PRTM: Leicester City Local Plan

Base Year Model Review

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Quality Information

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Section 1 – Overview

1.1 Introduction

1.1.1 Leicester City Council (LCiC) is currently in the process of producing a new Local Plan that covers a 15-year timescale to 2036. The draft Local Plan sets out a need for:

- a total of 29,104 new homes over the period to 2036; and
- a total of 67 hectares of employment land over the period to 2036.

1.1.2 AECOM has been commissioned to undertake a strategic assessment of the new Local Plan using the Pan-Regional Transport Model (PRTM).

1.1.3 This Base Year Model Review will assess the performance of the base year highway model in PRTM and review the suitability of the model to assess the proposed growth defined in the new Leicester City Local Plan. The base year highway model represents an average weekday during April, May and June 2014 and the following three time periods:

- the AM Peak hour between 08:00 and 09:00;
- an average Interpeak hour between 10:00 and 16:00; and
- the PM Peak hour between 17:00 and 18:00.

1.1.4 For the purposes of this review a Review Area has been defined. As discussed in our proposal and inception meeting, this has been based on the Leicester Travel to Work Area to capture locations likely to be affected by the proposed growth and/or potential mitigation measures, including along the Strategic Road Network. Figure 1.1 shows the location of the Review Area and the Leicester City boundary.

1.1.5 The review will focus on the following tasks:

- a high-level review of the Review Area seeking to identify outliers in the base year network coding, such as the application of link lengths, speed-flow curves/fixed cruise speeds and junction saturation flows;
- a detailed review of a limited subset of the network coding considered to be central to the assessment and defined through discussion with the client; and
- a review of the base year highway model performance against observed flows and journey times within the Review Area.

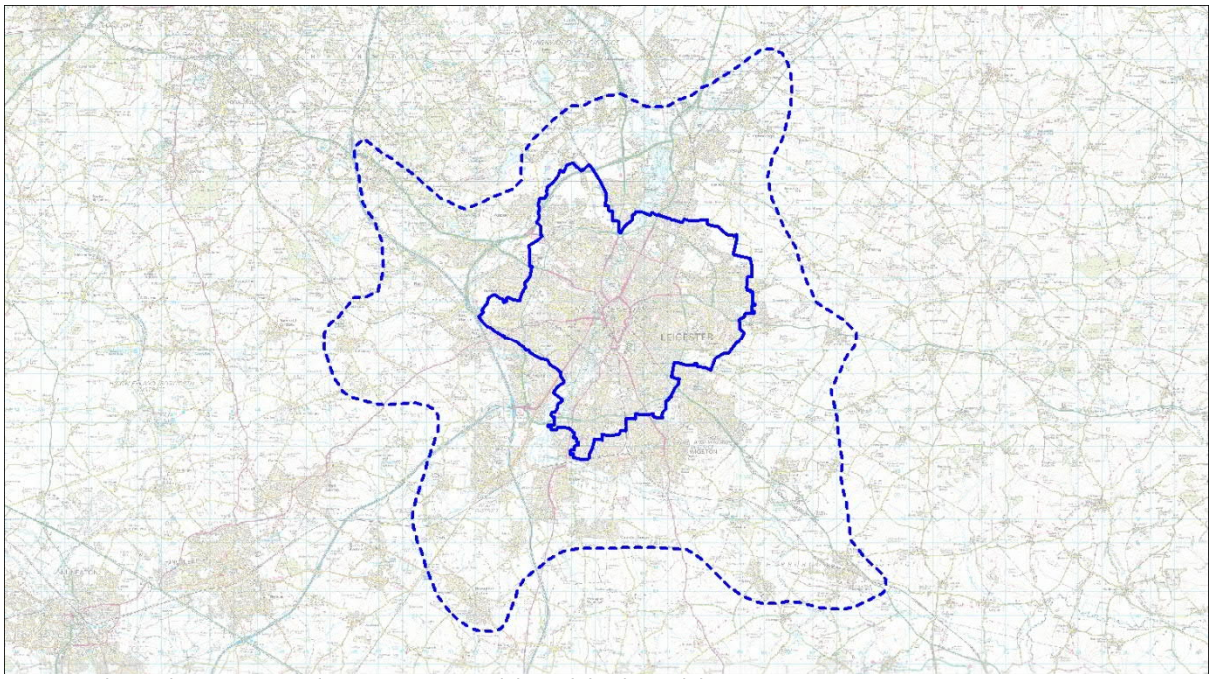

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Figure 1.1: Review Area and Leicester City Boundaries

1.2 Report Structure

1.2.1 In addition to this introduction, this report contains the following sections:

- Section 2 – High-Level Review: this section details the high-level review of a range of network attributes across the defined Review Area in order to identify outliers in the base year network coding.
- Section 3 – Detailed Highway Network Review: this section reports on the detailed network review for key junctions within the Review Area to verify that the base year coding corresponds with the standards set out in the adopted coding manual.
- Section 4 – Model Performance Review: this section provides a summary of the performance of the base year model against observed data for the screenlines, individual count locations and journey time routes within the Review Area.
- Section 5 – Summary of Findings: this section provides a summary of the base year model review undertaken for the assessment of the new Leicester City Local Plan.

Section 2 – High-Level Review

2.1 Introduction

2.1.1 Given the size of the Review Area, a proportional approach has been adopted which undertakes a high-level review of the base year highway model and is supplemented by a more detailed review of key routes within the Review Area (discussed in Section 3).

2.2 Overview of Model Zoning

2.2.1 The PRTM zone system is of a level of detail commensurate with the detail of the transport network, with a total of 1,478 geographical zones, and an additional 48 unallocated 'development zones' for use in forecasting. Figure 2.1 shows the adopted zone system within Leicester City and the surrounding area. This shows that there is a significant level of zonal detail, with a total of 285 zones in Leicester City and around 500 model zones within the wider Review Area.

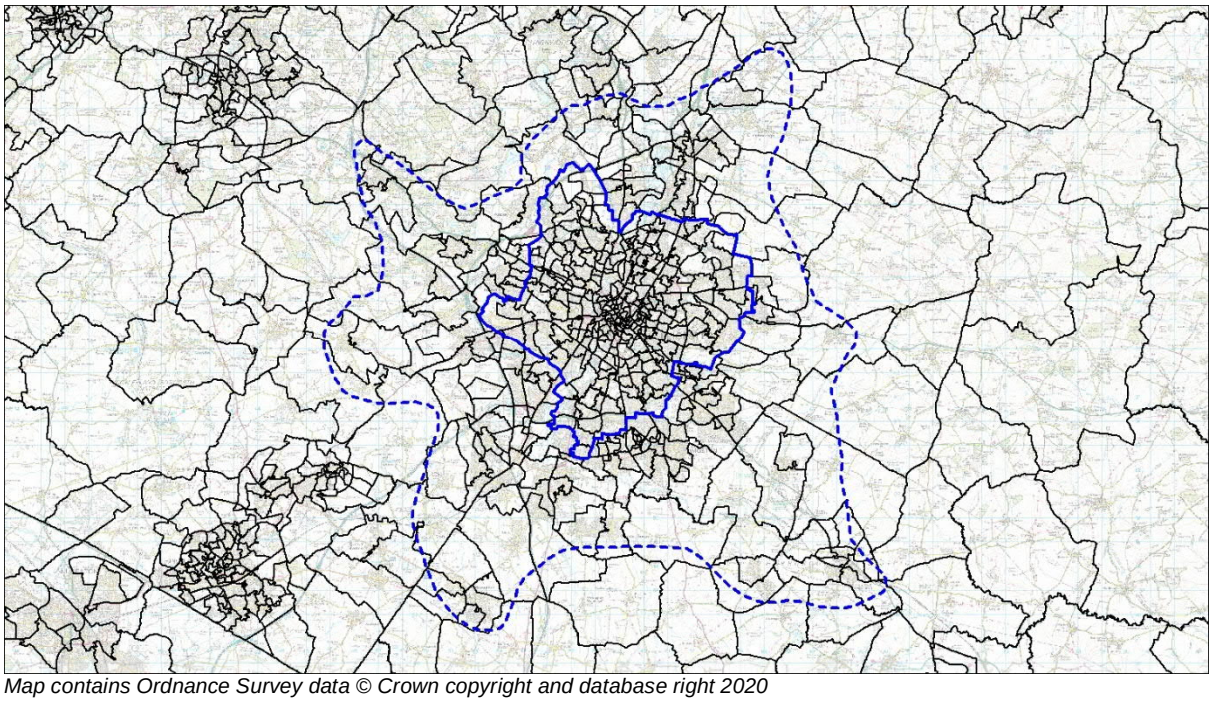

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Figure 2.1: PRTM Zone System, Review Area and Leicester City Boundaries

2.2.2 This level of model zoning is appropriate both within Leicester and in the wider Review Area for the assessment of the new Local Plan. There may be proposed developments within the new Local Plan which represent a step-change in land-use within a given area (such as a greenfield development) and/or where the traffic associated with the proposed development is required to be isolated in the analysis of the model forecasts. In these circumstances some of the 48 spare development zones will be used to represent these developments. These development zones include no travel demand in the base year and can be located throughout the model to represent proposed future year developments.

2.3 Review of Network Coding

2.3.1 As part of the base year network coding, multiple attributes have been defined within the PRTM highway network. These include the link length, road type, road classification, the number of lanes, whether a fixed or variable speed is applied, and the standard of each junction represented in the model.

2.3.2 These attributes have been reviewed against online data sources (such as Google Maps) to ensure the base year highway model coding is consistent with the highway network within the Review Area. From these high-level checks, any outliers which may suggest an error in the base year network coding have been reviewed.

2.3.3 The first stage of the high-level review of the base year network coding is a review of the coded link lengths within the model. These have been compared with the link length calculated from the length of each link within GIS software. The results of this comparison are shown in Figure 2.2. This shows that there is a strong correlation between the coded and recalculated link lengths within the base year highway model.

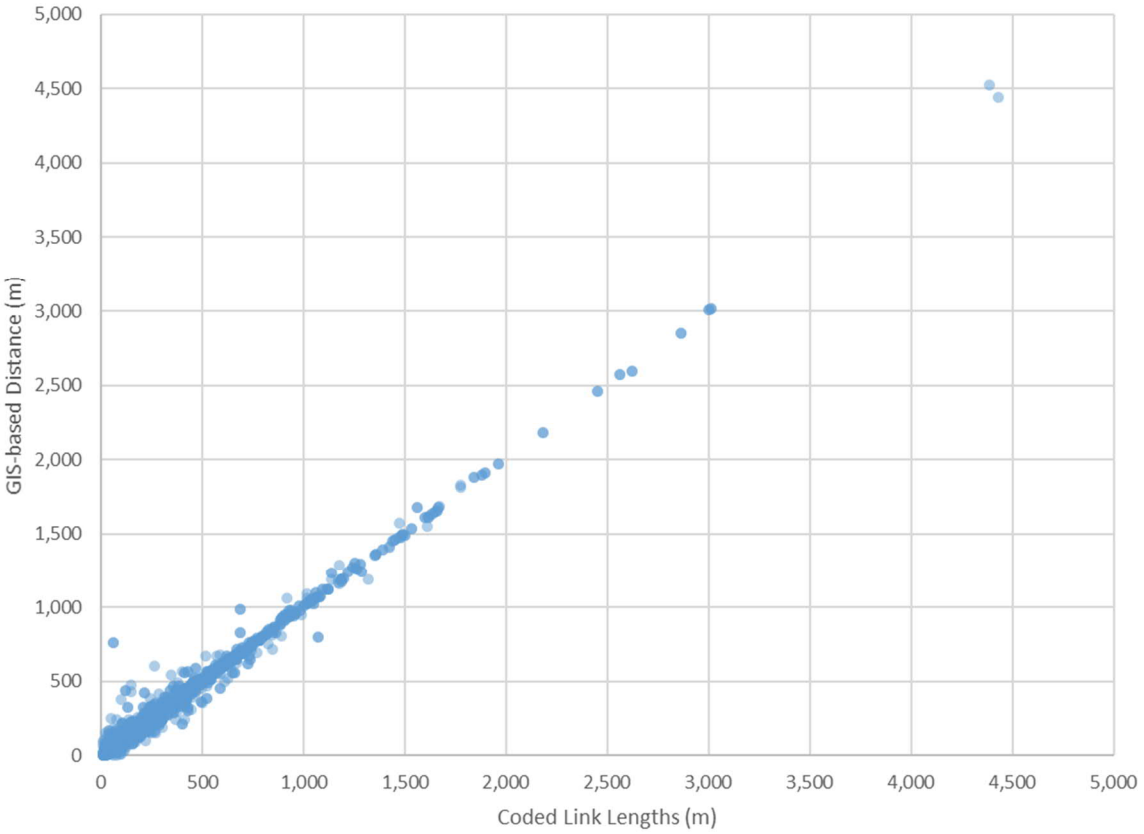

Figure 2.2: Comparison of Coded and GIS-based Link Lengths, Review Area, All Link Lengths

2.3.4 Figure 2.3 provides the same analysis of coded link lengths in the defined Review Area but focusses on links of up to 2 kilometres in length. Some differences between the coded and recalculated link lengths are shown in this analysis, and these differences have been investigated. Of the 15 most significant outliers, around half were due to coordinate or link shaping discrepancies which have no impact on the assignment. The remaining locations were found to have minor link distance errors which will be addressed before proceeding to model forecasting, however none are expected to have a significant impact on model flows beyond the local area.

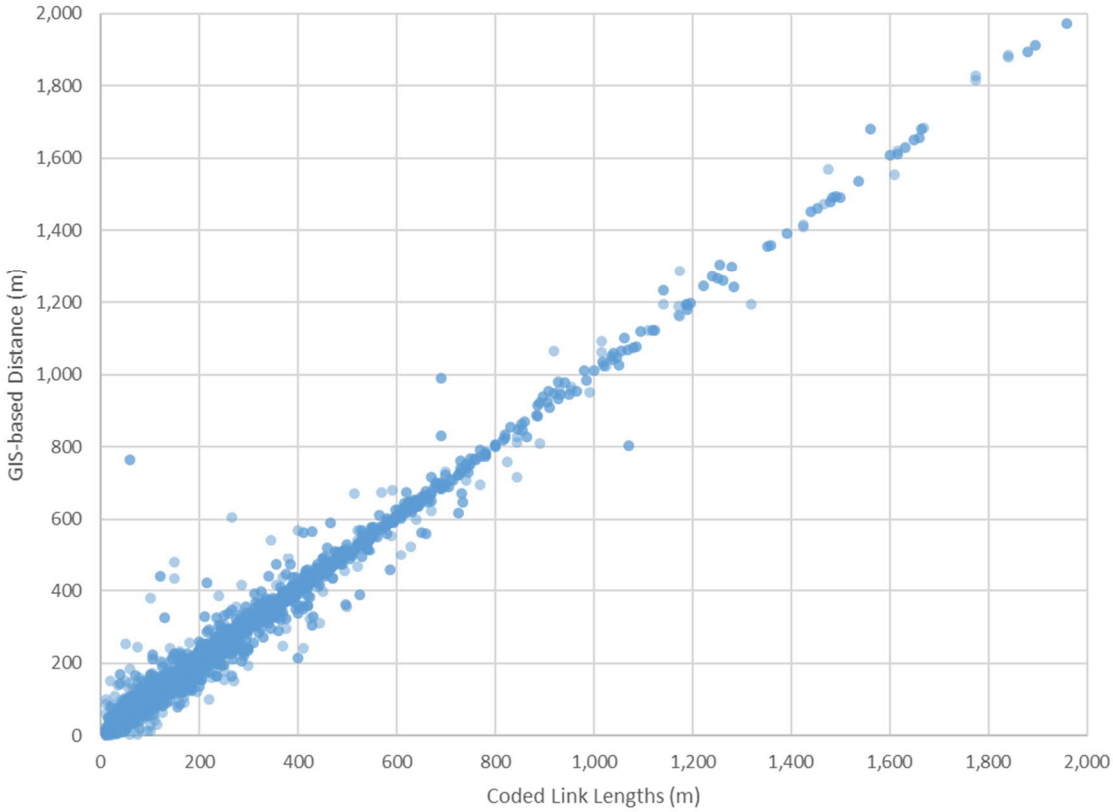

Figure 2.3: Comparison of Coded and GIS-based Link Lengths, Review Area, up to 2kms

2.3.5 Figure 2.4 shows the coded road type and location classifications across the Review Area. Within the PRTM highway network links are classified by their road type (motorway, A-road, or other) and their location (Leicester City, Leicestershire market town, or rural). These figures have been reviewed and no outliers in terms of the application of road type and location within the Review Area have been identified.

2.3.6 In addition to the road type and location classification, the coded base year network includes another measure of link type, defined as urban, suburban, interurban and motorway. The allocation of this attribute is shown in Figure 2.5.

2.3.7 As with the analysis of road type and location classification, the analysis of link type definitions in the base year model has not identified any outliers in the base year network coding.

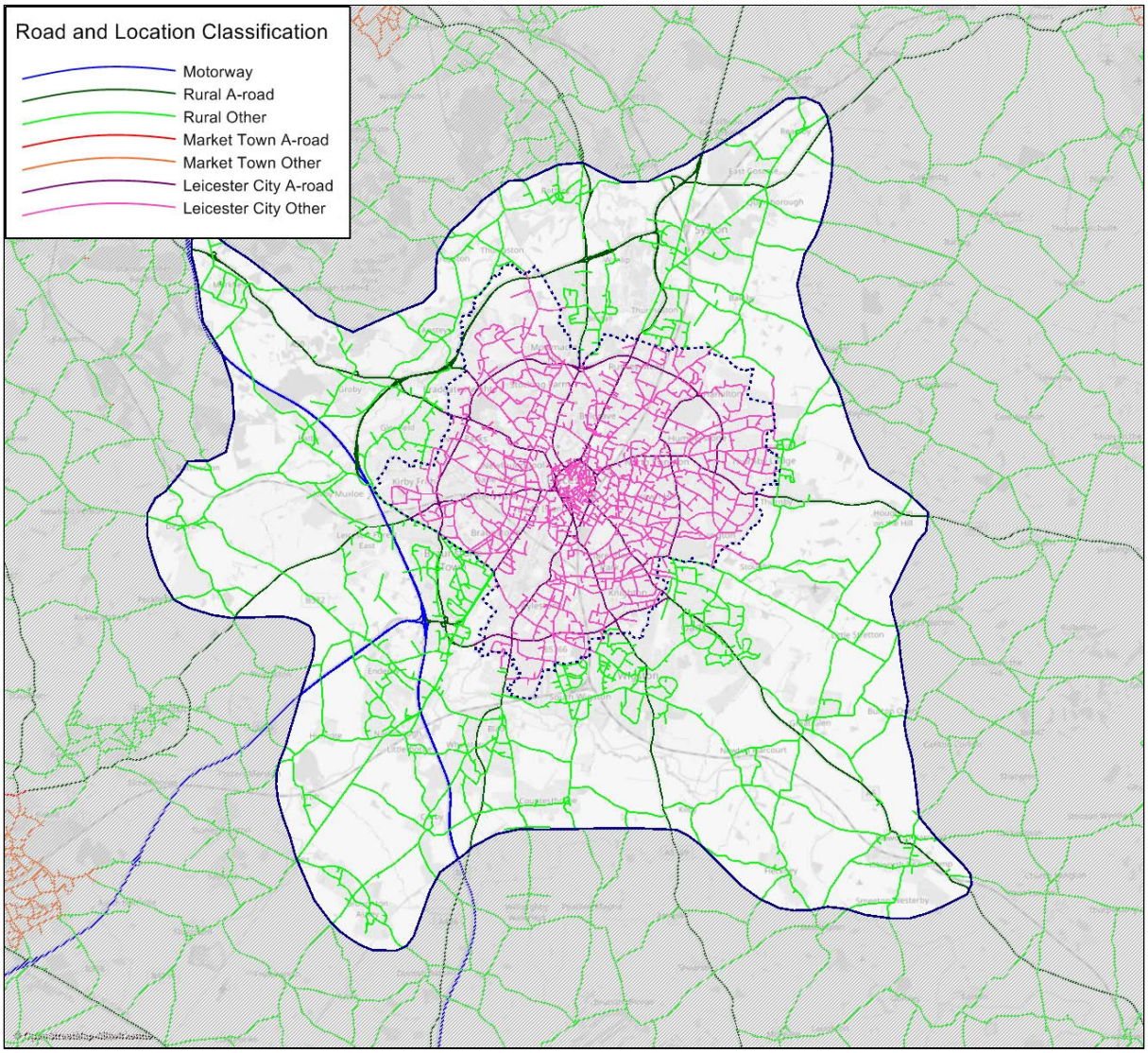

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Figure 2.4: Road Type and Location Classification

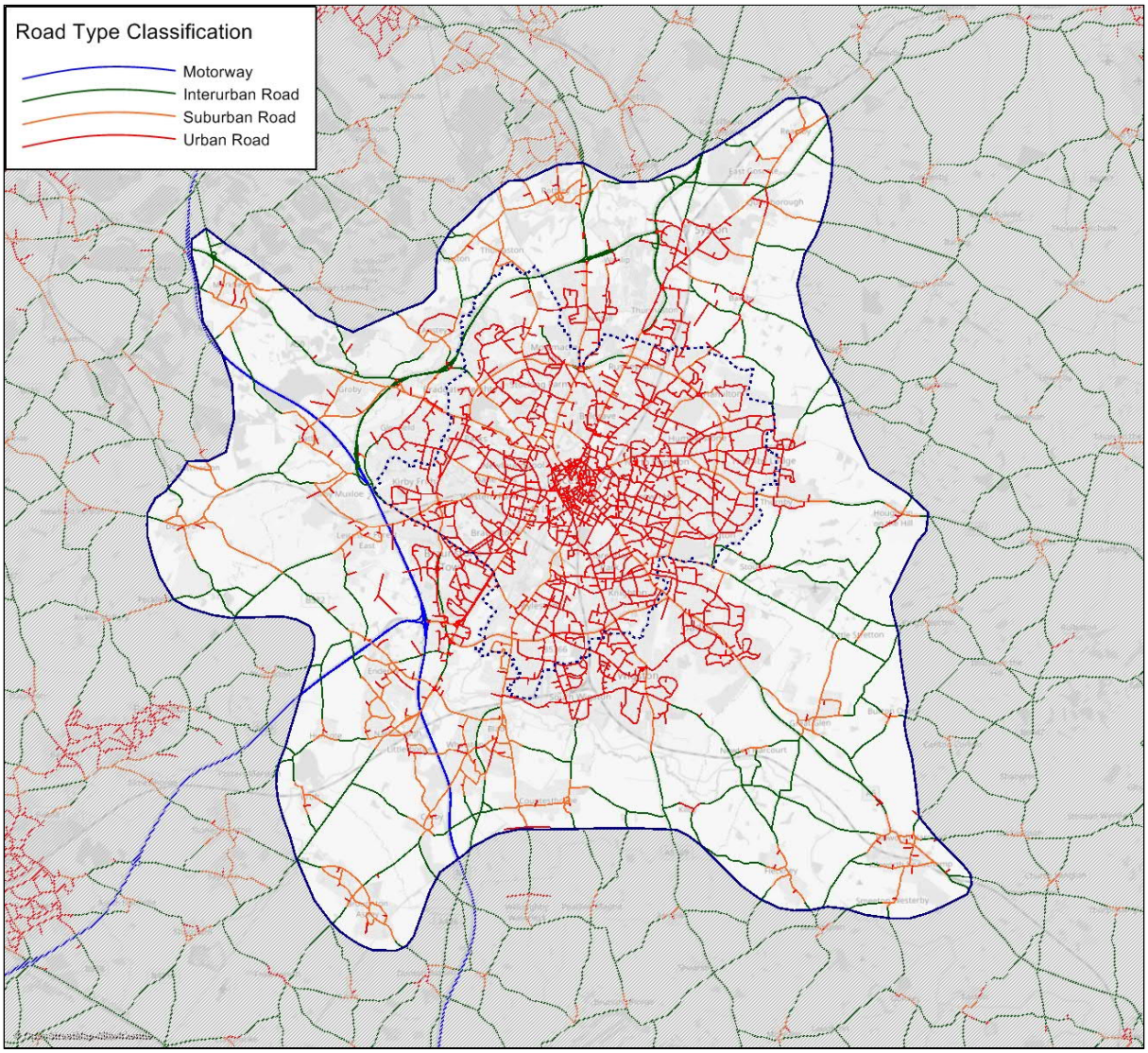

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Figure 2.5: Link Type Classification

2.3.8 Figure 2.6 shows the coded number of lanes within the 2014 base year highway network. This analysis closely aligns with the analysis of road type. Key interurban routes (such as the M1, M69 and A46) are coded with more than one lane, with most urban and minor, rural routes coded with a single lane.

2.3.9 A high-level review of the number of lanes coded within the highway network has highlighted one link where the incorrect number of lanes has been applied. This is located on Gaulby Lane to the east of the city and has been coded with two lanes rather than one. However, the capacity of the link is correct and so this error is not of great concern.

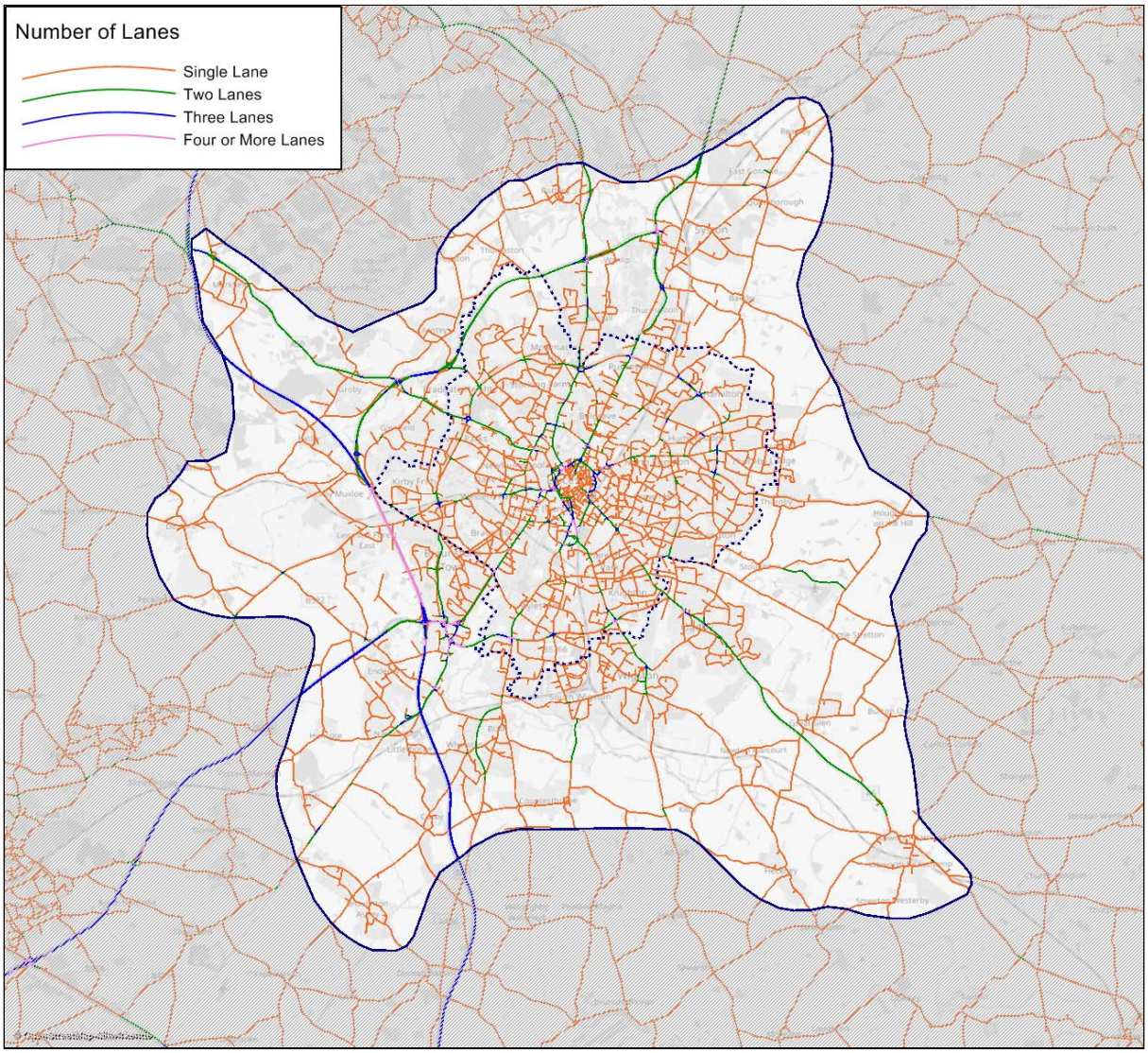

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Figure 2.6: Coded Number of Lanes

2.3.10 When coding the highway network there is a choice of using a fixed cruise speed for a link or a variable speed-flow curve where the speed on the link is a function of the modelled flow on the link. In general, fixed cruise speeds are applied where most delay along a route is attributable to junctions, whereas speed-flow curves are applied along routes where delay is largely due to the weight of traffic. This broadly equates to fixed cruise speeds being applied within urban areas and speed-flow curves applied on interurban routes.

2.3.11 Figure 2.7 shows the application of fixed cruise speeds and speed-flow curves within the Review Area. This shows that fixed cruise speeds are applied within urban areas and on zone connectors. There are a limited number of key routes within the Leicester City urban area where speed-flow curves have been applied, however it is mainly interurban routes which are coded with speed-flow curves.

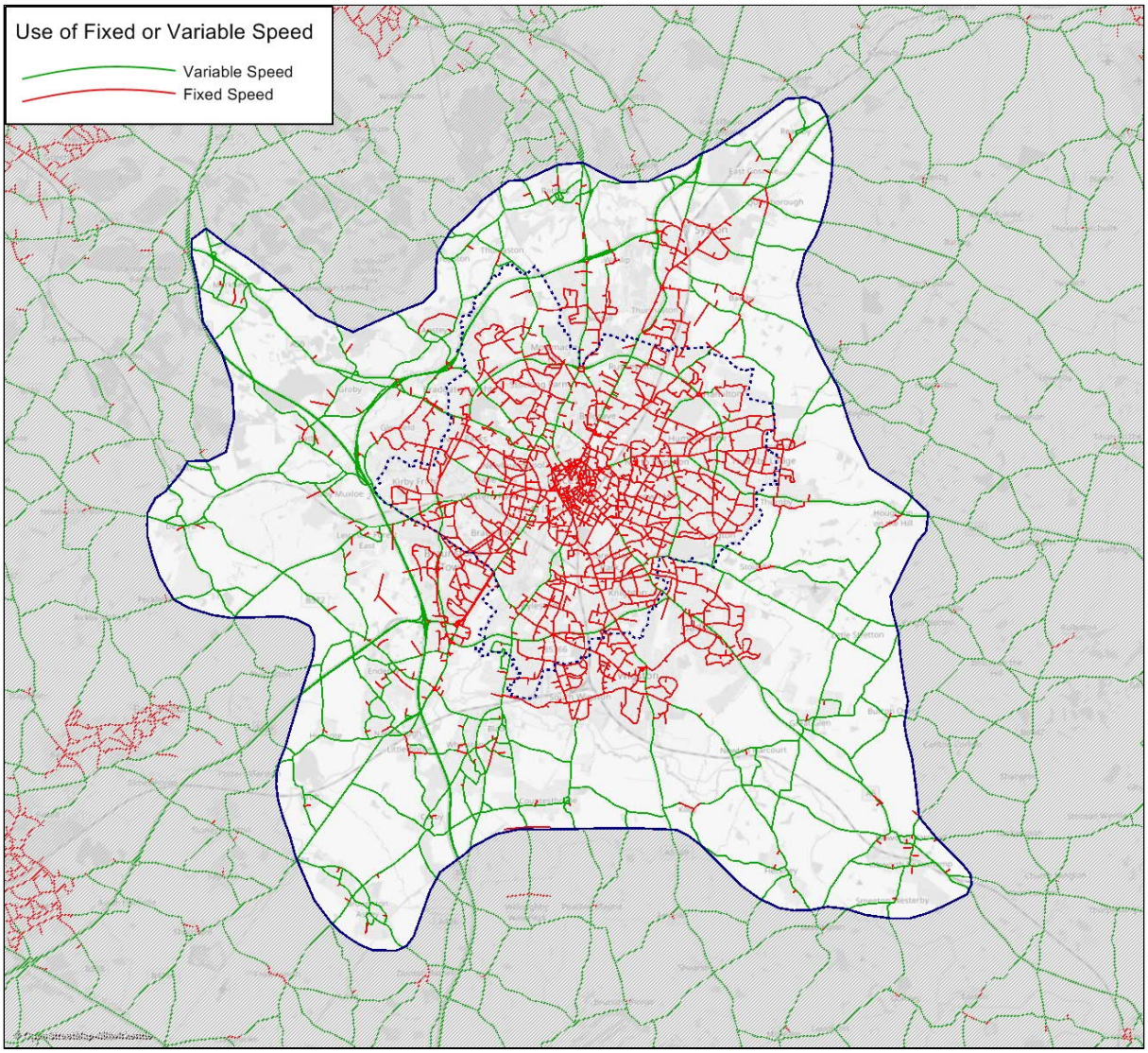

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Figure 2.7: Application of Fixed Cruise Speeds and Speed-flow Curves

2.3.12 As part of the coding of junctions within the base year highway network the standard of priority and signalised junctions is considered. For these two junction types, three standards are defined: 'tight'; 'average'; and 'wide'. These definitions relate to the turning radius of each junction, but in general 'tight' junctions are located within dense urban areas and 'wide' junctions are located in rural areas and/or along key strategic routes. (Roundabouts are modelled using a different set of assumptions, based on the number of lanes and the presence of a flare on each approach.)

2.3.13 Figure 2.8 shows the application of these three junction standards for priority and signalised junctions within the Review Area. These figures show that, in general, 'tight' junctions are located within the urban areas and 'wide' junctions are located along the key strategic routes. There are a small number of junctions which have been coded with 'wide' junctions which would have better suited 'average', but this will have limited impact on the assignment.

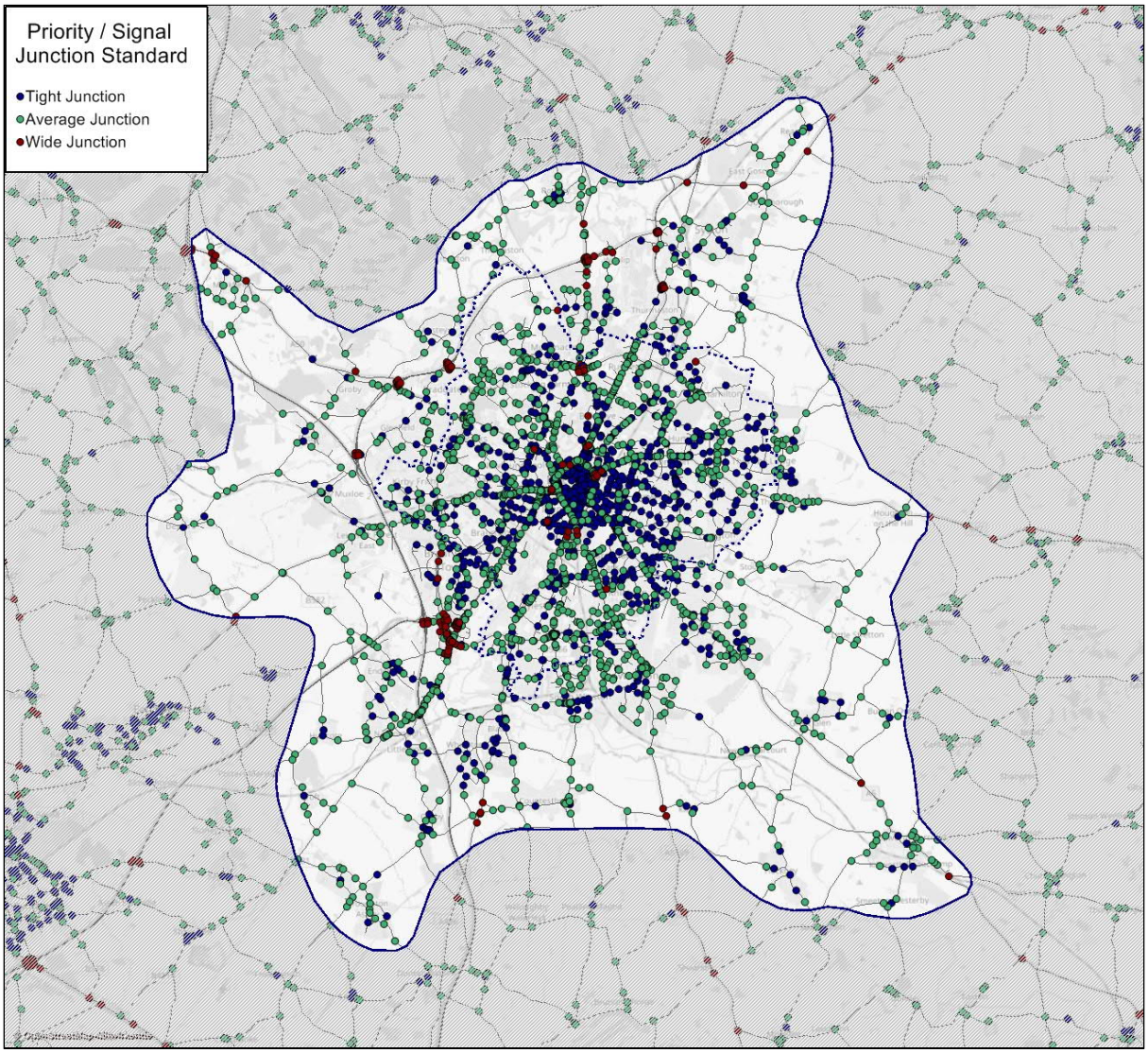

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Figure 2.8: Application of Junction Standards

2.4 High-Level Review of Base Year Highway Network Flows and Delays

2.4.1 In addition to the high-level review of the network coding, a high-level review of traffic volumes and delays has been undertaken. A more detailed review of the performance of the base year flows and delays against observed traffic counts and journey times is given in Section 4; however, this section summarises the general pattern of traffic and delays in the base year highway models.

2.4.2 Figure 2.9 shows the assigned traffic volumes in the 2014 base year model in the AM Peak hour, Interpeak hour and PM Peak hour for the Review Area. These figures show that the largest modelled flows are along the key strategic routes, namely the M1, M69 and A46. Below these key strategic routes, the modelled flows are highest along key arterial routes in and around the Leicester City urban area.

2.4.3 Figure 2.9 also shows the location of modelled junction delays within the Review Area. In general, the location of larger modelled junction delays aligns with known areas of congestion within Leicester city centre and along key arterial routes. The main exceptions to this are two junctions outside of the Leicester City boundary: the Queniborough Road/Barkby Road junction east of Syston, and the B582 Blaby Road/Leicester Lane/High Street junction in Enderby, which exhibit high levels of delay particularly in the peaks.

2.4.4 A review of the coding at these locations has not highlighted any issues with the assumptions adopted at this location, and the signal timings data for this location have been provided by LCC as part of the observed signal timing data for the development of the PRTM. Given their location it is unlikely that these will have a material impact on the forthcoming assessment, but this should be reviewed as part of the analysis of modelling results.

2.4.5 Appendix A provides larger versions of these plots.

AM Peak Hour

Interpeak Hour

PM Peak Hour

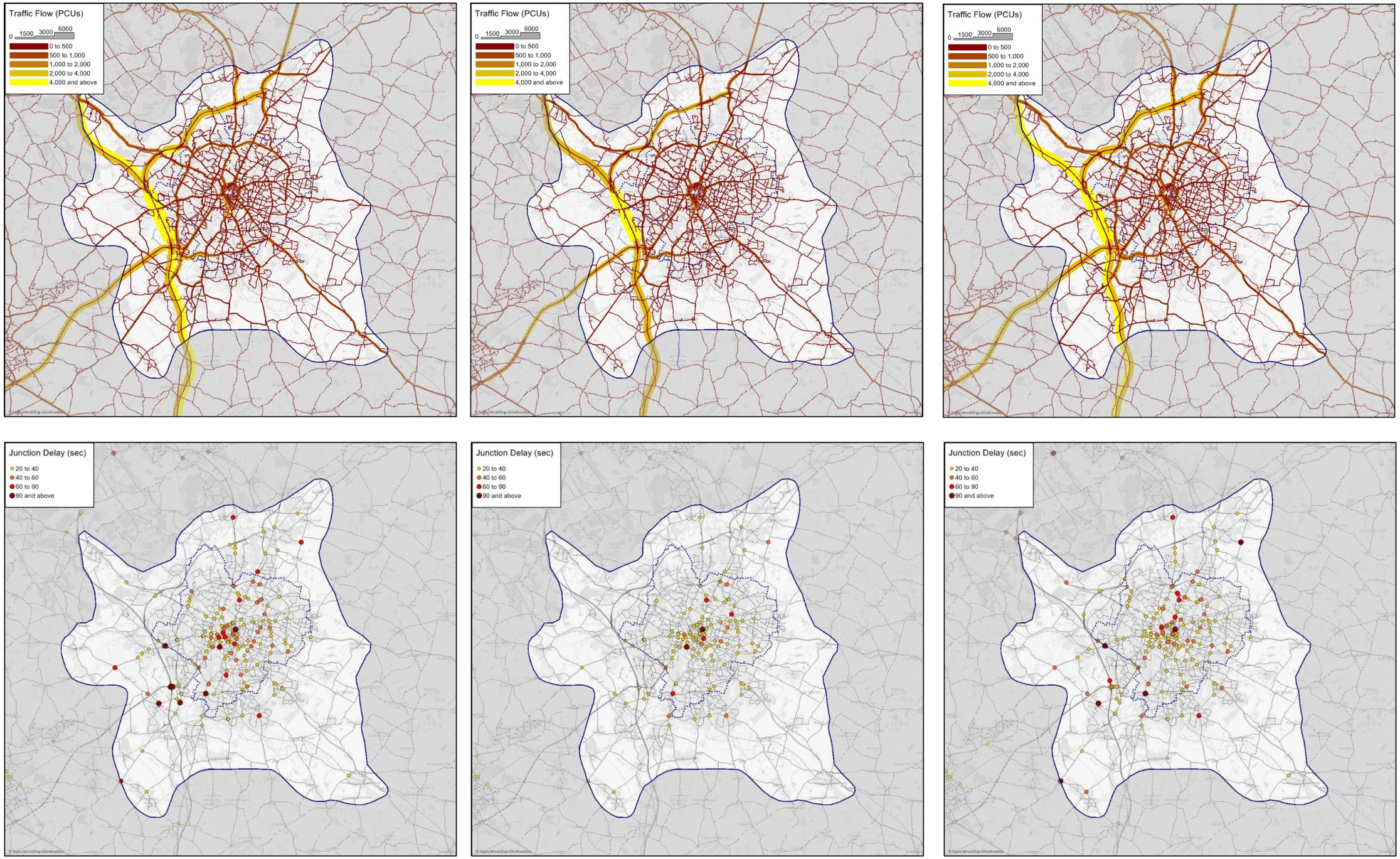

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Figure 2.9: Base Year Assigned Traffic Volumes and Junction Delays by Modelled Hour

Section 3 – Detailed Highway Network Review

3.1 Introduction

3.1.1 In addition to the high-level network checks detailed in Section 2, this section details the outcome of a more detailed review of the highway network coding for a limited number of junctions in the network. The junctions selected for this detailed coding review have been provided by the client and are:

- St Margaret's Way/Burleys Way/Vaughan Way;
- Lutterworth Road/Soar Valley Way/Glenhills Way;
- Aylestone Road/Middleton Street/Wigston Lane;
- Southgates/Newarke Street/Oxford Street;
- Fosse Road North/Blackbird Road/Groby Road/Woodgate;
- Blackbird Road/Abbey Lane/Abbey Park Road;
- Saffron Lane/Glenhills Way/Wigston Lane (Pork Pie);
- Narborough Road/Upperton Road;
- Welford Road/Putney Road/Victoria Park Road;
- Uppingham Road/Coleman Road;
- Aylestone Road/Welford Road Right Turn (old Granby Halls Site);
- Belgrave Road Corridor;
- Hungarton Boulevard/Lower Keyham Lane Roundabout; and
- Thurmaston Lane/Troon Way Roundabout.

3.1.2 The network coding for these junctions has been reviewed against the standards set out in the PRTM highway coding manual and photography of the routes and junctions available through Google Maps. The link and junction properties considered in this review include the coded link length, number of lanes, flare coding, saturation flows, free-flow speed, speed-flow curves and signal stage timings.

3.2 Detailed Network Review Findings

3.2.1 As part of the detailed network coding review of these junctions, the majority of network coding was found to be in-line with the adopted coding standards and information on the highway network available from Google Maps. A handful of minor discrepancies were found with regards to coded distances, signal timings and free flow speeds, however these were not deemed significant enough to warrant further review. Aside from these, two notable coding errors were identified.

- The Glenhills Way eastbound entry into the 'Pork Pie' roundabout has three lanes, of which the left-hand lane has been coded as left turn only. However, images indicate this lane can be used for vehicles going straight ahead, which would mean the capacity for going straight ahead should be increased (see Figure 3.1).
- The Aylestone Road/Welford Road junction has been coded as four lanes in the Aylestone Road northbound direction, with the two right-hand lanes used for turning right onto Welford Road. Images suggest this is one lane that becomes two immediately before the junction, and thus the 4th lane should be coded as a flare (see Figure 3.2).

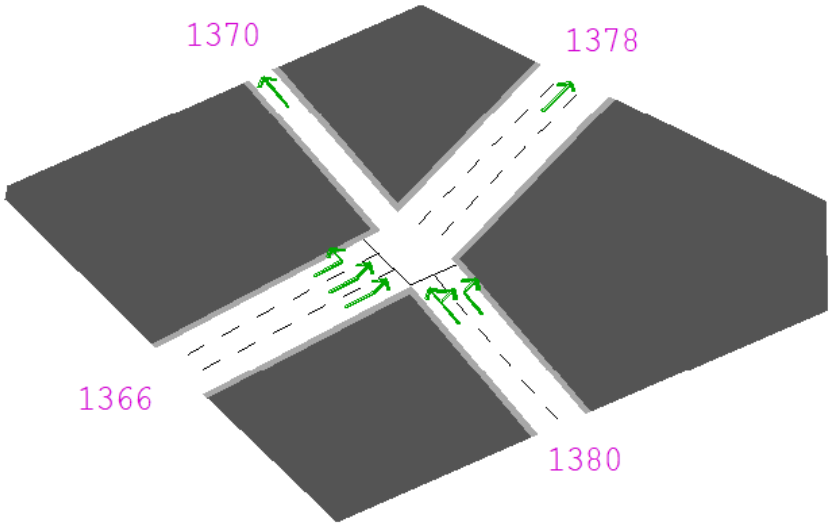
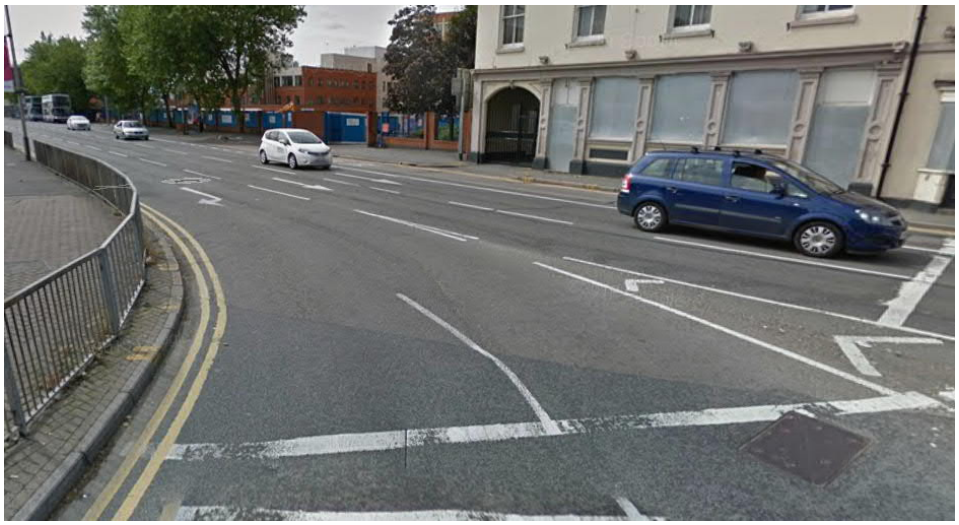


Figure 3.1: Glenhills Way/Pork Pie Roundabout Network Coding



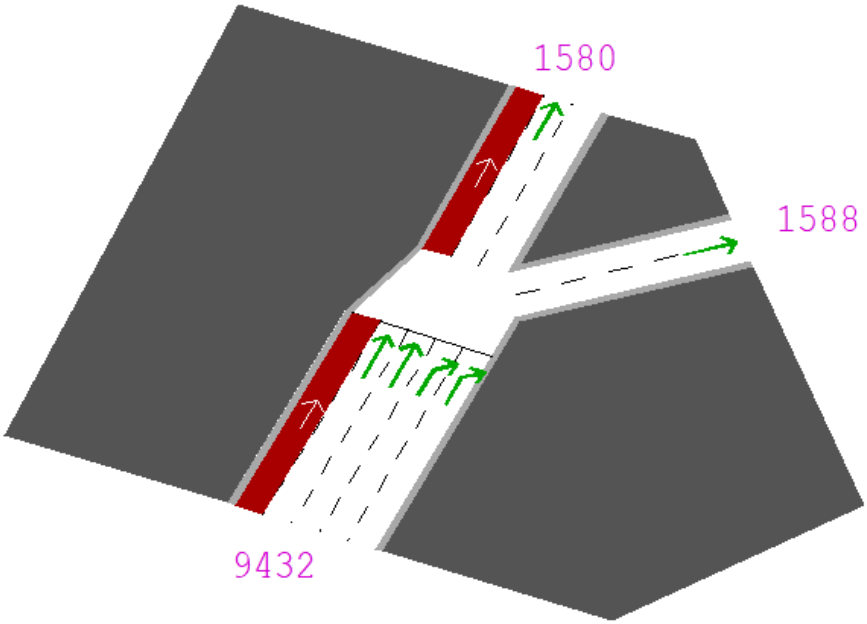


Figure 3.2: Aylestone Road/Welford Road Network Coding

3.2.2 A review was also undertaken of any changes introduced at these junctions between the base year and 2036 forecast year networks. A number of junctions featured changes which are in-line with information provided to AECOM for forecast year scheme coding, however there are a number of discrepancies which require discussion with LCiC:

- Changes at the Fosse Road North/Blackbird Road/Groby Road/Woodgate junction suggest a reduction in capacity on a number of arms however information to support this change could not be identified.
- The northbound exit from Belgrave Circle features a reduction in lanes from two to one, which is consistent with plans held for the Belgrave Flyover scheme but is not consistent with current layout in Google.
- Plans for the Hungarton Boulevard/Lower Keyham Lane roundabout feature two of the arms being converted to signals. The current uncertainty log states that this scheme is complete, however Google images suggest this may not be the case.

Section 4 – Model Performance Review

4.1 Introduction

4.1.1 As part of the development of the PRTM, a number of screenlines and cordons have been defined using traffic count data against which the modelled traffic volumes have been compared. In addition to this, the observed journey times along a number of defined routes have been calculated using Trafficmaster data, and the modelled journey times along these routes have been compared with the observed data.

4.1.2 Guidelines detailed in TAG Unit M3.1 have been adopted in assessing the performance of the base year highway model against the collated observed data. These criteria can be summarised as follows:

- for screenlines the difference between modelled and observed traffic volumes should be less than 5% for 'all or nearly all' screenlines;
- for individual count locations the modelled flows should be within the defined criteria for at least 85% of cases; and
- for journey times the modelled times along routes should be within 15% of surveyed times (or 1 minute, if higher than 15%) on at least 85% of routes.

4.1.3 For individual count locations, the guidelines set out in Table 2 of TAG Unit 3.1 state that a modelled link flow meets TAG criteria if at least one of the two following conditions is met:

- *Flow Criteria*:
  - modelled flow is within 100 vehicles for counts with an observed flow of less than 700 vehicles;
  - modelled flow is within 15% vehicles for counts with an observed flow between 700 and 2,700 vehicles; or
  - modelled flow is within 400 vehicles for counts with an observed flow greater than 2,700 vehicles.
- *GEH criteria:*
  - a GEH value of less than 5, where $GEH = \sqrt{\frac{(M-O)^2}{(M+O)/2}}$, M is the modelled flow and O is the observed flow.

4.2 Screenline Performance

4.2.1 Table 4.1 provides a summary of the performance for screenlines in Leicester City for total vehicle flows (i.e. car, LGV and HGV traffic combined). This includes inner, middle and outer cordons of the city, screenlines covering north/south and east/west traffic crossing the city, and groups of individual counts (not strictly screenlines) in local areas around the city. Table 4.2 provides the same summary for screenlines outside Leicester City which have at least some counts within the Review Area. These include screenlines within Charnwood, Harborough and Hinckley. The locations of all these screenlines is provided in Appendix B

4.2.2 Table 4.1 demonstrates that all but two of the screenlines in Leicester City meet the defined TAG criteria in all three modelled time periods. The M1 Screenline (Leicester City) Westbound has 6.5% more traffic in the model than observed in the PM Peak, and the Leicester City Inner Cordon Outbound has 5.9% less traffic in the model than observed in the AM Peak, which are both relatively minor failures. All screenlines in the wider Review Area pass the TAG criteria.

4.2.3 In summary, across the 58 screenlines and cordons within the Review Area, 99% meet the TAG criteria, demonstrating that the model achieves the TAG guideline for screenline performance of 'all or nearly all' screenlines being within 5% of the observed flows.

Table 4.1: Base Year Highway Model Screenline Performance, Leicester City

		AM Peak Hour			Interpeak Hour			PM Peak Hour		
Screenline	**Counts**	**Observed**	**Modelled**	**Pass**	**Observed**	**Modelled**	**Pass**	**Observed**	**Modelled**	**Pass**
Leicestershire T-Line (Leicester City) Northbound	29	14,078	14,001	✓	10,090	10,164	✓	12,075	12,214	✓
Leicestershire T-Line (Leicester City) Southbound	29	12,433	12,504	✓	9,571	9,640	✓	13,798	13,856	✓
Leicestershire S-Line (Leicester City) Eastbound	11	13,563	13,312	✓	9,542	9,552	✓	12,346	12,369	✓
Leicestershire S-Line (Leicester City) Westbound	11	12,093	12,046	✓	9,683	9,513	✓	13,656	13,668	✓
M1 Screenline (Leicester City) Eastbound	5	8,441	8,822	✓	5,346	5,370	✓	9,104	8,857	✓
M1 Screenline (Leicester City) Westbound	5	8,625	8,464	✓	5,368	5,363	✓	8,690	9,253	×
Leicester City Inner Cordon Inbound	14	4,337	4,344	✓	3,132	3,139	✓	3,474	3,418	✓
Leicester City Inner Cordon Outbound	22	3,365	3,166	×	3,585	3,414	✓	4,564	4,581	✓
Leicester City Middle Cordon (A563) Inbound	49	23,354	23,046	✓	16,044	16,130	✓	19,269	19,390	✓
Leicester City Middle Cordon (A563) Outbound	49	19,127	19,066	✓	16,345	16,306	✓	22,759	22,730	✓
Leicester City Outer Cordon Inbound	40	30,400	30,422	✓	19,025	19,072	✓	27,528	27,905	✓
Leicester City Outer Cordon Outbound	41	25,830	26,353	✓	19,191	19,289	✓	30,721	30,891	✓
Leicester City North-South Screenline (Beaumont Leys) Eastbound	8	3,027	3,001	✓	2,869	2,877	✓	3,903	3,935	✓
Leicester City North-South Screenline (Beaumont Leys) Westbound	8	4,456	4,407	✓	2,860	2,872	✓	3,452	3,420	✓
Leicester City North-South Screenline (Railway) Eastbound	4	2,200	2,169	✓	1,838	1,835	✓	2,527	2,502	✓
Leicester City North-South Screenline (Railway) Westbound	4	2,412	2,445	✓	1,826	1,815	✓	2,074	2,056	✓
Western Leicester S-Line Eastbound	4	2,064	2,029	✓	1,199	1,169	✓	1,583	1,557	✓
Western Leicester S-Line Westbound	4	1,594	1,549	✓	1,208	1,176	✓	1,845	1,780	✓
Northern Leicester T-Line Northbound	5	2,111	2,126	✓	2,367	2,376	✓	3,735	3,758	✓
Northern Leicester T-Line Southbound	5	3,883	3,884	✓	2,365	2,358	✓	2,636	2,626	✓
Glen Parva East-West Northbound	3	3,659	3,732	✓	2,315	2,314	✓	2,858	2,892	✓
Glen Parva East-West Southbound	3	2,819	2,849	✓	2,396	2,388	✓	3,393	3,385	✓
Southern Leicester T-line Northbound	9	4,587	4,572	✓	2,939	2,938	✓	2,997	3,007	✓
Southern Leicester T-line Southbound	9	3,207	3,211	✓	3,440	3,405	✓	5,185	5,118	✓
Fosse Park Individual Counts Calibration Inbound	3	2,364	2,338	✓	1,355	1,350	✓	1,895	1,906	✓
Fosse Park Individual Counts Calibration Outbound	3	1,705	1,683	✓	1,351	1,353	✓	2,123	2,118	✓
Fosse Park Individual Counts Validation Inbound	2	3,830	3,881	✓	2,792	2,768	✓	3,866	3,852	✓
Fosse Park Individual Counts Validation Outbound	2	3,558	3,459	✓	2,524	2,533	✓	3,294	3,316	✓
Inner City Individual Counts Calibration Clockwise	3	5,565	5,572	✓	4,716	4,750	✓	5,644	5,743	✓
Inner City Individual Counts Calibration Anti-Clockwise	3	5,712	5,420	✓	4,700	4,484	✓	5,612	5,516	✓
Inner City Individual Counts Validation Clockwise	2	4,332	4,362	✓	3,756	3,785	✓	4,569	4,608	✓
Inner City Individual Counts Validation Anti-Clockwise	2	4,264	4,259	✓	3,386	3,409	✓	4,353	4,517	✓
Saint Matthews Individual Counts Calibration Inbound	2	2,134	2,192	✓	1,524	1,535	✓	1,480	1,516	✓
Saint Matthews Individual Counts Calibration Outbound	2	1,431	1,410	✓	1,674	1,676	✓	2,130	2,115	✓

Table 4.2: Base Year Highway Model Screenline Performance, Wider Review Area

		AM Peak Hour			Interpeak Hour			PM Peak Hour		
Screenline	Counts	Observed	Modelled	Pass	Observed	Modelled	Pass	Observed	Modelled	Pass
Leicestershire S-Line (North) Westbound	4	2,642	2,610	✓	1,287	1,281	✓	1,844	1,849	✓
Leicestershire S-Line (North) Eastbound	4	1,690	1,687	✓	1,234	1,230	✓	2,533	2,531	✓
Melton-Charnwood North-South Screenline Westbound	12	4,788	4,785	✓	2,737	2,748	✓	4,351	4,365	✓
Melton-Charnwood North-South Screenline Eastbound	12	4,335	4,336	✓	2,720	2,731	✓	4,899	4,819	✓
Leicestershire T-Line (East) Southbound	6	635	639	✓	280	284	✓	479	487	✓
Leicestershire T-Line (East) Northbound	6	559	565	✓	294	299	✓	644	650	✓
Harborough District North-South Screenline (Great Glen) Westbound	4	1,189	1,190	✓	726	729	✓	1,268	1,291	✓
Harborough District North-South Screenline (Great Glen) Eastbound	4	1,165	1,177	✓	696	703	✓	1,175	1,174	✓
Harborough District East-West Screenline Southbound	18	10,668	10,980	✓	6,942	7,026	✓	10,220	10,252	✓
Harborough District East-West Screenline Northbound	18	9,990	9,888	✓	7,233	7,234	✓	11,629	11,836	✓
Harborough District North-South Screenline (A5199) Westbound	7	1,844	1,865	✓	785	788	✓	1,267	1,269	✓
Harborough District North-South Screenline (A5199) Eastbound	7	1,306	1,313	✓	785	790	✓	1,663	1,680	✓
M1 Screenline (South) Westbound	19	6,507	6,513	✓	4,546	4,479	✓	6,591	6,575	✓
M1 Screenline (South) Eastbound	19	6,450	6,504	✓	4,490	4,480	✓	6,731	6,709	✓
Leicestershire S-Line (South) Westbound	9	6,555	6,331	✓	4,891	4,851	✓	7,483	7,690	✓
Leicestershire S-Line (South) Eastbound	9	6,584	6,787	✓	4,599	4,706	✓	6,502	6,474	✓
Earl Shilton Cordon Outbound	7	1,361	1,379	✓	853	857	✓	1,093	1,105	✓
Earl Shilton Cordon Inbound	7	907	919	✓	880	882	✓	1,539	1,551	✓
Barwell Cordon Outbound	8	1,901	1,877	✓	1,355	1,307	✓	1,750	1,674	✓
Barwell Cordon Inbound	8	1,477	1,403	✓	1,388	1,346	✓	2,176	2,148	✓
Leicestershire T-Line (West) Southbound	11	8,971	9,041	✓	5,593	5,685	✓	7,820	7,920	✓
Leicestershire T-Line (West) Northbound	11	7,722	7,881	✓	5,761	5,764	✓	9,240	9,211	✓
M1 Screenline (North) Westbound	18	7,949	8,012	✓	5,082	5,085	✓	8,354	8,555	✓
M1 Screenline (North) Eastbound	18	8,607	8,600	✓	4,911	4,944	✓	8,411	8,431	✓

4.3 Individual Link Flow Performance

4.3.1 Each of the screenlines and cordons reported above are made up of a series of individual counts. In addition to these, the calibration and validation of the base year highway assignment model contains a number of individual count surveys on the Strategic Road Network. These include counts on the M1, the M69 and the A46.

4.3.2 Table 4.3 provides a summary of the proportion of individual link counts meeting the defined TAG criteria in the three modelled hours for total vehicle flows. These individual counts have been grouped based on the screenlines which contain each count, with the individual link counts along the Strategic Road Network also included in the analysis.

Table 4.3: Summary of Individual Link Flow Performance

Location	Counts	AM Peak	Interpeak	PM Peak
Leicester City	381	84%	93%	86%
Other Review Area	78	82%	95%	68%
Strategic Road Network	16	94%	100%	100%
All	**475**	**84%**	**94%**	**84%**

4.3.3 Table 4.3 shows that across all the counts selected for this analysis, 84% meet the defined TAG criteria in the AM Peak hour, 94% in the Interpeak hour, and 84% in the PM Peak hour. Within the reporting areas there is some variation in the pass rate against TAG criteria. Count performance in Leicester City is good and the Strategic Road Network counts have a pass rate of at least 94% in all time periods.

4.3.4 Performance in the rest of the Review Area is good in the AM Peak and Interpeak, and generally good in the PM Peak other than a small cluster of counts around the south and east of Syston. These belong to the Melton-Charnwood screenline which runs broadly along the boundary of the two districts and the Leicester City Outer cordon. As reported in Section 4.2, this screenline performs well at the overall level, and further analysis suggests that the performance across this subset of counts of concern is also good. However, at the individual count level there appear to be local issues with routeing and/or the allocation of travel demand to zones. The same set of counts was identified in the review of the model undertaken for the Charnwood Local Plan, but it was decided that no action should be taken to improve the detailed count validation given that total demand across the screenline in question was deemed to be good.

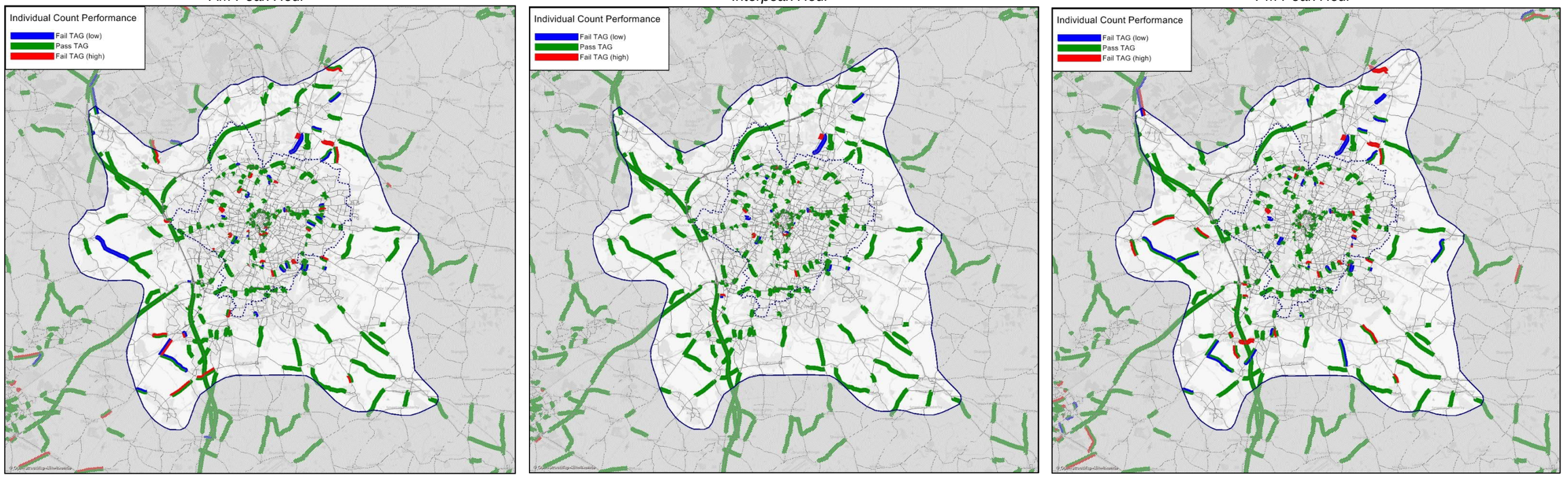
4.3.5 To provide additional information on the location of the traffic count surveys which meet or fail to meet the defined TAG criteria, Figure 4.1 provides an overview of the performance against individual link counts in the three modelled time periods. These figures show the wider Review Area and Leicester City performance against TAG criteria and, where a given location has not met the criteria, if the modelled flow is above or below the observed traffic count. This analysis demonstrates that, other than in the Syston area mentioned above, the locations of the failures are not clustered in one geographical location.

AM Peak Hour

Interpeak Hour

PM Peak Hour

Review Area



Map contains Ordnance Survey data © Crown copyright and database right 2020

Figure 4.1: Individual Link Flow Performance by Modelled Hour

4.4 Journey Time Performance

4.4.1 In assessing journey time performance, all journey time routes within Leicester City as well as any routes which have a substantial section inside the wider Review Area have been reviewed. This includes 16 routes in Leicester City, three routes on the SRN, and a further six routes in other areas within the Review Area. Each route is defined in two directions giving 50 reported journey time routes in all. The locations of these routes is provided in Appendix B

4.4.2 Table 4.4 provides a summary of the journey time performance by time period across the different areas. Overall 96% of the selected journey time routes meet the defined TAG criteria in the AM Peak hour, 88% in the Interpeak hour, and 94% in the PM Peak hour, all of which are above the 85% criterion recommended in TAG.

Table 4.4: Summary of Journey Time Performance

Location	AM Peak	Interpeak	PM Peak
Leicester City	94%	81%	91%
Strategic Road Network	100%	100%	100%
Other	100%	100%	100%
All	**96%**	**88%**	**94%**

4.4.3 Table 4.5, Table 4.6 and Table 4.7 provide further details on the performance of individual routes within Leicester City, along the Strategic Road Network, and in other areas within the Review Area.

4.4.4 In the AM Peak hour two routes fail the TAG criteria, namely the A50 Groby Inbound, and the A594 Inner Ring Road Anti-Clockwise. The latter has modelled journey time around 18% higher than observed, due to slight overestimates in delay at a number of junctions along its route. However, the former underestimates journey times by over 30%, and was identified in both the recent model reviews for the Strategic Sites work and Charnwood Local Plan. These reports highlight that network coding along this route is correct, and modelled flows are consistent with observed count data, and any additional work to attempt to improve performance here is likely to be unfruitful and could affect other aspects of model performance. It is possible that the observed journey time data was impacted by roadworks which can be observed in Google Street View images from around that period.

4.4.5 In the Interpeak, the two main routes of concern are the A563 Outer Ring Road 1 Clockwise and Anti-Clockwise, which overestimate journey times by 25% and 33% respectively. The outer ring road is subject to significant congestion in the peaks and therefore has been coded with lower fixed speeds in order to help replicate speeds observed in the busiest times. These speeds have been retained in the Interpeak resulting in an overestimation of total journey time along the route.

4.4.6 In the PM Peak, the worst performing route is the A563 Outer Ring Road 3 Anti-Clockwise which overestimates journey times by 20%. This overestimate cannot be attributed to any single location along the route, rather a series of slight overestimates at a number of different locations, and therefore is not a significant cause for concern.

4.4.7 Overall, as stated above, the model meets and exceeds the TAG criteria for journey time performance in the Review Area giving confidence that the representation of speed and delay in the base year highway model is reliable and a good basis for forecasting.

Table 4.5: Base Year Highway Model Journey Time Performance, Leicester City

		AM Peak Hour				Interpeak Hour				PM Peak Hour			
Location	**Route**	**Observed**	**Modelled**	**Diff**	**Pass**	**Observed**	**Modelled**	**Diff**	**Pass**	**Observed**	**Modelled**	**Diff**	**Pass**
Leicester City	A47 Thurnby Inbound	15:03	14:05	-6.4%	✓	12:03	13:09	9.1%	✓	12:15	13:07	7.1%	✓
Leicester City	A47 Thurnby Outbound	13:03	12:45	-2.3%	✓	12:34	12:40	0.8%	✓	16:00	13:41	-14.5%	✓
Leicester City	A607 Thurmaston Inbound	13:27	14:02	4.3%	✓	12:41	11:49	-6.9%	✓	12:57	12:35	-2.9%	✓
Leicester City	A607 Thurmaston Outbound	11:47	12:14	3.8%	✓	12:19	12:08	-1.6%	✓	14:36	15:28	6.0%	✓
Leicester City	A6 Birstall Inbound	15:14	13:47	-9.5%	✓	10:30	10:50	3.1%	✓	11:33	11:40	0.9%	✓
Leicester City	A6 Birstall Outbound	10:47	10:47	-0.1%	✓	09:50	10:41	8.7%	✓	12:37	13:02	3.4%	✓
Leicester City	B5327 Anstey Inbound	10:17	09:15	-10.0%	✓	05:50	06:49	16.7%	✓	06:22	07:26	17.0%	×
Leicester City	B5327 Anstey Outbound	06:15	06:35	5.2%	✓	06:03	06:30	7.2%	✓	07:59	08:06	1.3%	✓
Leicester City	A50 Groby Inbound	15:18	10:36	-30.7%	×	08:31	08:54	4.5%	✓	11:29	10:00	-13.0%	✓
Leicester City	A50 Groby Outbound	08:24	09:29	12.9%	✓	08:01	08:53	10.8%	✓	12:13	12:03	-1.3%	✓
Leicester City	A47 Leicester Forest East Inbound	17:38	19:28	10.4%	✓	11:04	12:30	12.9%	✓	13:46	14:19	4.1%	✓
Leicester City	A47 Leicester Forest East Outbound	13:09	14:09	7.6%	✓	11:34	12:12	5.4%	✓	15:37	17:33	12.3%	✓
Leicester City	A5460 Enderby Inbound	18:29	16:39	-9.9%	✓	11:48	12:55	9.4%	✓	13:28	13:19	-1.0%	✓
Leicester City	A5460 Enderby Outbound	15:00	13:57	-7.0%	✓	11:28	12:19	7.5%	✓	15:45	14:05	-10.6%	✓
Leicester City	A426 Blaby Inbound	18:09	16:11	-10.8%	✓	10:01	11:08	11.1%	✓	12:34	11:13	-10.7%	✓
Leicester City	A426 Blaby Outbound	13:04	14:21	9.8%	✓	10:41	12:56	21.1%	×	16:10	16:25	1.6%	✓
Leicester City	Saffron Lane Inbound	11:43	11:55	1.7%	✓	07:53	08:58	13.7%	✓	08:32	09:21	9.5%	✓
Leicester City	Saffron Lane Outbound	09:52	10:00	1.4%	✓	08:27	09:44	15.1%	×	12:21	10:54	-11.8%	✓
Leicester City	A5199 Wigston Inbound	12:23	13:00	5.0%	✓	08:44	09:20	6.8%	✓	09:34	09:47	2.3%	✓
Leicester City	A5199 Wigston Outbound	09:48	10:40	8.9%	✓	09:10	09:53	7.9%	✓	11:05	12:35	13.5%	✓
Leicester City	A6 Oadby Inbound	18:29	17:55	-3.0%	✓	12:45	13:54	9.1%	✓	15:10	15:00	-1.1%	✓
Leicester City	A6 Oadby Outbound	12:24	13:44	10.8%	✓	11:52	13:14	11.5%	✓	15:56	16:50	5.7%	✓
Leicester City	A594 IRR Clockwise	15:31	17:03	9.9%	✓	12:44	14:52	16.9%	×	15:59	15:35	-2.4%	✓
Leicester City	A594 IRR Anti-Clockwise	12:29	14:46	18.2%	×	10:20	11:44	13.6%	✓	12:43	13:08	3.2%	✓
Leicester City	A563 ORR1 Clockwise	18:33	17:15	-7.1%	✓	11:25	14:18	25.2%	×	13:42	15:23	12.2%	✓
Leicester City	A563 ORR1 Anti-Clockwise	16:07	15:05	-6.4%	✓	11:12	14:51	32.6%	×	21:30	17:50	-17.1%	×
Leicester City	A563 ORR2 Clockwise	14:45	13:52	-6.0%	✓	11:53	13:14	11.3%	✓	15:24	14:19	-7.1%	✓
Leicester City	A563 ORR2 Anti-Clockwise	14:08	15:01	6.3%	✓	10:52	12:20	13.5%	✓	12:47	13:51	8.3%	✓
Leicester City	A563 ORR3 Clockwise	12:53	13:20	3.4%	✓	11:15	12:27	10.7%	✓	15:46	14:41	-6.9%	✓
Leicester City	A563 ORR3 Anti-Clockwise	13:05	14:45	12.7%	✓	11:07	13:16	19.3%	×	11:28	13:47	20.1%	×
Leicester City	Fullhurst Clockwise	17:16	17:04	-1.1%	✓	13:47	15:45	14.3%	✓	16:01	17:46	11.0%	✓
Leicester City	Fullhurst Anti-Clockwise	15:51	17:05	7.8%	✓	13:52	15:07	9.0%	✓	18:18	18:58	3.6%	✓

Table 4.6: Base Year Highway Model Journey Time Performance, Strategic Road Network

		AM Peak Hour				Interpeak Hour				PM Peak Hour			
Location	**Route**	**Observed**	**Modelled**	**Diff**	**Pass**	**Observed**	**Modelled**	**Diff**	**Pass**	**Observed**	**Modelled**	**Diff**	**Pass**
SRN	M1 (Jn16 to Jn26) Northbound	51:39	57:44	11.8%	✓	53:29	56:14	5.1%	✓	00:08	00:57	1.4%	✓
SRN	M1 (Jn16 to Jn26) Southbound	59:46	02:02	3.8%	✓	52:48	56:00	6.1%	✓	52:49	59:16	12.2%	✓
SRN	M69 (M6 to M1) Northbound	17:57	19:49	10.4%	✓	14:25	14:22	-0.4%	✓	17:03	15:05	-11.6%	✓
SRN	M69 (M6 to M1) Southbound	14:26	14:49	2.7%	✓	14:28	14:17	-1.3%	✓	14:15	14:35	2.3%	✓
SRN	A46 (M1 to A52) Northbound	25:17	26:35	5.1%	✓	24:21	25:26	4.5%	✓	28:33	29:29	3.3%	✓
SRN	A46 (M1 to A52) Southbound	27:25	29:50	8.8%	✓	24:35	25:35	4.1%	✓	24:13	26:46	10.5%	✓

Table 4.7: Base Year Highway Model Journey Time Performance, Other Review Area

		AM Peak Hour				Interpeak Hour				PM Peak Hour			
Location	**Route**	**Observed**	**Modelled**	**Diff**	**Pass**	**Observed**	**Modelled**	**Diff**	**Pass**	**Observed**	**Modelled**	**Diff**	**Pass**
South-west Leicestershire	A47 (Leicester Forest East to Earl Shilton) Eastbound	06:36	06:03	-8.3%	✓	05:38	05:41	1.0%	✓	06:50	06:06	-10.7%	✓
South-west Leicestershire	A47 (Leicester Forest East to Earl Shilton) Westbound	05:39	05:25	-4.0%	✓	05:23	05:07	-5.1%	✓	05:30	05:17	-3.7%	✓
South-west Leicestershire	A50 (A46 to M1) Northbound	06:37	05:43	-13.6%	✓	05:57	05:33	-6.8%	✓	06:04	06:55	13.9%	✓
South-west Leicestershire	A50 (A46 to M1) Southbound	06:43	06:06	-9.0%	✓	05:57	05:47	-2.7%	✓	05:51	06:10	5.6%	✓
South Leicestershire	A6 (Market Harborough to Leicester) Northbound	14:44	14:28	-1.8%	✓	14:06	13:43	-2.7%	✓	14:34	15:36	7.1%	✓
South Leicestershire	A6 (Market Harborough to Leicester) Southbound	14:45	15:08	2.6%	✓	13:45	13:20	-3.1%	✓	13:29	14:15	5.6%	✓
South Leicestershire	A47 (Thurnby to Belton-in-Rutland) Eastbound	13:25	12:32	-6.6%	✓	13:31	12:22	-8.6%	✓	13:08	12:32	-4.6%	✓
South Leicestershire	A47 (Thurnby to Belton-in-Rutland) Westbound	13:25	12:42	-5.4%	✓	13:26	12:24	-7.7%	✓	12:48	12:38	-1.2%	✓
North Leicestershire	A6 (A46 to Loughborough) Northbound	05:56	05:52	-1.0%	✓	05:40	05:44	1.0%	✓	05:36	05:57	6.2%	✓
North Leicestershire	A6 (A46 to Loughborough) Southbound	06:05	05:54	-2.9%	✓	05:53	05:42	-3.2%	✓	05:30	05:52	6.6%	✓
North-east Leicestershire	A607 (A46 to Melton Mowbray) Northbound	11:09	10:36	-5.0%	✓	10:27	10:08	-3.0%	✓	10:39	10:51	1.9%	✓
North-east Leicestershire	A607 (A46 to Melton Mowbray) Southbound	11:04	10:47	-2.6%	✓	10:37	10:09	-4.4%	✓	10:32	10:34	0.3%	✓

Section 5 – Summary of Findings

5.1 Summary of Base Year Model Review

5.1.1 PRTM represents an average weekday in April, May and June in 2014 for an AM Peak, average Interpeak and PM Peak hour. This review focussed on the network within the defined Review Area, and the suitability of the model has been reviewed for use in the strategic assessment of the proposed Leicester City Local Plan.

5.1.2 A high-level review of the network within the Review Area has been completed for a number of key link and junction attributes and has also assessed the overall pattern of traffic flows and delays within Leicester City and the Review Area. This review identified some minor link length discrepancies which should be addressed before proceeding to the forecasting stage of the assessment.

5.1.3 Following this high-level review of the highway network, a more detailed network coding review of key junctions within the Review Area was undertaken. This review identified two minor coding errors in the network, at the 'Pork Pie' roundabout and the Aylestone Road/Welford Road junction, which should be corrected in the base year model before proceeding to forecasting. In addition, a number of observations were made regarding forecast network assumptions at three junctions which require further discussion with LCiC.

5.1.4 Finally, a review of the base year model performance against observed traffic volumes and journey times within the Review Area has been undertaken. In terms of the screenlines and cordons, all but two meet the required TAG criteria, and those that fail only do so marginally. Individual count performance is generally good with some concern around links south and east of Syston in the PM Peak hour which should be kept in mind when interpreting forecast model results. The journey time validation performance meets TAG guidelines across the Review Area.

5.2 Recommendations

5.2.1 The performance of the base year highway model against observed traffic counts and journey time surveys shows that the model meets the defined TAG acceptability guidelines across the Review Area. On this basis, and due to the limited number of coding corrections which have been identified as part of this review, the PRTM highway model is considered a suitable tool for assessing the new Leicester City Local Plan.

5.2.2 A number of minor network corrections will be incorporated into the model without requiring a full recalibration of the model.

5.2.3 Further discussion with LCiC is required to agree forecast network assumptions at a number of sites identified during the network coding review.

5.2.4 By considering the key findings of this review of the base year model as part of the assessment of the model forecasts, the PRTM highway assignment model is considered a suitable tool to draw robust conclusions on the forecast impacts of growth proposed in the Leicester City Local Plan.

Appendix A Base Year Traffic Volume and Delay

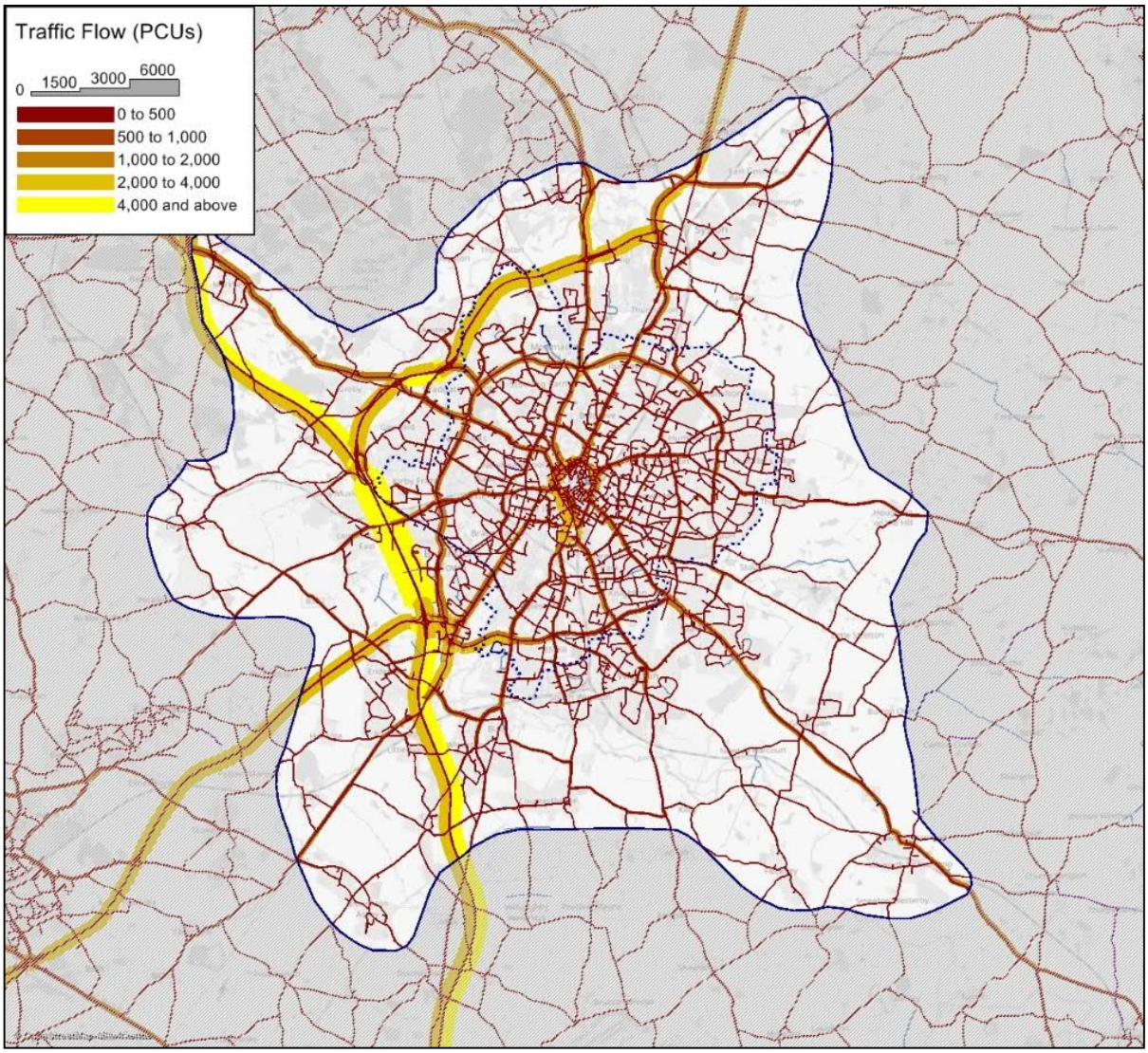


Figure A.1: AM Peak Base Year Assigned Traffic Volumes

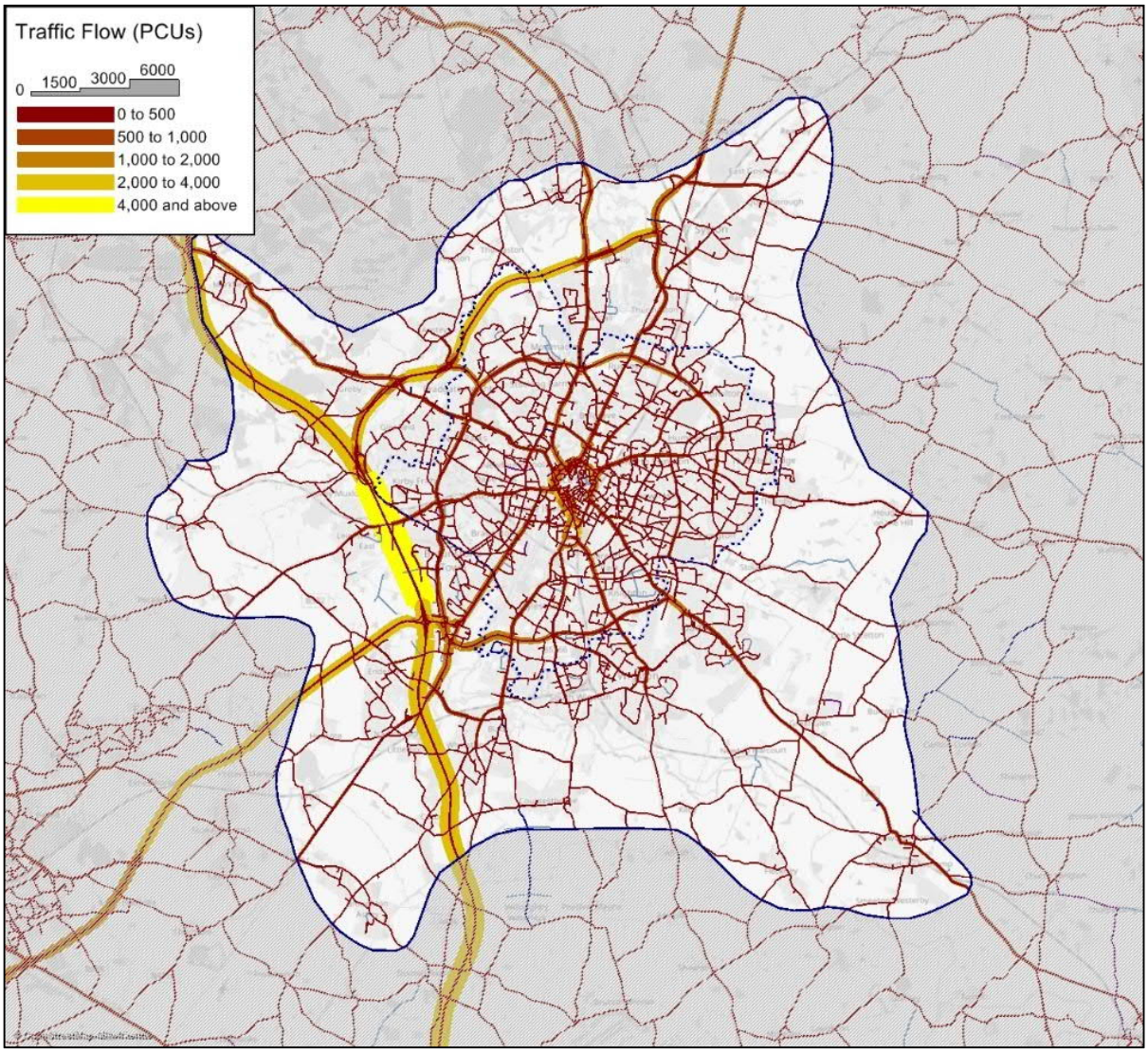


Figure A.2: Interpeak Base Year Assigned Traffic Volumes

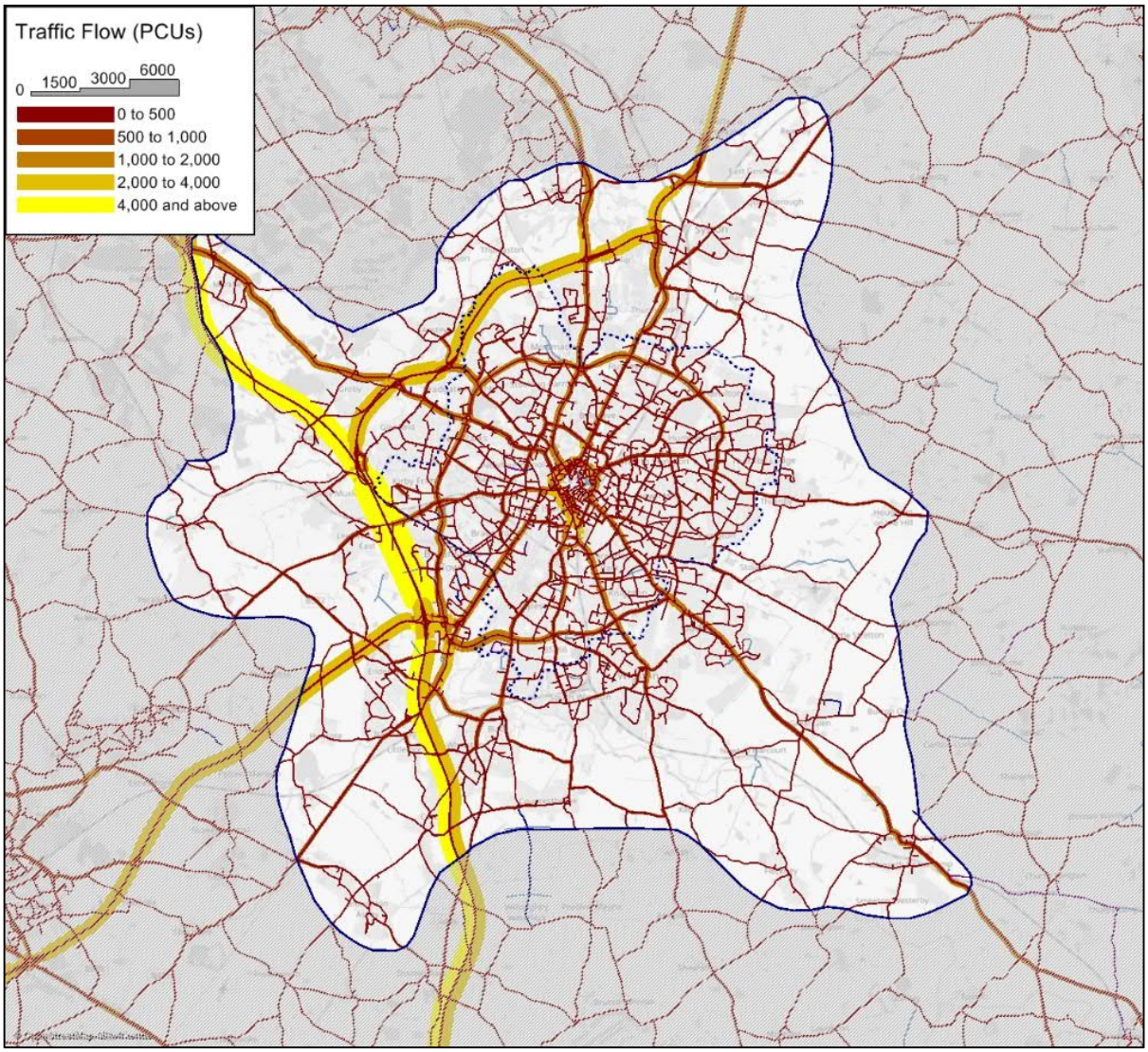


Figure A.3: PM Peak Base Year Assigned Traffic Volumes

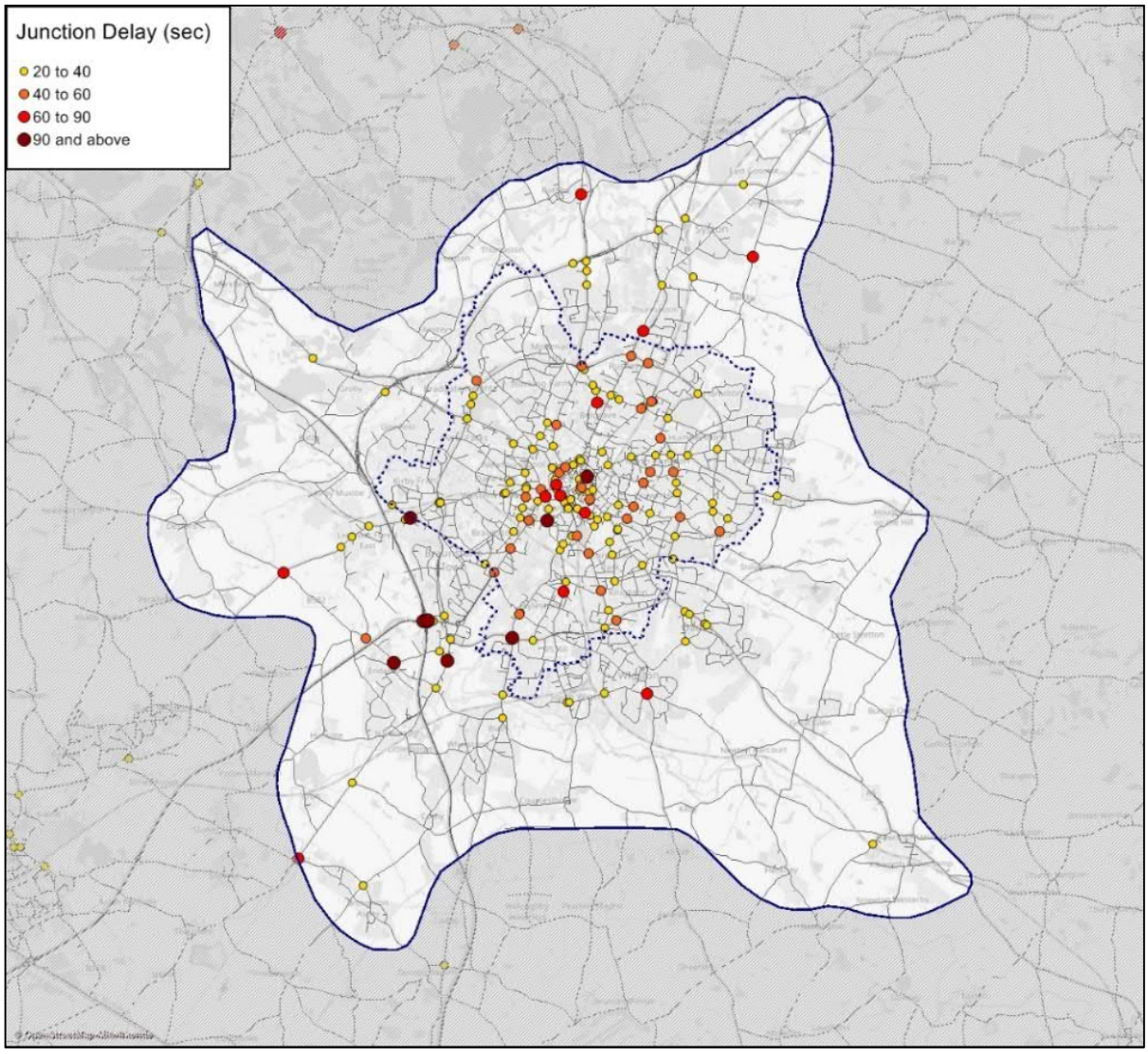


Figure A.4: AM Peak Base Year Junction Delays

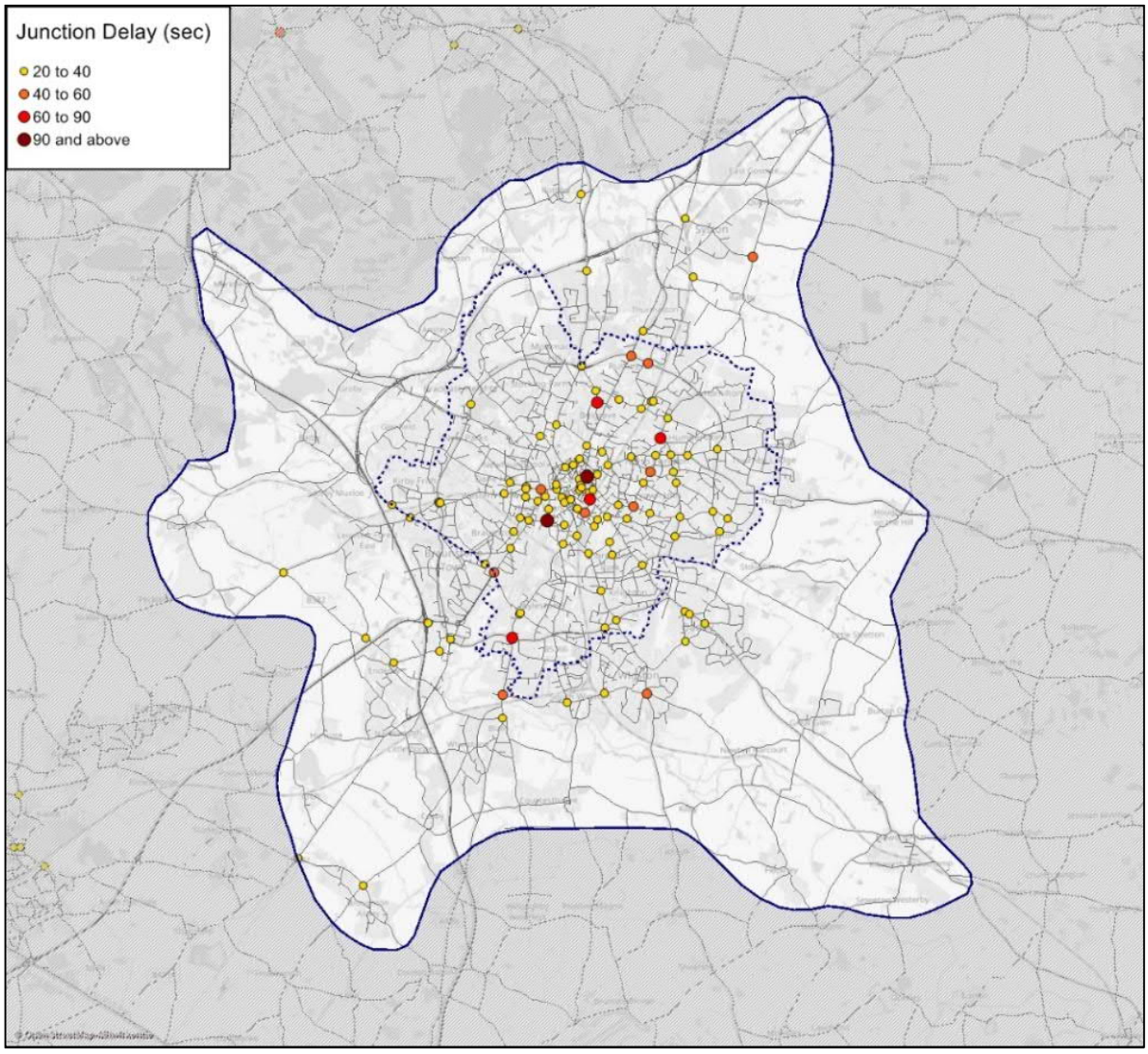


Figure A.5: Interpeak Base Year Junction Delays

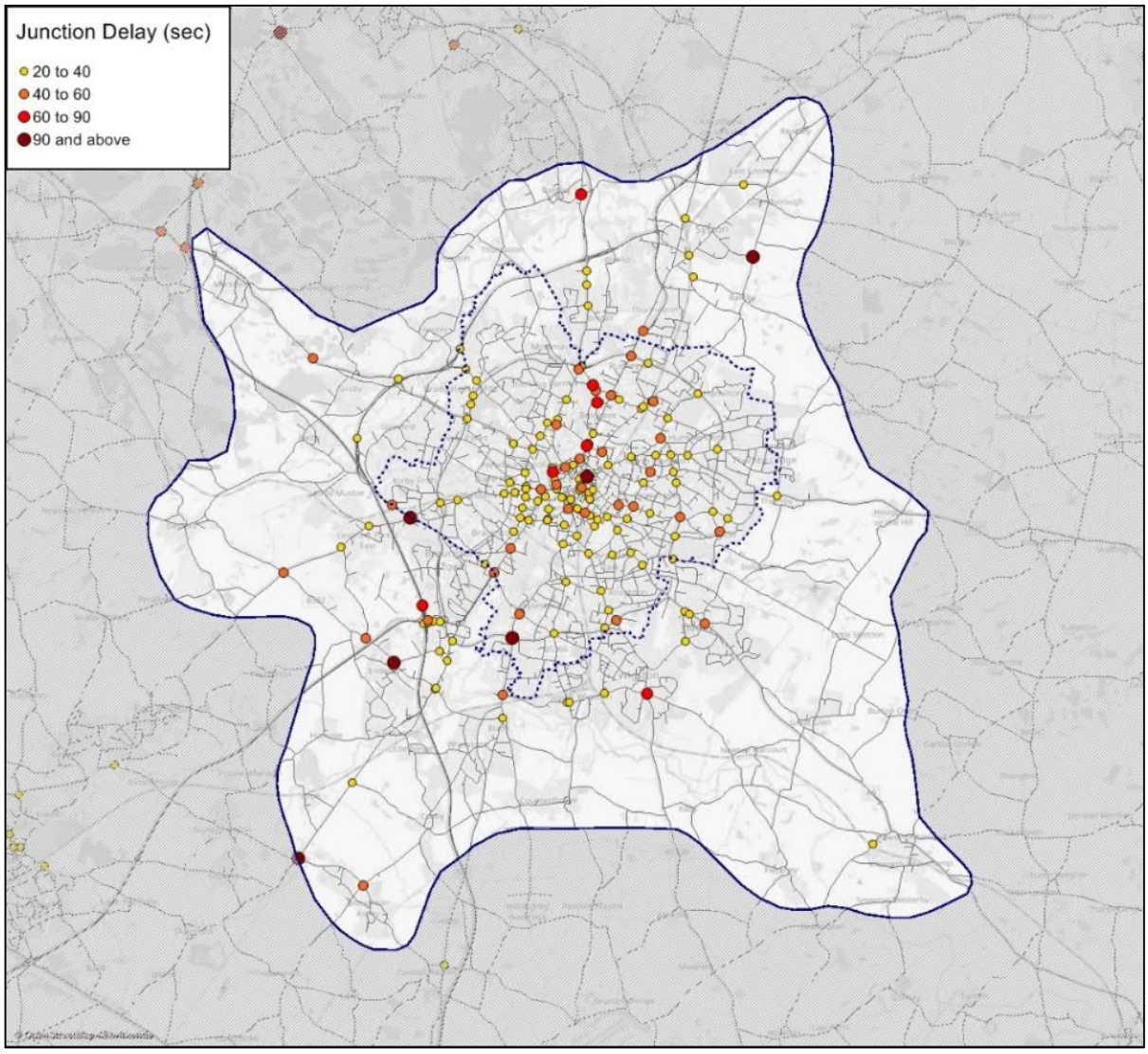


Figure A.6: PM Peak Base Year Junction Delays

Appendix B Screenline and Journey Time Locations

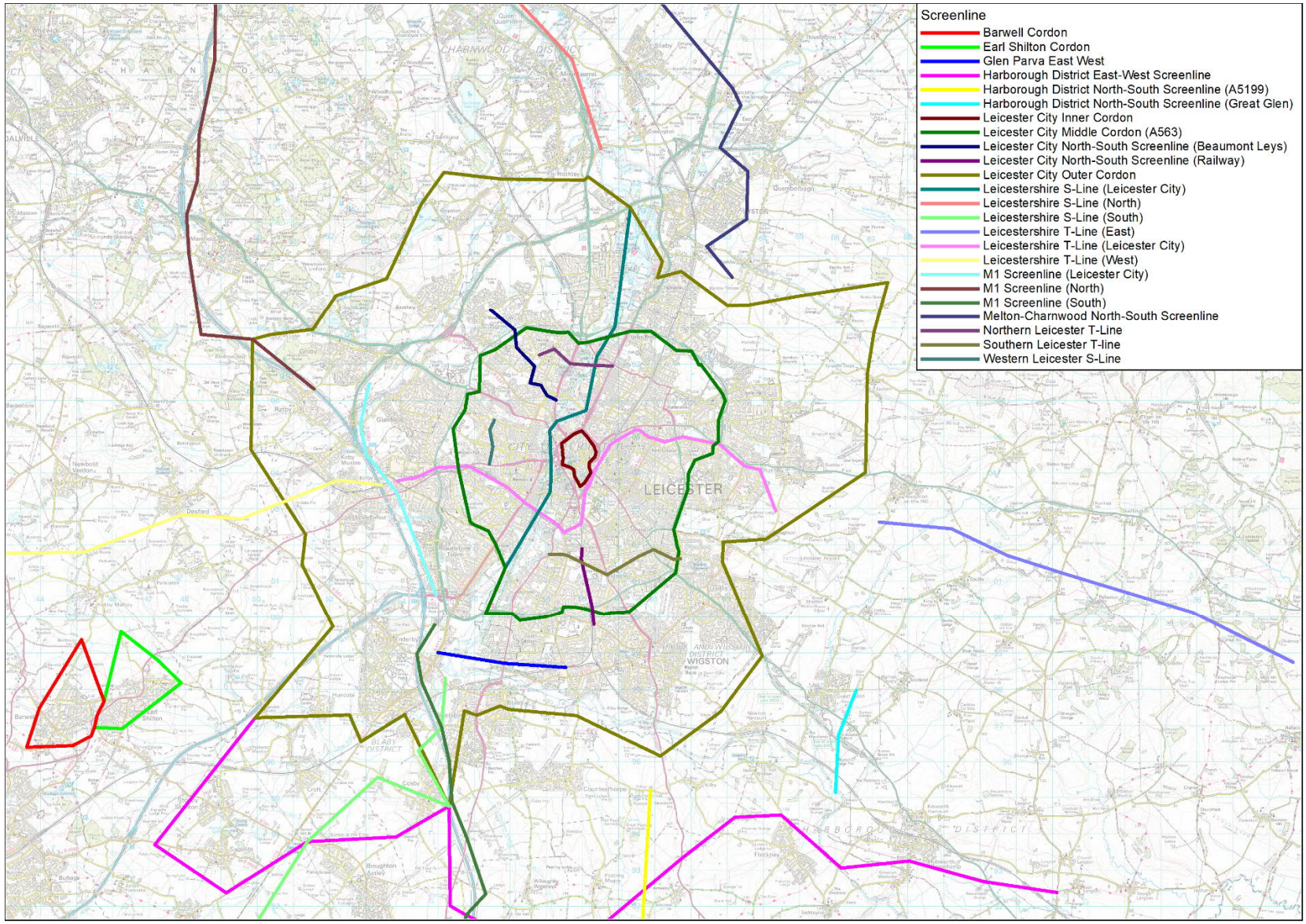


Figure B.1: Screenline Locations

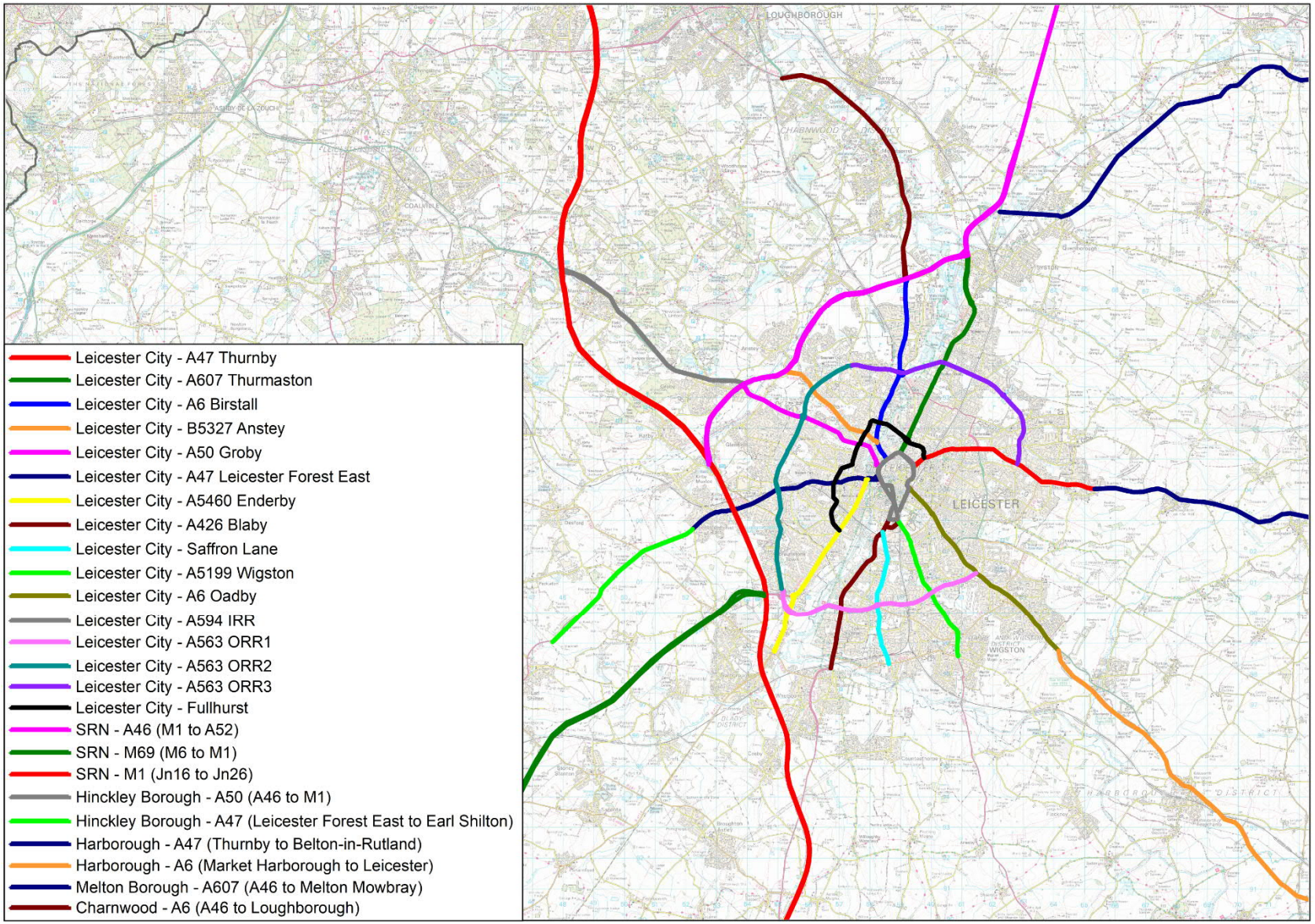


Figure B.2: Journey Time Route Locations

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