17 **2016 Forecast** (Figures 9.21 – 9.22): Overall the junction performance plots suggest that the inclusion of the development traffic from the LDF development sites and the growth in background traffic does not have a large detrimental impact during the 2016 morning and evening peak hours. Despite the increase in traffic volumes, there are still 30 overcapacity signalised junctions in the morning peak hour. This is partly because the green time at all the signalised junctions has been optimised in the SATURN model to maximise capacity. In reality, this is likely to be achieved by the wider introduction of SCOOT and MOVA control at groups of junctions or at single isolated junctions, which will offset at least some of the potential deterioration cause by the additional traffic in 2016.

9.18 A further five roundabouts are forecast to be operating over-capacity by the 2016 morning peak hour, including the roundabouts at the junctions of A579 Atherleigh Way / A572 Twist Lane, A572 Manchester Road / Holden Road / Green Lane, and A579 Atherleigh Way / A577 Wigan Road.

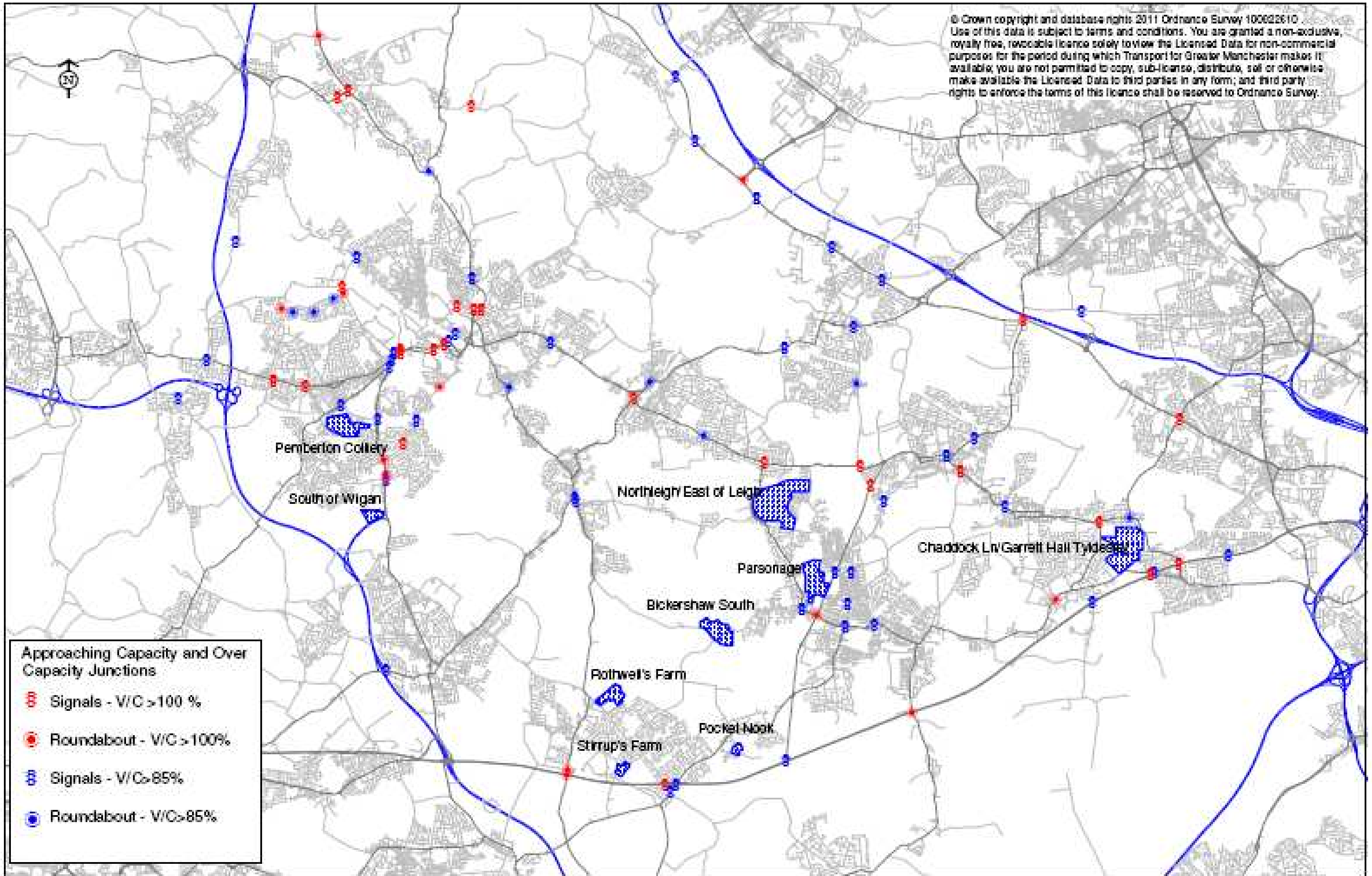
9.19 During the 2016 evening peak hour there are anticipated to be 32 over-capacity signal controlled junctions and 14 over-capacity roundabouts, representing a slight deterioration in junction performance compared to the 2009 Base. Junctions of particular note that are anticipated to suffer a deterioration in performance include:

- A580 East Lancashire Road / B5258 Newearth Road
- A580 East Lancashire Road / A572 Newton Road
- A577 Tyldesley Road / Shakerley Road
- A573 Warrington Road / B5237 Bickershaw Lane
- A49 Warrington Road / A577 Ormskirk Road

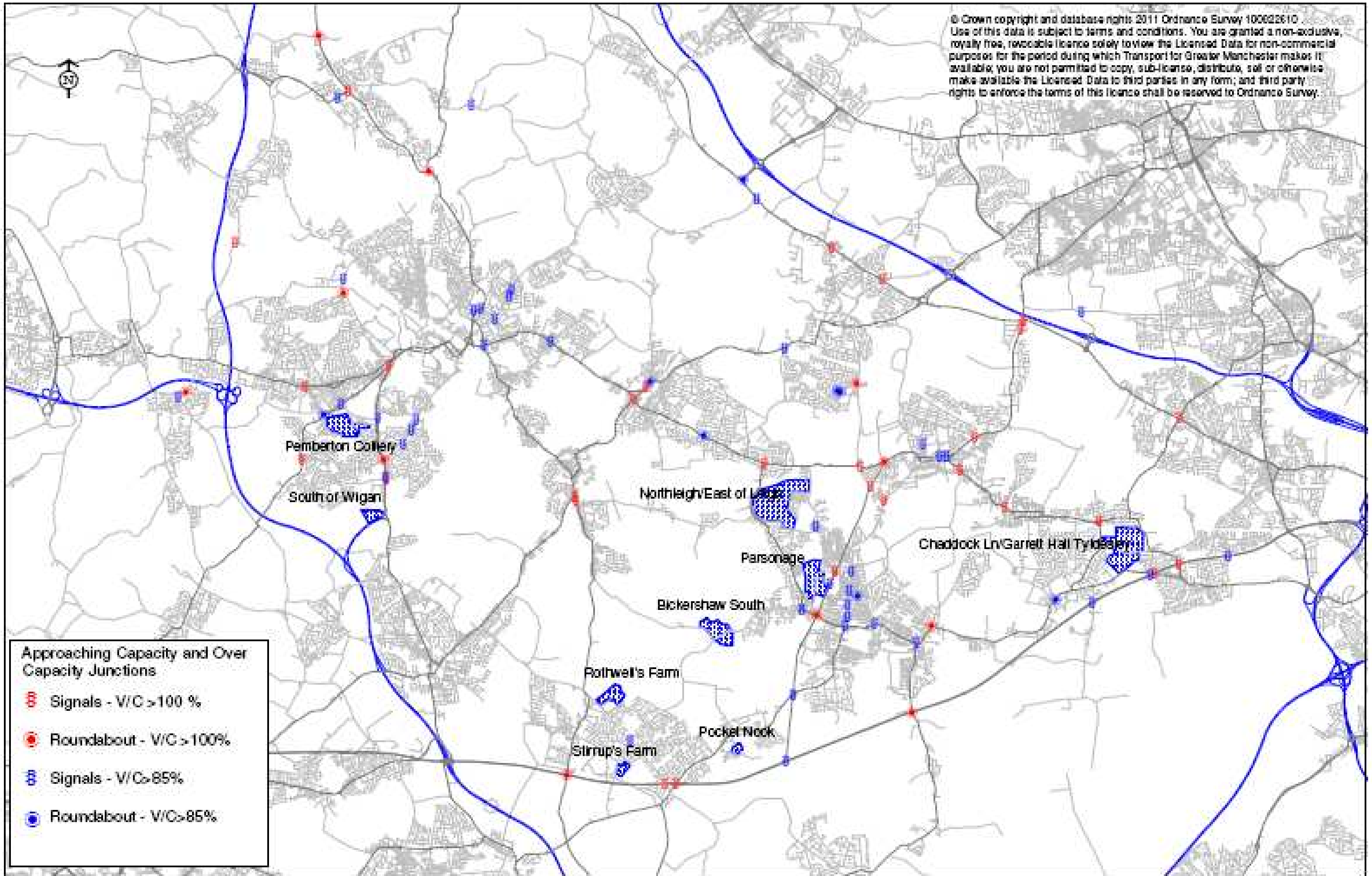
9.20 In a number of cases, the deterioration in performance at junctions can be attributed to the wider growth in background traffic rather than to the traffic generated by the LDF sites. This is discussed in more detail later in this chapter.



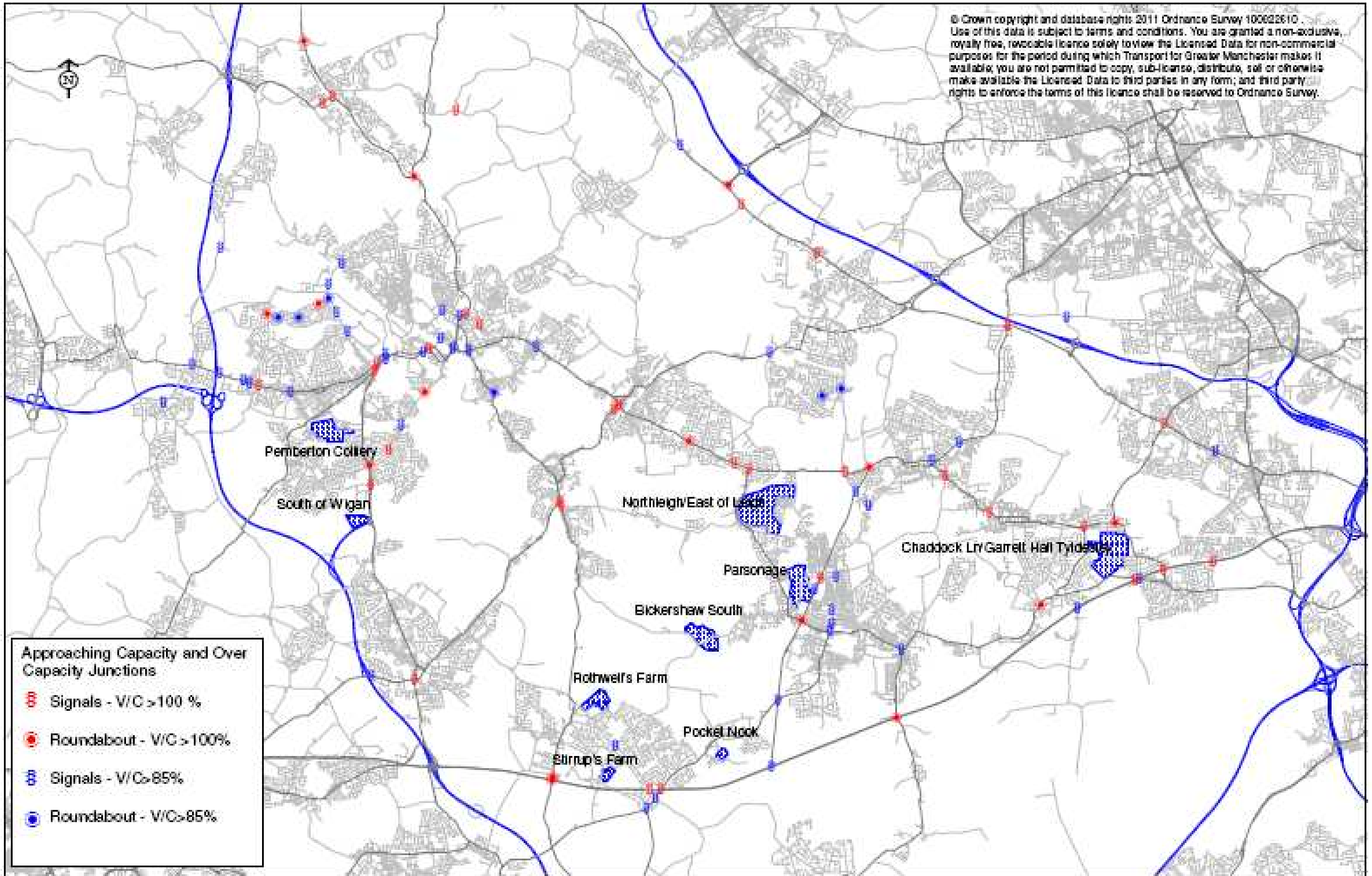
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Wigan LDF 2009 Base - AM Peak-hour: Approaching and Over Capacity Junctions			
	Drawn By : E Atkinson	Scale : NTS	Date : June 2011	Figure 9.19



Transport for Greater Manchester, 2 Piccadilly Place, Manchester, M1 3BG	Wigan LDF 2009 Base - PM Peak-hour: Approaching and Over Capacity Junctions			
	Drawn By : E Atkinson	Scale : NTS	Date : June 2011	Figure 9.20



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Wigan LDF 2016 Forecasting - AM Peak-hour: Approaching and Over Capacity Junctions			
	Drawn By : E Atkinson	Scale : NTS	Date : June 2011	Figure 9.21



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Wigan LDF 2016 Forecasting - PM Peak-hour: Approaching and Over Capacity Junctions			
	Drawn By : E Atkinson	Scale : NTS	Date : June 2011	Figure 9.22

LDF Development Site Traffic Impact

9.21 Figures 9.23 and 9.24 show where the development traffic from the LDF development sites has the most impact. The plots identify roads in Wigan where traffic generated by the LDF development sites makes up 5% or more of the total flow in the 2016 morning and evening peak hours.

9.22 Not surprisingly, it is clear from both the morning and evening peak hour plots that the roads with the most significant proportion of development traffic are close to the development sites. In particular, a significant proportion of the traffic on Plank Lane (up to 30% in both peak hours) is generated by the Bickershaw South, Parsonage and Northleigh sites. Development traffic on A578 Wigan Road is forecast to comprise between 10% and 15% of the total flow during the morning and evening peak hours respectively, again mostly generated by the Northleigh and Parsonage sites. The development traffic from Northleigh also increases traffic flow on B5237 Bickershaw Lane by about 10% (westbound direction) during the morning peak hour and by about 8% (in both directions) during the evening peak hour.

9.23 Traffic generated by the development sites accounts for about 10-15% of the traffic on the main roads in Golborne and Lowton. The development traffic is also forecast to contribute 5-10% (northwest bound) during the morning peak hour and 10-15% in the opposite direction during the evening peak of the total flow on B5207 Church Lane.

9.24 Development traffic generated by the South of Wigan (M6 Junction 25) and Pemberton Colliery sites contributes to the increased flows on the A49 Wigan Road. The development traffic entering (during the morning peak hour) and leaving (during the evening peak hour) the South of Wigan site is forecast comprise about 7% of the total flow on the A49 Wigan Road in the immediate vicinity of the site.

9.25 The development traffic generated by the Pemberton Colliery site is forecast to account for a significant proportion of the overall traffic flow on Little Lane in both peak hours. However, the development traffic is not forecast to significantly increase traffic flows on most of the links in and around Wigan town centre.

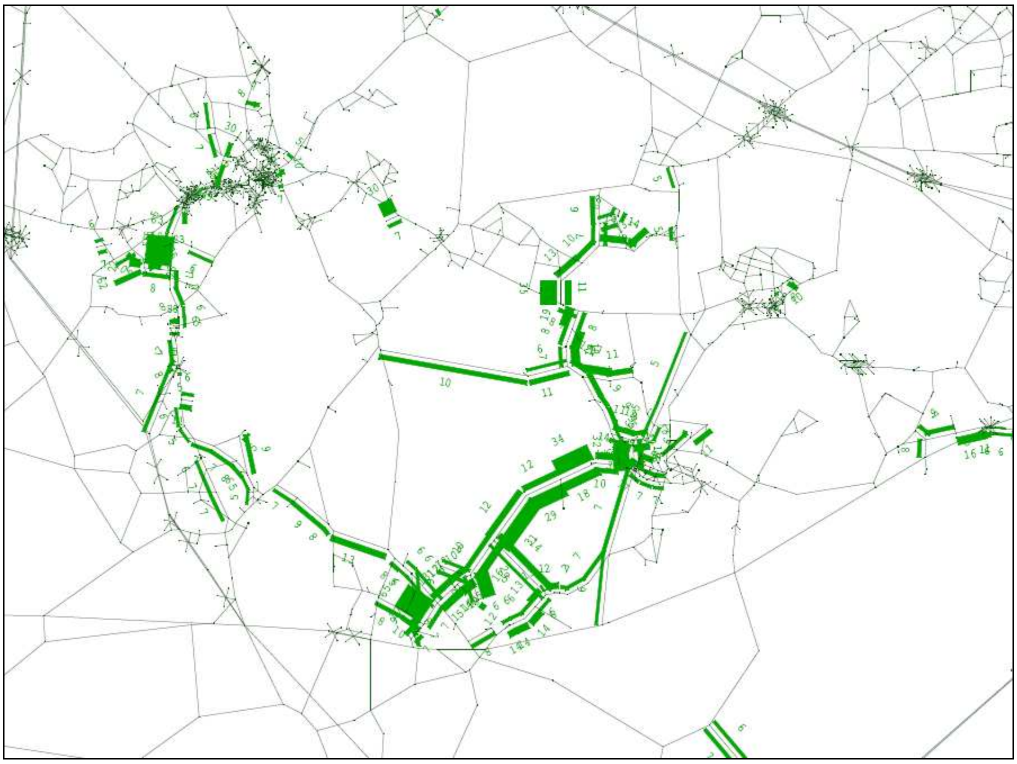


Figure 9.23: Development traffic percentage – AM peak-hour

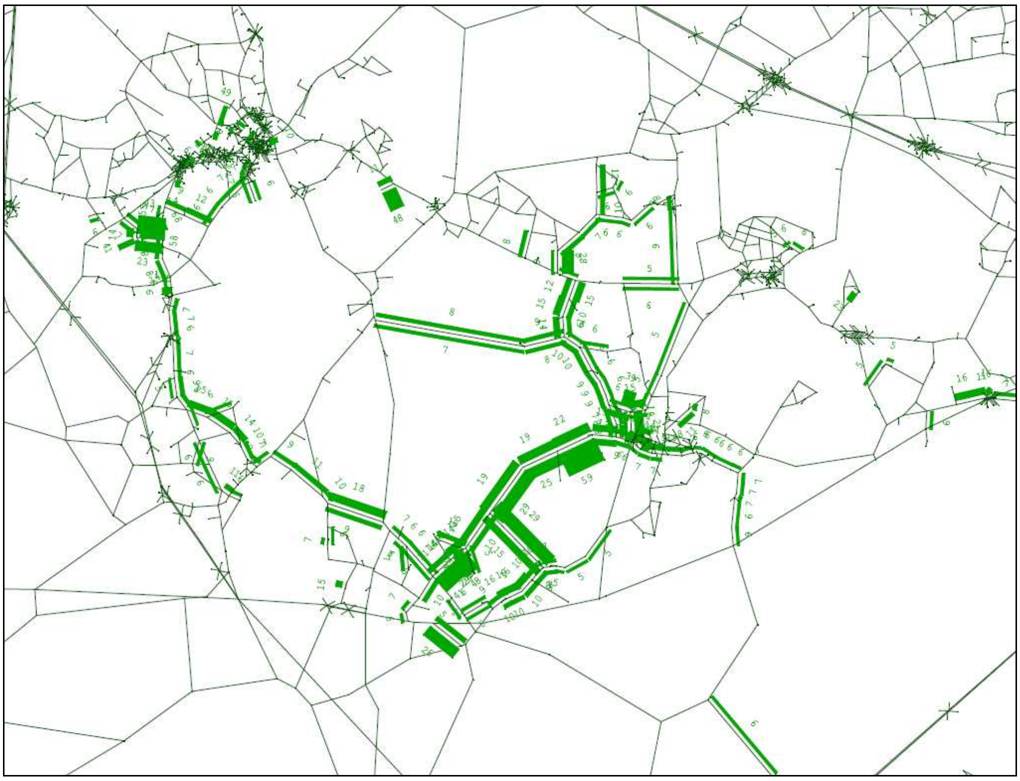


Figure 9.24: Development traffic percentage – PM peak-hour

Degradation in Junction Performance

9.26 To help identify the junctions where performance has deteriorated we have produced an additional set of junction performance plots comparing the 2009 Base with the 2016 forecast scenario.

9.27 The plots (Figures 9.25 – 9.26) highlight those junctions that suffer degradation in performance as a result of the growth in traffic to 2016 including the additional traffic generated by the LDF development sites during the morning and evening peak hours. They only show junctions that suffer from poorer performance as a result of the additional site traffic and also separate those junctions that suffer more severe increases in delay. The degradation of performance at signalised junctions and roundabouts is graded as follows:

- Green - junctions where delay has increased by between to 90 - 180 seconds (1½ - 3 minutes)
- Amber - junctions where delay has increased by between 180 seconds and 270 seconds (3 – 4½ minutes)
- Red - junctions where delay has increased by over 270 seconds (4½ minutes)

9.28 **Morning Peak Hour** (Figure 9.25)**:** The degradation plot for the AM peak-hour indicates that very few junctions have experienced more than 180 seconds (3 minutes) increase in delay and no junction experience an increase in delay above 270 seconds (4½ minute). The plot also shows that many of the junctions are remote from the LDF development site locations.

9.29 However, there are a number of junctions were the Development Sites are likely to have some impact, which may require mitigation measures.

9.30 The A577 Atherton Road / A578 Leigh Road signalised junction suffers an increase in delay on all turning movements, particularly on the Leigh Road exit arm and the right turn into Leigh Road from Atherton Road. Traffic generated by the Northleigh and Parsonage sites is likely to have the most significant impact on this junction.

9.31 Traffic generated by Northleigh and Parsonage using B5237 Bickershaw Lane is likely to have an impact on its junction with A573 Warrington Road and the Warrington Road / A58 Lily Lane junction in Platt Bridge. The right-turn from Bickershaw Lane into Warrington Road is forecast to operate over capacity as is the northbound straight-ahead movement at the Warrington Road / A58 Lily Lane junction.

9.32 The Chaddock Lane / Garret Hall site is forecast to have some impact on the A580 East Lancashire Road at its junctions with A572 Chaddock Lane, A577 Common Road and B5258 Newearth Road. Further to the west the Pocket Nook, Stirrups Farm and Rothwell's Farm sites are also likely to have some impact on the East Lancashire Road at its junction with A572 Newton Road and B5207 Church Lane. However, the increases in delay at these junctions are largely on the through movements where increases in the background traffic flow have the greatest impact.

9.33 Traffic generated by the Bickershaw South site is likely to have some impact on the B5207 Golborne Road / Slag Lane junction which is forecast to experience some increase in delay.

9.34 The M6 Junction 25 (South of Wigan) site is likely to have some impact on the A49 Warrington Road /Worthington Way junction particularly on the southbound right-turn into Worthington Way from Warrington Road. It is likely the both the South of Wigan and Pemberton Colliery sites will also have some impact on the A49 Warrington Road / B5238 Poolstock Lane roundabout though the increases in delay at this junction are influenced by the increase in background traffic.

9.35 **Evening Peak Hour** (Figure 9.26)**:** The degradation plot for the evening peak hour indicates a similar pattern to the morning peak hour, with few junctions experiencing an increase in delay of more than 180 seconds (3 minutes). However, two junctions on the A580 East Lancashire Road (at A577 Common Road and B5258 Newearth Road) suffer an increase in delay in excess of 270 seconds (4½ minutes).

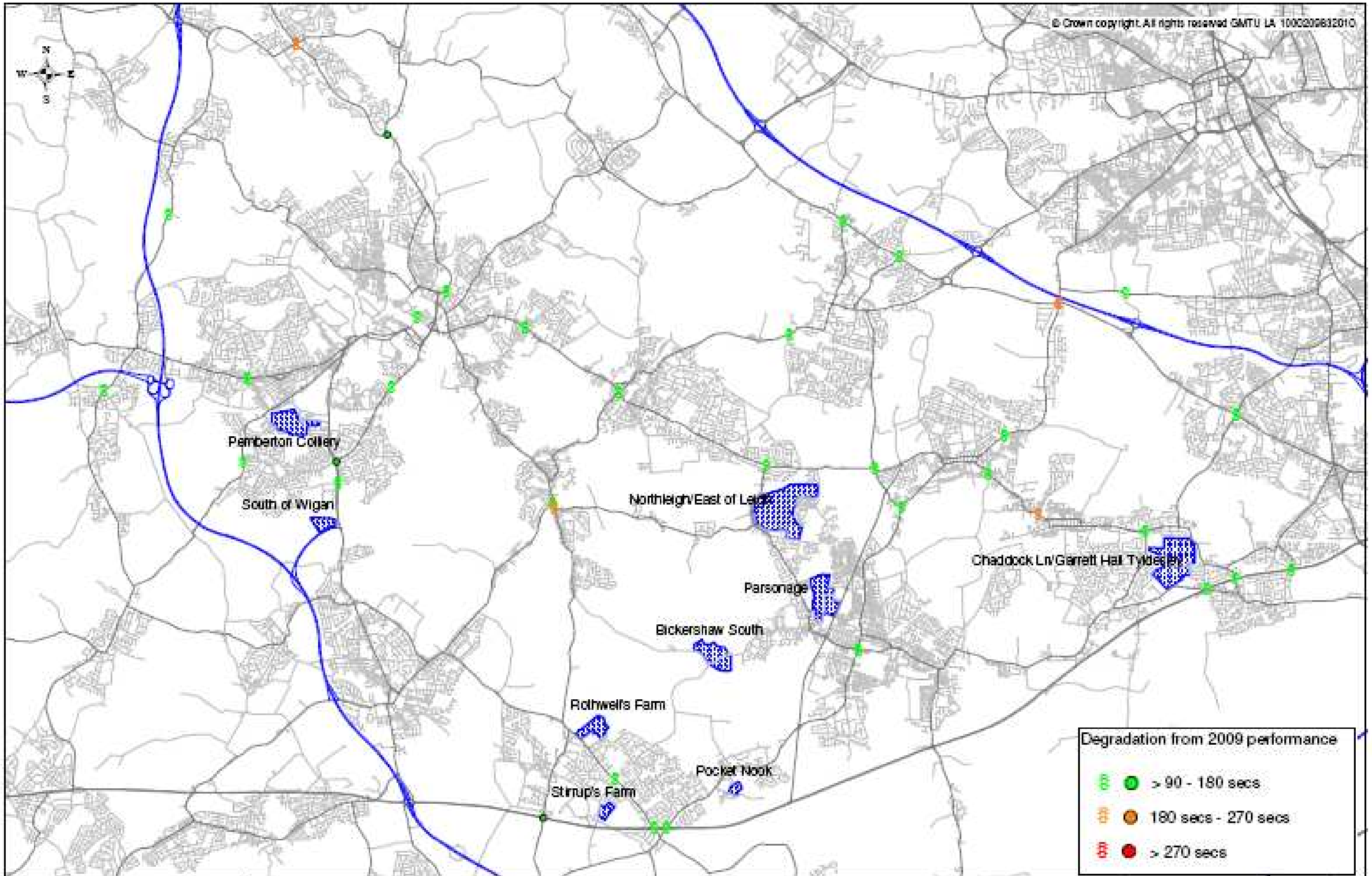
9.36 The A577 Atherton Road / A578 Leigh Road signalised junction suffers an increase in delay, again particularly on the Leigh Road exit arm and on the right turn into Leigh Road from Atherton Road due to traffic generated by the Northleigh and Parsonage sites. While to the east along the A577 there is an increase in delay at the Wigan Road / B5235 Lovers Lane junction, though this is more likely to be attributable to the growth in background traffic.

9.37 Traffic generated by the Parsonage and Bickershaw South sites is forecast to cause some degradation in performance at the A579 Atherleigh Way / A572 Twist Lane roundabout, particularly on the Atherleigh Way northbound approach.

9.38 Both the signalised junctions with the A573 Warrington Road (at Bickershaw Lane and Lily Lane) in Platt Bridge are forecast to experience an increase in delay with the right-turn from Bickershaw Lane into Warrington Road again a particular issue.

9.39 The traffic generated by the Pocket Nook, Stirrups Farm and Rothwell's Farm sites is likely to have some impact on delay at the A580 East Lancashire Road junctions with A572 Newton Road and B5207 Church Lane. However, as is the case during the morning peak hour, the main increases in delay are on the through movements at these junctions where increases in the background traffic flow have the greatest impact.

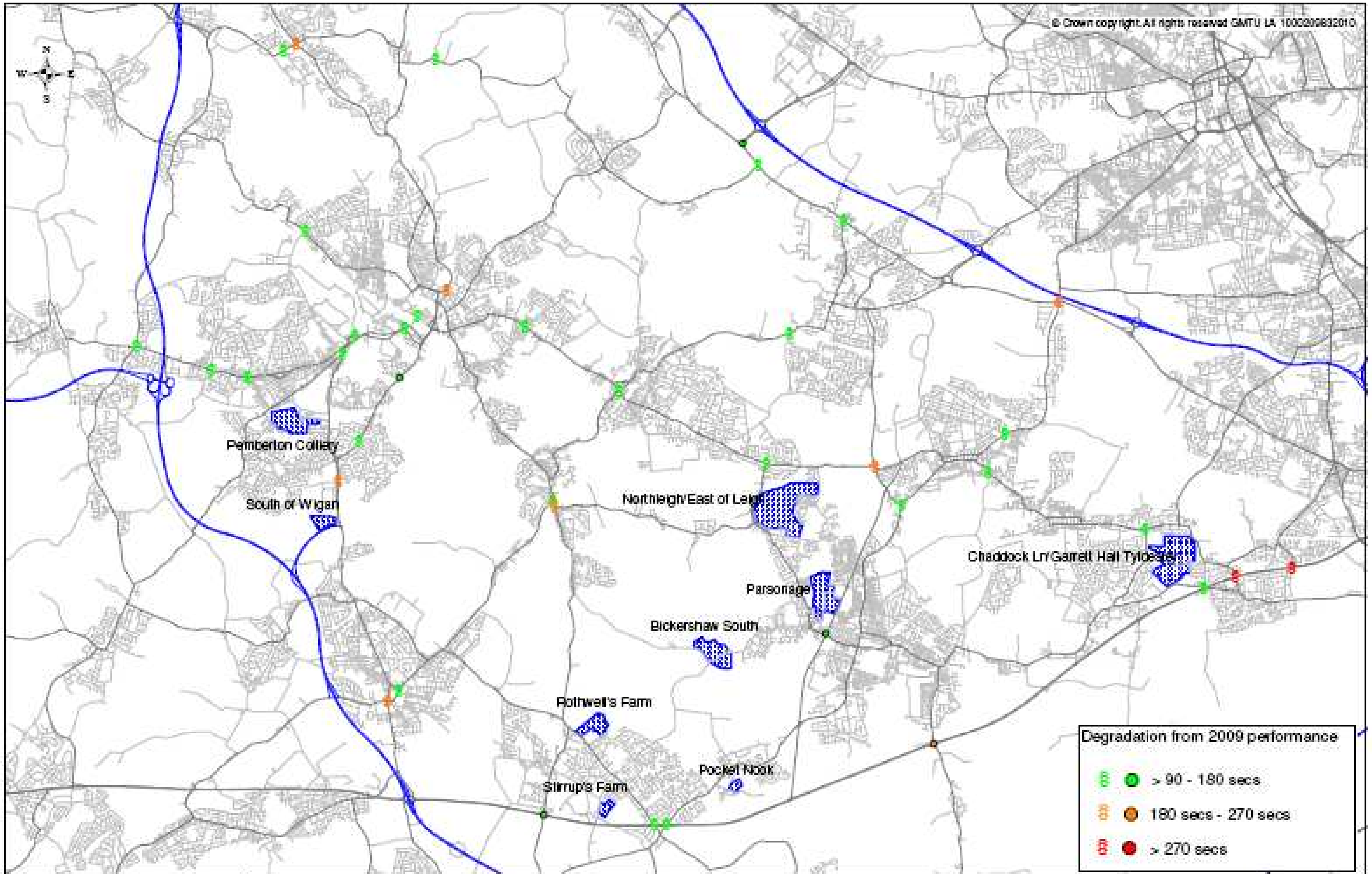
9.40 The M6 Junction 25 (South of Wigan) site is forecast to impact on the A49 Warrington Road / Worthington Way junction particularly on the right-turn from Worthington Way into Warrington Road resulting in an increase in delay.



Transport for Greater Manchester
2 Piccadilly Place, Manchester, M1 3BG

Over Capacity Junctions - 2016 AM Forecast scenario
Each junction graded by its degradation in performance compared with the 2009 Base scenario

Drawn By : E Atkinson	Scale : NTS	Date : June 2011	Figure 9.25



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Over Capacity Junctions - 2016 PM Forecast scenario Each junction graded by its degradation on performance compared to the 2009 Base scenario			
	Drawn By : E Atkinson	Scale : NTS	Date : June 2011	Figure 9.26

Summary

9.41 Overall the growth in background traffic to 2016 is likely to have a greater impact on junction performance in the Wigan district than traffic generated by the LDF development sites. Nevertheless, the traffic generated by the LDF development sites are forecast to have a modest detrimental impact on a number of junctions, in particular:

- **Northleigh and Parsonage** account for increased traffic volumes on A578 Leigh Road / Wigan Road and B5237 Bickershaw Lane resulting in a degradation in performance at the Leigh Road / Atherton Road signalised junction, Atherleigh Way / Twist Lane roundabout (PM peak-hour) and A573 Warrington Road junctions with Bickershaw Lane and A58 Lily Lane.

- **Bickershaw South** increases traffic flow on Plank Lane which impacts on the B5207 Golborne Road / Slag Lane junction (AM peak-hour).

- Traffic generated by the **Chaddock Lane / Garret Hall** is likely to have some impact on the A580 East Lancashire Road particularly at its junction with Chaddock Lane. There is also degradation in performance at the East Lancashire Road junctions with the A577 Common Road and B5258 Newearth Road, though increases in the background traffic flow are likely to have a greater impact at these junctions.

- **Pocket Nook, Stirrups Farm** and **Rothwell's Farm** are not likely to have a significant impact on the highway network given their relatively low trip generation. However, the combined traffic from these sites may have a detrimental impact on the A580 East Lancashire Road junctions with A572 Newton Road and B5207 Church Lane.

- The impact of traffic generated by the **M6 Junction 25 (South of Wigan)** site is primarily on the A49 Warrington Road / Worthington Way junction which is forecast to experience some increase in delay in both peak-hours. This traffic is also likely to have some impact on the Warrington Road / B5238 Poolstock Lane roundabout.

- The **Pemberton Colliery** site is forecast to significantly increase traffic flow on Little Lane and is likely to have some impact at junctions on the A49 Warrington Road.

9.42 We have identified where the traffic generated by the LDF development sites is likely to have most impact on the highway network across Wigan and which junctions are most likely to experience degradation in performance. There is further potential to examine the operation of particularly problematic junctions in more detail to identify the scale of improvements required to mitigate for the effects of the additional traffic. Mitigation measures could include introducing signal optimisation measures (i.e. MOVA or SCOOT) at signalised junctions currently using fixed times. Where appropriate, localised capacity improvements could also be considered to improve junction operation.

9.43 In some cases, the capacity problems may be such that only an unacceptable or unachievable junction improvement would be sufficient to resolve the capacity problems. In these cases, it would be possible to identify the LDF development sites generating the development traffic that is causing the problem and then determine either:

- A lower level of development that would remove / reduce the traffic impacts of the site down to an acceptable level; or

- Travel Plan measures and additional PT provision to reduce the impact of vehicle trips generated by the sites.

10. Emissions Modelling (EMIGMA)

The EMIGMA Database

10.1 Road traffic emissions were modelled using the atmospheric emissions inventory for Greater Manchester, EMIGMA.

10.2 The original EMIGMA database was compiled by the London Research Centre in 1997 on behalf of the Department of the Environment, Transport and the Regions (DETR) Air and Environment Quality Research Programme. Released in June 1997, it represents the second of a series of atmospheric emissions inventories covering many of the UK's major urban and industrial zones.

10.3 GMTU has been responsible for updating the road traffic components of the database since the late 1990s. GMTU took over responsibility for updating the non-traffic elements of the database in 2004.

10.4 The EMIGMA database is used to estimate mass emissions from selected areas across Greater Manchester and it allows the relative importance of different generating sources of emissions to be estimated. The emissions sources are grouped into three broad categories:

- Point / area sources – representing emissions from domestic and industrial sources
- Emissions from rail and aviation sources
- Road traffic emissions, representing emissions from vehicles travelling on roads in Greater Manchester.

10.5 The 2006 EMIGMA database covers an area of 1272 km^2 encompassing the ten administrative districts of Greater Manchester.

10.6 The database allows the magnitude and spatial distribution of emissions across Greater Manchester to be investigated and enables the relative importance of different sources of air pollution to be examined. The emissions data has a further role in providing the basis for dispersion modelling exercises and air quality management planning. In conjunction with transport models (as in this study) it also provides the basis for forecasting air quality and determining the effects of changes in land use planning and transportation policies on mass emissions.

Road Traffic Emissions

10.7 Road traffic emissions in EMIGMA are estimated using data from two sources:

- Traffic speeds and flow data from the Greater Manchester Saturn Model (or in this case, the Wigan Saturn model variant of the Greater Manchester Model)
- Road traffic emission factors and fleet composition data from the National Atmospheric Emissions Inventory website (NAEI, www.naei.org.uk)

10.8 The traffic speed and flow data from the Saturn model allows the impacts of changes in vehicle flows on emissions to be estimated, and the variation in vehicle emissions with traffic speed to be taken into account. (Traffic emissions are generally higher, for example, for vehicles travelling at low speeds – in congested areas – and for vehicles travelling at high speeds – on motorways).

10.9 The road traffic emission factors from the NAEI provide estimates of vehicle emissions (in g/km) for vehicles traveling at different speeds, complying with different Euro emission standards. Euro emission standards are normally tightened every five years or so, so that vehicles become less polluting over time, as older more polluting vehicles are replaced by newer/cleaner models. The impacts of changes in the fleet composition are predicted using fleet composition projections (also from the NAEI) to reflect changes in the proportion of vehicle kilometres travelled by vehicles in each of the Euro emission classes over time.

10.10 Within EMIGMA, traffic emissions are calculated separately for each of the time periods represented by the Saturn model, comprising the morning peak hour (0800-0900), the evening peak hour (1700-1800) and an average inter-peak hour for the period 1000-1530. The hourly emissions are then converted into daily and then annual totals, using road traffic annualisation factors derived from traffic counts.

10.11 Emissions are calculated separately for the following eight vehicle types:

- Motorcycles
- Petrol cars
- Diesel cars
- Petrol LGVs
- Diesel LGVs
- Rigid HGVs
- Articulated HGVs
- Buses.

10.12 The separate vehicle emissions are then combined to calculate all vehicle emissions for analysis. Emissions are initially calculated at the network link level. Link emissions can, however, be aggregated, to calculate emission totals within areas, such as traffic model zones, wards, districts and grid squares.

10.13 Emissions are estimated for the following pollutants:

- CO_2
- NO_X
- PM_{10}

Nitrogen Oxides (NO_x) Emissions

10.14 The NO_x emissions calculated by EMIGMA comprise nitrogen oxides (NO_x), representing the sum of nitric oxide, (NO), and nitrogen dioxide (NO_2). Traffic emissions mostly comprise NO, but this is transformed into NO_2 by reaction with ozone. (The EU has set target values limiting NO_2 emissions, to be met by January 2010). The reaction with ozone changes the proportion of NO_2, and this has to be allowed for if concentration dispersion modelling is undertaken. There is, however, the added complexity of background NO and NO_2 mixing with traffic emissions, so that prediction of NO_2 concentrations at the roadside is not straight forward ("A New Approach to Deriving NO_2 from NOx for Air Quality Assessments of Roads", http://uk-air.defra.gov.uk/reports/cat06/NewMethodforNOxtoNO2(Final).pdf).

10.15 Approximately 37% of the UK's emissions of NO_x were from road transport in 2004 (Environmental Assessment Techniques, DMRB Volume 11 Section 3 Part 1).

10.16 NO_2 concentrations are normally estimated from NO_x totals using dispersion models, employing methods based on chemical models, or empirical relationships.

10.17 Forecasts of NO_x emissions from EMIGMA indicate that emissions from road traffic have been falling steadily over time, and it might be expected that this would be reflected in observed NO_2 concentrations in Greater Manchester. In practice, however, this is not reflected on the ground, with observed concentrations of NO_2 at monitoring sites declining at a slower rate than predicted, or remaining static in many urban locations.

10.18 It is unclear why this is happening, although it has been suggested that it might reflect increased usage of diesel vehicles (which emit a greater proportion of NO_x as NO_2), or the effect of abatement equipment targeted at reducing particulates, which can produce increased emissions of NO_2. The forecast changes in road traffic NO_x emissions from EMIGMA should be treated with some caution, particularly when used as a proxy for changes in emissions of NO_2.

10.19 A dispersion model is required to properly understand the relationship between NO_x and NO_2 in specific locations for a specific time period. Only a dispersion model is capable of carrying out the necessary chemical reaction calculations for the weather conditions prevailing during the period of interest. If linked with a comprehensive inventory (such as EMIGMA), it will also be able to properly account for the traffic and non-traffic element of total NO_2 in the locality. Dispersion modelling at the county level is currently being undertaken by GMTU, including future year forecasts. Results from this work are expected to be available later this year.

PM_{10} Emissions

10.20 For the county as a whole, PM_{10} emissions have been forecast to increase by approximately 2% over the period 2009-2016. There is, however, considerable local variation, with approximately 30% of wards (in the county) showing a reduction in PM_{10} emissions, and 12 wards showing increases of more than 10%. (Percentage changes should be treated with some caution, as a large percentage change might be associated with a small absolute change from a low base). Possible reasons for local variations can be due to:

- Variations in traffic growth (due to redevelopment/land use changes)
- Local changes in vehicle kilometres (due to re-assignment/re-routing effects)

- Local variations in vehicle speeds due to modelled congestion
- Local changes in fleet composition (car/LGV/OGV proportions).

Emission Changes in Wigan 2009-2016

10.21 Figures 10.1 to 10.3 respectively show the forecast change in CO_2, NO_x and PM_{10} emissions between 2009 and 2016 assuming development levels on the draft Core Strategy sites described earlier in this report.

10.22 Carbon dioxide emissions tend to rise over time as they are closely related to increases in vehicle kilometres. From Figure 10.1, it is apparent that the largest CO_2 emission increases (increases of between 15 and 20%) are forecast to be in the Abram, Wigan Central, Wigan West and Douglas wards.

10.23 Emissions of Nitrogen oxides (NO_x) tend to fall over time, reflecting improvements in engine efficiency. This is shown in Figure 10.2, which identifies NO_X reductions of between 20 and 40% over large parts of the Wigan borough.

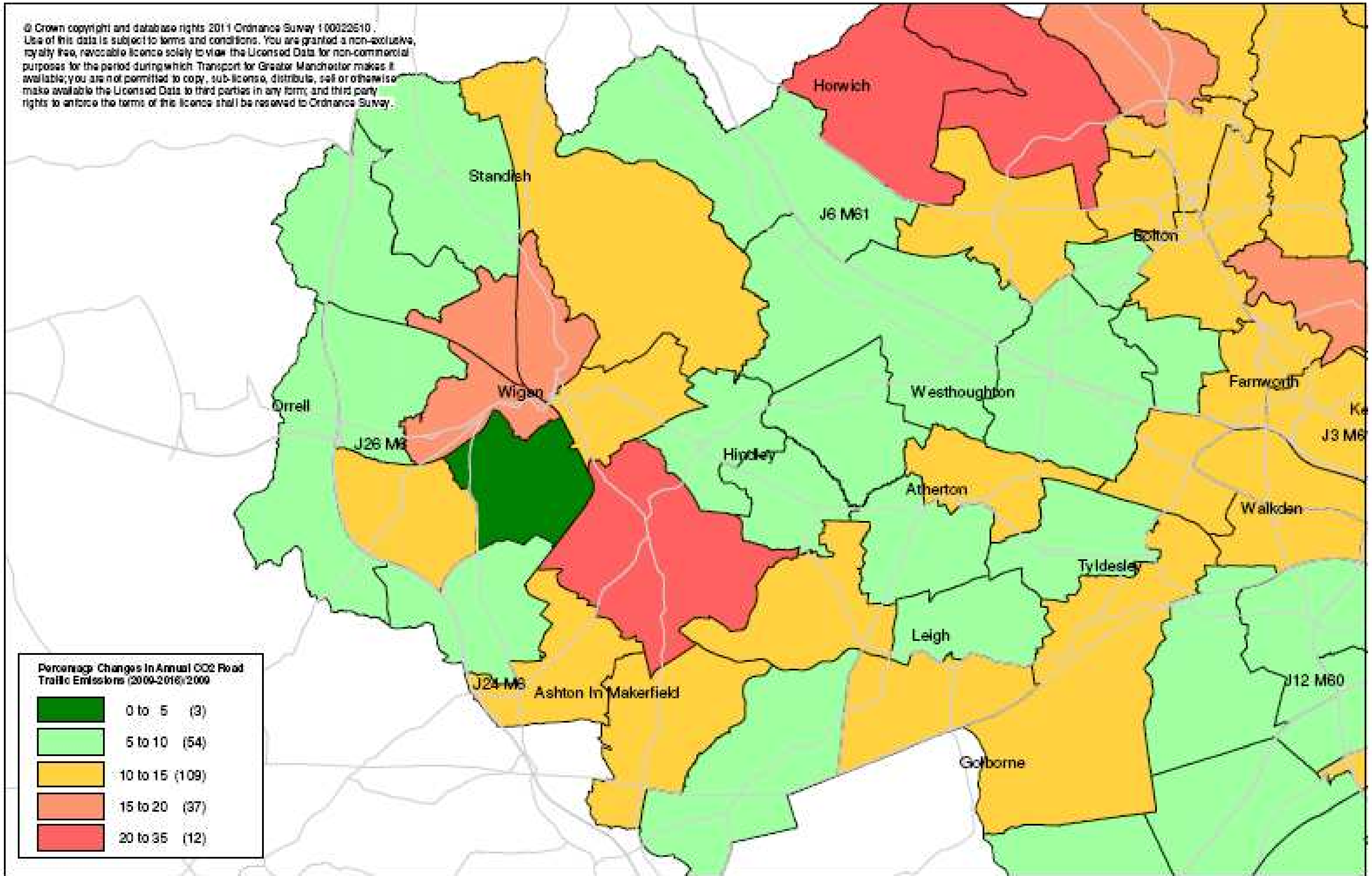
10.24 Emissions of PM_{10} particulates are affected both by increases in vehicle kilometres travelled and improvements in vehicle efficiency. Figure 10.3 shows that PM_{10} emissions fall in the less built-up parts of the borough, but that they increase in Wigan town centre wards and along an east-west corridor running through the central part of the borough between Wigan and Leigh.

10.25 Table 10.1 shows emissions by ward within Wigan in 2009 and anticipated changes by 2016 assuming the draft Core Strategy development proposals described earlier in this report. All emissions shown in the table are expressed in tonnes per annum.

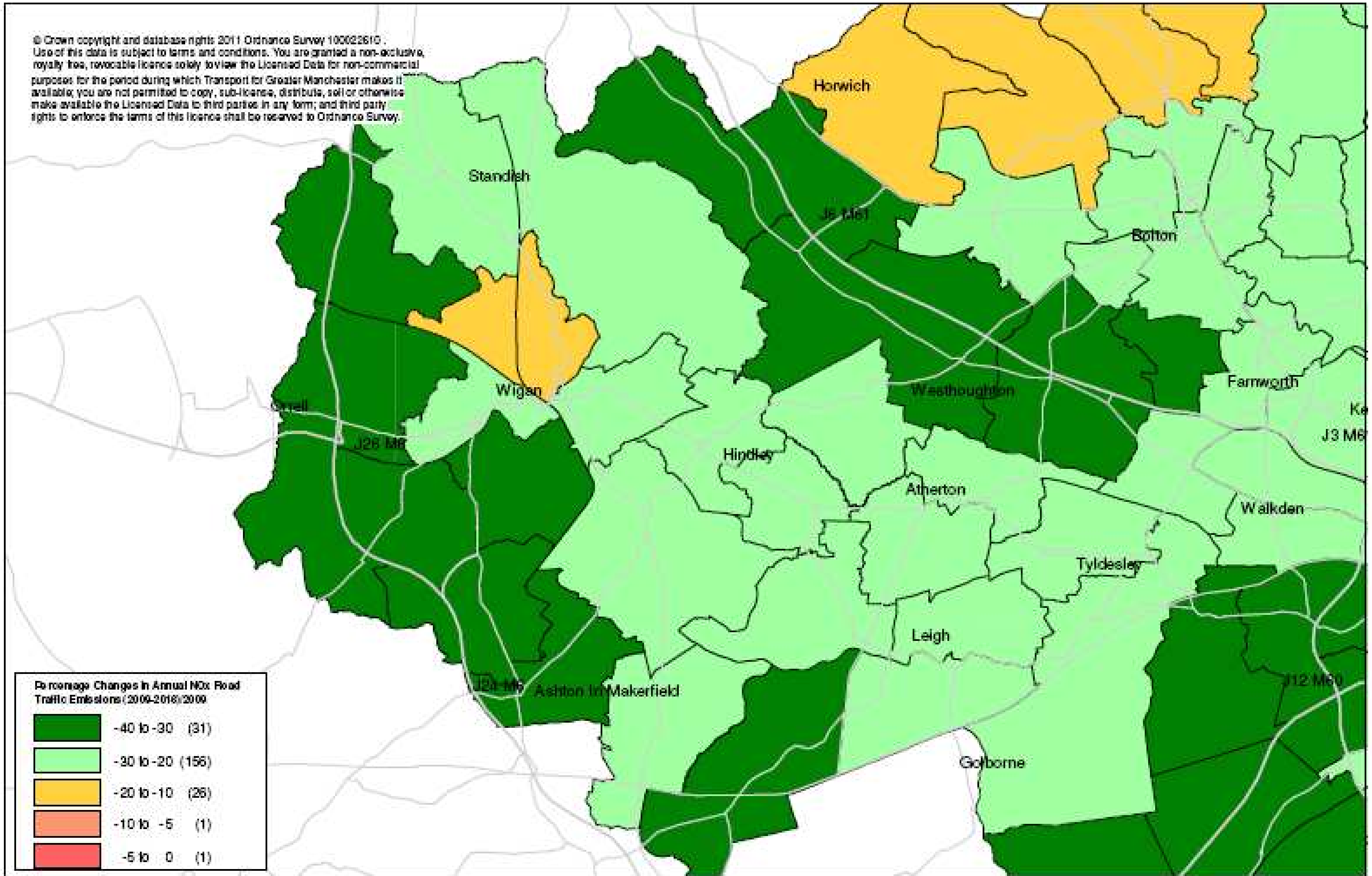
10.26 For the borough as a whole, carbon dioxide emissions are forecast to increase by just over 10% between 2009 and 2016, while both nitrogen oxides and PM_{10} particulates are anticipated to fall by 30% and just under 2% respectively.

Table 10.1 Wigan Draft Core Strategy Forecast Change in Emissions (2009 to 2016) by Ward (Tonnes per Annum)

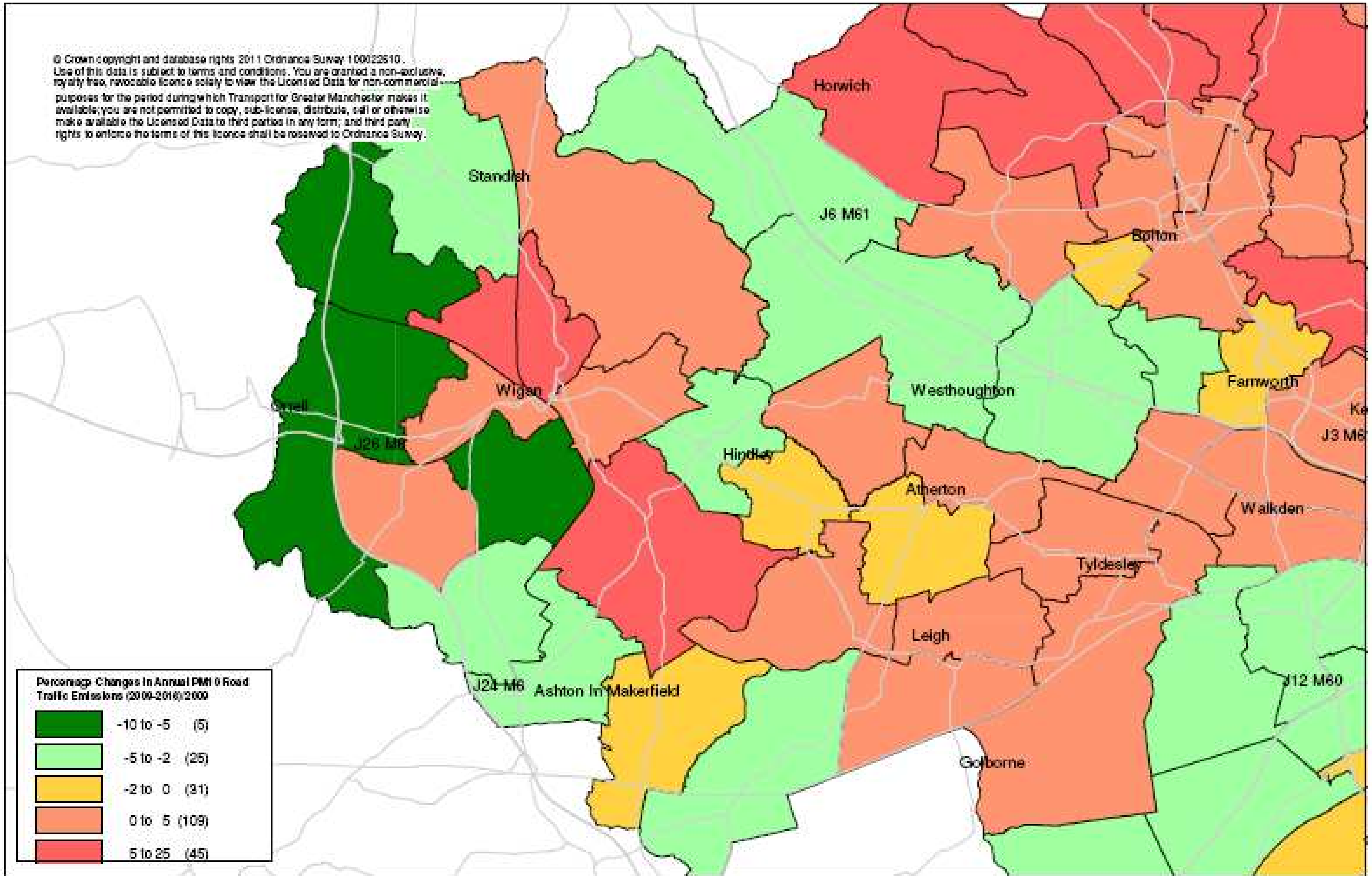
Ward	Carbon Dioxide			Nitrogen Oxides			PM10 Particulates		
	2009 Total	Change	% Change	2009 Total	Change	% Change	2009 Total	Change	% Change
Abram	3284.4	670.3	20.4	35.6	-7.5	-21.1	4.201	0.344	8.2
Ashton	6602.0	717.9	10.9	84.7	-27.0	-31.8	7.228	-0.168	-2.3
Aspull New Springs Whelley	4952.3	671.0	13.5	55.5	-14.7	-26.5	6.161	0.159	2.6
Astley Mosley Common	6237.4	633.3	10.2	68.3	-19.8	-28.9	7.802	0.041	0.5
Atherleigh	3995.1	272.4	6.8	38.8	-10.2	-26.2	5.034	-0.048	-1.0
Atherton	2362.5	292.8	12.4	24.4	-5.9	-24.1	2.977	0.107	3.6
Bryn	12637.8	1157.6	9.2	168.4	-56.8	-33.7	12.534	-0.621	-5.0
Douglas	4471.6	852.8	19.1	50.3	-11.7	-23.2	5.610	0.165	2.9
Golborne and Lowton West	3531.7	364.3	10.3	37.3	-9.4	-25.1	4.512	-0.081	-1.8
Hindley	2293.7	166.2	7.2	25.8	-7.6	-29.6	2.904	-0.104	-3.6
Hindley Green	1892.8	164.0	8.7	18.8	-4.8	-25.3	2.371	-0.012	-0.5
Ince	2526.4	273.8	10.8	29.4	-7.9	-26.8	3.207	0.012	0.4
Leigh East	1923.5	184.1	9.6	21.6	-5.5	-25.4	2.557	0.008	0.3
Leigh South	6563.5	699.9	10.7	74.8	-21.2	-28.3	8.024	0.081	1.0
Leigh West	2789.5	367.6	13.2	30.0	-6.6	-22.1	3.687	0.096	2.6
Lowton East	6176.9	539.9	8.7	73.8	-23.5	-31.9	7.310	-0.220	-3.0
Orrell	16743.6	1512.7	9.0	218.5	-74.5	-34.1	16.543	-0.911	-5.5
Pemberton	9230.6	703.1	7.6	120.4	-41.3	-34.4	9.522	-0.505	-5.3
Shevington with Lower Ground	14881.0	754.3	5.1	200.0	-74.2	-37.1	13.877	-1.206	-8.7
Standish with Langtree	3641.6	255.5	7.0	37.6	-10.5	-27.9	4.683	-0.227	-4.8
Tyldesley	1966.9	175.4	8.9	19.8	-4.9	-24.9	2.651	0.012	0.5
Wigan Central	3699.0	716.9	19.4	41.2	-8.0	-19.4	4.672	0.435	9.3
Wigan West	1495.9	266.2	17.8	15.4	-2.5	-16.3	2.128	0.181	8.5
Winstanley	10145.7	1455.1	14.3	133.7	-41.4	-31.0	9.889	0.081	0.8
Worsley Mesnes	2572.0	116.2	4.5	28.3	-9.0	-31.9	3.231	-0.180	-5.6
Wigan Borough Total	**136617.5**	**13983.1**	**10.2**	**1652.5**	**-506.3**	**-30.6**	**153.3**	**-2.6**	**-1.7**



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Annual CO2 Road Traffic Emissions - Percentage Changes By Ward 2009 - 2016			
	Drawn By : A. Morris	Scale : NTS	Date : June 2011	Figure 10.1



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Annual NOx Road Traffic Emissions - Percentage Changes By Ward 2009 - 2016			
	Drawn By : A. Morris	Scale : NTS	Date : June 2011	Figure 10.2



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Annual PM10 Road Traffic Emissions - Percentage Changes By Ward 2009 - 2016			
	Drawn By : A. Morris	Scale : NTS	Date : June 2011	Figure 10.3

11. Draft Core Strategy Public Transport Impacts

Distribution of Public Transport Trips

11.1 The public transport trips forecast to be generated by each of the LDF Development Sites were distributed using the newly developed PT-DEVTRIPS program. A potential weakness of this approach is that the programme estimates the distribution of public transport trips on the basis of a level of supply contained in the GM-PT model. In other words, the distribution of public transport trips is dependent on the assumptions regarding future PT infrastructure and service provision made in the model. Because of this, it may not fully reflect areas where there is demand but that is poorly served by public transport services.

11.2 While this may provide a useful indication of what is possible in terms of PT trips the model does not provide any indication of where people might wish to travel by public transport and therefore where there might be gaps in current/planned PT supply.

11.3 In order to establish a picture of what might be regarded as "suppressed" demand, the PT trip volumes estimated through application of TRICS modal splits have therefore also been input to the standard highway-based DEVTRIPS programme. The outputs from this can be regarded as providing an indication of where people would travel if PT services were provided.

11.4 The outputs from the PT and highway-DEVTRIPS runs for each of the Development Sites are summarised below.

11.5 In considering the following summary, it should be noted that the forecast distribution of public transport trips is based on an estimate of the maximum "cost" (i.e. the combined cost of waiting time, in vehicle time and interchange time in "cost minutes") that a prospective public transport passenger would be willing to accept. This means that there are no trips longer than this upper limit in the estimated distribution, on the basis that these trips would be made by an alternative mode.

11.6 Tables 11.1 and 11.2 show the total number and percentage proportion of two-way public transport trips to and from each ward within the Wigan district and for surrounding districts for each of the Development Sites. Ward or district locations that are forecast to account for 5% or more of the total public transport trips to/from each site are highlighted.

11.7 For simplicity in the site summaries below, we refer to areas which are groups of wards as follows:

Wigan Town Centre	Wigan Central, Wigan West and Douglas
Leigh	Leigh East, Leigh South and Leigh West
Atherton	Atherton and Atherleigh
Hindley	Hindley and Hindley Green

Site Public Transport Trip Distribution Summary

Bickershaw South (EM1G)

11.8 The Bickershaw South site is to be developed for employment and housing uses, but it is anticipated that only some of the housing elements will be delivered by the 2016 forecast year. Based on the TRICS mode choice estimates described earlier, the Bickershaw site is expected to generate only 8 public transport trips during the morning peak hour. This is an exceptionally low figure, based on the mode choice characteristics of other sites with similar land-uses and in similar locations. It suggests that very careful consideration should be given to suitable travel plan measures to encourage the use of more sustainable modes of transport as the site is brought forward.

11.9 Not surprisingly the majority of these trips are forecast to be to/from Leigh, which accounts for 52% and 43% of PT trips during the morning and evening peak hours respectively. Wigan Town Centre accounts for 6% and 12% of PT trips during the morning and evening peak hours respectively, which is probably indicative of poor public transport links between the site and Wigan Town Centre. Within the Wigan district the only other significant public transport origin/destination is Atherton, which accounts for 8% of trips during both the morning and evening peak hours.

11.10 Almost 20% of the public transport trips generated by the site would be to/from places outside the Wigan district, especially to/from the Manchester and Bolton districts.

Chaddock Lane / Garret Hall (EM1A 9 / SP4.3)

11.11 The Chaddock Lane (EM1A 9) is allocated for employment and Garret Hall (SP4.3) for housing. Together they are anticipated to generate 28 and 24 public transport trips during the morning and evening peak hours respectively. The site is located on the A572 with access to relatively high frequency bus services operating along this route.

11.12 During the morning peak hour, 51% of the public transport trips are anticipated to be to/from Wigan Town Centre, with much of the remainder (33%) accounted for by trips to/from outside the Wigan district. The site is particularly accessible from the districts of Salford and Manchester, which account for 17% and 10% respectively of the trips to/from the site during the morning peak hour. It is also interesting to note that 13% of public transport trips generated by the site would be to/from the Astley Mosley Common ward, which is the ward that the site is located in. However, given the relatively large size of this ward, this is to be expected.

11.13 During the evening peak hour there are far fewer public transport trips (only 2%) to/from Wigan Town Centre, suggesting that public transport linkages between the site and Wigan Town Centre may be poorer during this time period. The Manchester (33%), Salford (26%) and Bolton (8%) districts account for most of the public transport trips during the evening peak hour, which is a reflection of the site's close proximity to districts to the east of Wigan. As was noted during the morning peak hour, 9% of public transport trips are expected to be within the Astley Mosley Common ward.

11.14 Although the Chaddock Lane / Garret Hall site is relatively close to Leigh, there are very few public transport trips between the site and Leigh (especially during the morning peak hour).

East Lancashire Road Corridor Housing Sites (SP4.6)

11.15 The location of the East Lancashire Road Corridor housing sites is as yet not fully determined, but could include development on Pocket Nook, Rothwell's Farm or Stirrup's Farm. For modelling purposes, we treated them as a single public transport origin/destination given their close proximity to each other and the uncertainty about which site would be brought forward.

11.16 The combined public transport trip generation from the three sites is low, with just 11 and 6 trips during the morning and evening peak hours respectively. The public transport provision along the East Lancashire Road corridor is currently relatively poor with no local bus services operating on the section of A580 through the Wigan borough. Even with a higher public transport demand at the sites, there would be very few public transport trips to/from districts outside Wigan. It suggests that very careful consideration should be given to suitable travel plan measures to encourage the use of more sustainable modes of transport as the site is brought forward.

11.17 Wigan and Leigh account for the majority of the public transport demand generated by the site during both peak hours suggesting that current service provision is adequate between the sites and Wigan and Leigh Town Centres.

Northleigh (SP3*)*

11.18 The Northleigh site is allocated for a mixture of housing and employment uses, but it is anticipated that only a portion of the housing allocation will be brought forward by 2016. Based on this land use and the site location, the site is only forecast to generate between 13 and 22 two-way peak hour public transport trips. This is a very low figure, given the scale of the development. It suggests that very careful consideration should be given to suitable travel plan measures to encourage the use of more sustainable modes of transport as the site is brought forward.

11.19 As would be expected, the majority of the public transport trips generated by the site would be to/from Leigh and Wigan Town Centre, which would account for between 56 and 60% of the site public transport trips.

Parsonage (EM1A 6)

11.20 The Parsonage site is allocated for a mixture of uses, but with an emphasis on employment uses. From the trip generation work described earlier in this report, it is anticipated that the site would generate more significant volumes of public transport trips.

11.21 The site is located relatively close to the centre of Leigh town centre and benefits from the regular bus services that radiate from town centre. As would be expected, the most important origin / destination for the site's public transport trips is to/from the Leigh wards, which account for approximately 45% of the peak hour public transport trips. Approximately 18% of the site's public transport trips are expected to go to/from Wigan town centre, while a further 8% are expected to go to/from Atherton. As many as 10-12% of the site's public transport trips are expected to go to/from areas outside the Wigan borough.

11.22 The higher volumes of public transport trips generated by the Parsonage development could put some stress on the local public transport network, particularly on services within the Leigh wards, but also between the site and Wigan town centre. These impacts would have to be examined in more detail as the development of the site is progressed.

Pemberton Colliery (EM1A 30)

11.23 The Pemberton Colliery site is proposed for employment and housing uses, but it is anticipated that only some of the housing elements will be delivered by the 2016 forecast year. Based on the public transport trip generation estimates detailed earlier in this report, the site will only generate a very small number of public transport trips by 2016. However, given that the site is adjacent to A49 Warrington Road, which has high frequency bus services serving a variety of destinations and it is also close to Pemberton rail station, the site has the potential for public transport to take a higher share of the total trips generated by the site.

11.24 Unsurprisingly, the majority of the public transport trips generated by the site would be to/from Wigan town centre wards (53 to 62%). Approximately 9% would go to/from the Pemberton ward and a further 9 to 12% to/from the Worsley Mesnes ward.

South of Wigan, M6 Junction 25 (SP4.5)

11.25 This site is allocated for employment uses, particularly warehousing and distribution. It is expected to generate between 35 and 39 peak hour two-way public transport trips in 2016. Approximately 30% of these trips would be to/from Wigan town centre, while a further 11-20% would be to/from the Winstanley and Worsley Mesnes wards. Perhaps surprisingly, only between 5 and 12 % of the public transport trips would be to/from the Ashton and Bryn wards.

Summary

11.26 This study examined the potential transport impacts of development on LDF sites up to 2016. Given that this is only a forecast for the next five years, the amount of development anticipated on the sites is relatively restricted. The analysis demonstrated that the traffic generated by these sites would cause some deterioration in the operation of a number of junctions in the vicinity of the sites, but that the volumes of traffic generated were not sufficient to cause wider congestion and capacity problems.

11.27 The majority of the sites identified in the draft Core Strategy are reliant on the bus services that radiate on routes out of Wigan and Leigh town centres. The only exception to this is the Pemberton Colliery site, which is also served by Pemberton rail station, giving access to rail services between Wigan and Kirby (with connections to Liverpool). Although there is a relatively good network of bus services operating on the main routes across the Wigan borough, some of the sites have poor public transport linkages to the borough's town centres.

11.28 With the exception of the Parsonage site, the remaining sites are expected to generate low numbers of public transport trips. The Parsonage site is expected to generate approximately 100 peak hour two-way public transport trips, which may require some limited improvements to capacity on nearby public transport routes.

11.29 The public transport catchment areas for the sites are largely restricted to the Wigan borough and the analysis demonstrates that there would be few new public transport trips to/from areas outside the district. The only real exception to this is the Chaddock Lane / Garret Hall site, which due to its location close to the borough boundary would generate some new public transport trips to/from surrounding districts.

11.30 Measures to encourage greater public transport usage at these sites and a detailed examination of any potential capacity issues related to increased passenger numbers should be addressed as part of the site specific travel plans developed as the sites are brought forward.

Appendix 1

WIRR 2009 Saturn Model – Local Validation Results Summary

Introduction

Wigan Council commissioned GMTU (now known as GMFAS and part of Transport for Greater Manchester) to undertake traffic modelling to identify transport impacts and possible remedial actions required to take forward their Local Development Framework Draft Core Strategy.

This latest work builds on results from previous LDF modelling (Phase 1 and 2a) carried out using the 2007 Wigan SATURN model, which was developed in 2005 for examination of highway proposals in the borough. For this latest phase of the work, the modelling will be carried out using the recently developed 2009 Wigan Inner Relief Route (WIRR) SATURN Model. The WIRR SATURN model is a variant of the Greater Manchester SATURN Model (GMSM) with network and zonal alterations to improve the representation of travel patterns in the Wigan area. This model also includes new origin-destination data collected at roadside interview survey sites in and around Wigan town centre during March 2010.

This briefing note reports the updated validation of the 2009 WIRR SATURN model using additional count data for the M61 and M6 motorways in the matrix estimation process. It also reports the revised model validation on the all-purpose highway network across the Wigan borough. This note forms a supplement to the full model development and validation report (GMTU Report 1630, August 2010).

Given that the Highways Agency is a key stakeholder in the development of a robust examination into the impacts of the draft LDF Core Strategy, it is important that the model reflects traffic flows and journey times on both the M6 and M61 with a good degree of accuracy. The primary concern of the HA is any potential impact that the LDF proposals may have on the motorway network.

The development of the 2009 Wigan Inner Relief Route SATURN Model is fully documented in the Data Collection and Surveys Report (GMTU Report 1635, August 2010) and the Model Development and Validation Report (GMTU Report 1630, August 2010).

Wigan Area Updated Model Validation

As stated previously, GMTU Report 1630 (LMVR) describes in detail the validation of the WIRR SATURN model and shows that the model validates well against DMRB criteria.

Additional count data was included in a further round of matrix estimation to improve the validation of traffic flows and journey times on:

- M6 – in the Wigan borough between Junctions 24 and 27
- M61 – running close to and parallel with the Wigan boundary (in Bolton MBC) between Junctions 4 and 6.

Recent (2008 and 2009) ATC count data (split into the individual vehicle classes; car, LGV, OGV) from these sections of motorway was used for the updated matrix estimation exercise. Matrix estimation was run for the inter-peak, morning and evening peak-hour modelled time periods.

Count Data Validation

Tables A.1 and A.2 compare observed and modelled traffic flows on the M6 and M61 respectively. To aid interpretation, the GEH values are shaded as follows:

- Green - GEH less than 5.0 is considered to validate well
- Amber - GEH in the range 5.0 to 7.5 is considered to validate acceptably
- Red - GEH is greater than 7.5 is considered to validate poorly.

Table A.1 shows that on the on the M6 motorway, the additional matrix estimation run improved the modelled representation of observed flows at all locations except on the section of M6 between Junctions 25 and 24 during the evening peak-hour. Assignment validation on the M6 Jn-25 link road (between M6 and A49) also improved considerably during both peak-hours.

Table A.2 shows that on the M61 motorway, the additional matrix estimation run improved the modelled representation of observed flows at most locations, particularly between M61 Junctions 4 and 5 (southeast bound during the morning peak-hour and northwest bound during the inter-peak and evening peak-hour). However, the evening peak-hour validation between M61 Junctions 5 and 6 remained relatively poor.

Tables A.3 - A.5 compare the morning, average inter-peak and evening peak-hour assignment validation between the base WIRR model and the updated model at various count sites across the Wigan borough. All three tables indicate that the improvements in motorway flow validation have not been at the expense of the wider model validation. Indeed, at a number of locations the validation has been improved.

Table A.1 Peak-hour Comparison between Val-2009 and Updated Model Traffic Flows at Count Sites on the M6 Motorway

Period	Location	Direction	Observed Count	Modelled Flows		Modelled - Observed		% Diff		GEH	
				Val-2009	Updated	Val-2009	Updated	Val-2009	Updated	Val-2009	Updated
AM	Jn 26 to 27	N	4853	4901	4871	48	18	1%	0%	0.69	0.26
	Jn 27 to 26	S	4552	4431	4427	-121	-125	-3%	-3%	1.81	1.87
	Jn 25 to A49 (link road)	N	1057	1111	1013	54	-44	5%	-4%	1.64	1.37
	A49 to Jn 25 (link road)	S	1137	1403	1108	266	-29	19%	-3%	7.46	0.87
	Jn 24 to 25	N	5520	6153	6032	633	512	10%	8%	8.29	6.74
	Jn 25 to 24	S	5961	6004	5700	43	-261	1%	-5%	0.56	3.42
IP	Jn 26 to 27	N	3933	3804	3806	-129	-127	-3%	-3%	2.07	2.04
	Jn 27 to 26	S	3382	3744	3729	362	347	10%	9%	6.06	5.82
	Jn 25 to A49 (link road)	N	805	774	784	-31	-21	-4%	-3%	1.10	0.75
	A49 to Jn 25 (link road)	S	1177	861	1017	-316	-160	-37%	-16%	9.90	4.83
	Jn 24 to 25	N	4637	4450	4445	-187	-192	-4%	-4%	2.77	2.85
	Jn 25 to 24	S	4776	4833	4977	57	201	1%	4%	0.82	2.88
PM	Jn 26 to 27	N	4550	4367	4336	-183	-214	-4%	-5%	2.74	3.21
	Jn 27 to 26	S	4911	5144	5138	233	227	5%	4%	3.29	3.20
	Jn 25 to A49 (link road)	N	1663	1197	1539	-466	-124	-39%	-8%	12.32	3.10
	A49 to Jn 25 (link road)	S	1753	1349	1668	-404	-85	-30%	-5%	10.26	2.06
	Jn 24 to 25	N	6165	5851	6158	-314	-7	-5%	0%	4.05	0.09
	Jn 25 to 24	S	5562	6510	6800	948	1238	15%	18%	12.20	15.75

Table A.2 Peak-hour Comparison between Val-2009 and Updated Model Traffic Flows at Count Sites on the M61 Motorway

Period	Location	Direction	Observed Count	Modelled Flows		Modelled - Observed		% Diff		GEH	
				Val-2009	Updated	Val-2009	Updated	Val-2009	Updated	Val-2009	Updated
AM	Jn 5 to 6	NW	4292	4488	4512	196	220	4%	5%	2.96	3.32
	Jn 6 to 5	SE	3690	3498	3354	-192	-336	-5%	-10%	3.20	5.66
	Jn 4 to 5	NW	4865	4681	4879	-184	14	-4%	0%	2.66	0.20
	Jn 5 to 4	SE	3732	4565	3711	833	-21	18%	-1%	12.93	0.34
IP	Jn 5 to 6	NW	3051	3397	3397	346	346	10%	10%	6.09	6.09
	Jn 6 to 5	SE	2858	3076	3074	218	216	7%	7%	4.00	3.97
	Jn 4 to 5	NW	3207	3931	3204	724	-3	18%	0%	12.12	0.05
	Jn 5 to 4	SE	3144	3224	3150	80	6	2%	0%	1.42	0.11
PM	Jn 5 to 6	NW	4443	5183	5169	660	726	14%	14%	10.67	10.47
	Jn 6 to 5	SE	4420	3799	3873	-621	-547	-16%	-14%	9.69	8.49
	Jn 4 to 5	NW	5077	5625	5083	548	6	10%	0%	7.49	0.08
	Jn 5 to 4	SE	4236	3941	4241	-295	5	-7%	0%	4.61	0.08

Table A.3 AM Peak-hour Comparison between Val-2009 and Updated Model Traffic Flows at Independent Count Sites in Wigan

Location	Direction	Observed Factored Count	Modelled Flows		Modelled - Observed		% Diff		GEH	
			Val-2009	Updated	Val-2009	Updated	Val-2009	Updated	Val-2009	Updated
B5239 Red Rock Lane	W	446	503	523	57	77	12.78	17.29	2.62	3.50
B5239 Red Rock Lane	E	357	600	597	243	240	68.07	67.27	11.11	10.99
A49 Caroline Street	NW	817	929	942	112	125	13.71	15.35	3.79	4.23
B5206 Gathurst Lane	S	568	467	463	-101	-104	-17.78	-18.47	4.44	4.62
B5206 Gathurst Lane	N	645	512	507	-133	-137	-20.62	-21.34	5.53	5.73
B5376 Mesnes Road	S	537	550	551	13	14	2.42	2.69	0.56	0.62
C Dorning Street	SE	165	92	114	-73	-50	-44.24	-30.71	6.44	4.29
C Wallgate	NE	510	463	444	-47	-65	-9.22	-13.01	2.13	3.04
U Mesnes Street	SE	51	38	38	-13	-12	-25.49	-26.37	1.95	2.02
A49 Wallgate	SW	903	975	908	72	5	7.97	0.58	2.35	0.17
A49 Wallgate	NE	1187	1163	1147	-24	-39	-2.02	-3.34	0.70	1.16
A577 Darlington Street East	E	366	430	427	64	61	17.49	16.78	3.21	3.08
A577 Darlington Street East	W	589	566	560	-23	-28	-3.90	-4.98	0.96	1.22
C Highfield Grange Ave	E	687	692	679	5	-7	0.73	-1.12	0.19	0.29
A49 Wigan Road	NW	478	435	489	-43	11	-9.00	2.23	2.01	0.48
B5375 Park Road	W	242	315	313	73	71	30.17	29.31	4.37	4.26
B5375 Park Road	E	380	371	367	-9	-12	-2.37	-3.41	0.46	0.67
B5375 Northway	E	1177	1107	1115	-70	-61	-5.95	-5.28	2.07	1.84
A49 High Street	SE	553	636	613	83	60	15.01	10.85	3.40	2.49
A49 High Street	NW	725	560	548	-165	-176	-22.76	-24.35	6.51	7.00
A5209 Almond Brook Road	S	586	715	699	129	113	22.01	19.34	5.06	4.47
A5209 Almond Brook Road	N	739	943	939	204	200	27.60	27	7.03	6.89
A49 Wallgate	E	1859	1976	2008	117	149	6.29	7.99	2.67	3.38
A577 Orrell Road	W	548	452	451	-96	-96	-17.52	-17.65	4.29	4.33
A577 Orrell Road	E	617	836	835	219	218	35.49	35.3	8.13	8.08
A573 Warrington Road	N	368	396	397	28	29	7.61	8.01	1.43	1.51
C Spencer Road West	E	586	489	518	-97	-67	-16.55	-11.61	4.18	2.89
A49 Warrington Road	N	1058	881	898	-177	-159	-16.73	-15.11	5.68	5.11
C Beech Hill Avenue	E	772	614	630	-158	-141	-20.47	-18.46	6.00	5.38
U Princess Road	SE	288	305	330	17	42	5.90	14.72	0.99	2.41
U King Street	NW	347	365	372	18	25	5.19	7.18	0.95	1.31
U Stadium Way	SE	105	137	138	32	33	30.48	31.88	2.91	3.03
U Mesnes Terrace	SW	104	59	64	-45	-39	-43.27	-38.71	4.98	4.40
U Bus Station Entrance	SE	84	68	68	-16	-15	-19.05	-18.9	1.84	1.82
A58 Lily Lane	SW	421	325	304	-96	-116	-22.80	-27.77	4.97	6.14
B5375 Northway	NW	784	829	832	45	48	5.74	6.14	1.58	1.69
B5408 Manchester Road	NW	417	626	598	209	181	50.12	43.47	9.15	8.05
C Hindley Road	W	309	377	447	68	138	22.01	44.81	3.67	7.12
U Nel Pan Lane	SW	218	199	195	-19	-22	-8.72	-10.47	1.32	1.59
A572 ST Helens Road	SW	538	559	556	21	18	3.90	3.27	0.90	0.75
B5408 Manchester Road	SE	437	383	375	-54	-61	-12.36	-14.09	2.67	3.05
C Hindley Road	E	211	327	294	116	83	54.98	39.53	7.07	5.25
U Nel Pan Lane	NE	270	370	370	100	100	37.04	37.06	5.59	5.59
A572 ST Helens Road	NE	644	630	629	-14	-16	-2.17	-2.64	0.55	0.67
A49 Warrington Road	N	1454	1552	1562	98	108	6.74	7.45	2.53	2.79
A571 Pemberton Road	N	527	508	512	-19	-14	-3.61	-2.89	0.84	0.67
A577 Orrell Road	E	865	929	929	64	64	7.40	7.44	2.14	2.15
C Spring Road	E	700	612	612	-88	-87	-12.57	-12.54	3.44	3.43
C Scot Lane	SW	1230	1122	1123	-108	-106	-8.78	-8.67	3.15	3.11
A49 Wallgate	SW	920	1037	1044	117	124	12.72	13.46	3.74	3.95
B5238 Poolstock Lane	SW	780	790	793	10	13	1.28	1.69	0.36	0.47
C Scot Lane	NE	899	822	836	-77	-62	-8.57	-7.03	2.62	2.15
A49 Wallgate	NE	1468	1607	1621	139	153	9.47	10.45	3.54	3.90
B5238 Poolstock Lane	NE	1157	1224	1224	67	67	5.79	5.83	1.94	1.96
B5375 Wigan Lower Road	E	705	659	663	-46	-41	-6.52	-6.02	1.76	1.62
A49 Wigan Lane	SE	1282	1127	1115	-155	-166	-12.09	-13.04	4.47	4.83
B5238 Wigan Road	SW	784	735	733	-49	-50	-6.25	-6.53	1.78	1.86
A577 Wigan Road	NW	913	762	761	-151	-151	-16.54	-16.69	5.22	5.27
A573 Warrington Road	NW	749	914	910	165	161	22.03	21.54	5.72	5.60

Table A.4 Inter-peak hour Comparison between Val-2009 and Updated Model Traffic Flows at Independent Count Sites in Wigan

Location	Direction	Observed Factored Count	Modelled Flows		Modelled - Observed		% Diff		GEH	
			Val-2009	Updated	Val-2009	Updated	Val-2009	Updated	Val-2009	Updated
B5239 Red Rock Lane	W	273	359	359	86	86	31.50	31.6	4.84	4.85
B5239 Red Rock Lane	E	237	337	338	100	101	42.19	42.79	5.9	5.98
A49 Caroline Street	NW	883	818	824	-65	-58	-7.36	-6.68	2.23	2.02
B5206 Gathurst Lane	S	404	380	388	-24	-15	-5.94	-3.95	1.21	0.8
B5206 Gathurst Lane	N	382	483	483	101	101	26.44	26.31	4.86	4.83
B5376 Mesnes Road	S	265	257	259	-8	-5	-3.02	-2.26	0.5	0.37
C Dorning Street	SE	155	109	119	-46	-35	-29.68	-23.48	4	3.11
C Wallgate	NE	433	289	283	-144	-149	-33.26	-34.53	7.58	7.9
U Mesnes Street	SE	65	40	40	-25	-24	-38.46	-38.59	3.45	3.46
A49 Wallgate	SW	946	928	835	-18	-110	-1.90	-11.73	0.59	3.72
A49 Wallgate	NE	1043	862	852	-181	-190	-17.35	-18.33	5.86	6.21
A577 Darlington Street East	E	389	389	388	0	0	0.00	-0.3	0	0.06
A577 Darlington Street East	W	488	496	491	8	3	1.64	0.63	0.36	0.14
C Highfield Grange Ave	E	441	492	491	51	50	11.56	11.38	2.36	2.32
A49 Wigan Road	NW	543	480	490	-63	-52	-11.60	-9.78	2.79	2.34
B5375 Park Road	W	289	228	224	-61	-64	-21.11	-22.5	3.79	4.06
B5375 Park Road	E	248	280	279	32	31	12.90	12.49	1.97	1.91
B5375 Northway	E	1126	710	664	-416	-461	-36.94	-41	13.73	15.43
A49 High Street	SE	463	555	548	92	85	19.87	18.37	4.08	3.78
A49 High Street	NW	600	521	517	-79	-82	-13.17	-13.91	3.34	3.53
A5209 Almond Brook Road	S	596	668	656	72	60	12.08	10.06	2.86	2.4
A5209 Almond Brook Road	N	673	692	701	19	28	2.82	4.11	0.73	1.06
A49 Wallgate	E	1889	1938	1941	49	52	2.59	2.74	1.12	1.18
A577 Orrell Road	W	539	571	568	32	29	5.94	5.4	1.36	1.24
A577 Orrell Road	E	507	713	708	206	201	40.63	39.61	8.34	8.15
A573 Warrington Road	N	330	320	317	-10	-12	-3.03	-3.83	0.55	0.7
C Spencer Road West	E	494	397	395	-97	-98	-19.64	-20.14	4.6	4.72
A49 Warrington Road	N	732	776	770	44	38	6.01	5.14	1.6	1.37
C Beech Hill Avenue	E	529	516	512	-13	-16	-2.46	-3.12	0.57	0.72
U Princess Road	SE	389	234	230	-155	-158	-39.85	-40.92	8.78	9.05
U King Street	NW	297	287	290	-10	-6	-3.37	-2.49	0.59	0.43
U Stadium Way	SE	90	212	212	122	122	135.56	135.01	9.93	9.9
U Mesnes Terrace	SW	54	11	11	-43	-42	-79.63	-79.07	7.54	7.47
U Bus Station Entrance	SE	87	80	80	-7	-6	-8.05	-8.56	0.77	0.82
A58 Lily Lane	SW	445	346	345	-99	-99	-22.25	-22.39	4.98	5.01
B5375 Northway	NW	603	653	670	50	67	8.29	11.05	2	2.64
B5408 Manchester Road	NW	499	503	581	4	82	0.80	16.49	0.18	3.54
C Hindley Road	W	147	319	264	172	117	117.01	79.72	11.27	8.17
U Nel Pan Lane	SW	252	197	197	-55	-54	-21.83	-21.82	3.67	3.67
A572 ST Helens Road	SW	430	681	671	251	241	58.37	56.01	10.65	10.27
B5408 Manchester Road	SE	339	263	262	-76	-76	-22.42	-22.73	4.38	4.45
C Hindley Road	E	148	232	232	84	84	56.76	56.75	6.09	6.09
U Nel Pan Lane	NE	244	298	297	54	53	22.13	21.83	3.28	3.24
A572 ST Helens Road	NE	438	507	505	69	67	15.75	15.34	3.17	3.09
A49 Warrington Road	N	1222	1282	1283	60	61	4.91	4.95	1.7	1.71
A571 Pemberton Road	N	352	382	384	30	32	8.52	9.16	1.57	1.68
A577 Orrell Road	E	786	832	818	46	32	5.85	4.12	1.62	1.14
C Spring Road	E	254	312	315	58	61	22.83	24.16	3.45	3.64
C Scot Lane	SW	1015	986	993	-29	-21	-2.86	-2.12	0.92	0.68
A49 Wallgate	SW	1049	1024	1031	-25	-17	-2.38	-1.68	0.78	0.55
B5238 Poolstock Lane	SW	668	803	796	135	128	20.21	19.13	4.98	4.72
C Scot Lane	NE	718	803	804	85	86	11.84	11.91	3.08	3.1
A49 Wallgate	NE	1324	1162	1171	-162	-152	-12.24	-11.56	4.59	4.33
B5238 Poolstock Lane	NE	673	737	739	64	66	9.51	9.79	2.41	2.48
B5375 Wigan Lower Road	E	335	382	385	47	50	14.03	14.8	2.48	2.61
A49 Wigan Lane	SE	733	672	644	-61	-88	-8.32	-12.18	2.3	3.4
B5238 Wigan Road	SW	558	606	611	48	53	8.60	9.58	1.99	2.21
A577 Wigan Road	NW	840	715	713	-125	-126	-14.88	-15.06	4.48	4.54
A573 Warrington Road	NW	653	647	648	-6	-4	-0.92	-0.72	0.24	0.19

Table A.5 PM Peak-hour Comparison between Val-2009 and Updated Model Traffic Flows at Independent Count Sites in Wigan

Location	Direction	Observed Factored Count	Modelled Flows		Modelled - Observed		% Diff		GEH	
			Val-2009	Updated	Val-2009	Updated	Val-2009	Updated	Val-2009	Updated
B5239 Red Rock Lane	W	460	602	602	142	142	30.85	30.87	6.16	6.16
B5239 Red Rock Lane	E	384	499	482	115	98	30.01	25.52	5.48	4.71
A49 Caroline Street	NW	609	557	553	-51	-56	-8.58	-9.20	2.16	2.32
B5206 Gathurst Lane	S	644	635	641	-8	-3	-1.35	-0.47	0.34	0.12
B5206 Gathurst Lane	N	471	488	486	17	15	3.71	3.18	0.80	0.69
B5376 Mesnes Road	S	262	258	258	-3	-4	-1.72	-1.53	0.28	0.25
C Dorning Street	SE	99	66	54	-32	-45	-33.49	-45.45	3.65	5.14
C Wallgate	NE	328	221	223	-106	-105	-32.73	-32.01	6.48	6.33
U Mesnes Street	SE	48	34	34	-13	-14	-29.68	-29.17	2.23	2.19
A49 Wallgate	SW	850	880	958	30	108	3.5	12.71	1.01	3.59
A49 Wallgate	NE	967	854	858	-112	-109	-11.68	-11.27	3.74	3.61
A577 Darlington Street East	E	476	481	489	5	13	1.1	2.73	0.24	0.59
A577 Darlington Street East	W	387	401	409	14	22	3.61	5.68	0.70	1.10
C Highfield Grange Ave	E	564	501	467	-62	-97	-11.24	-17.20	2.75	4.27
A49 Wigan Road	NW	536	325	501	-210	-35	-39.33	-6.53	10.16	1.54
B5375 Park Road	W	389	389	394	0	5	-0.02	1.29	0.00	0.25
B5375 Park Road	E	280	247	257	-32	-23	-11.78	-8.21	2.03	1.40
B5375 Northway	E	1417	849	865	-567	-552	-40.06	-38.96	16.86	16.34
A49 High Street	SE	546	700	711	154	165	28.16	30.22	6.16	6.58
A49 High Street	NW	794	785	799	-8	5	-1.12	0.63	0.32	0.18
A5209 Almond Brook Road	S	722	715	710	-6	-12	-1.02	-1.66	0.27	0.45
A5209 Almond Brook Road	N	813	871	873	58	60	7.15	7.38	2.00	2.07
A49 Wallgate	E	1789	1757	1752	-31	-37	-1.78	-2.07	0.76	0.88
A577 Orrell Road	W	635	617	612	-17	-23	-2.81	-3.62	0.71	0.92
A577 Orrell Road	E	468	568	558	100	90	21.44	19.23	4.41	3.97
A573 Warrington Road	N	383	404	398	21	15	5.6	3.92	1.08	0.76
C Spencer Road West	E	562	446	453	-115	-109	-20.68	-19.40	5.18	4.84
A49 Warrington Road	N	835	918	911	83	76	9.99	9.10	2.82	2.57
C Beech Hill Avenue	E	606	600	611	-5	5	-0.95	0.83	0.23	0.20
U Princess Road	SE	252	248	326	-3	74	-1.74	29.37	0.28	4.35
U King Street	NW	342	351	347	9	5	2.61	1.46	0.48	0.27
U Stadium Way	SE	251	185	193	-65	-58	-26.12	-23.11	4.44	3.89
U Mesnes Terrace	SW	3	7	7	4	4	141.87	133.33	1.88	1.79
U Bus Station Entrance	SE	79	67	67	-11	-12	-15.47	-15.19	1.43	1.40
A58 Lily Lane	SW	541	502	502	-38	-39	-7.29	-7.21	1.73	1.71
B5375 Northway	NW	987	838	824	-148	-163	-15.09	-16.51	4.93	5.42
B5408 Manchester Road	NW	804	1131	1131	327	327	40.65	40.67	10.51	10.51
C Hindley Road	W	322	346	314	24	-8	7.51	-2.48	1.32	0.45
U Nel Pan Lane	SW	341	251	235	-89	-106	-26.48	-31.09	5.25	6.25
A572 ST Helens Road	SW	656	355	356	-300	-300	-45.93	-45.73	13.4	13.34
B5408 Manchester Road	SE	399	318	322	-80	-77	-20.32	-19.30	4.28	4.06
C Hindley Road	E	249	337	313	88	64	35.17	25.70	5.12	3.82
U Nel Pan Lane	NE	288	243	240	-44	-48	-15.5	-16.67	2.74	2.95
A572 ST Helens Road	NE	505	532	529	27	24	5.26	4.75	1.17	1.06
A49 Warrington Road	N	1819	1681	1686	-137	-133	-7.58	-7.31	3.30	3.18
A571 Pemberton Road	N	651	652	648	1	-3	0.17	-0.46	0.04	0.12
A577 Orrell Road	E	877	903	897	26	20	2.94	2.28	0.87	0.67
C Spring Road	E	436	450	450	14	14	3.22	3.21	0.67	0.67
C Scot Lane	SW	1339	1233	1233	-105	-106	-7.95	-7.92	2.97	2.96
A49 Wallgate	SW	1236	1277	1279	41	43	3.32	3.48	1.16	1.21
B5238 Poolstock Lane	SW	965	1020	1019	55	54	5.74	5.60	1.76	1.71
C Scot Lane	NE	1047	1019	1002	-27	-45	-2.72	-4.30	0.89	1.41
A49 Wallgate	NE	1141	999	991	-141	-150	-12.47	-13.15	4.35	4.59
B5238 Poolstock Lane	NE	685	672	688	-12	3	-1.83	0.44	0.48	0.11
B5375 Wigan Lower Road	E	440	472	470	32	30	7.23	6.82	1.49	1.41
A49 Wigan Lane	SE	830	649	677	-180	-153	-21.76	-18.43	6.64	5.57
B5238 Wigan Road	SW	751	809	812	58	61	7.67	8.12	2.06	2.18
A577 Wigan Road	NW	672	607	592	-64	-80	-9.67	-11.90	2.57	3.18
A573 Warrington Road	NW	638	614	616	-23	-22	-3.76	-3.45	0.96	0.88

Journey Time Validation

In order to assess how well the updated 2009 WIRR model replicates journey times on the M6 and M61, we compared modelled and observed journey times between Junctions 24 and 27 of the M6, and Junctions 4 and 6 of the M61. Although the M61 does not cross the Wigan district boundary, the section between Junctions 4 and 6 passes within 2 km of the boundary and any changes to the Wigan network could potentially impact on this section of the M61.

The observed journey times were estimated using Trafficmaster© data for the period September 2008 to August 2009. This data is collected on behalf of the Department for Transport by Trafficmaster© Plc, and provides information about average vehicle speeds on roads across the UK for vehicles fitted with GPS devices.

The information in the database was processed by GMTU to exclude observations collected during school and national holidays, and to calculate average times for non-stopping vehicles (i.e. excluding buses and taxis) for standardised time periods. For the purpose of the analysis, the modelled times were compared with observed weekday journey times during the morning peak hour (0800-0900), an average inter-peak hour, and the evening peak hour (1700-1800).

The DMRB requirement for journey time validation is that modelled times should be within 15% (or 1 minute if this is higher) of the observed time on more than 85% of routes. Tables A.6 - A.9 summarise the journey time validation for the M6 northbound and southbound (Figure 2.1), and M61 north-westbound and south-eastbound (Figure 2.2) routes respectively during the morning, inter-peak and evening peak hours. Figures 2.3 to 2.14 show the time-distance plots for the four journey time routes during the morning, inter and evening peak hours.

Analysing the journey time data, we note that:

- the M6 northbound and M61 southbound routes meets DMRB guidelines during all three modelled hours, while the M6 southbound route meets DMRB guidelines during the inter-peak and evening peak hour, and on the M61 north-westbound during the morning peak hour and inter-peak.

- the model slightly under-estimates southbound journey times on the M6 by 17% in the morning peak hour

- M61 north-westbound journey times during the evening peak hour are slightly over-estimated by 33% (or 1.3 minutes). This is partially due to the model over-estimating the traffic flow between Junctions 5 and 6.

Table A.6	**M6 Northbound (Junction 24 – 27) Journey Time Route Comparison**							
Pk-hr		**From Junction 24 to….**	**Cumulative Distance km**	**Cumulative Observed Time min**	**Cumulative Modelled Time min**	**Diff min**	**% Diff**	**DMRB Pass**
AM	1	M6 Jn 25 off-slip	1.5	0.9	1.0	0.0	4%	
	2	M6 Jn 26 off-slip	5.9	3.4	3.4	-0.1	-3%	
	3	M6 Jn 27 off-slip	12.3	6.9	6.8	-0.2	-2%	
		Total	**12.3**	**6.9**	**6.8**	**-0.2**	**-2%**	✓
IP	1	M6 Jn 24 off-slip	1.5	0.9	1.0	0.1	9%	
	2	M6 Jn 25 off-slip	5.9	3.3	3.3	0.0	1%	
	3	M6 Jn 26 off-slip	12.3	6.7	6.7	0.0	1%	
		Total	**12.3**	**6.7**	**6.7**	**0.0**	**1%**	✓
PM	1	M6 Jn 24 off-slip	1.5	1.0	1.0	-0.1	-9%	
	2	M6 Jn 25 off-slip	5.9	3.6	3.4	-0.2	-7%	
	3	M6 Jn 26 off-slip	12.3	7.1	6.8	-0.3	-4%	
		Total	**12.3**	**7.1**	**6.8**	**-0.3**	**-4%**	✓

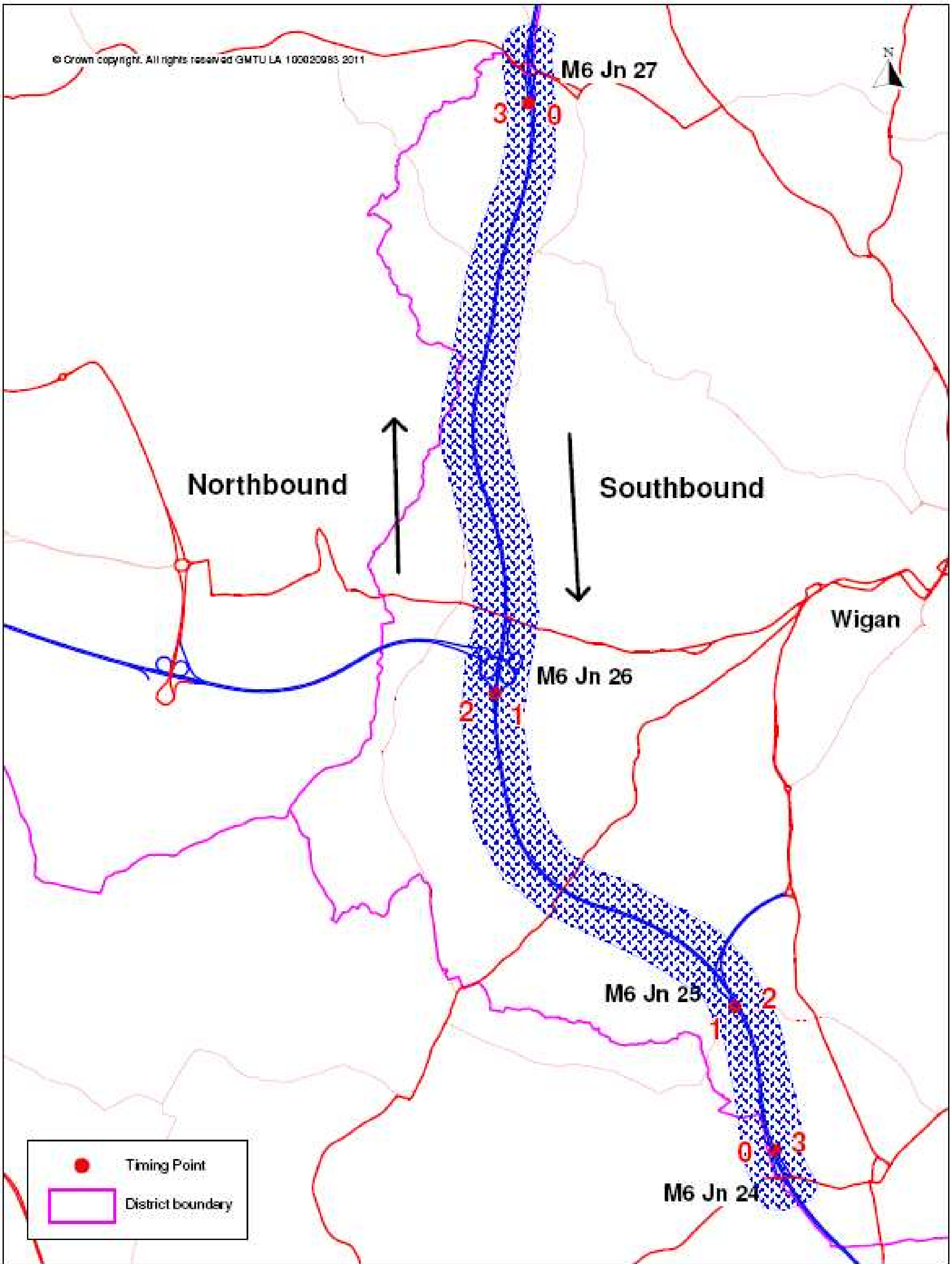
Table A.7 M6 Southbound (Junction 27 – 24) Journey Time Route Comparison							
Pk-hr	**From Junction 27 to….**	**Cumulative Distance km**	**Cumulative Observed Time min**	**Cumulative Modelled Time min**	**Diff min**	**% Diff**	**DMRB Pass**
AM	1 M6 Jn 26 off-slip	5.9	4.1	4.0	-0.1	-2%	
	2 M6 Jn 25 off-slip	10.5	7.8	6.4	-1.3	-17%	
	3 M6 Jn 24 off-slip	12.3	9.2	7.6	-1.6	-17%	
	Total	**12.3**	**9.2**	**7.6**	**-1.6**	**-17%**	✗
IP	1 M6 Jn 26 off-slip	5.9	3.2	3.6	0.4	11%	
	2 M6 Jn 25 off-slip	10.5	5.7	6.0	0.3	5%	
	3 M6 Jn 24 off-slip	12.3	6.7	7.2	0.5	7%	
	Total	**12.3**	**6.7**	**7.2**	**0.5**	**7%**	✓
PM	1 M6 Jn 26 off-slip	5.9	3.6	4.6	1.1	5.9	
	2 M6 Jn 25 off-slip	10.5	6.2	7.1	0.9	10.5	
	3 M6 Jn 24 off-slip	12.3	7.9	8.3	0.4	12.3	
	Total	**12.3**	**7.9**	**8.3**	**0.4**	**12.3**	✓

Table A.8 M61 North-westbound (Junction 4 – 6) Journey Time Route Comparison

Pk-hr		From Junction 4 to….	Cumulative Distance km	Cumulative Observed Time min	Cumulative Modelled Time min	Diff min	% Diff	DMRB Pass
AM	1	M61 Jn 5 off-slip	3.0	1.6	1.7	0.1	7%	
	2	M61 Jn 6 off-slip	7.1	3.9	4.5	0.7	17%	
		Total	**7.1**	**3.9**	**4.5**	**0.7**	**17%**	✓
IP	1	M61 Jn 5 off-slip	3.0	1.6	1.7	0.1	6%	
	2	M61 Jn 6 off-slip	7.1	3.8	4.1	0.3	7%	
		Total	**7.1**	**3.8**	**4.1**	**0.3**	**7%**	✓
PM	1	M61 Jn 5 off-slip	3.0	1.8	2.2	0.4	25%	
	2	M61 Jn 6 off-slip	7.1	4.1	5.4	1.3	33%	
		Total	**7.1**	**4.1**	**5.4**	**1.3**	**33%**	✗

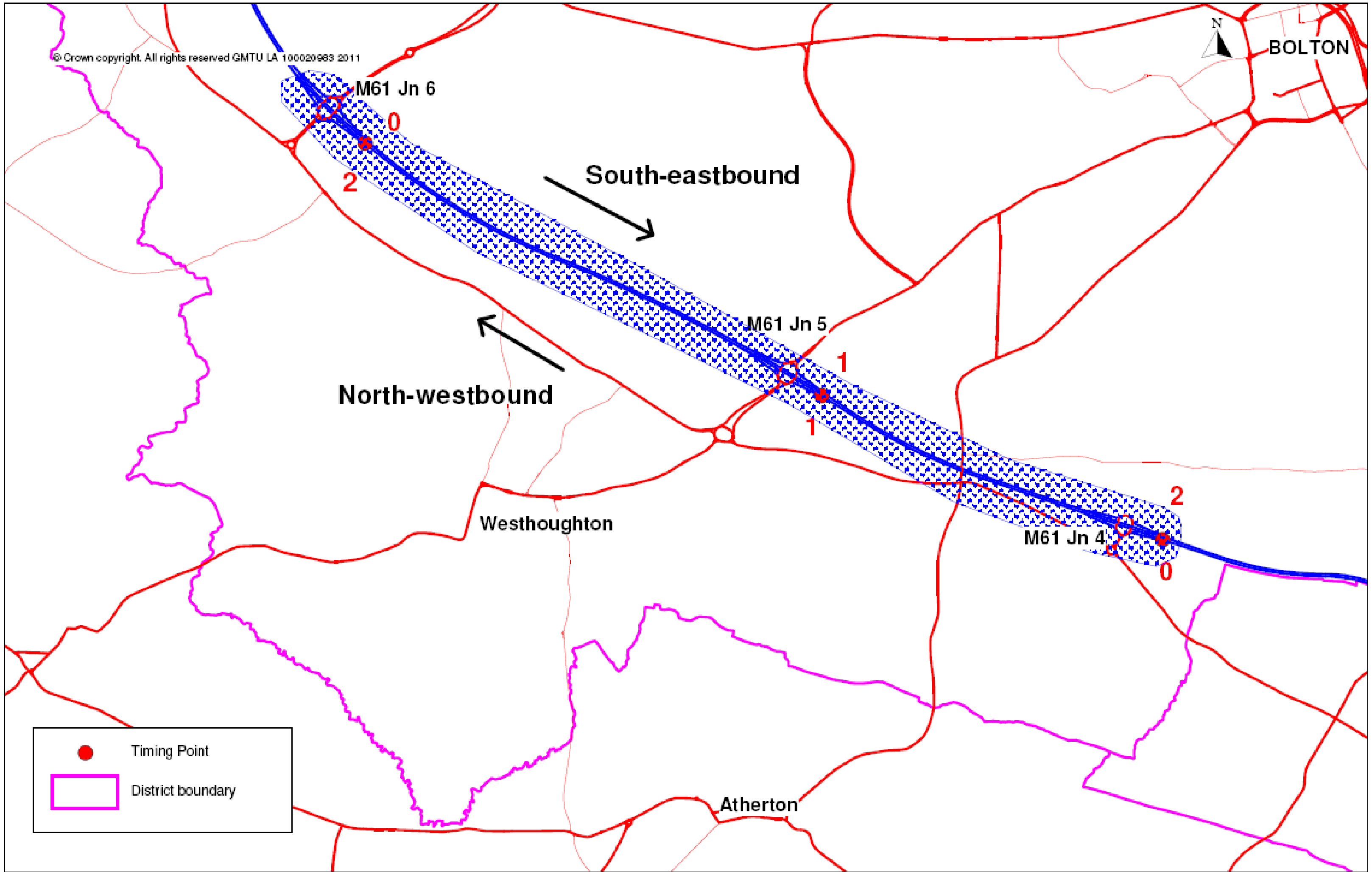
Table A.9 M61 South-eastbound (Junction 6 – 4) Journey Time Route Comparison

Pk-hr		From Junction 6 to….	Cumulative Distance km	Cumulative Observed Time min	Cumulative Modelled Time min	Diff min	% Diff	DMRB Pass
AM	1	M61 Jn 5 off-slip	4.2	2.3	2.4	0.1	5%	
	2	M61 Jn 4 off-slip	7.2	4.5	4.1	-0.4	-9%	
		Total	**7.2**	**4.5**	**4.1**	**-0.4**	**-9%**	✓
IP	1	M61 Jn 5 off-slip	4.2	2.2	2.4	0.1	7%	
	2	M61 Jn 4 off-slip	7.2	3.9	4.1	0.2	5%	
		Total	**7.2**	**3.9**	**4.1**	**0.2**	**5%**	✓
PM	1	M61 Jn 5 off-slip	4.2	2.3	2.6	0.3	12%	
	2	M61 Jn 4 off-slip	7.2	4.0	4.5	0.5	13%	
		Total	**7.2**	**4.0**	**4.5**	**0.5**	**13%**	✓



Wigan LDF - M6 Journey Time Routes

GMTU 3rd Floor Heron House 47 Lloyd Street Manchester M2 5LE	Drawn By : EA	Date : April 2011
	Scale : NTS	Figure : 2.1



Wigan LDF - M61 Journey Time Routes			
Drawn By : EA	Scale : NTS	Date : April 2011	Figure 2.2

GMTU
3rd Floor Heron House
47 Lloyd Street
Manchester M2 5LE

Figure 2.3 - M6 Northbound AM Peak-hour Journey Time Comparison

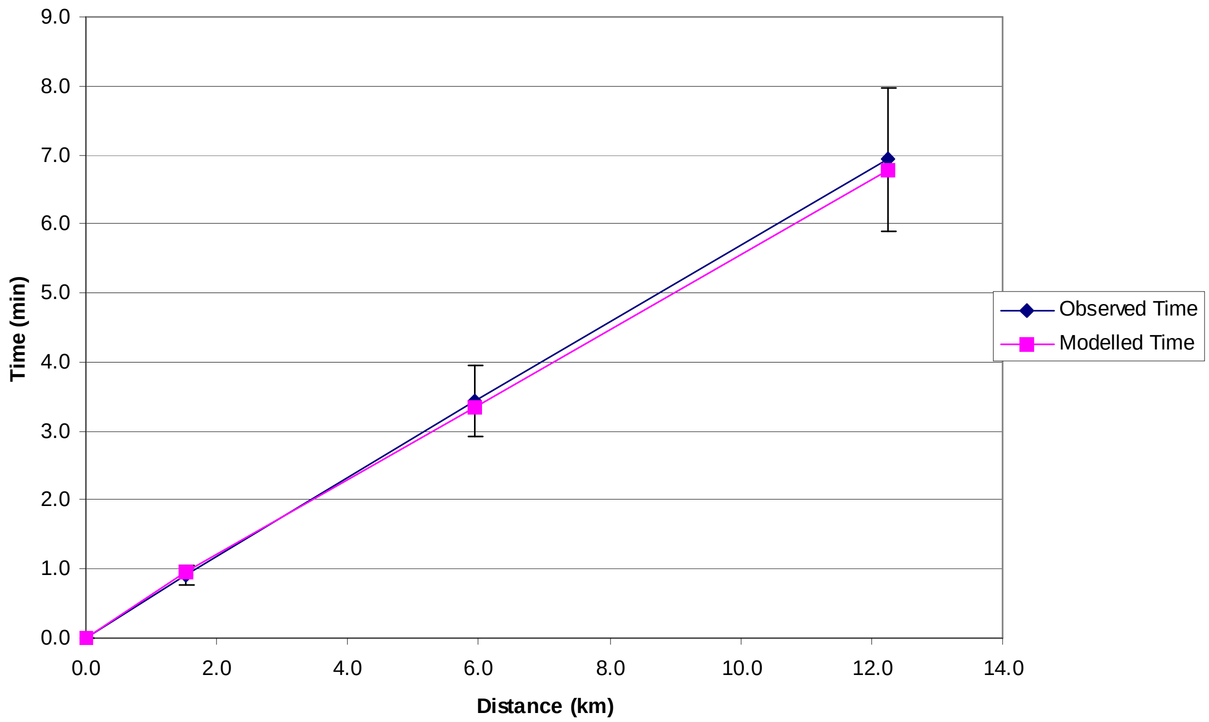


Figure 2.4 - M6 Northbound Inter-peak Journey Time Comparison

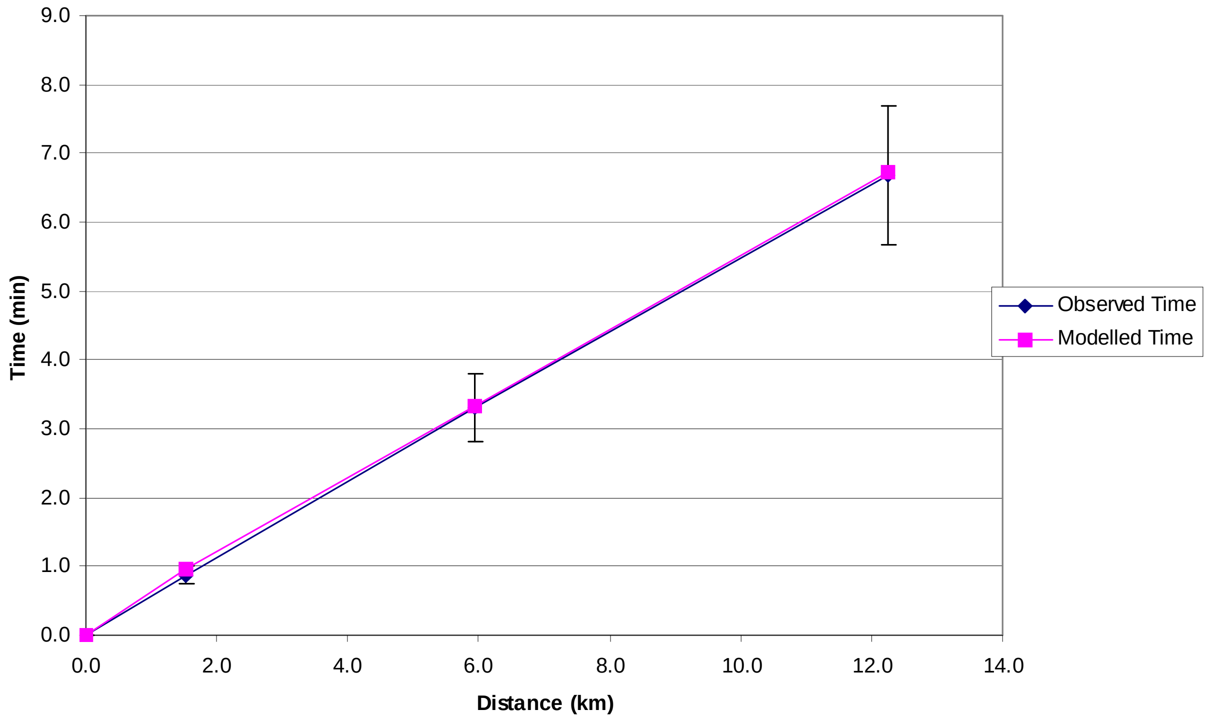


Figure 2.5 - M6 Northbound PM Peak-hour Journey Time Comparison

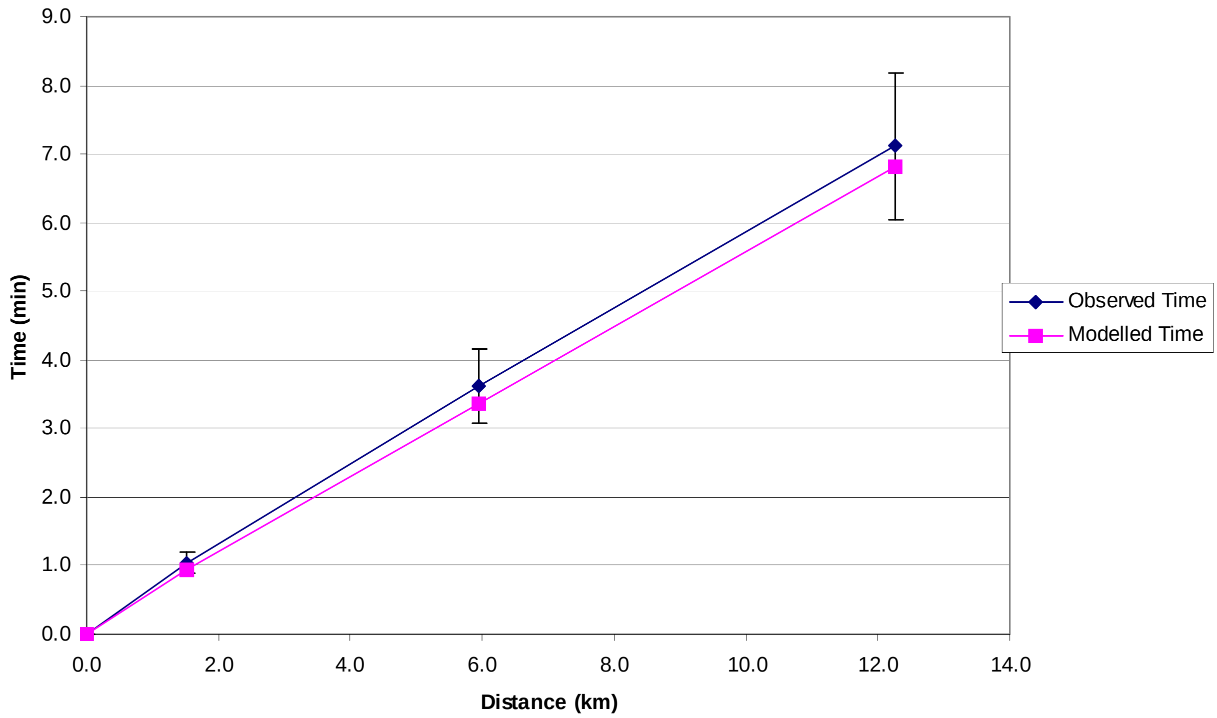


Figure 2.6 - M6 Southbound AM Peak-hour Journey Time Comparison

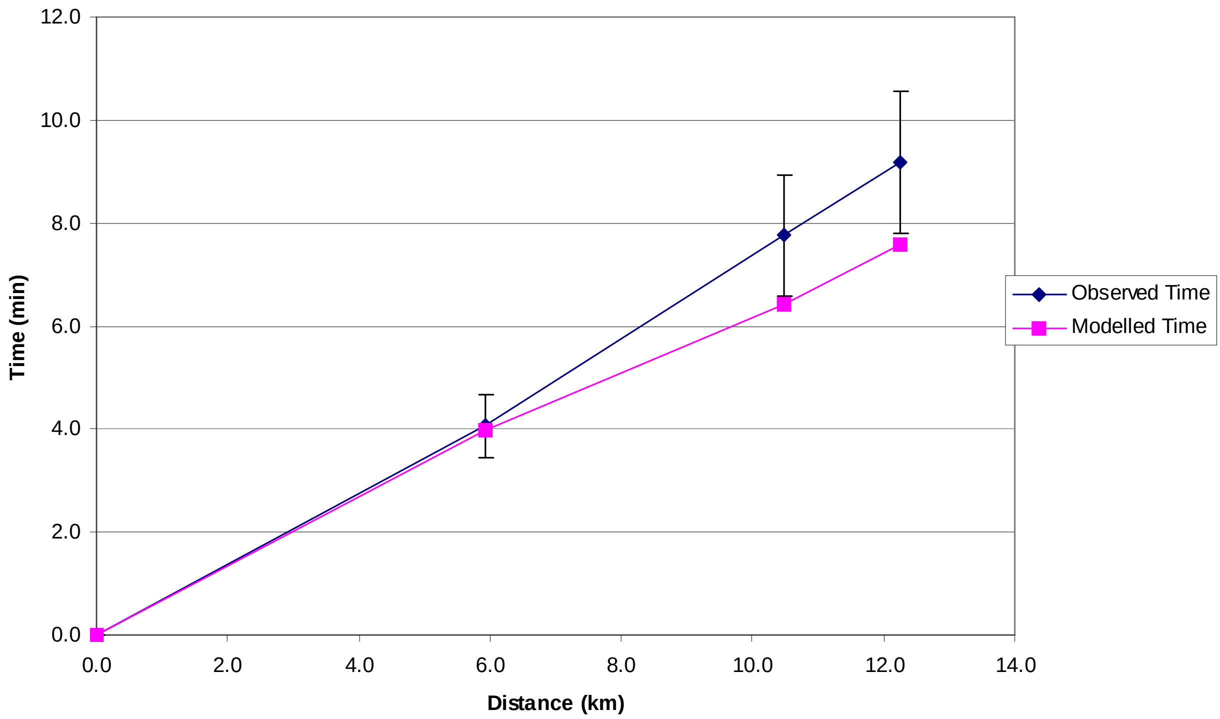


Figure 2.7 - M6 Southbound Inter-peak Journey Time Comparison

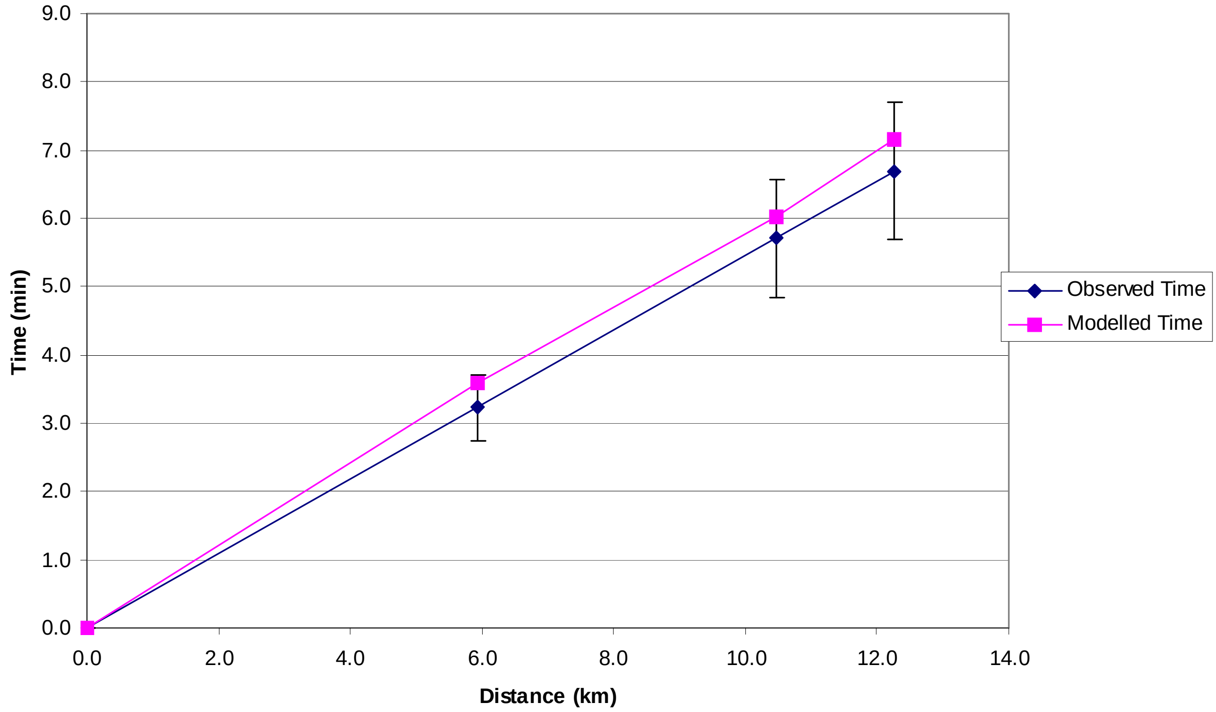


Figure 2.8 - M6 Southbound PM Peak-hour Journey Time Comparison

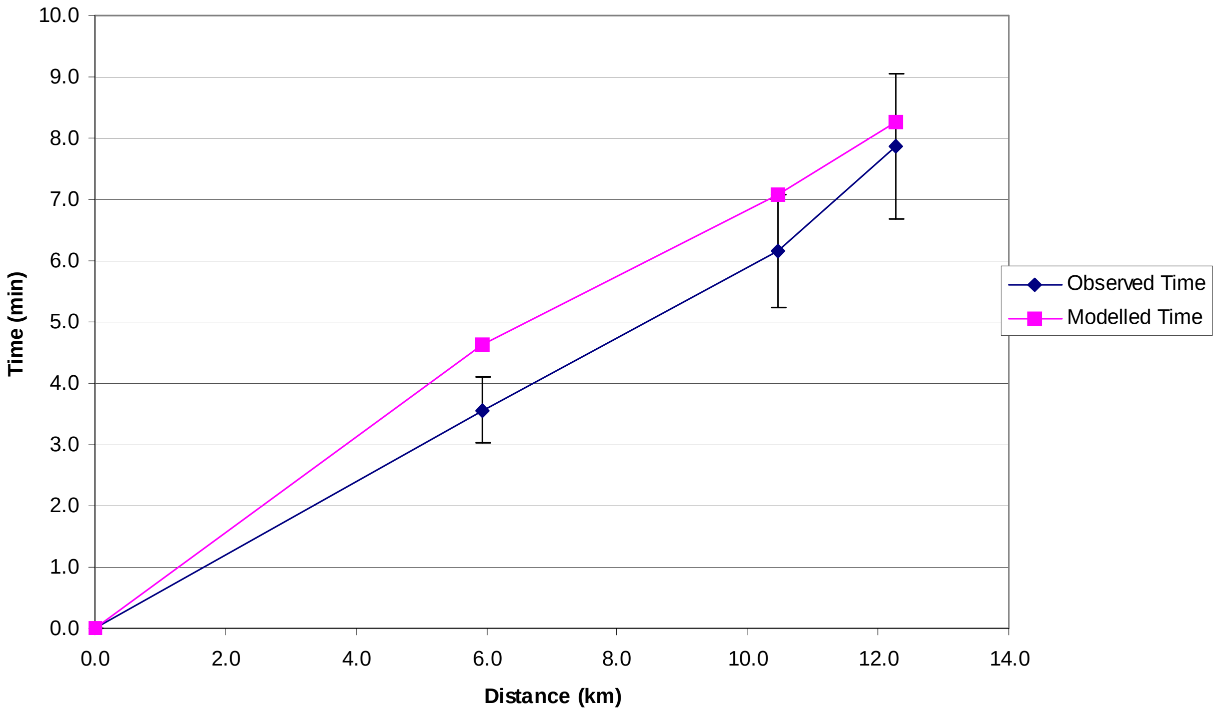


Figure 2.9 - M61 North-westbound AM Peak-hour Journey Time Comparison

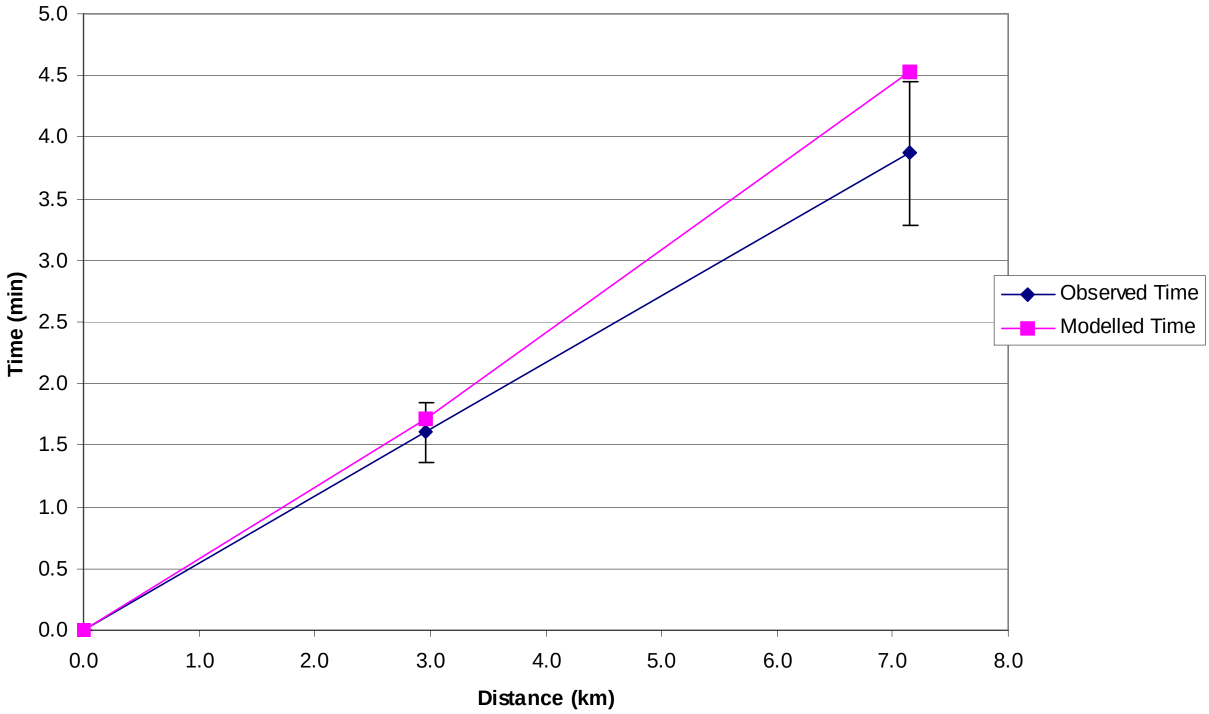


Figure 2.10 - M61 North-westbound Inter-peak Journey Time Comparison

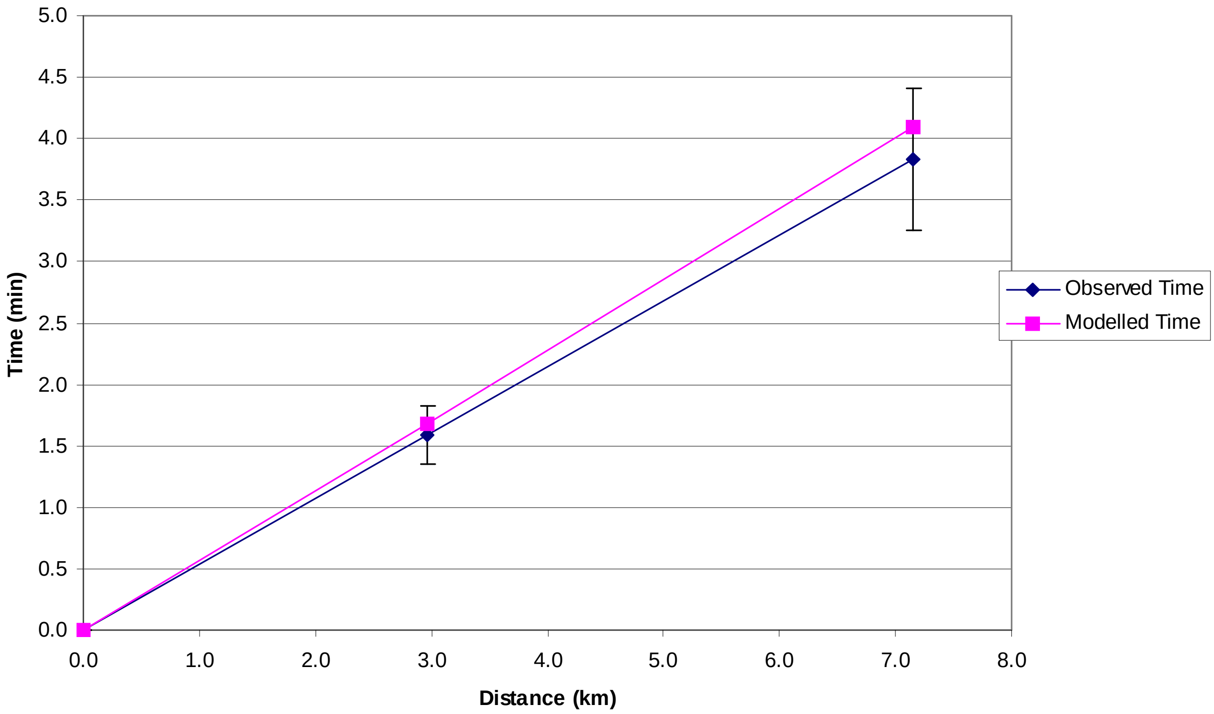


Figure 2.11 - M61 North-westbound PM Peak-hour Journey Time Comparison

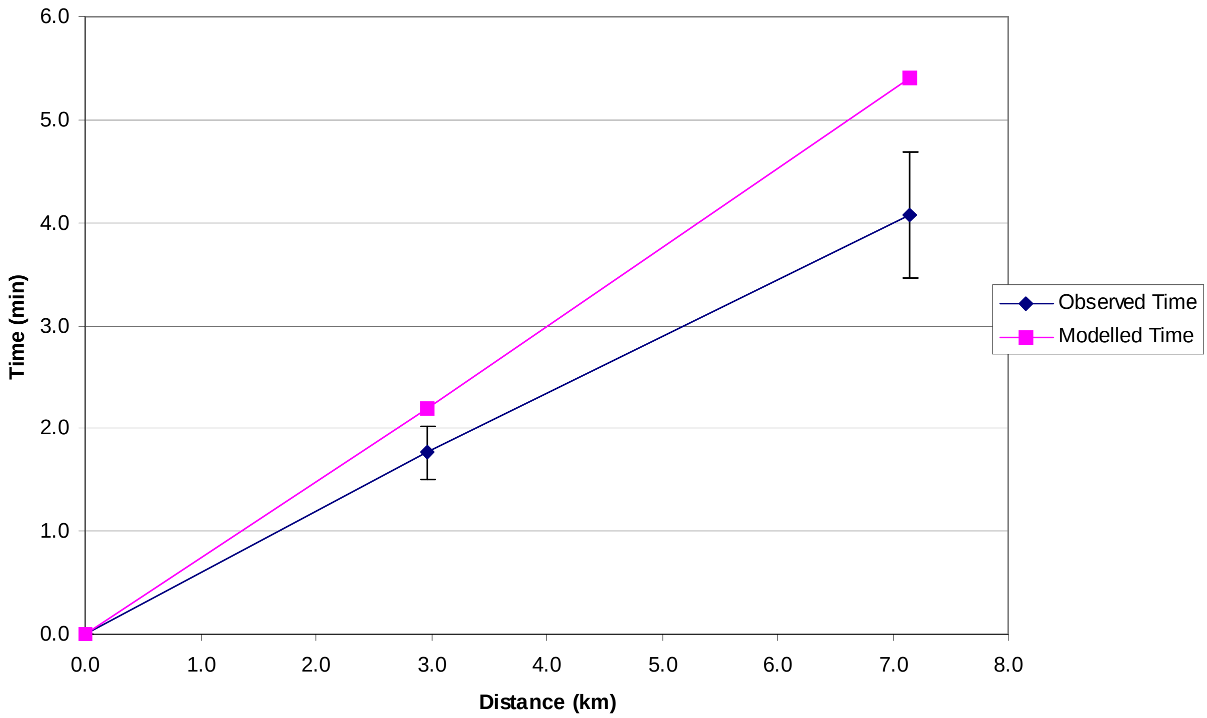


Figure 2.12 - M61 South-eastbound AM Peak-hour Journey Time Comparison

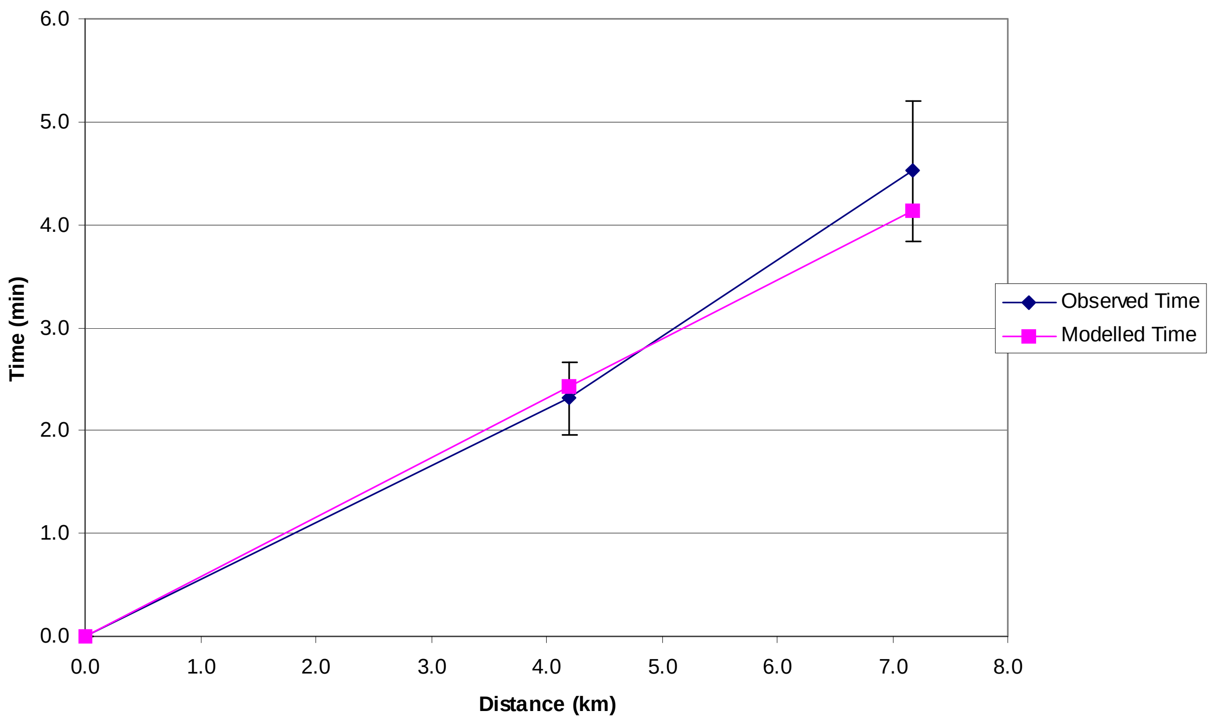


Figure 2.13 - M61 South-eastbound Inter-peak Journey Time Comparison

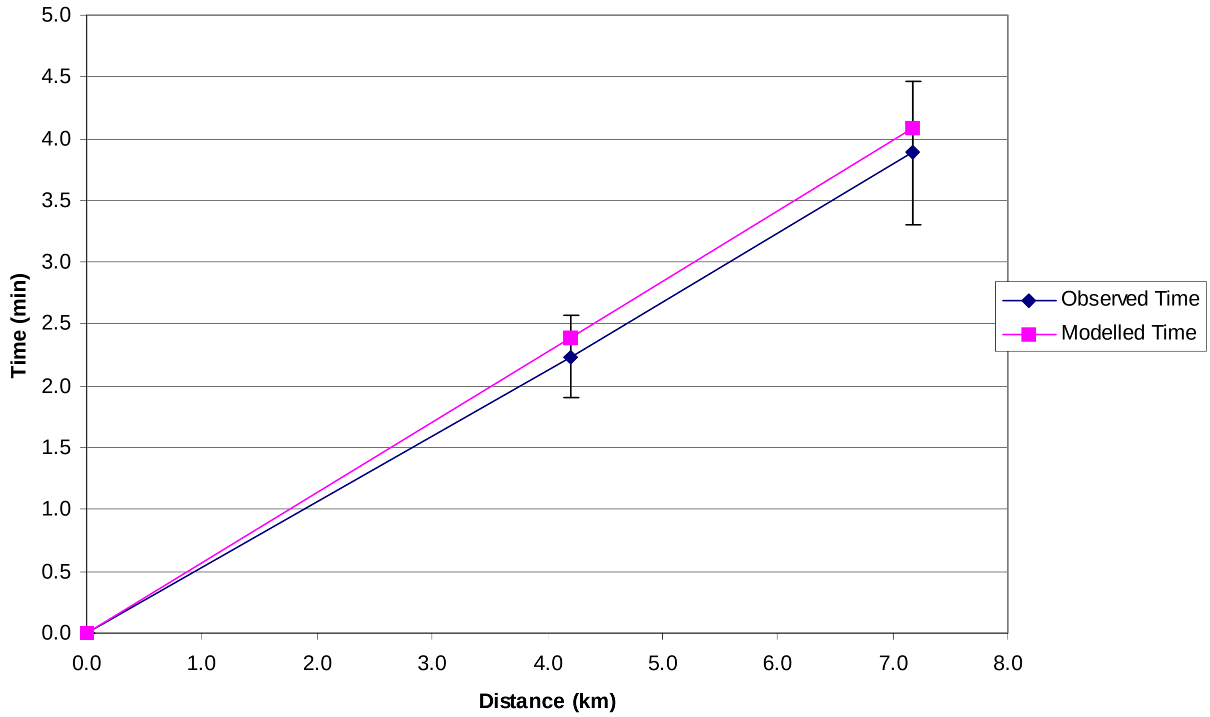
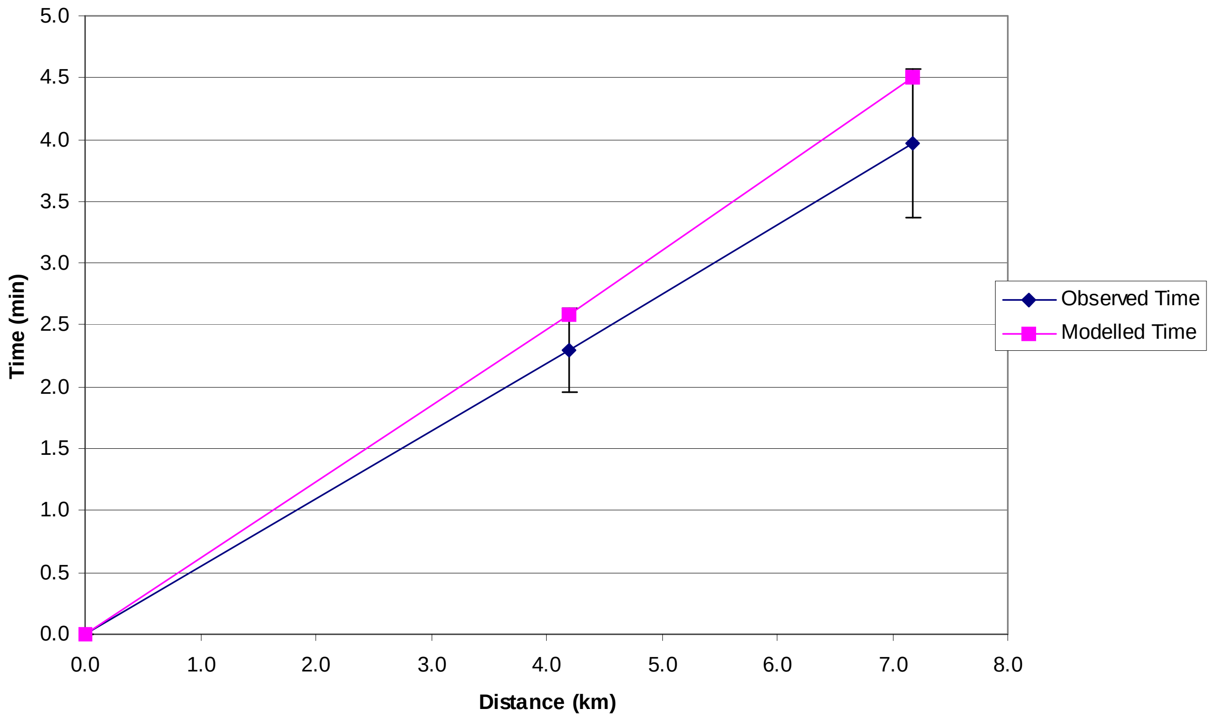


Figure 2.14 - M61 South-eastbound PM Peak-hour Journey Time Comparison



Summary and Conclusions

The WIRR SATURN Model was recently validated across Wigan to 2009 traffic flows. For this current piece of work, we carried out some further work to improve the validation of traffic flows and journey times on the M6 and M61. The model already validated well on the local authority highway network in the Wigan borough, but to allay any concerns from the Highways Agency we also confirmed that the model can replicate current conditions on both the M6 and M61, to ensure that the subsequent analysis into the impacts of the LDF Core Strategy is robust.

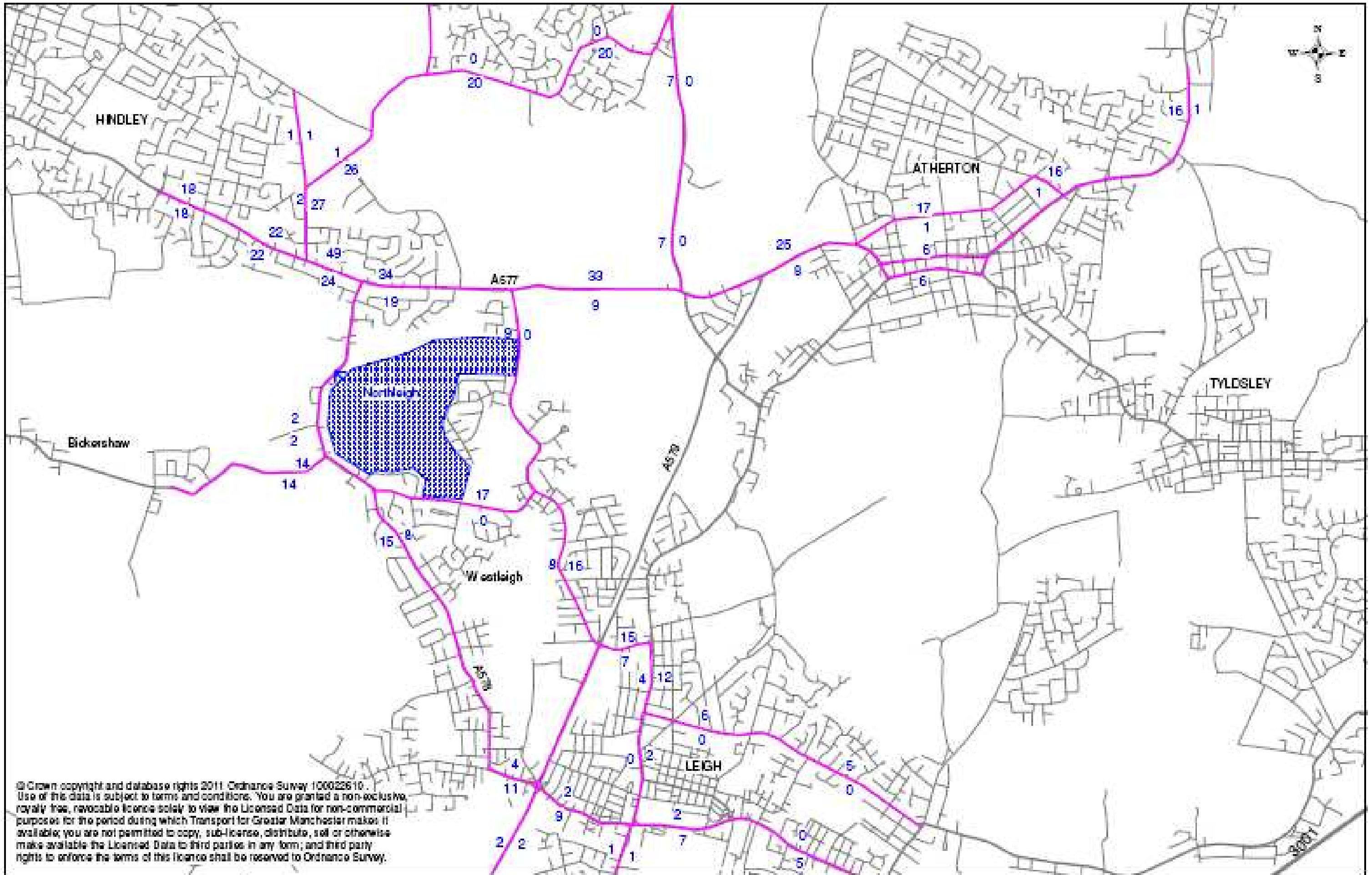
An additional run of matrix estimation using observed flow data on both the M6 and M61 motorways considerably improved the validation of motorway flows compared to the original WIRR model, while overall validation across Wigan generally remained unaffected and in some instances, actually improved.

The journey time validation on both the M6 and M61 is good, with the majority of modelled journey times meeting DMRB requirements in all the three modelled time periods.

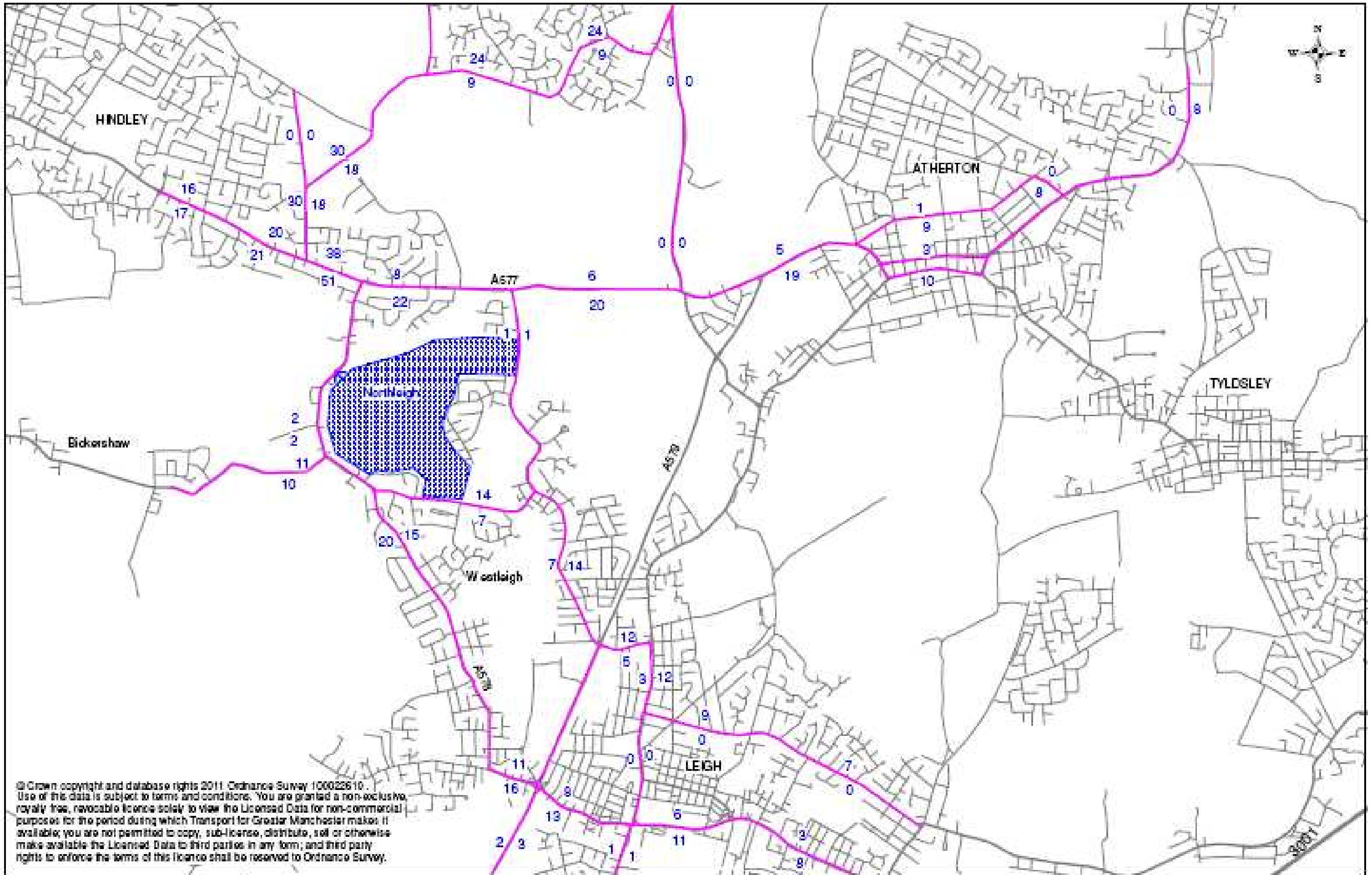
In view of the above, we believe that the updated version of the 2009 WIRR SATURN model is a robust and reliable tool for the Phase 2b study to examine the potential impacts of the Wigan LDF Core Strategy study.

Appendix 2

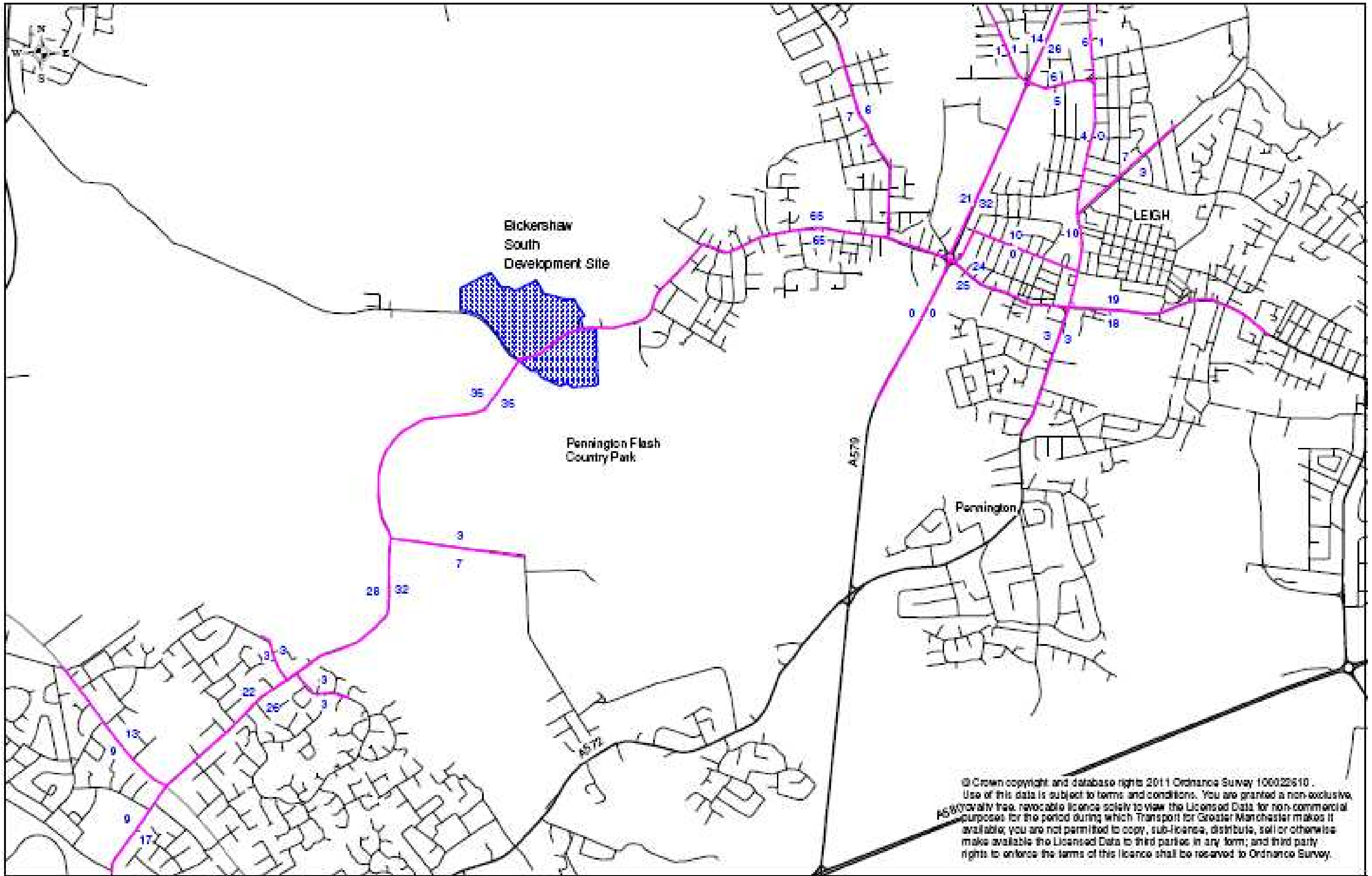
DEVTRIPS Distribution Plots (Figures 9.1 – 9.18)



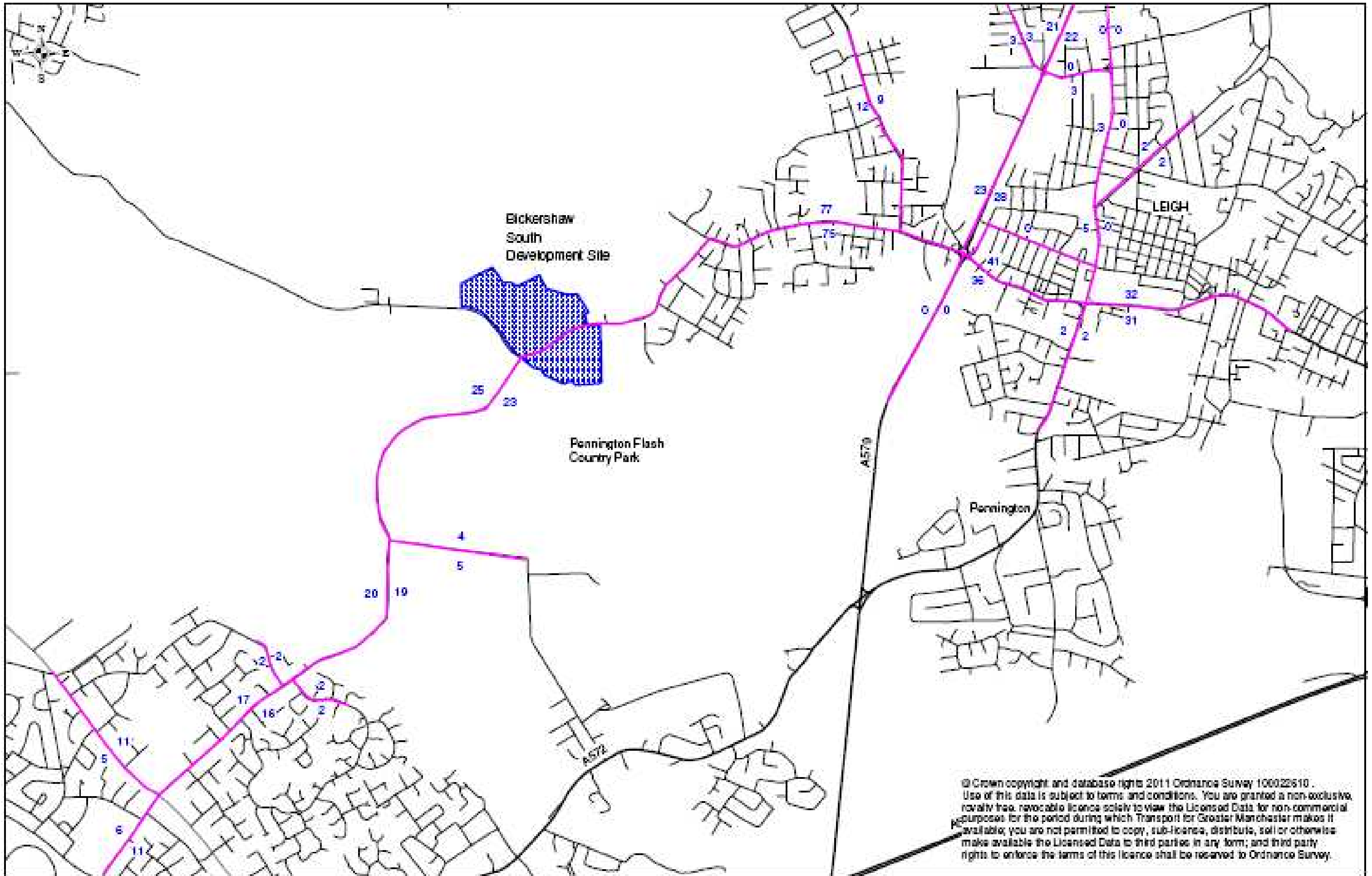
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Northleigh Develpoment - Morning Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.1



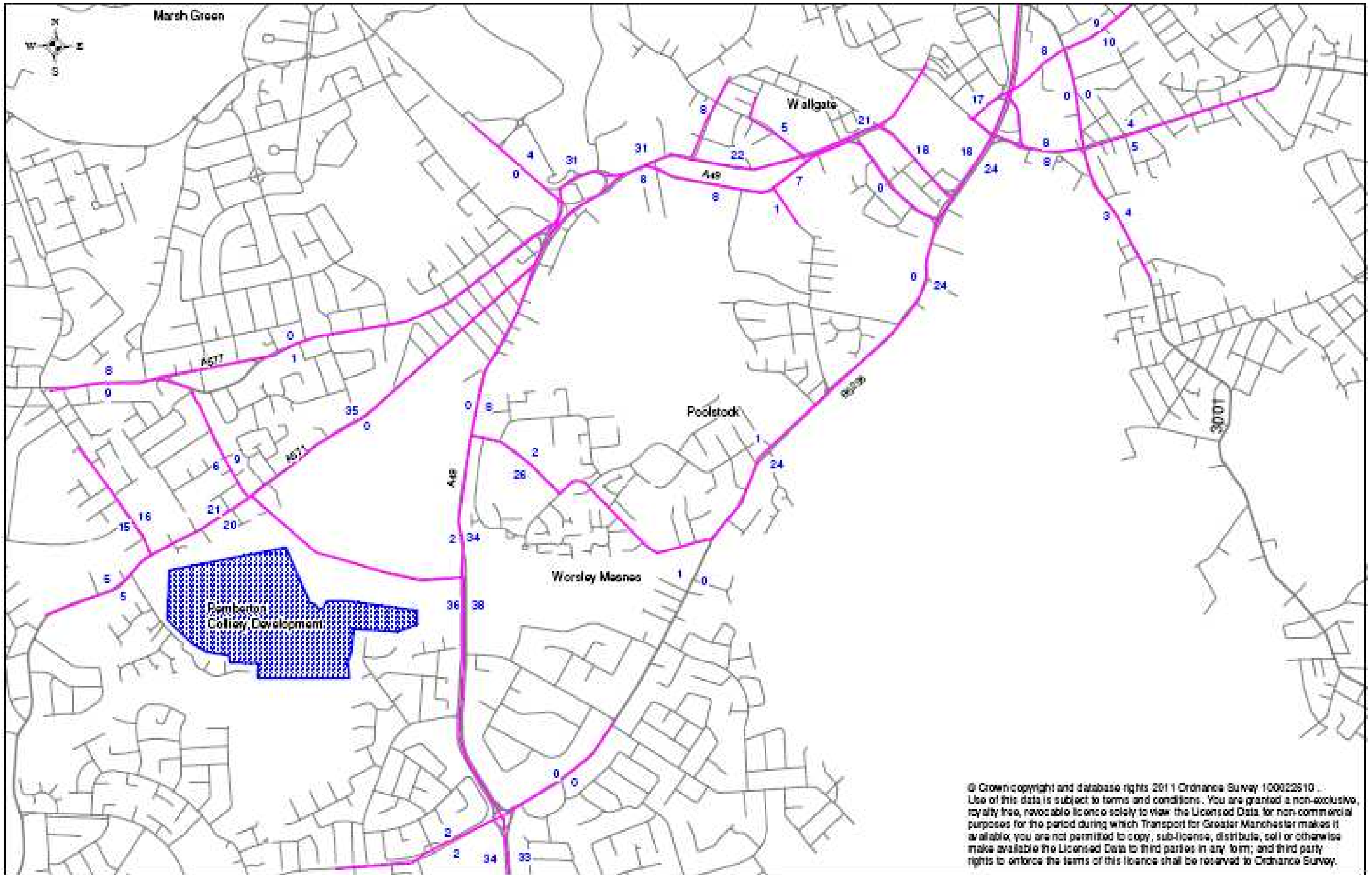
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Northleigh Develpoment - Evening Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.2



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Bickershaw Development - Morning Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.3



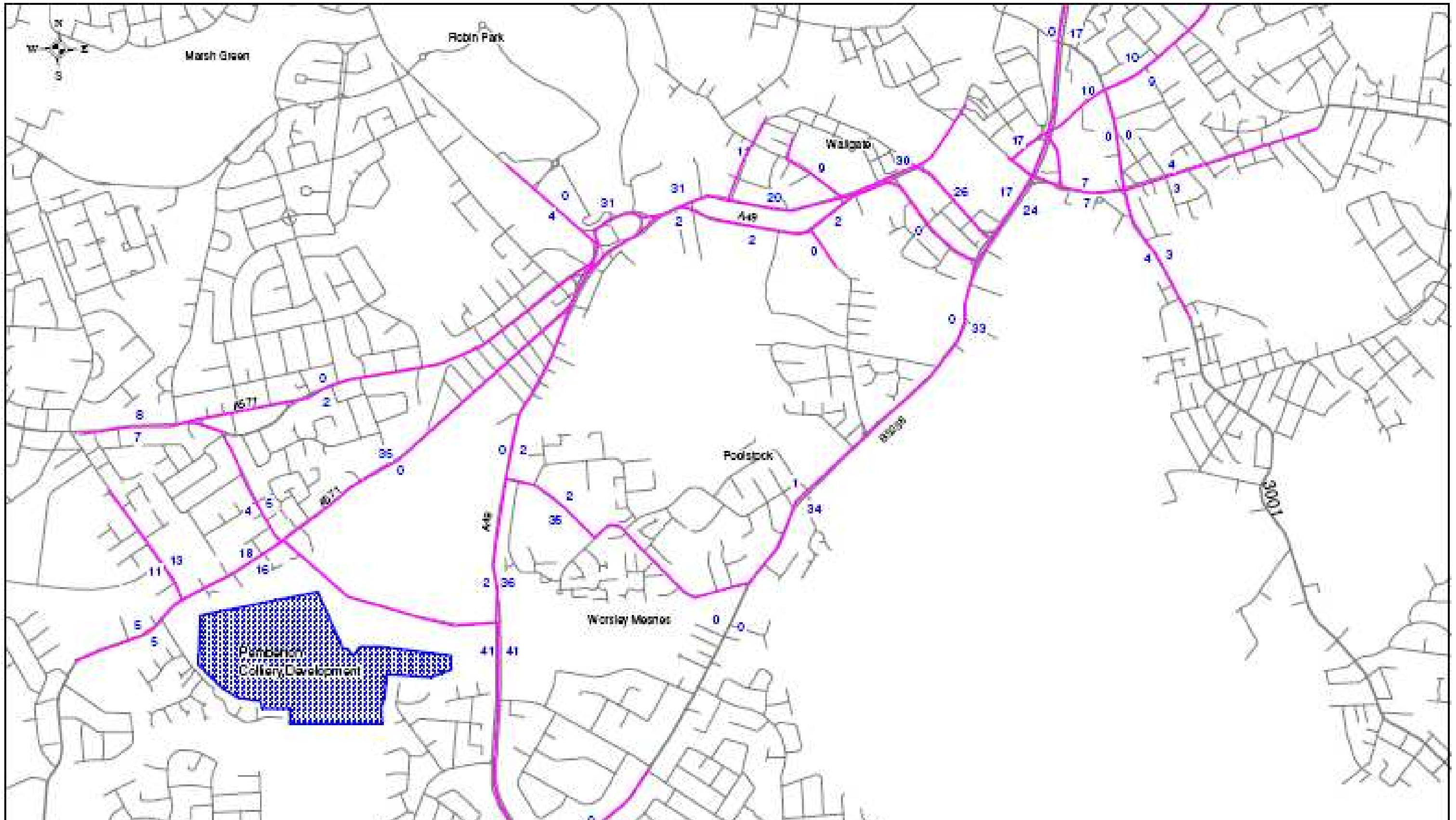
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Bickershaw Development - Evening Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.4



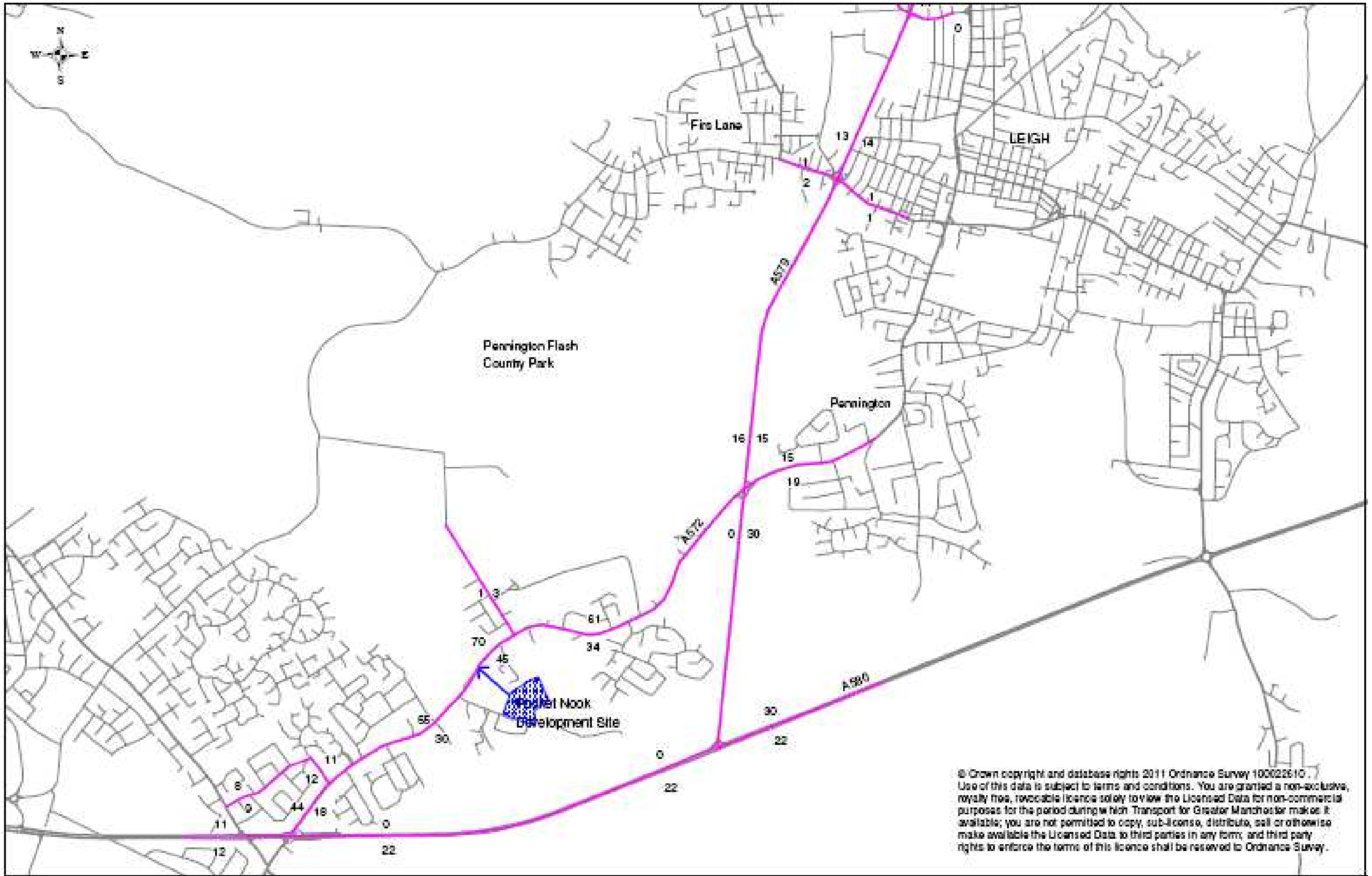
Transport for Greater Manchester
2 Piccadilly Place,
Manchester,
M1 3BG

Percentage Distribution of traffic generated by the Pemberton Colliery Development - Morning Peak

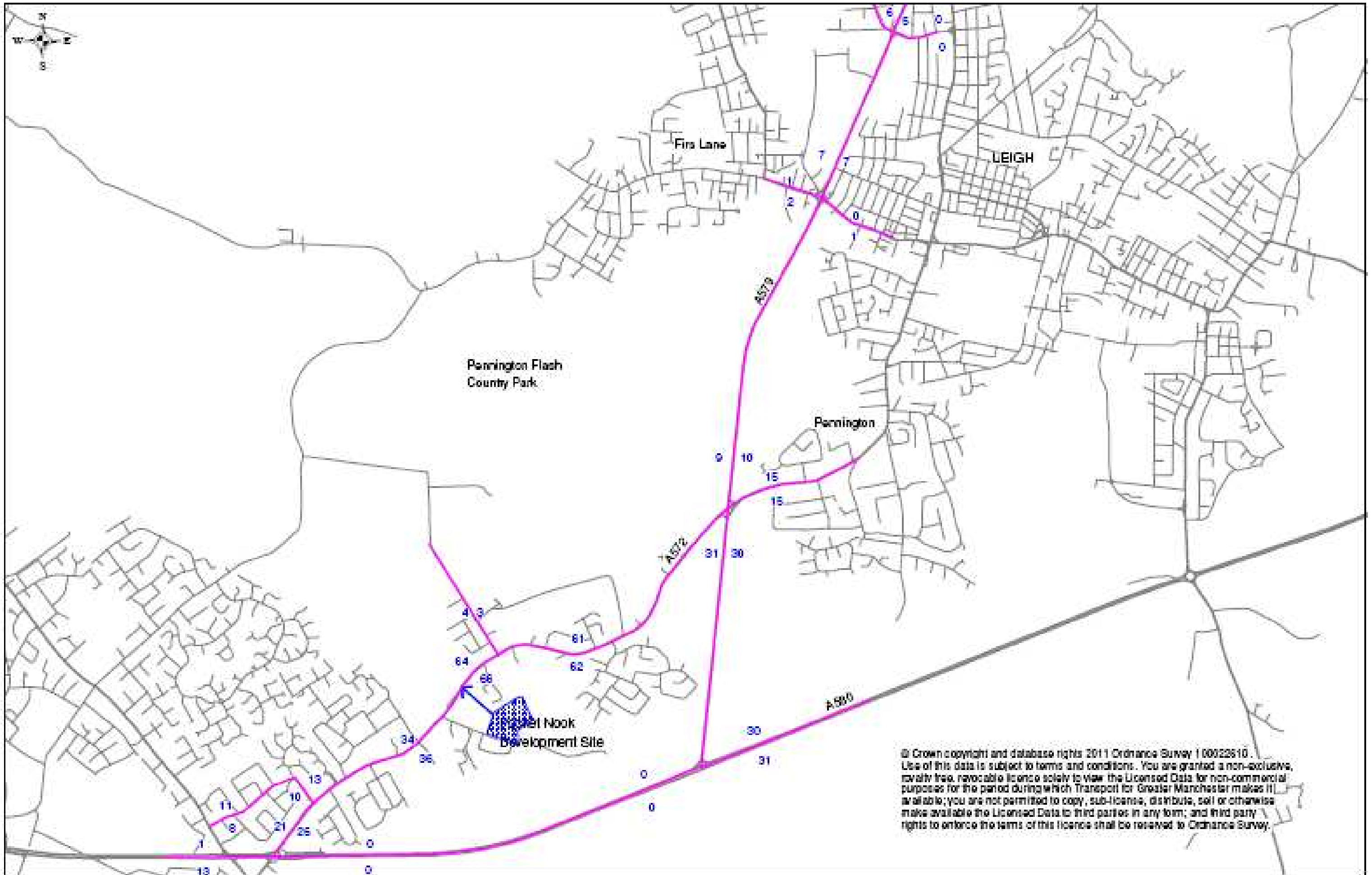
Drawn By : A Tomkinson | Scale : NTS | Date : June 2011 | Figure 9.5



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by the Pemberton Colliery Development - Evening Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.6



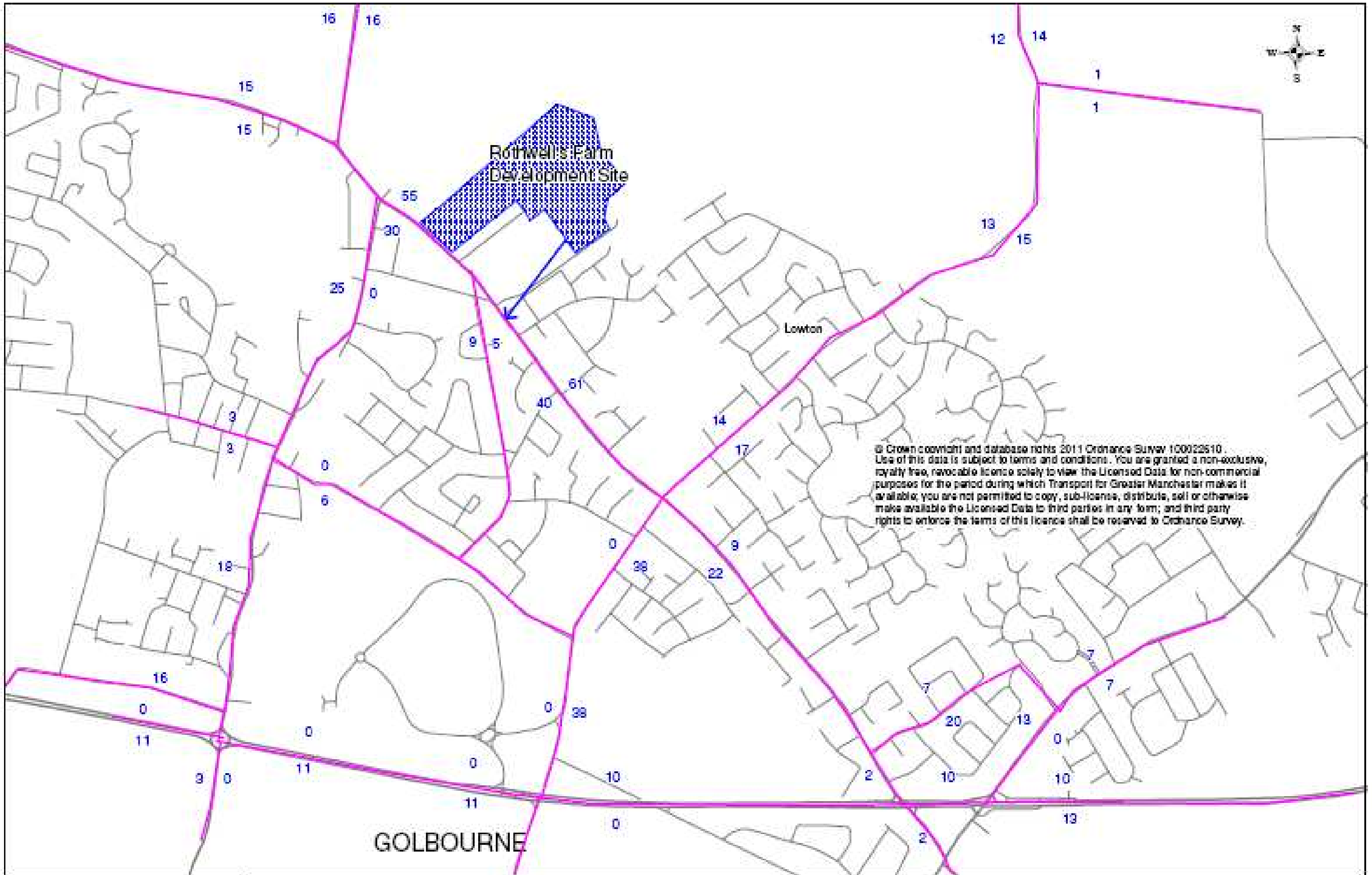
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Pocket Nook Develpoment - Morning Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.7



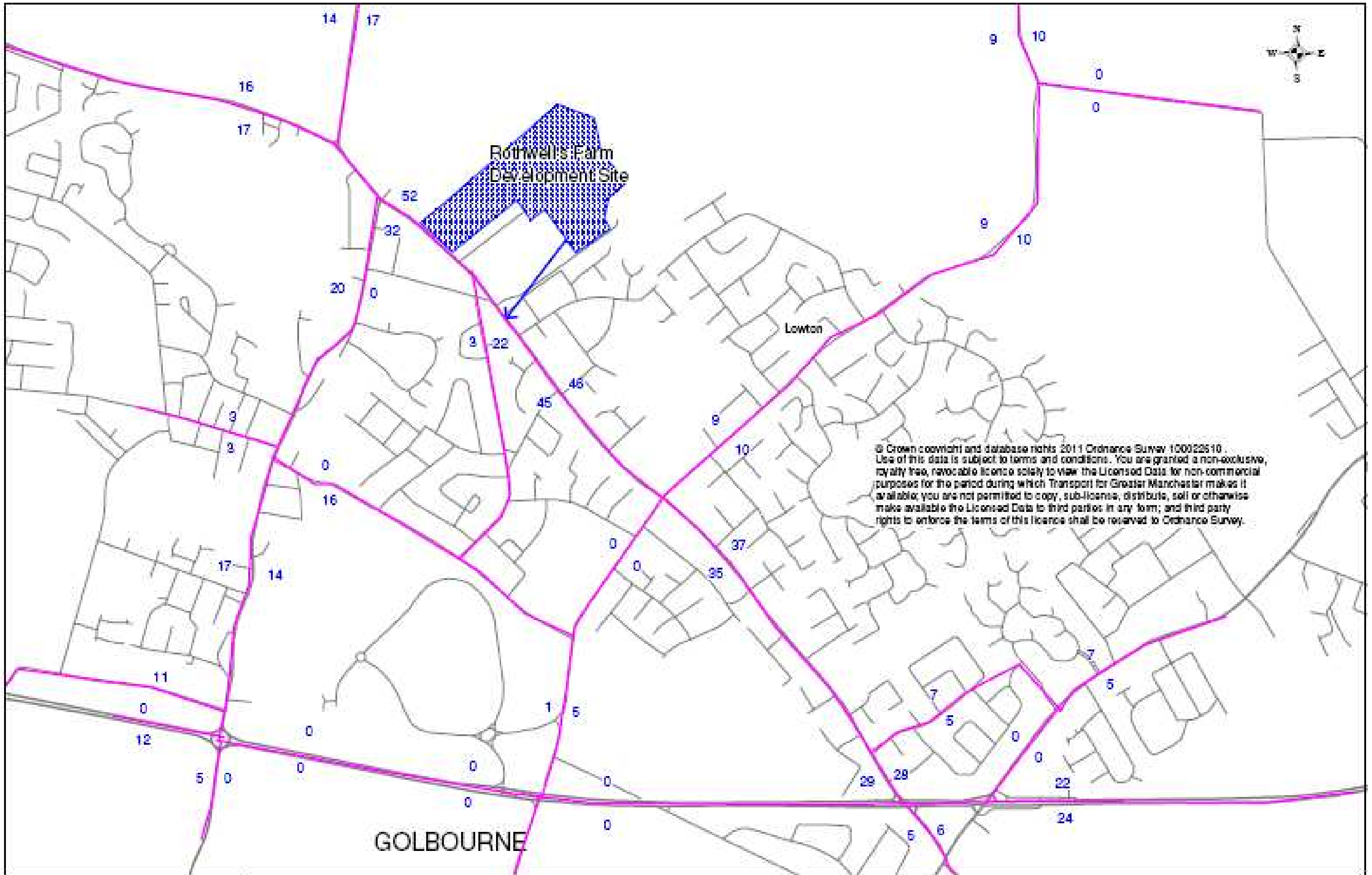
Transport for Greater Manchester
2 Piccadilly Place,
Manchester,
M1 3BG

Percentage Distribution of traffic generated by Pocket Nook Develpoment - Evening Peak

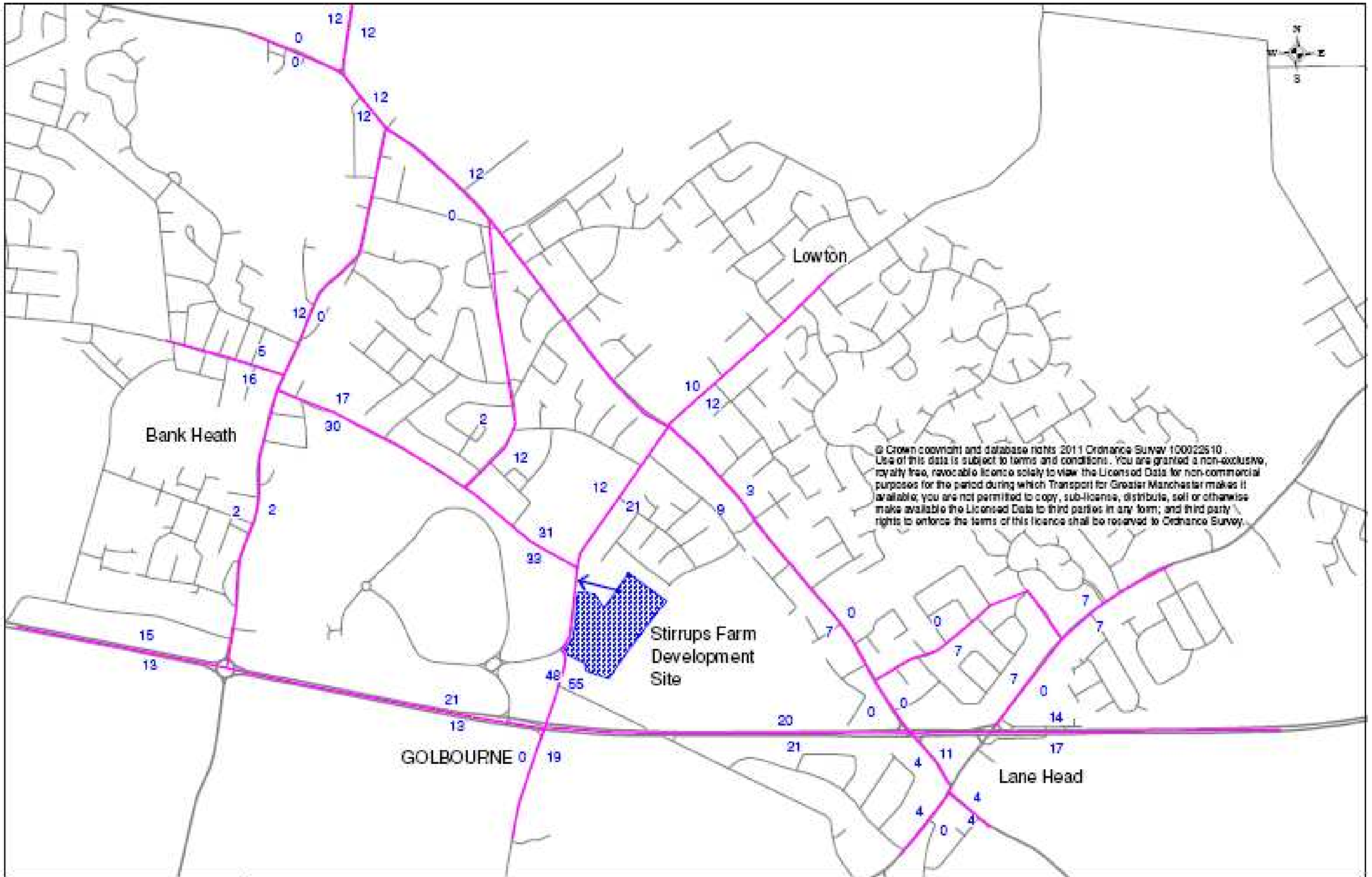
Drawn By : A Tomkinson | Scale : NTS | Date : June 2011 | Figure 9.8



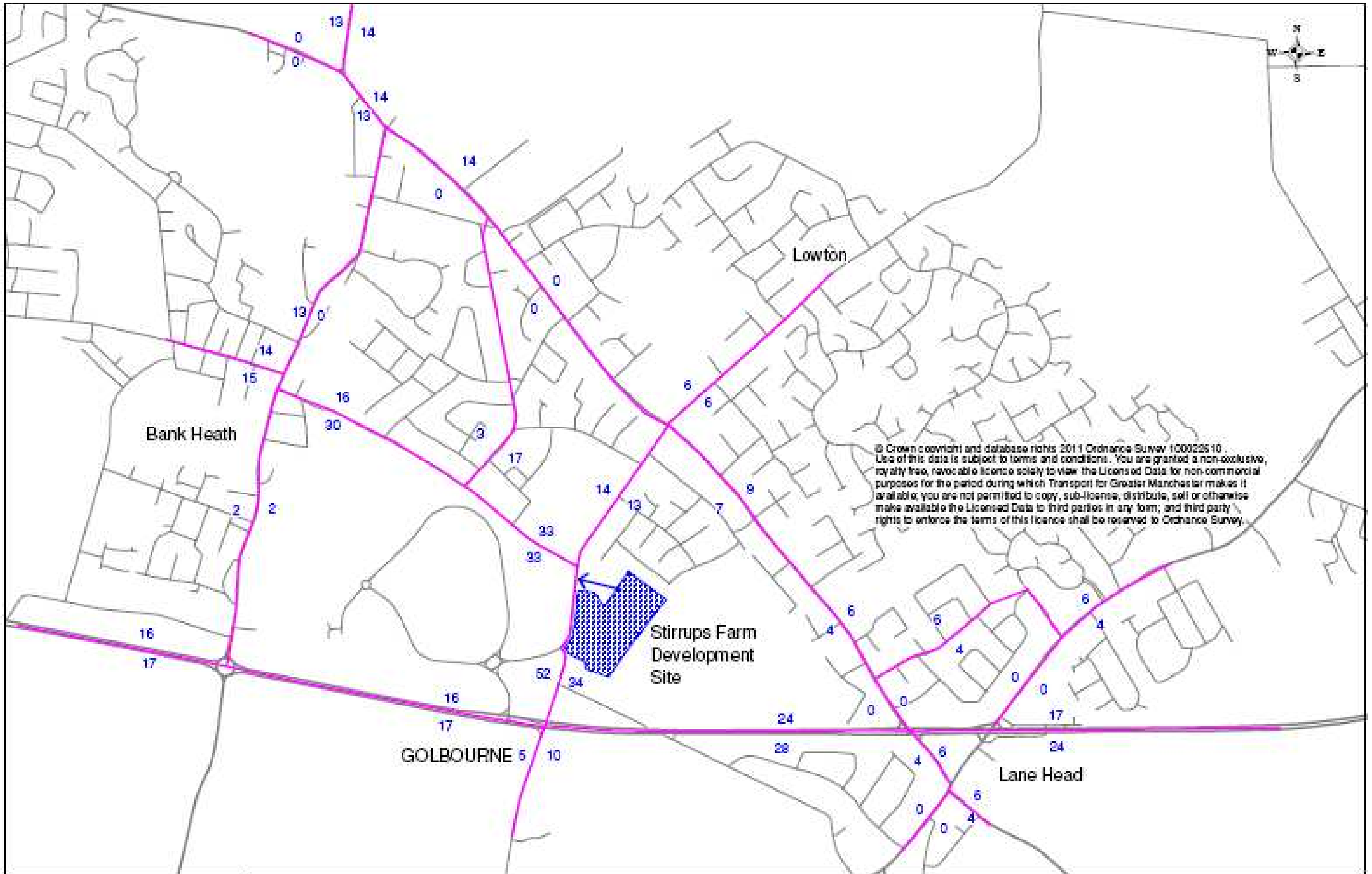
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Rothwell Farm Development - Morning Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.9



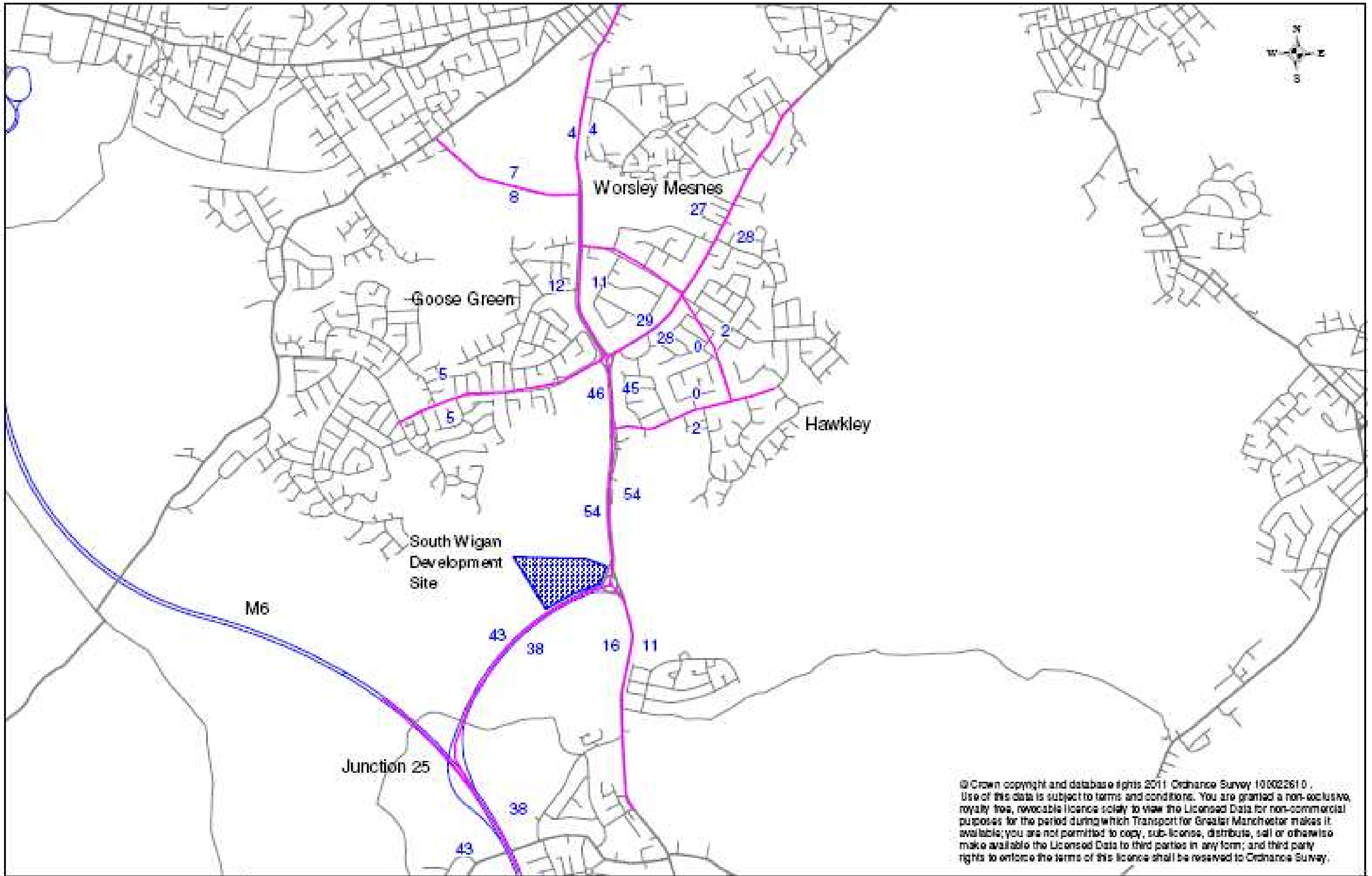
Transport for Greater Manchester, 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Rothwell's Farm Development - Evening Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.10



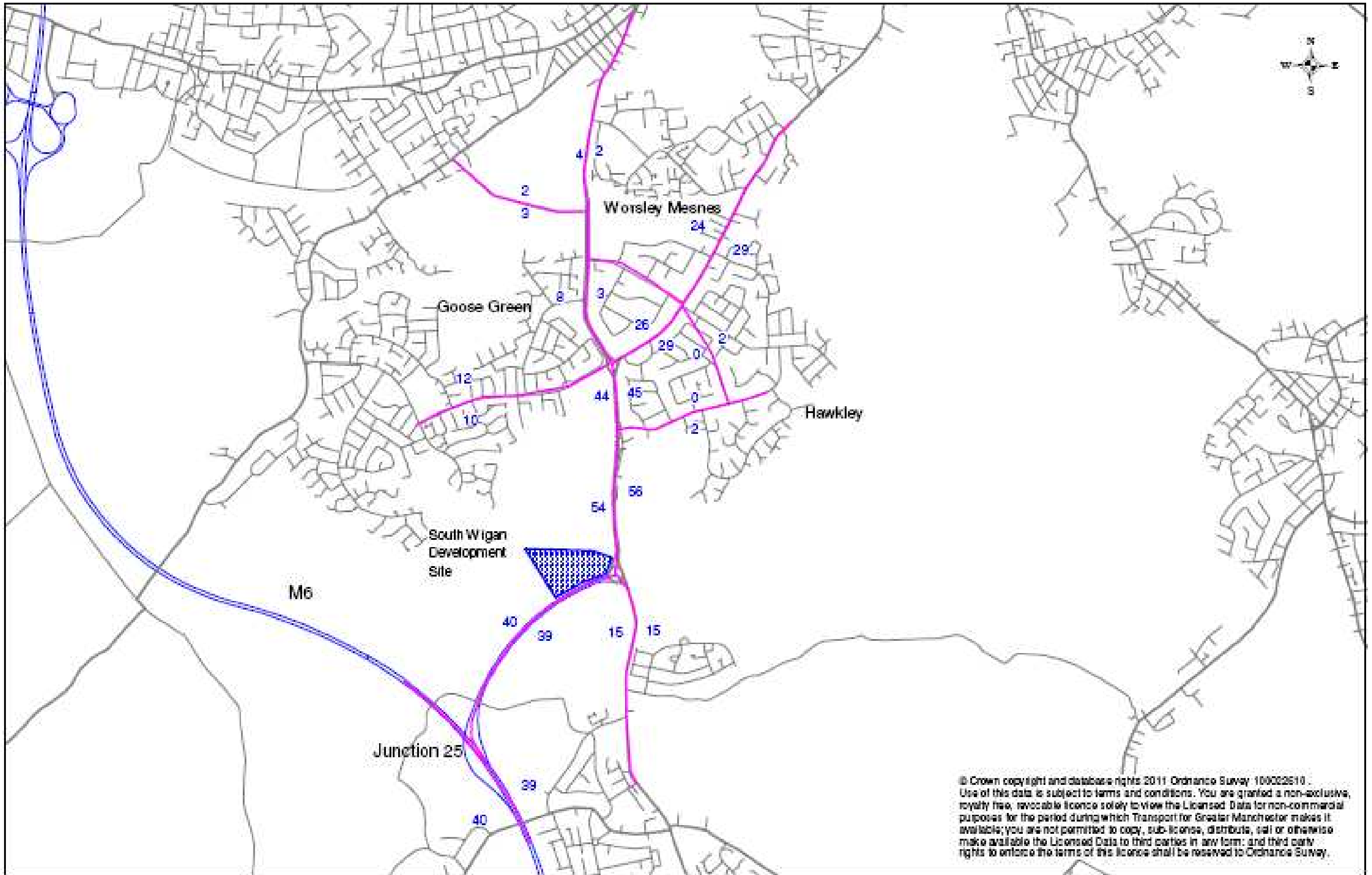
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Stirrups Farm Development - Morning Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.11



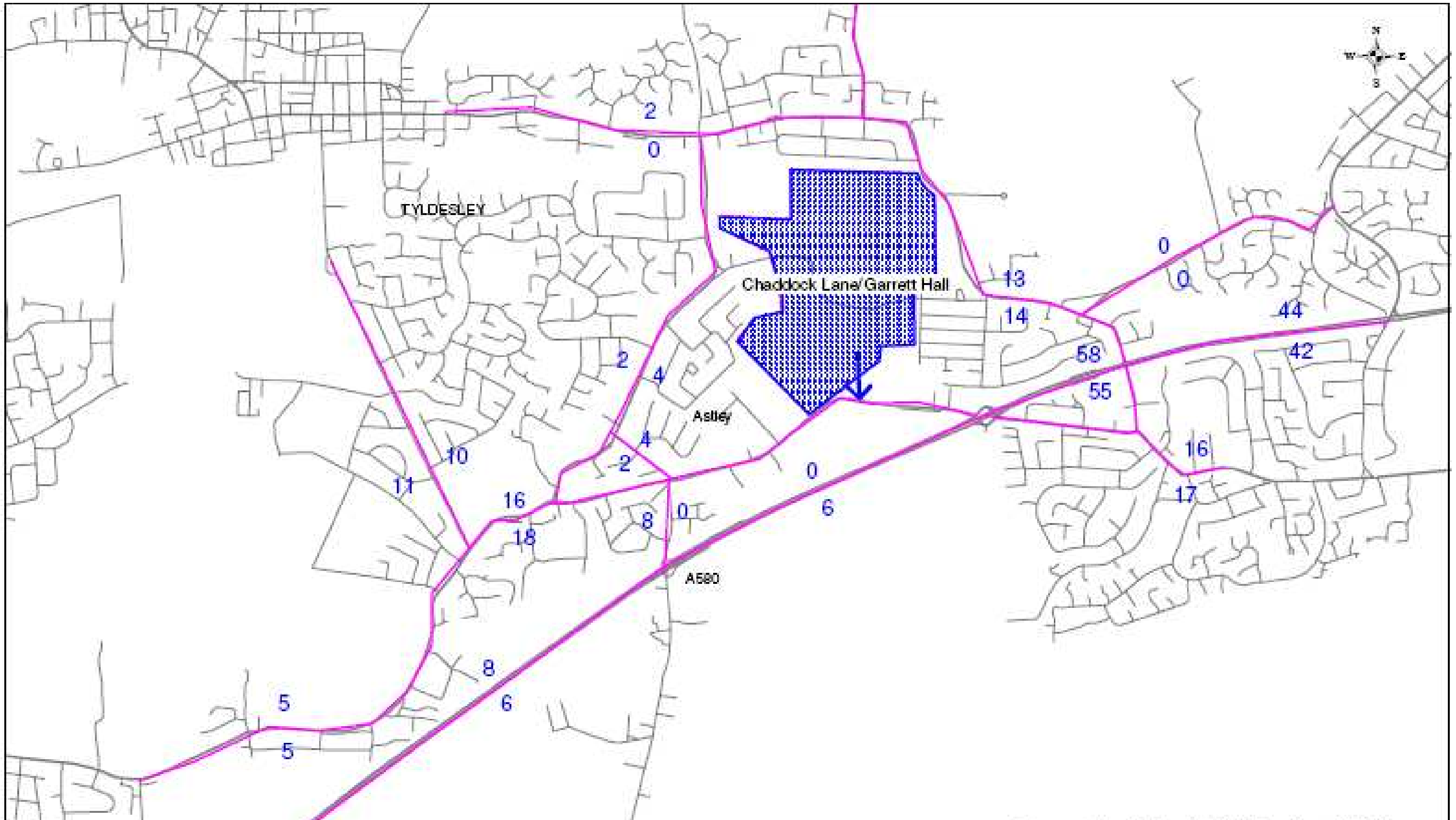
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Stirrups Farm Development - Evening Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.12



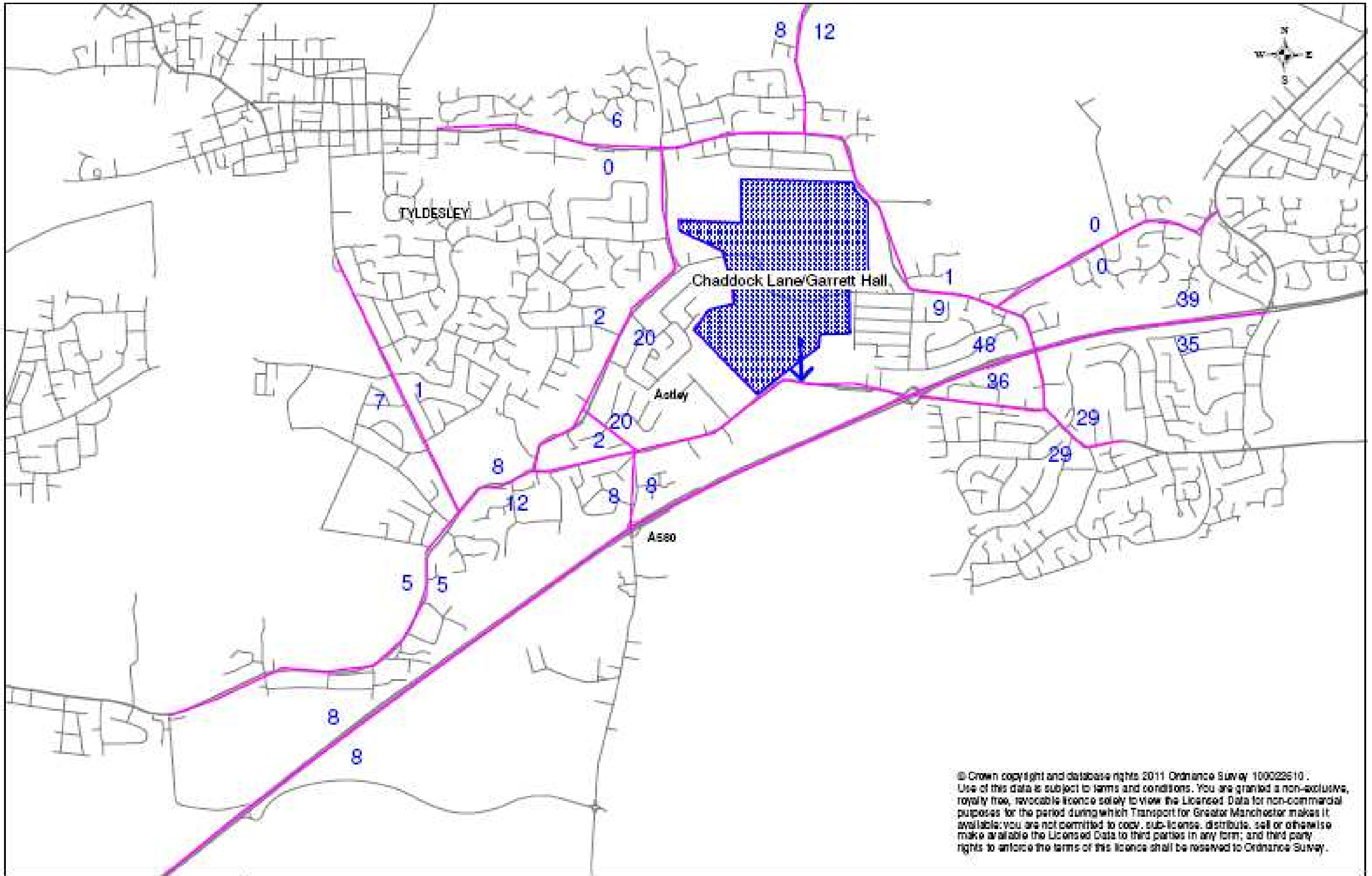
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by South Wigan Development M6 Jnc 25 - Morning Peak			
	Drawn By : A Tomkinson	Scale : NTS	Date : June 2011	Figure 9.13



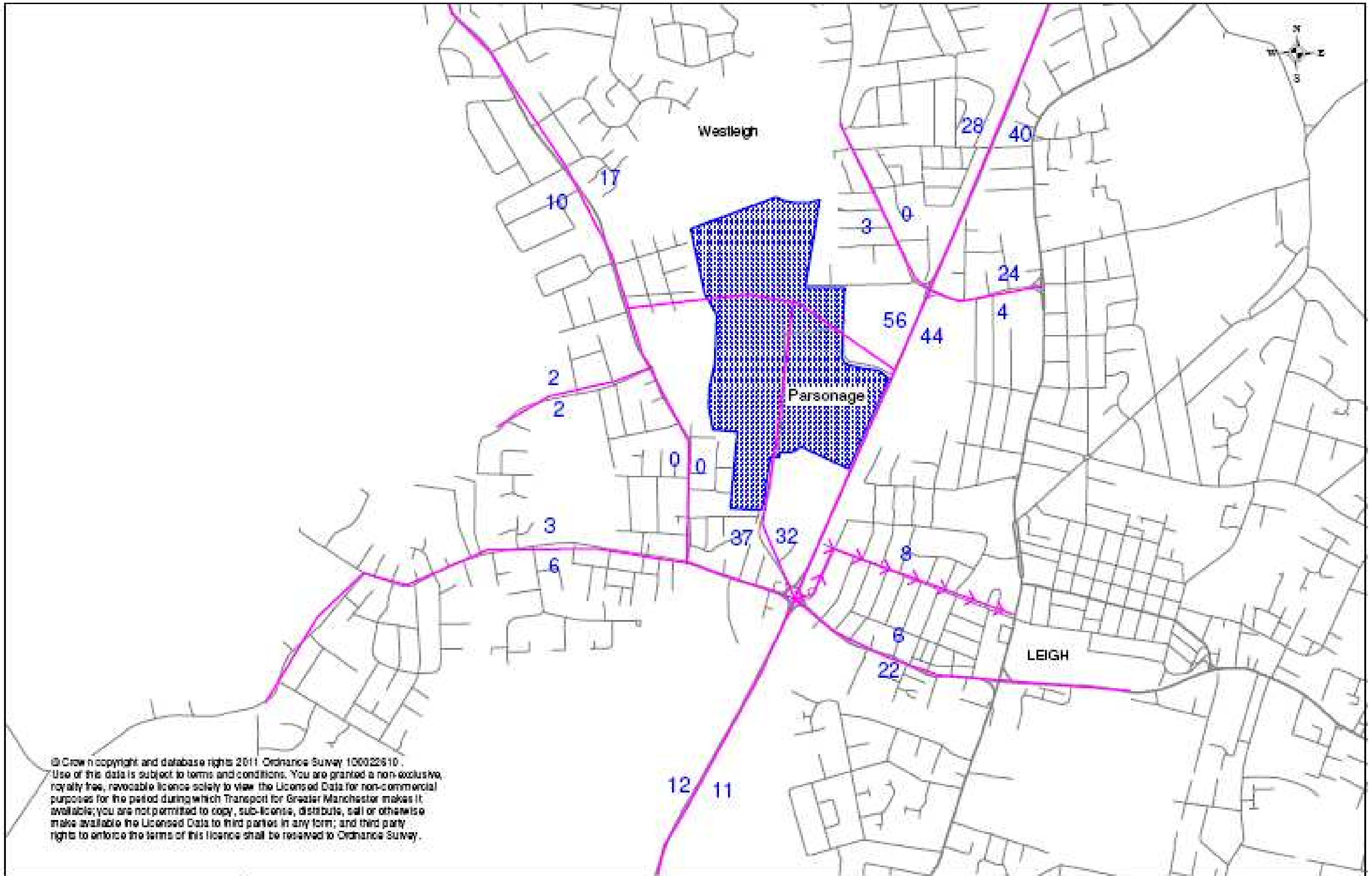
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by South Wigan Development M6 Jnc 25 - Evening Peak			
	Drawn By : E Atkinson	Scale : NTS	Date : July 2011	Figure 9.14



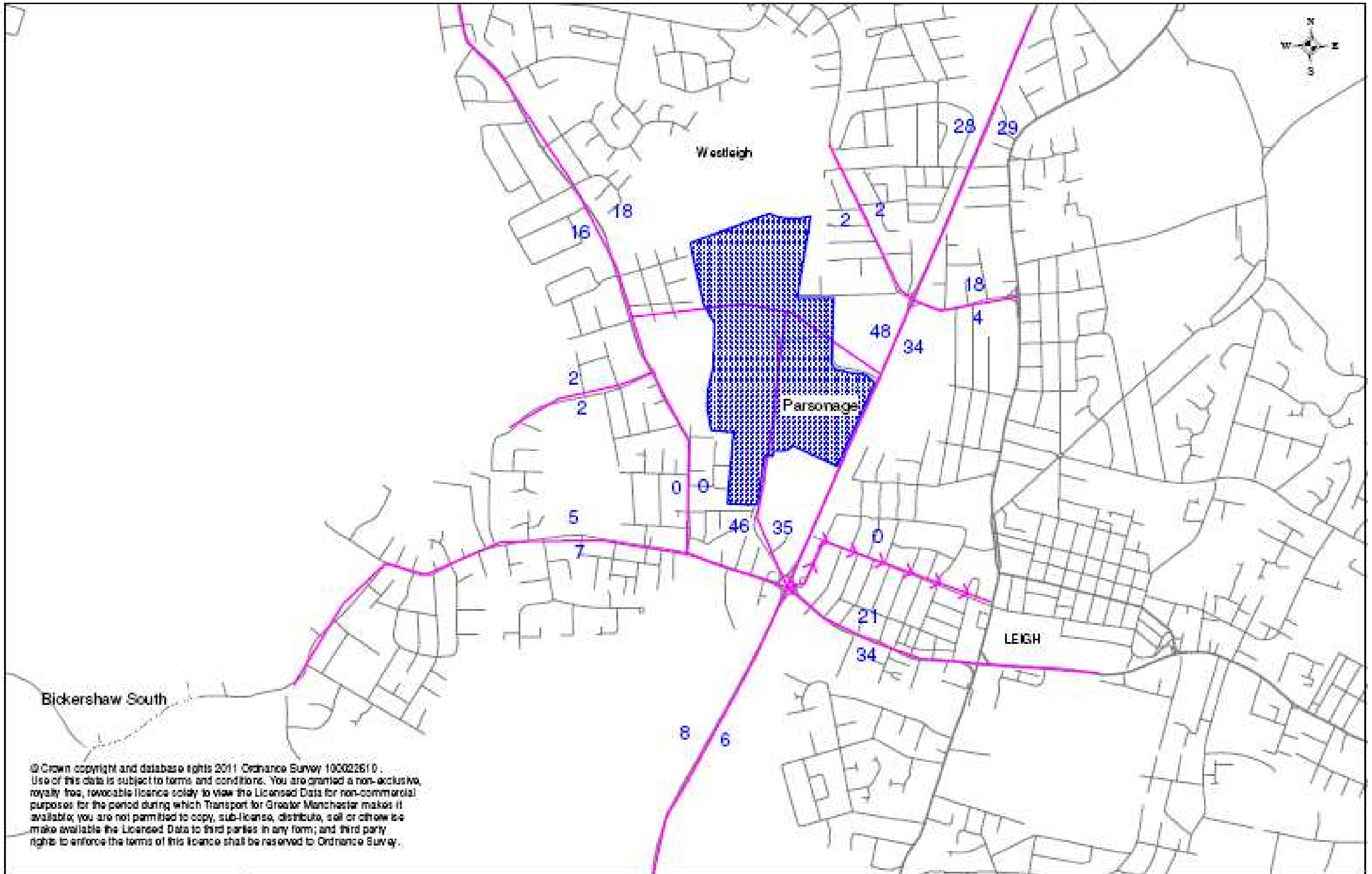
Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Chaddock Lane / Garret Hall - Morning Peak			
	Drawn By : E Atkinson	Scale : NTS	Date : July 2011	Figure 9.15



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Chaddock Lane / Garret Hall - Evening Peak			
	Drawn By : E Atkinson	Scale : NTS	Date : July 2011	Figure 9.16



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Parsonage - Morning Peak			
	Drawn By : E Atkinson	Scale : NTS	Date : July 2011	Figure 9.17



Transport for Greater Manchester 2 Piccadilly Place, Manchester, M1 3BG	Percentage Distribution of traffic generated by Parsonage - Evening Peak			
	Drawn By : E Atkinson	Scale : NTS	Date : July 2011	Figure 9.18