The Leicester and Leicestershire Strategic Growth Plan (Consultation Draft)

Strategic Assessment of Transport Impacts

v5

26th March 2018

The Leicester and Leicestershire Strategic Growth Plan (Consultation Draft)

Project No:	B4160005
Document Title:	Strategic Assessment of Transport Impacts
Document No.:	N/A
Revision:	v5
Date:	26th March 2018
Client Name:	Leicester & Leicestershire authorities and the LLEP
Project Manager:	Hermann Maier
Author:	Dan Sheppard
File Name:	P:\B2000000\B4160005 - LLITM PUA Study\3 JC Tech Work\3.1 Transportation\3.1.8 Strategic Modelling\Reporting\SGP_Strategic Assessment of Transport Impacts_v5.doc

Jacobs U.K. Limited

1 City Walk
Leeds, West Yorkshire LS11 9DX
United Kingdom
T +44 (0)113 242 6771
F +44 (0)113 389 1389
www.jacobs.com

Document history and status

Revision	Date	Description	By	Review	Approved
V0	18/01/2017	Draft report headings only for client review	Dan Sheppard	Hermann Maier	
V1	05/02/2017	Draft report headings for client review following comment	Dan Sheppard	Hermann Maier	
V2	22/02/2018	Draft report for client review	Dan Sheppard	Hermann Maier	
V3	16/03/2018	Draft final report	Dan Sheppard	Hermann Maier	
V4	22/03/2018	Final report	Dan Sheppard	Hermann Maier	Dan Sheppard
V5	26/03/2018	Final report for publication	Dan Sheppard	Hermann Maier	Dan Sheppard

Contents

1. Introduction

1.1 Background

1.1.1 The nine local authorities in Leicester and Leicestershire and the Leicester and Leicestershire Enterprise Partnership (LLEP) have developed a draft Strategic Growth Plan (SGP). This is the overarching plan which identifies aspirations for delivering growth in Leicester and Leicestershire until 2050.

1.1.2 The SGP will provide strategic direction and help shape Local Plans that the nine local authorities are or will be preparing or reviewing. The aim is that the SGP will also be used to support bids for government funding to deliver the infrastructure needed to support growth. As such, the draft SGP is supported by infrastructure proposals contained in the Midlands Connect Strategy, including those for major road and rail investment.

1.1.3 Jacobs have been appointed to undertake high level strategic transport modelling investigating the potential impacts of the SGP growth proposals for the periods to 2036 and 2050 in addition to the impacts of committed transport infrastructure, including that proposed by Midlands Connect. The aim of this early work is to assess the impact of the proposed strategy.

1.1.4 The purpose of this report is therefore to provide commentary on the changes in the Leicester and Leicestershire areas as forecast by initial high level strategic modelling using inputs from the Leicester and Leicestershire Transport Model (LLITM), in addition to the SGP proposals and Midlands Connect infrastructure to 2036 and 2051, as it is important to understand why, where and how future travel patterns are likely to change in future years.

1.1.5 The forecast year of 2036 was chosen as Leicester and Leicestershire's study of new homes and employment covers the period 2011 to 2036[1] and this data will be used as a basis for preparing or reviewing Local Plans with 2036 as an end date.

1.1.6 The forecast year of 2051 was chosen to support longer term planning, in line with SGP growth projections to 2050. LLITM has been recently updated (to Version 6) and includes forecast years up to 2051. Consequently, it is felt that given the indicative nature of this modelling exercise it is suitable to use 2051 as a proxy for 2050.

1.1.7 This assessment takes into account the likely increased travel demand from the number of people expected to live in the area over the plan period. Relevant regional level transport priorities, as set out in the Midlands Connect Strategy, and also known local transport commitments and proposals by the two Transport Authorities are taken into account.

[1] Leicester and Leicestershire Housing and Economic Development Needs Assessment (January 2017)

1.2 Study Objectives

1.2.1 This is a strategic piece of work aiming to provide an initial assessment of the potential transport impacts of both SGP growth and Midlands Connect highways infrastructure proposals to both 2036 and 2051. In doing this it provides an initial transport context for longer term planning for future growth, development and transport investment. The interaction between this work and requirements for future, more local, assessment which will also need to consider cross-boundary issues where relevant is shown below:

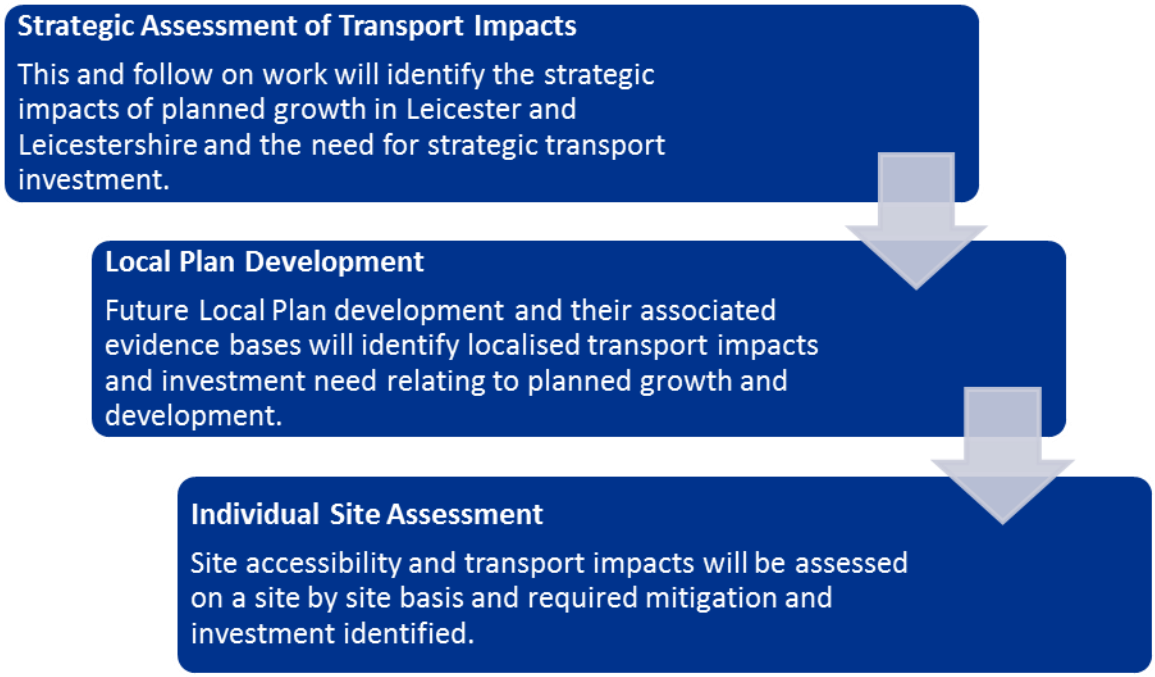


Figure 1 Different Levels of Assessment

2. Context: Planning for Population Growth

2.1.1 The SGP and this report discuss growth mostly in terms of employment and housing. However, it is important to note that these requirements are driven in the main by population growth, although economic growth and changes in household composition play a role.

2.1.2 Leicester and Leicestershire had a population of 1,017,936 in mid-2015[2] and saw strong population growth of 124,900 (14%) between 2001 and 2015. The SGP informed by recent work studying the need for new homes and employment land concludes that growth will continue, resulting in the need for 96,580 new homes and 367-423 hectares of employment land in the period 2011-2031[3].

2.1.3 Having analysed the amount of development that has already been built, has planning permission or is allocated in adopted or emerging Local Plans, much of the required housing and employment land is already provided for to 2031. Whilst Leicester City has declared that it will be unable to meet its housing needs there is confidence that any shortfall in this period can be met through provision in other areas.

2.1.4 The SGP and the work informing it also cover the period 2011-2036, and conclude that 117,900 new homes and 459-497 hectares of employment land are required over this period. Analysis shows that whilst much of this need for new housing and employment land during this period can be met through existing or expected allocations, there is likely to be a shortfall. The SGP confirms that this shortfall will be met in part by development in strategic locations. The agreed distribution of this development for 2011-2036 will be used as the basis for preparing Local Plans with 2036 as an end date.

2.1.5 For the period 2036-50 there are no reliable estimates of population growth or household change. However, the long-term planning horizons required for delivery of strategic development and related transport infrastructure mean some indication of the likely scale of growth is required. As such the SGP estimates the 'notional' need for housing for the period 2031-2050 by projecting forward the figures for the period 2011-36. This indicates a 'notional' need for 90,500 new homes; the plan proposes that 62% of these would be delivered on strategic sites.

2.1.6 There is an appreciation that the transport network in Leicester and Leicestershire favours north-south movements with east-west movements being more difficult, especially by public transport. Current structural issues such as this will be exacerbated by forecast growth, with all major transport routes being congested and few having capacity to support growth beyond 2031. It is therefore clear that significant new development cannot be delivered in Leicester and Leicestershire without significant investment in infrastructure and services.

2.1.7 The Midlands Connect Strategy[4] endorses a number of key rail projects in Leicester & Leicestershire, including the Midland Mainline upgrade and electrification, and improved rail services between Leicester, Coventry and Birmingham. Key road proposals include improving the A5, M42/A42 and A46 to expressway standard, including a new road to the south and east of Leicester linking into the M69 to the west. The government has announced its intention to cancel the proposed electrification of the Midland Mainline north of Kettering; however, arguments in favour of its reinstatement continue to be made.

[2] ONS 2015 Mid-Year Population Estimates
[3] Leicester and Leicestershire 2050: Our Vision for Growth (Strategic Growth Plan - Consultation Draft)
[4] Midlands Connect Strategy: Powering the Midlands Engine (March 2017)

2.1.8 The Midlands Connect strategic transport investment proposals and other identified investment will support development of the SGP spatial strategy towards 2036 and beyond. The purpose of this work is to contribute to the evidence base supporting identification of other areas where investment in strategic transport measures may be required to support growth and success towards 2050.

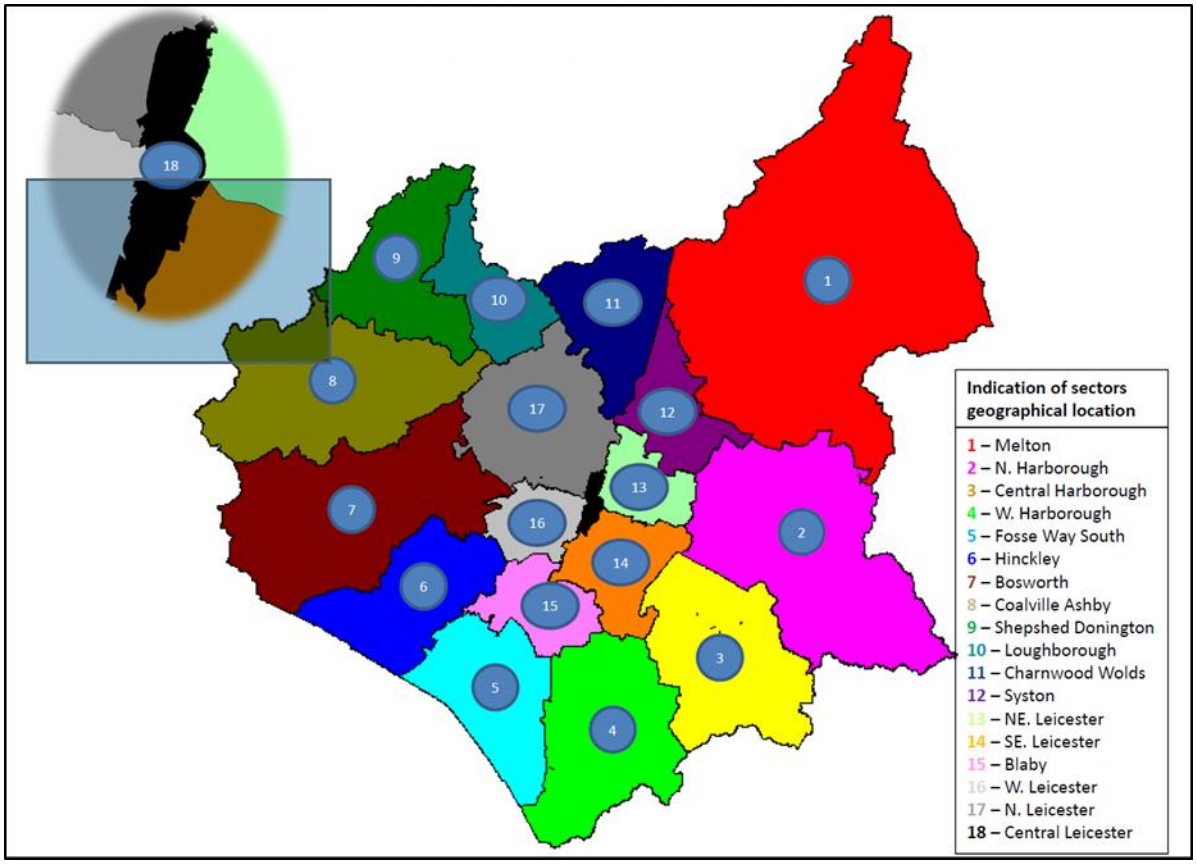
2.1.9 There is a clear need for Leicester, Leicestershire and regional partners to adopt a planned approach to growth that aligns with national policy such as the government's Industrial Strategy and stated aspiration for increased housing delivery to ensure long-term success. This level of strategic planning and partnerships are well established in Leicester and Leicestershire, including through Transport for the East Midlands and Midlands Connect. This type of planning over longer term horizons is very much in the region and country's interest.

3. Definition of Modelling Scenarios

3.1 Overview

3.1.1 Following engagement with planning leads from each of the relevant planning authorities' agreement was reached in terms of the indicative location and type of housing and B1, B2 and B8 employment growth. This was agreed in terms of a high level sector plan of Leicester and Leicestershire as shown in Figure 2 below. This work was performed at a high spatial scale and individual development sites were not identified.

Figure 2 Strategic Transport Assessment Sector Plan



3.1.2 Due to the indicative nature of this modelling exercise forecast years were assessed in the AM Peak (8–9 AM) SATURN highway assignment only rather than using the full demand modelling suite. Therefore, the full distributive impacts of the A5 and A46 improvements which have been coded in to the model for this work are not reflected, in that trip origins and destinations will not change in line with the availability of these two infrastructure improvements. However, all other forecast improvements are included in the distribution as part of the standard LLITM reference case, and trips in this modelling will route along the A46 and A5 where appropriate.

3.1.3 This proportionate high-level approach was agreed in order to provide an initial assessment of the SGP and Midlands Connect highways investment and is appropriate at this stage. However, as plans develop there is likely to be a need for further assessment looking at individual sites.

3.1.4 This report provides an assessment of how the forecast increase in population could impact traffic levels, delays and congestion and provides a spatial breakdown based upon Leicester and Leicestershire and defined spatial sectors.

3.1.5 The following assumptions were agreed:

Residential

- Trip rate: 08:00 - 09:00 two-way with 25/75 Arrival/Departure split = 0.55

Employment

- Arrival rate: Mixed Land use (B1, B2, B8) = 0.391/100m^2
- Arrival rate: Office (B1A) = 0.998/100m^2 (predominately for Sector 18 - Central Leicester)

Apartments/flats

- Reduced trip rate = 0.3
- This was assumed for 9% of new dwellings county wide and 60% in Sector 18 – Central Leicester

Mode share

- County wide highway mode share = 87%

3.1.6 Input data relating to housing and employment development was provided by stakeholders and the draft SGP where data was available. The growth in housing and employment applied to the current 2031 LLITM forecast year for the 2036 and 2051 forecasts is shown in the next section. The growth in jobs relates to expected development across employment types and the model therefore includes trips for all employment types.

3.1.7 For the purposes of this work two strategic highway schemes were coded in to the SATURN network based on concept design assumptions agreed with stakeholders and aligning with proposals in both the Midlands Connect Strategy and Leicestershire County Council's Prospectus for Growth. These were the A46 Expressway including southern and eastern bypass; and the A5 Watling Street strategic upgrade. Planned upgrades to the A42/M42 were already accounted for in the highway model network and so also included in this assessment.

3.1.8 It was assumed that all relevant Midlands Connect highway infrastructure investment would be delivered by the first forecast year of 2036, as agreed with stakeholders and aligning with the Midlands Connect Strategy[5].

[5] Midlands Connect Strategy: Powering the Midlands Engine (March 2017)

3.1.9 **A46 Expressway including Leicester Southern and Eastern Bypass**: This will provide a new strategic route to allow travel between A46, M1 and M6 and around Leicester's urban area. This will support wider Midlands Connect aspirations for a new South West/South Wales route to the North East and Scotland (J8 M5 to A1/A46 Newark) and will also provide an opportunity to link to the M1, via a new junction 20A[6].

Figure 3 A46 Expressway including Leicester Southern and Eastern Bypass

3.1.10 **A5 Strategic Upgrade:** There is an aspiration to upgrade the A5 between the A38 and the M1 to Expressway standards. This will provide an alternative route to the motorway, enhance strategic links between the North West and South East and relieve congestion on the M6, between J8 and the M1[7].

Figure 4 A5 Strategic Upgrade

[6] Leicestershire County Council, Prospectus for Growth (September 2017)
[7] Leicestershire County Council, Prospectus for Growth (September 2017)

4. Forecast Growth Scenarios

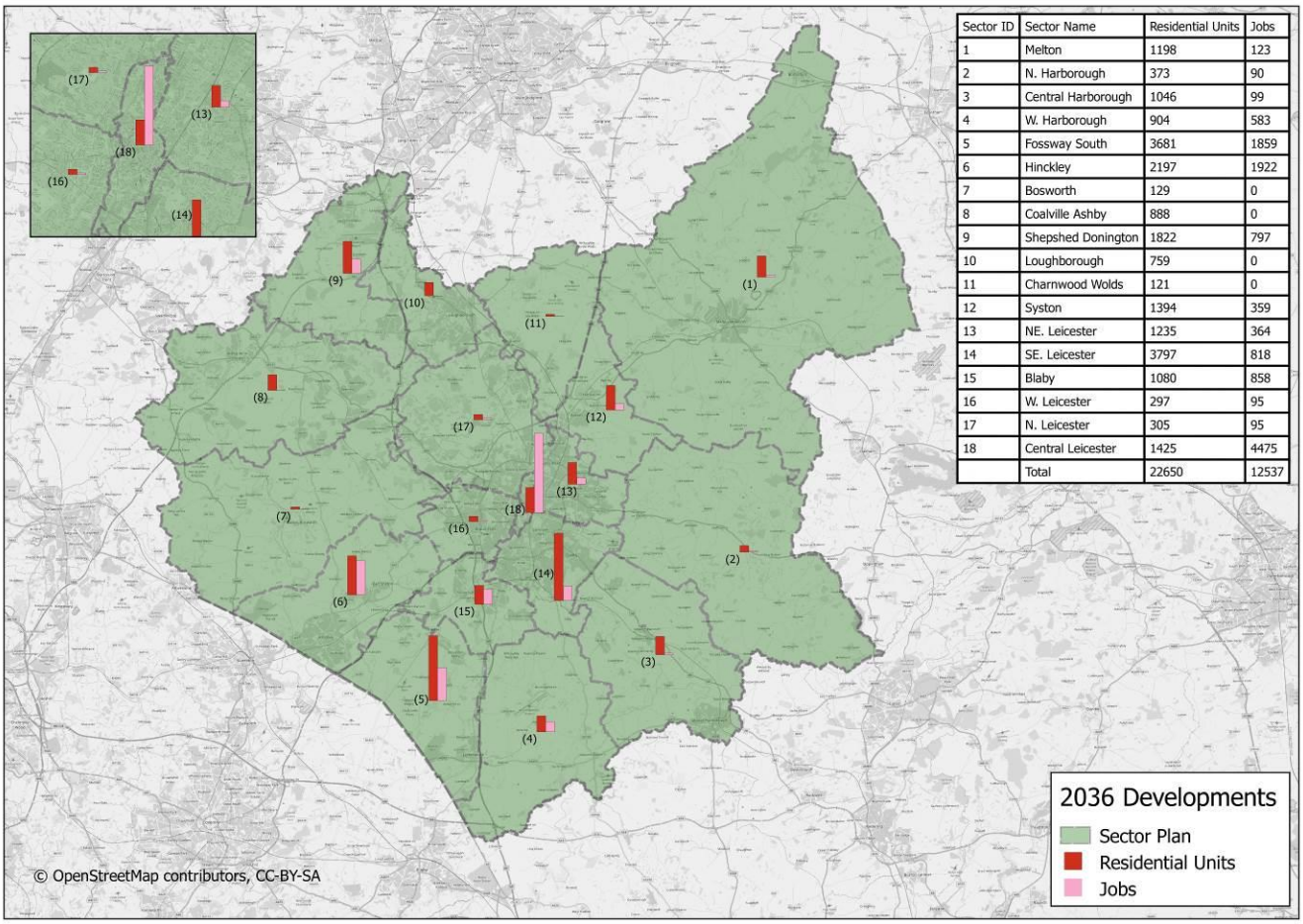
4.1 Introduction

4.1.1 In this section we set out the two growth scenarios that have been tested in the modelling, a) to 2036 and b) to 2051 (see Figures 5 and 6). We then set out the growth in trips which is likely to be generated by this scale of growth (see Figures 7 and 8).

4.2 Growth Scenario: 2036

4.2.1 Figure 5 below shows the location of new housing units and B1, B2 and B8 jobs which form the 2036 growth scenario as tested in this work. Other employment types and trips purposes were implicitly assumed by the modelling. These were added to the LLITM 2031 forecast scenario to assess the potential impact of this growth in terms of highway operation.

Figure 5 Growth Scenario: 2036



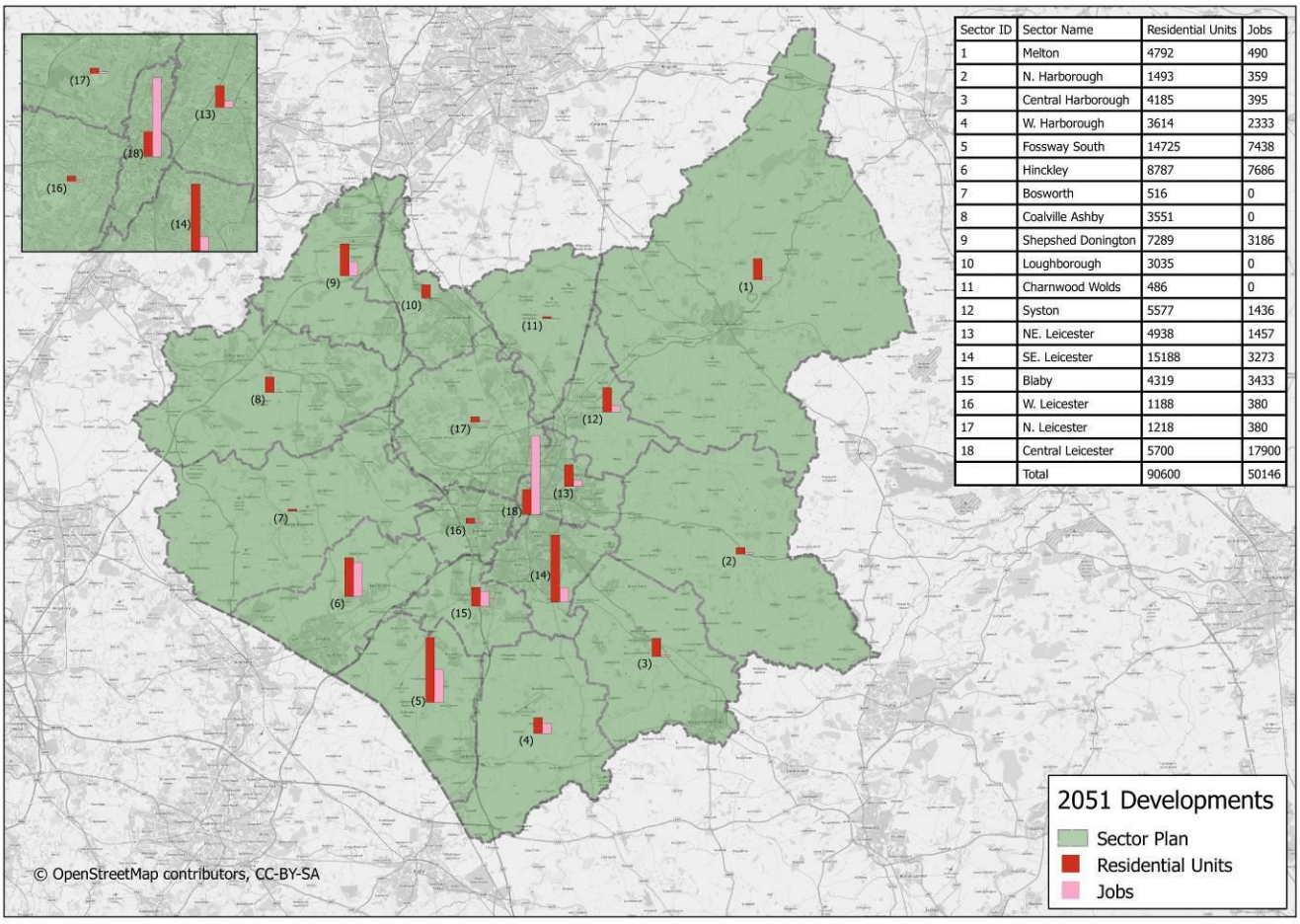
Sector ID	Sector Name	Residential Units	Jobs
1	Melton	1198	123
2	N. Harborough	373	90
3	Central Harborough	1046	99
4	W. Harborough	904	583
5	Fossway South	3681	1859
6	Hinckley	2197	1922
7	Bosworth	129	0
8	Coalville Ashby	888	0
9	Shepshed Donington	1822	797
10	Loughborough	759	0
11	Charnwood Wolds	121	0
12	Syston	1394	359
13	NE. Leicester	1235	364
14	SE. Leicester	3797	818
15	Blaby	1080	858
16	W. Leicester	297	95
17	N. Leicester	305	95
18	Central Leicester	1425	4475
	Total	22650	12537

4.3 Growth Scenario: 2051

4.3.1 Figure 6 below shows the location of new housing units and B1, B2 and B8 jobs which form the 2051 growth scenario as tested in this work. Other employment types and trips purposes were implicitly assumed by the modelling. These were added to the LLITM 2031 forecast scenario to assess the potential impact of this growth in terms of highway operation.

4.3.2 Due to the way that growth was projected forward in the SGP from 2036 to 2050 this has the same distribution as Figure 5. However, the scale of growth is significantly larger, as shown in the adjacent table.

Figure 6 Growth Scenario: 2051



Sector ID	Sector Name	Residential Units	Jobs
1	Melton	4792	490
2	N. Harborough	1493	359
3	Central Harborough	4185	395
4	W. Harborough	3614	2333
5	Fossway South	14725	7438
6	Hinckley	8787	7686
7	Bosworth	516	0
8	Coalville Ashby	3551	0
9	Shepshed Donington	7289	3186
10	Loughborough	3035	0
11	Charnwood Wolds	486	0
12	Syston	5577	1436
13	NE. Leicester	4938	1457
14	SE. Leicester	15188	3273
15	Blaby	4319	3433
16	W. Leicester	1188	380
17	N. Leicester	1218	380
18	Central Leicester	5700	17900
	Total	90600	50146

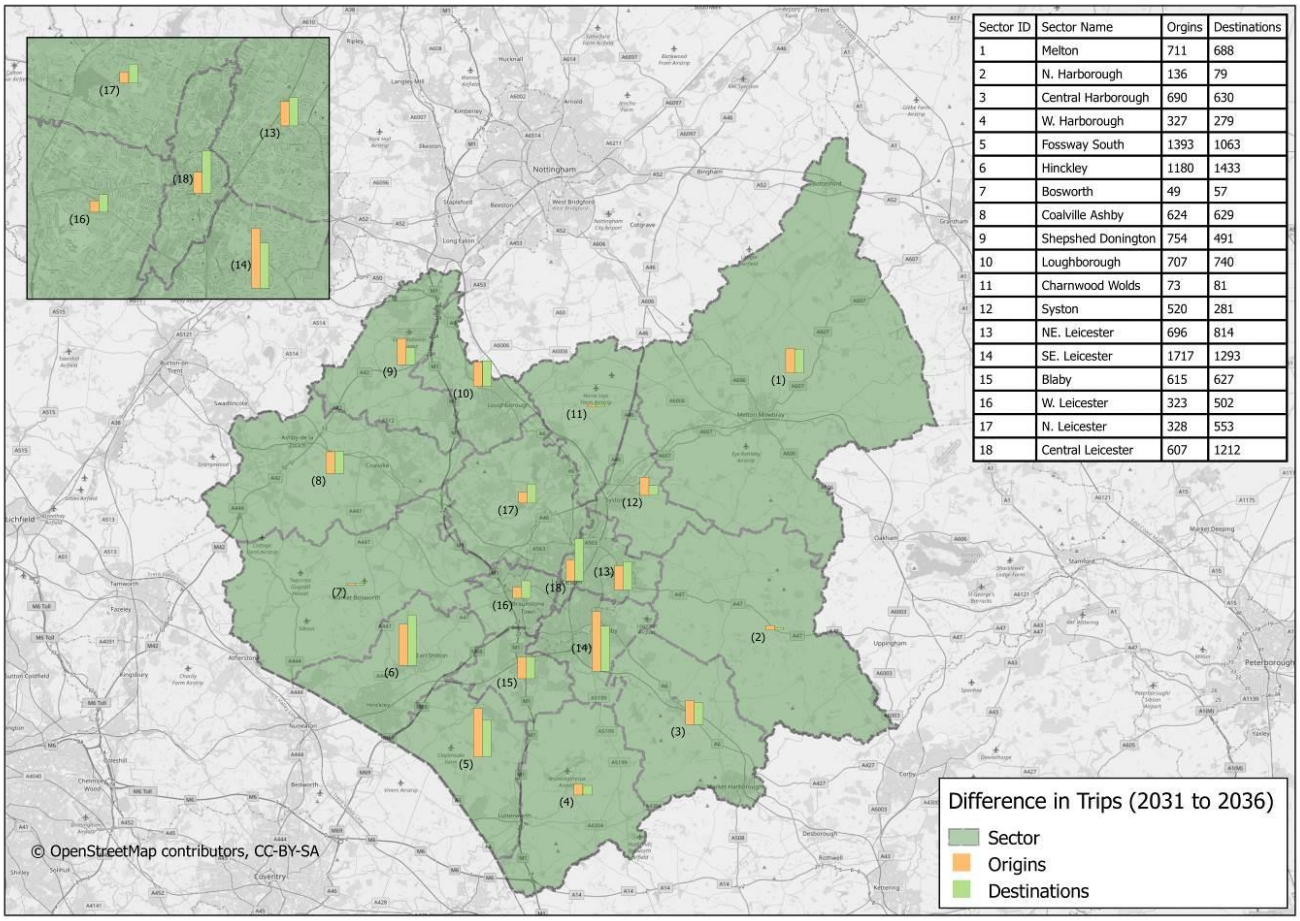
4.4 Trip Growth: 2036

4.4.1 Adding additional houses causes the number of trips in the morning peak hour to increase due to people leaving for work, school etc. As these trips make up a large proportion of the total trips made we would expect to see a strong correlation between growth of new trips that originate in each sector and the number of dwellings. Whilst we would not expect a perfect match due to (for instance) shift working, this work shows a strong relationship between dwelling growth and the number of new trips originating in sectors and provides confidence that new trips are being added to the transport model in the most appropriate places.

4.4.2 There was a requirement for growth in external traffic which will enter Leicester and Leicestershire to be accounted for. As discussed, the process inside the city and county was that the specific 2036 and 2051 reference case growth was added to the forecast 2031 trip ends. However, externally TEMPRO was used to increase trip ends based on national figures. This ensured that the impact of likely growth in through traffic from external locations was accounted for.

4.4.3 Figure 7 below shows the increase in highway trips forecast from 2031-2036 as a result of the 2036 growth scenario shown in Figure 5.

Figure 7 Trip Growth 2031-2036

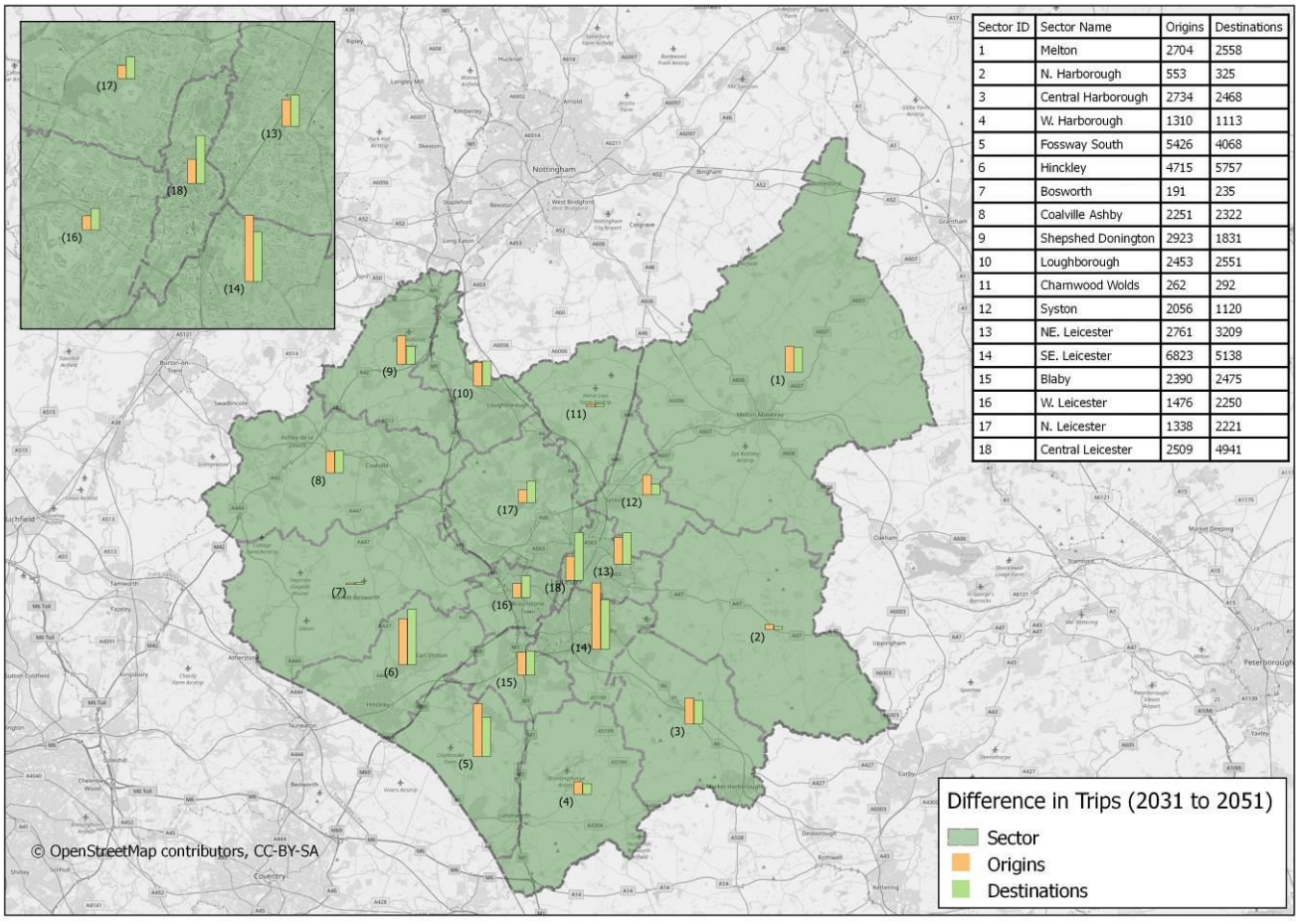


4.5 Trip Growth: 2051

4.5.1 Figure 8 below shows the increase in highway trips forecast from 2031-2051 as a result of the 2051 growth scenario shown in Figure 6.

4.5.2 Due to the way that growth was projected forward in the SGP from 2036 to 2050 this has the same distribution as Figure 7. However, the scale of growth is significantly larger, as shown in the adjacent table.

Figure 8 Trip Growth 2031-2051



Sector ID	Sector Name	Origins	Destinations
1	Melton	2704	2558
2	N. Harborough	553	325
3	Central Harborough	2734	2468
4	W. Harborough	1310	1113
5	Fossway South	5426	4068
6	Hinckley	4715	5757
7	Bosworth	191	235
8	Coalville Ashby	2251	2322
9	Shepshed Donington	2923	1831
10	Loughborough	2453	2551
11	Charnwood Wolds	262	292
12	Syston	2056	1120
13	NE. Leicester	2761	3209
14	SE. Leicester	6823	5138
15	Blaby	2390	2475
16	W. Leicester	1476	2250
17	N. Leicester	1338	2221
18	Central Leicester	2509	4941

5. Origin and Destination Analysis

5.1 Introduction

5.1.1 Having determined the increase in the number of new trips arriving and departing from each sector due to the increase in new housing and B1/B2/B8 employment land the trip making patterns were estimated based upon the patterns of movement forecast in 2031 as a starting point. Trips for schools, leisure and employment not undertaken on employment land was implicitly included in this process in order to obtain a county wide pattern of movement.

5.1.2 These results from the traffic modelling have been analysed in terms of trip origins and destinations to show the changes in trips both within and between sectors for both of the growth scenarios (2036 and 2051) in comparison to the 2031 forecast.

5.1.3 The detailed results of this analysis are contained in Table 4 and Table 5 in Appendix A relating to the 2036 and 2051 growth scenarios. The headline summary provided below relates to information contained in Appendix A.

5.2 Summary

5.2.1 A number of sectors show a marked increase in movement as a result of growth, including Fosse Way South, Hinckley, South East Leicester, North East Leicester and Central Leicester.

5.2.2 Over both time periods there is a pattern of increased intra-sector trips for a number of locations, particularly in Melton, Central Harborough, Fosse Way South, Hinckley, Coalville Ashby, Shepshed Donnington, Loughborough and South East Leicester. This is in part a reflection of the comparatively large size of the sectoring system used, as a function of the strategic nature of this work, and the current early stages of defining the spatial distribution of long-term development and the location and relative delivery of residential and employment development. This may result in a need for particular focus on the local transport networks within these locations to ensure they remain accessible.

5.2.3 The existing relationship between Fosse Way South and Hinckley is forecast to continue, especially following delivery of improvements to the A5. This may require further investigation around a need for local infrastructure supporting accessibility to/from the A5.

5.2.4 In both time scenarios there is a marked increase in trips in to Central Leicester from adjacent sectors (North East Leicester, South East Leicester, West Leicester, and North Leicester). This is to be expected as these sectors include parts of Leicester's wider urban area. This is indicative of people commuting in to Central Leicester in the AM peak and the area's reliance on these incoming workers. In particular South East Leicester shows a large increase as a result of the marked increase in trip generation in this sector. This is a product of Midlands Connect highway investment proposals and the related spatial distribution of SGP growth around this infrastructure and must be reflected in future planning for strategic transport investment, especially with regards to the need for delivery of improved radial connectivity between Central Leicester, its wider urban area and beyond.

6. Highway Operation

6.1 Introduction

6.1.1 In the preceding section we set out the two growth scenarios that we are testing and the likely growth in trips as a result. We now consider how highways operation across Leicester & Leicestershire might be affected if growth were to be distributed as proposed in the SGP.

6.1.2 To assess highways operation we have looked at overall travel time, travel distance, delay and average speed forecast for vehicles on Leicester and Leicestershire's highway network in the AM peak. Examining these statistics is the clearest way of understanding the implications of the proposed growth at a high level. It should be noted, however, that whilst this chapter takes into account the proposed spatial distribution set out in the SGP, highway operation is likely to be significantly affected in any case as a result of population growth occurring over this time period.

6.1.3 Within this chapter the two growth scenarios (2036 and 2051) are compared to the 2031 LLITM forecast so that overall trends can be identified. The proposed A46 and A5 improvements have been included in the 2031 reference case as a means of examining the draft SGP in isolation by removing the impact that the Midlands Connect highway infrastructure will have in terms of route choice. As such, the changes shown below assume that the A5 and A46 infrastructure is in place in all three years and so examine the potential impacts of the growth scenarios only.

6.2 Leicester and Leicestershire Highway Operation

6.2.1 Table 1 below shows overall travel time, travel distance, delay and average speed forecast for vehicles on Leicester and Leicestershire's highway network in the AM peak for the 2031 reference case and the two growth scenarios. Please note numbers may not sum due to rounding.

Table 1 Leicester and Leicestershire Highway Operation

Network Statistics	2031 AM (including A46 and A5 improvements for comparison)	2036 AM	2051 AM	Change 2031 to 2036	Change 2031 to 2051
Vehicle hours	67,684	74,473	113,181	10%	67%
Vehicle delay hours	12,425	14,431	30,679	16%	147%
Proportion of vehicle hours which are delay *(Vehicle hours / Vehicle Delay Hours)*	18%	19%	27%	6%	50%
Average Speed (Kilometres per hour)	42	40	30	-4%	-29%
Total vehicle distance (Kilometres)	2,828,001	2,984,683	3,376,009	6%	19%

6.2.2 Table 1 shows an explicit link between population growth and worsening highway efficiency. As such, whatever spatial distribution of growth was chosen a detrimental impact on highway operation would occur. The disproportionate impact of additional trips resulting from population growth, in terms of reduced highway operation efficiency is a function of the non-linear relationship between traffic and congestion. This is due to the fact that, especially in peak periods, small increases in traffic cause disproportionate increases in congestion. The inverse is also the case as witnessed in peak-periods during school holidays for example.

6.2.3 Table 1 shows that over time as the number of trips being made across Leicester and Leicestershire increases the proportion of vehicle hours which are delayed increases more significantly. This means that by 2051 27% of all journey time is forecast to be delay.

6.2.4 Reduced highway efficiency over time is also shown by decreasing average speeds. Between 2031 and 2036 average speeds drop by 2km per hour. However, between 2031 and 2051 average speeds drop by 12km per hour.

6.2.5 Overall there is a clear pattern where highway operation deteriorates slightly to 2036 but gets much worse by 2051. This would suggest that beyond 2036 additional transport infrastructure may be required to support effective highway operation.

6.3 Sector Level Highway Operation

6.3.1 Analysis has been carried out on the characteristics of travel within each sector in the two growth scenarios in comparison to the 2031 forecast, including the same transport infrastructure as a means of separating out the potential impacts of growth on more localised highway operation.

6.3.2 The overall figures in terms of sector level highway operation are included as Appendix B. The headline summary information below and key observations relate to information in Appendix B.

6.3.3 Table 2 below shows a high level summary of the changes in highway operation between the 2031 scenario and the 2036 growth scenario. Please note numbers may not sum due to rounding.

Table 2 Highway Operation Sector Summary: 2031 - 2036

	Change 2031 to 2036			
Sector	**Increased vehicle hours**	**Increased vehicle delay hours**	**Reduced average speed (Kilometres per hour)**	**Increased total vehicle distance (Kilometres)**
1. Melton	6%	10%	-1%	5%
2. N. Harborough	9%	11%	-1%	8%
3. C. Harborough	12%	20%	-3%	8%
4. W. Harborough	5%	9%	-2%	4%
5. Fosse Way South	14%	25%	-4%	10%
6. Hinckley	12%	16%	-3%	9%
7. Bosworth	5%	6%	-1%	4%
8. Coalville Ashby	5%	10%	-2%	3%
9. Shepshed Donnington	8%	17%	-4%	4%
10. Loughborough	11%	18%	-8%	3%
11. Charnwood Wolds	5%	8%	-1%	4%
12. Syston	10%	14%	-2%	8%
13. NE. Leicester	12%	16%	-3%	9%
14. SE. Leicester	15%	21%	-5%	10%
15. Blaby	10%	11%	-2%	8%
16. W. Leicester	7%	10%	-3%	4%
17. N. Leicester	9%	15%	-4%	4%
18. C. Leicester	18%	22%	-11%	5%
Leicester and Leicestershire	10%	16%	-4%	6%

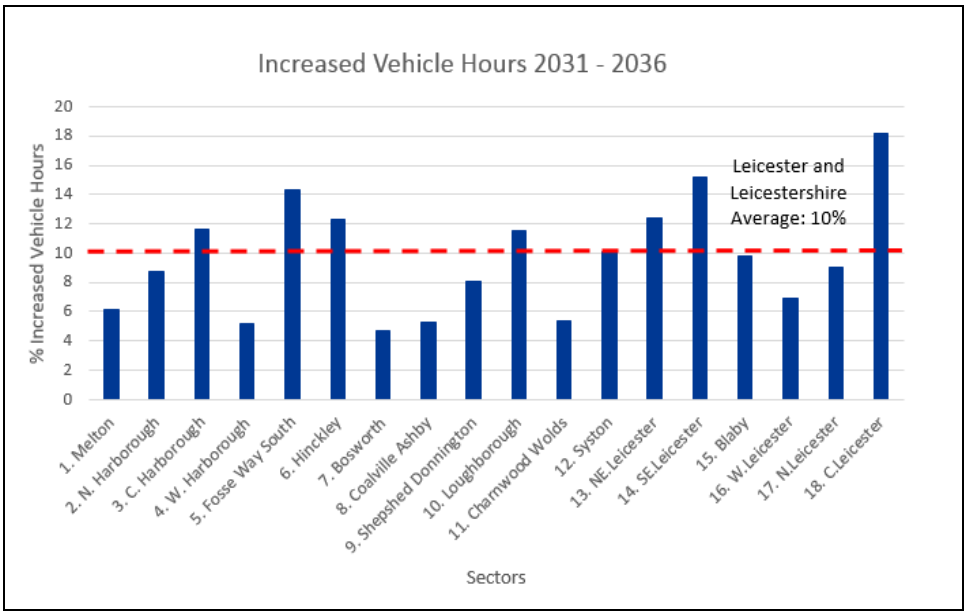
6.3.4 Table 3 below shows a high level summary of the changes in highway operation between the 2031 scenario and the 2051 growth scenario. Please note numbers may not sum due to rounding.

Table 3 Highway Operation Sector Summary: 2031 – 2051

	Change 2031 to 2051			
Sector	**Increased vehicle hours**	**Increased vehicle delay hours**	**Reduced average speed (Kilometres per hour)**	**Increased total vehicle distance (Kilometres)**
1. Melton	25%	40%	-5%	19%
2. N. Harborough	33%	59%	-5%	27%
3. C. Harborough	45%	84%	-12%	28%
4. W. Harborough	24%	61%	-9%	13%
5. Fosse Way South	61%	144%	-17%	33%
6. Hinckley	71%	129%	-22%	34%
7. Bosworth	19%	29%	-4%	14%
8. Coalville Ashby	16%	26%	-5%	10%
9. Shepshed Donnington	61%	202%	-31%	11%
10. Loughborough	49%	85%	-28%	8%
11. Charnwood Wolds	22%	37%	-6%	15%
12. Syston	48%	83%	-8%	36%
13. NE. Leicester	101%	165%	-32%	36%
14. SE. Leicester	159%	309%	-50%	29%
15. Blaby	62%	129%	-19%	31%
16. W. Leicester	51%	96%	-25%	13%
17. N. Leicester	47%	90%	-22%	15%
18. C. Leicester	204%	267%	-64%	10%
Leicester and Leicestershire	67%	147%	-29%	19%

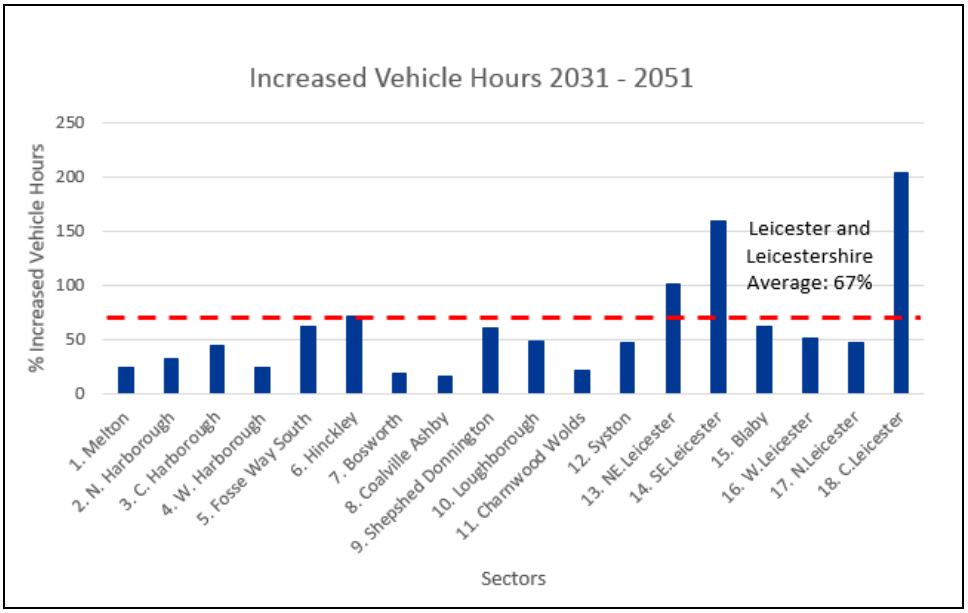
6.3.5 Figure 9 below shows the percentage increase in vehicle hours in each sector from 2031 to the 2036 growth scenario.

Figure 9 Increased Vehicle Hours 2031 - 2036



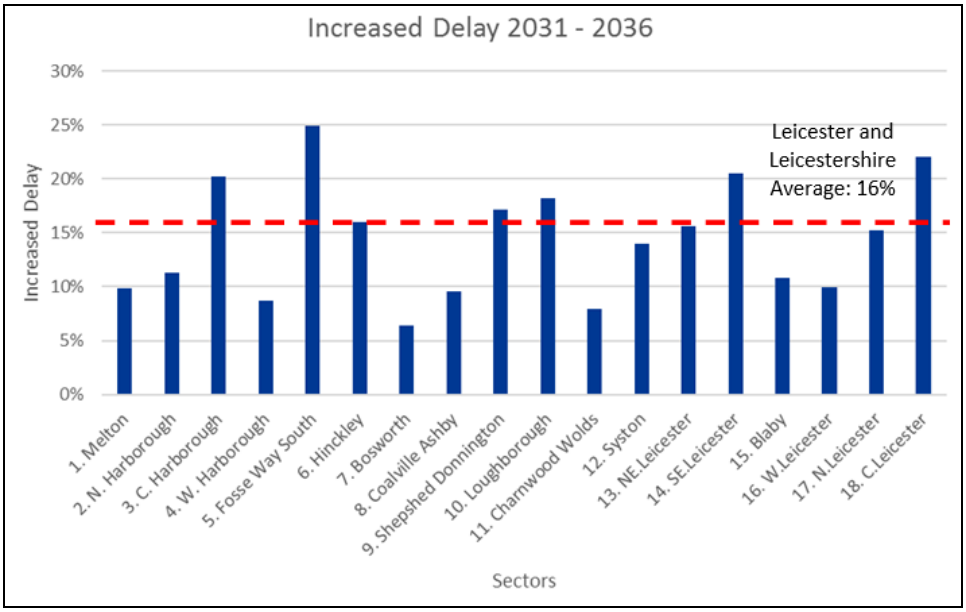
6.3.6 Figure 10 below shows the percentage increase in vehicle hours in each sector from 2031 to the 2051 growth scenario.

Figure 10 Increased Vehicle Hours 2031 - 2051



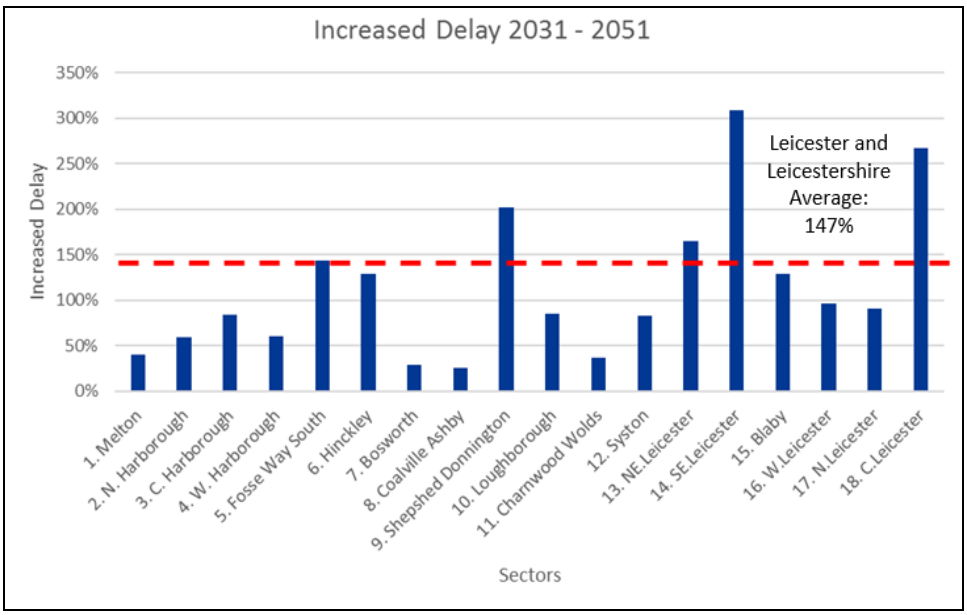
6.3.7 Figure 11 below shows the percentage increase in delay in each sector from 2031 to the 2036 growth scenario.

Figure 11 Increased Vehicle Delay 2031 – 2036



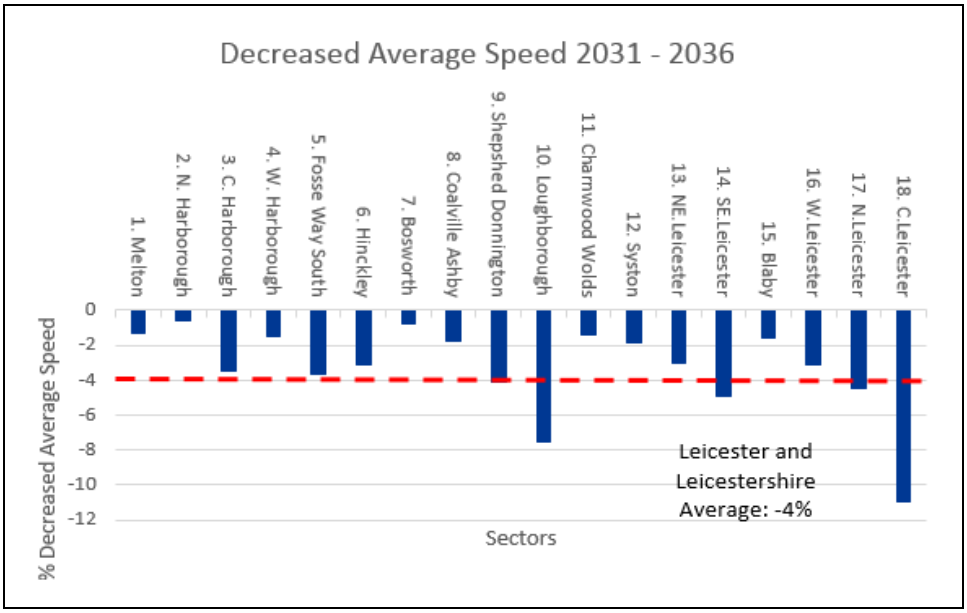
6.3.8 Figure 12 below shows the percentage increase in delay in each sector from 2031 to the 2051 growth scenario.

Figure 12 Increased Vehicle Delay 2031 – 2051



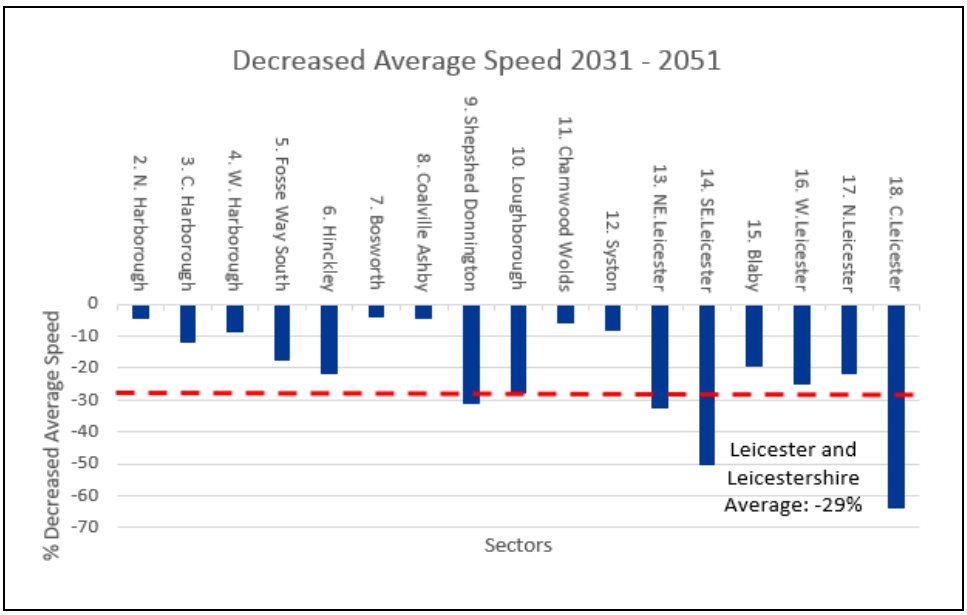
6.3.9 Figure 13 below shows the percentage decrease in average vehicle speeds in each sector from 2031 to the 2036 growth scenario.

Figure 13 Decreased Average Speed 2031 - 2036



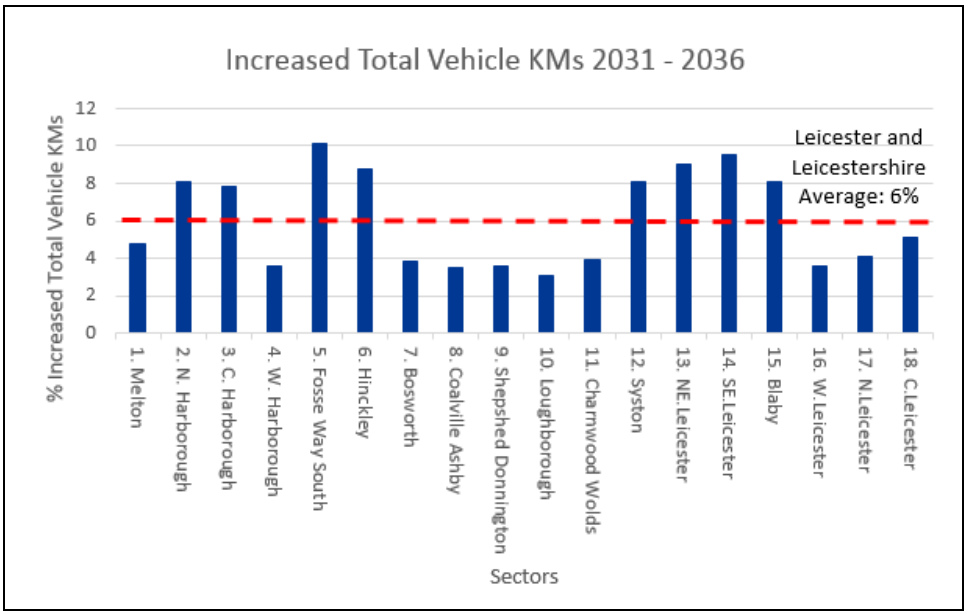
6.3.10 Figure 14 below shows the percentage decrease in average vehicle speeds in each sector from 2031 to the 2051 growth scenario.

Figure 14 Decreased Average Speed 2031 - 2051



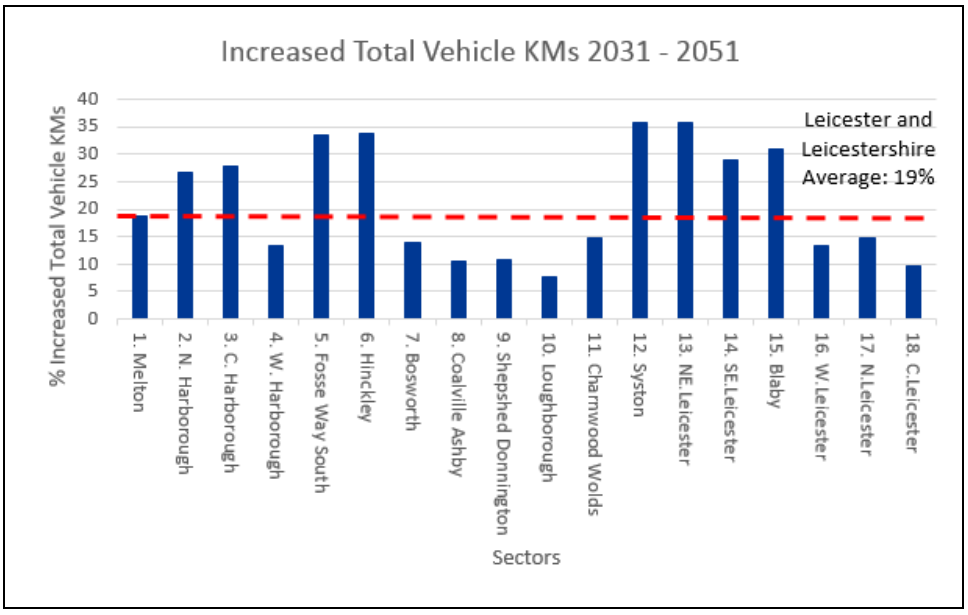
6.3.11 Figure 15 below shows the percentage increase in total vehicle distance (KMs) in each sector from 2031 to the 2036 growth scenario.

Figure 15 Increased Total Vehicle KMs 2031 - 2036



6.3.12 Figure 16 below shows the percentage increase in total vehicle distance (KMs) in each sector from 2031 to the 2051 growth scenario.

Figure 16 Increased Total Vehicle KMs 2031 - 2051



6.4 Sector Level Summary

6.4.1 There is a clear pattern across the county where the highway network in each sector is able to operate with relatively small detriment to 2036 assuming successful Midlands Connect road delivery by this point, including the A5, M42/A42 and A46. However, by 2051 the impact of growth results in much greater reductions in average speeds and increases in delay. This is indicative of the impact of planned transport investment being able to support the delivery of forecast growth to 2036 albeit probably requiring more localised supporting investment at congestion hotspots etc. However, there is a likely requirement for additional significant investment to support growth forecasts and ambition to 2051.

6.4.2 There is a clear reliance on the proposed relevant Midlands Connect highways infrastructure schemes with regards to the delivery of growth on strategic sites and the ability to offer connectivity to employment etc. Fosse Way South has a relationship with Hinckley and Central Leicester that will be increasingly important to the delivery of the substantial growth planned for the sector. The delivery of this growth is likely reliant on access to the A5 supporting connectivity with Hinckley and further afield; as well as to the M69, A46, M1 and radial connectivity in to and within Central Leicester. This trend whereby proposed growth is likely reliant on reliable connectivity to and on the strategic road network is repeated in Shepshed Donington and its links with the M1. The large drop in average speeds seen in these two sectors in the 2051 growth scenario is likely a result of future requirements to improve access to the strategic routes.

6.4.3 There is a pattern whereby the neighbouring sectors which will be linked by the A46 proposals show commuting relationships, for instance the links between South East Leicester and adjacent sectors. It is therefore clear that the A46 proposals will be central to support delivery of the scale of growth proposed in the current spatial distribution utilising strategic sites. South East Leicester also sees a large increase in vehicle delay which is due to the large amount of growth located in the sector.

6.4.4 Central Leicester has strong relationships with neighbouring sectors as would be expected, especially in light of the forecast increase in employment which is the largest in the county to both 2036 and 2051. The need for investment in the city's highway network as well as high quality active and public transport facilities and to support inward commuting on radial routes is evidenced by the large increase in vehicle delay to 2051.

7. Conclusions and Recommendations

7.1 Context and Approach

7.1.1 The requirement to assess the transport impacts of the SGP proposals relate in part to the well-established relationship between population growth and increased transport demand. The scale of growth proposed by the SGP in Leicester and Leicestershire, as informed by a strong evidence base around need, makes it clear that long-term planning is required for infrastructure to support this delivery.

7.1.2 Further strategic level assessment will be required to guide the development of emerging Local Plans, Local Transport Plans, strategic level transport planning and decisions at a more local and site specific level.

7.2 Overview

7.2.1 With the scale of population growth forecast it is clear that there will be network stress. The spatial distribution of proposed growth as modelled in this work, and based upon committed and planned schemes as well as engagement with stakeholders, is dependent upon the delivery of strategic transport infrastructure as proposed by Midlands Connect. Indeed, it is clear that significant new development cannot be delivered in Leicester and Leicestershire in the planned spatial distribution based on a reliance on strategic sites beyond 2036 without significant investment in infrastructure and services.

7.2.2 There is a clear pattern across the city and county where the highway network is broadly able to operate and support growth with relatively small detriment to 2036, albeit requiring additional targeted supporting investment at congestion hotspots etc. However, by 2051 the impact of growth results in much greater impact in terms of reduced average speeds and increased delay. This is indicative of the impact of planned transport investment being able to broadly support the delivery of forecast growth to 2036 but likely requiring significant further investment to support growth forecasts and ambition to 2051.

7.2.3 This work highlights the explicit link between population growth and detrimental highway operation. The disproportionate impact of additional trips between 2036 to 2051, resulting from population growth, in terms of reduced highway operation efficiency, is a function of the non-linear relationship between traffic and congestion.

7.2.4 Strategic transport investment over and above that identified in Midlands Connect and covering all modes of transport will be required to support successful delivery of development as per the proposed SGP scale and spatial distribution. It is deemed unlikely that investment in sustainable transport modes alone will be sufficient to mitigate the scale of growth proposed. This relates in part to the significant sub-regional movements which are less likely to be supported by sustainable modes alone, and the imbalance in specific sectors ability to deliver parity between housing and employment growth e.g. Central Leicester, South East Leicester and Fosse Way South.

7.2.5 The need for strategic investment is supported by a trend whereby growth appears reliant on effective connectivity to the Strategic Road Network e.g. Shepshed Donnington and its links to the M1. There is also a clear reliance on the proposed relevant Midlands Connect highways infrastructure schemes (A5 and A46 investment) with regards to the delivery of growth on strategic sites and the ability to offer connectivity to employment etc. For example, Fosse Way South has a relationship with Hinckley and Central Leicester that will be increasingly important to the delivery of the substantial growth planned in the sector. The delivery of this growth is therefore reliant on access to the A5 supporting connectivity with Hinckley and further afield; as well as to the M69, A46, M1 and radial connectivity in to and within Central Leicester.

7.2.6 This work has not provided the level of detail required to identify specific scheme requirements over and above Midlands Connect and Leicestershire County Council's Prospectus for Growth proposed investment which has been taken as a major influence on the current spatial SGP distribution. Indeed, overall there is a pattern whereby the sectors linked by the A46 proposals show commuting relationships. It is therefore clear that the A46 proposals will be central to supporting delivery of the scale of growth proposed in the current spatial distribution utilising strategic sites and will require additional highway and other transport investment to mitigate specific areas of network stress.

7.2.7 There will therefore be a need to develop a comprehensive transport strategy for Leicester and Leicestershire which identifies specific packages of schemes and supporting strategies to mitigate and support delivery of the SGP; this would need to consider all options and modes and include both infrastructure investment and demand management interventions. As discussed this work cannot identify exactly what will be needed but is able to signpost that if the level of growth and spatial distribution remains as predicted it is likely that in Central Leicester, the wider urban area and surrounding sectors improved radial connectivity will be required, especially to 2051 to support inward commuting and proposed A46 delivery. The most effective form of this is not clear but is likely to include some elements of Park and Ride and public transport priority routes. Consideration will need to be given to demand or parking management interventions given the large increase in delay forecast in Central Leicester to 2051. More generally there will be a need to continue to support modal switch to more sustainable modes in Central Leicester and countywide given the large increased in intra-sector trips in specific sectors which are more likely to be converted to active and public modes supporting greater highway efficiency. There is also likely to be a requirement to support proposed strategic highways investment in the A46, A5 and M1 to ensure efficient access continues to be provided to and on these strategic routes.

7.2.8 This assessment indicates that effective long term transport planning and infrastructure investment will be needed to manage and limit the impact of the considerable level of development envisaged and its proposed distribution. Do nothing is not an option and substantial investment will be needed in roads as well as public transport, cycling and walking. The assessment points to where this investment is likely to be needed, and will be used to shape detailed infrastructure assessments which will be undertaken as part of new and emerging Local Plans.

7.2.9 Work is progressing to develop business cases for the delivery of long term strategic road and rail schemes for the city and county areas through the Midlands Connect partnership. The two Transport Authorities will need to develop strategic and local transport plans to identify in more detail what transport infrastructure is required to support the delivery of these regional schemes at the local level. These plans will also be used to help secure funding to support early infrastructure scheme delivery to enable growth to take place in a managed way within our communities linked to the planning process.

7.2.10 The two Transport Authorities will need to and have committed to continuing to work closely with the team leading the preparation of the Strategic Growth Plan and to support other partners including district councils on any transport related matters highlighted through the current consultation exercise.

Appendix A. Sector Level Origin and Destination Matrix

Table 4 Trip Change by Sector: 2031-2036

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total Origins (trips originating in this sector)
1. Melton	568	7	5	1	1	3	-0	3	1	16	7	14	16	11	2	15	19	23	711
2. N. Harborough	20	11	4	0	1	1	1	5	1	1	1	8	26	16	3	5	13	18	136
3. C. Harborough	4	6	423	14	11	6	1	1	-1	2	0	1	15	119	8	9	7	65	690
4. W. Harborough	1	1	12	23	166	22	0	1	1	1	0	0	4	30	41	9	7	10	327
5. Fosse Way South	3	2	28	130	407	432	8	2	8	6	1	1	13	52	152	79	26	43	1,393
6. Hinckley	3	1	1	41	221	735	15	21	2	13	0	4	9	27	10	27	30	18	1,180
7. Bosworth	0	-0	1	3	1	24	7	5	-2	0	-0	-1	-1	0	-0	1	6	5	49
8. Coalville Ashby	4	3	2	2	-0	14	10	417	67	35	1	3	5	5	14	3	21	21	624
9. Shepshed Donnington	7	0	2	0	1	8	4	115	344	160	13	4	13	7	9	19	43	4	754
10. Loughborough	20	1	2	2	6	6	1	34	69	440	19	10	12	7	5	10	45	19	707
11. Charnwood Wolds	6	0	0	0	2	0	-0	1	-1	14	12	12	4	1	2	1	6	11	73
12. Syston	12	3	5	0	3	13	1	8	1	22	13	138	112	33	5	22	73	55	520
13. NE.Leicester	5	13	9	3	17	4	2	2	-2	6	6	49	230	109	11	28	55	148	696
14. SE.Leicester	10	20	105	23	66	58	4	2	5	10	2	8	252	612	104	79	68	287	1,717
15. Blaby	4	3	14	29	43	52	4	8	1	9	1	9	6	79	209	83	17	45	615
16. W.Leicester	5	2	2	4	106	30	-0	-5	-3	-2	-1	-3	-4	16	24	23	19	111	323
17. N.Leicester	5	3	2	1	9	7	-2	2	-1	1	3	13	-3	68	11	15	31	162	328
18. C.Leicester	11	3	15	1	2	18	1	6	1	7	2	10	105	100	16	74	67	167	607
Total Destinations (trips destined for this sector)	688	79	630	279	1,063	1,433	57	629	491	740	81	281	814	1,293	627	502	553	1,212	11,451

Table 4 is an origin and destination matrix showing the changes in trip patterns across the sectors between the 2031 base forecast and the 2036 growth scenario. Any negative figures in individual origin-destination movements are the result of the matrix balancing process after the trip ends are added to the matrix as origin and destination totals. They are not material.

Below we provide a worked example to aid in interrogating these tables:

Sector 1 (Melton): 711 additional trips will be generated in Melton as a result of this growth scenario; 688 additional trips will be destined for Melton from all sectors (including Melton); 568 additional trips will be generated in Melton and stay within Melton.

Table 5 Trip Change by Sector: 2031-2051

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total Origins (trips originating in this sector)
1. Melton	2,141	26	17	6	2	11	-0	9	1	50	27	53	61	59	8	63	75	94	2,704
2. N. Harborough	72	48	21	0	4	2	3	20	4	2	5	35	107	71	10	19	48	81	553
3. C. Harborough	13	23	1,663	52	37	21	1	4	-1	4	1	3	49	522	26	34	23	260	2,734
4. W. Harborough	3	2	44	132	601	106	2	4	2	3	0	0	15	114	178	35	26	41	1,310
5. Fosse Way South	8	9	88	524	1,761	1,613	29	9	29	16	2	2	46	180	522	294	104	189	5,426
6. Hinckley	9	6	7	135	704	3,089	63	86	9	43	-0	10	41	127	63	131	112	81	4,715
7. Bosworth	1	-0	1	11	4	79	40	16	-7	-3	-1	-3	-2	5	-2	11	24	18	191
8. Coalville Ashby	13	12	5	6	0	64	39	1,488	237	96	2	10	18	22	54	19	78	87	2,251
9. Shepshed Donnington	23	1	6	0	3	30	15	487	1,301	626	45	26	50	27	35	77	151	21	2,923
10. Loughborough	59	2	6	7	20	24	3	111	240	1,509	65	34	43	32	16	51	159	70	2,453
11. Charnwood Wolds	19	1	2	1	7	1	-1	5	-3	34	47	44	20	4	9	11	23	40	262
12. Syston	44	14	24	1	8	60	5	27	3	72	49	573	424	136	16	96	278	226	2,056
13. NE.Leicester	17	52	37	10	64	17	6	6	-7	19	23	173	920	465	43	107	214	595	2,761
14. SE.Leicester	36	92	408	89	314	211	13	4	22	28	8	48	960	2,433	387	317	259	1,193	6,823
15. Blaby	15	9	50	115	158	198	12	23	4	28	3	31	20	309	854	326	57	179	2,390
16. W.Leicester	24	6	16	15	335	124	2	-15	-5	3	-1	1	-1	87	132	194	113	447	1,476
17. N.Leicester	18	11	11	5	33	28	-1	14	-3	3	8	42	17	125	49	151	214	615	1,338
18. C.Leicester	45	11	61	4	12	78	5	24	5	22	9	39	422	418	78	311	263	704	2,509
Total Destinations (trips destined for this sector)	2,558	325	2,468	1,113	4,068	5,757	235	2,322	1,831	2,551	292	1,120	3,209	5,138	2,475	2,250	2,221	4,941	44,875

Table 5 is an origin and destination matrix showing the changes in trip patterns across the sectors between the 2031 base forecast and the 2051 growth scenario. Any negative figures in individual origin-destination movements are the result of the matrix balancing process after the trip ends are added to the matrix as origin and destination totals. They are not material

Below we provide a worked example to aid in interrogating these tables:

Sector 18 (Central Leicester): 2509 additional trips will be generated in Central Leicester as a result of this growth scenario; 4941 additional trips will be destined for Central Leicester from all sectors (including Central Leicester); 704 additional trips will be generated in Central Leicester and stay within Central Leicester.

Appendix B. Sector Level Highway Operation Statistics

Table 6 Sector Level Highway Operation Statistics

	2031				2036				2051			
Sector	Veh-delay (hrs)	Total veh-hrs	Veh-dist (km)	Avg Speed (kph)	Veh-delay (hrs)	Total veh-hrs	Veh-dist (km)	Avg Speed (kph)	Veh-delay (hrs)	Total veh-hrs	Veh-dist (km)	Avg Speed (kph)
1. Melton	257	2,670	142,099	53	282	2,835	148,876	53	360	3,333	168,857	51
2. N. Harborough	39	1,201	92,617	77	43	1,306	100,069	77	62	1,595	117,434	74
3. C. Harborough	343	2,477	116,404	47	412	2,765	125,488	45	630	3,594	148,805	41
4. W. Harborough	203	2,388	171,956	72	220	2,513	178,142	71	325	2,970	195,022	66
5. Fosse Way South	225	2,464	166,065	67	281	2,818	182,862	65	549	3,977	221,693	56
6. Hinckley	603	3,448	130,317	38	700	3,870	141,754	37	1,382	5,903	174,223	30
7. Bosworth	215	2,654	168,414	63	229	2,778	174,926	63	278	3,153	192,064	61
8. Coalville Ashby	529	5,073	273,775	54	579	5,342	283,265	53	666	5,868	302,355	52
9. Shepshed Donnington	597	4,618	262,538	57	699	4,989	271,923	55	1,805	7,415	291,153	39
10. Loughborough	2,024	7,501	222,447	30	2,394	8,363	229,227	27	3,737	11,189	239,394	21
11. Charnwood Wolds	149	1,411	86,950	62	161	1,486	90,339	61	204	1,716	99,828	58
12. Syston	113	1,265	84,290	67	128	1,393	91,095	65	206	1,867	114,474	61
13. NE.Leicester	1,149	4,652	92,142	20	1,328	5,226	100,435	19	3,043	9,336	125,058	13
14. SE.Leicester	1,571	6,297	143,843	23	1,893	7,253	157,588	22	6,417	16,316	185,426	11
15. Blaby	443	3,417	192,062	56	491	3,752	207,594	55	1,014	5,542	251,328	45
16. W.Leicester	1,374	6,443	226,515	35	1,511	6,891	234,709	34	2,694	9,748	256,849	26
17. N.Leicester	1,255	6,264	224,762	36	1,446	6,828	234,004	34	2,388	9,195	258,236	28
18. C.Leicester	1,338	3,443	30,805	9	1,633	4,068	32,386	8	4,917	10,464	33,810	3
Leicester and Leicestershire	12,425	67,684	2,828,001	42	14,431	74,473	2,984,683	40	30,679	113,181	3,376,009	30

Table 6 shows the highway operation for each sector in the forecast year of 2031 as well as both growth scenarios of 2036 and 2051.