Leicester & Leicestershire Strategic Planning Partnership

Leicester and Leicestershire Strategic Growth Plan – Strategic Transport Assessment Stage 1

Leicestershire County Council, Environment and Transport Department

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1. Introduction

1.1. Purpose of Document

1.1.1. This report provides a summary of the key outputs and findings of the transport modelling work undertaken through Stage 1 of the *Leicester and Leicestershire Strategic Growth Plan* (SGP) *Strategic Transport Assessment* (STA) and then analyses and interprets these findings from a transport policy perspective.

1.1.2. The accompanying STA Stage 1 'technical' report (Appendix A) provides a more detailed assessment of the modelling outputs and findings. It also outlines the modelling process followed and the key modelling inputs and assumptions underpinning this process. Relevant sections of the technical report are referred to within this document, and both documents should be read in conjunction with the other.

1.2. Background

1.2.1. The STA was commissioned by the Leicester and Leicestershire Strategic Planning Partnership in Spring 2021. It is one of several pieces of Leicester and Leicestershire Housing Market Area (HMA)-wide evidence commissioned since 2020 to help identify how growth should be distributed across the HMA in future, over a long-term period covering at least to 2051.

1.2.2. The STA is not intended to establish or set out a new land-use or transport planning policy position. Rather, the evidence developed through the STA will inform future reviews and decisions by the Partnership concerning the Leicester and Leicestershire SGP, which provides the HMA's current blueprint for long-term growth up to 2050. It is also envisaged that the STA will provide an evidential platform for other key projects (planned and ongoing) flowing from the SGP, including:

- Further work to be undertaken at Partnership/HMA-wide scale – e.g. in relation to passenger transport.

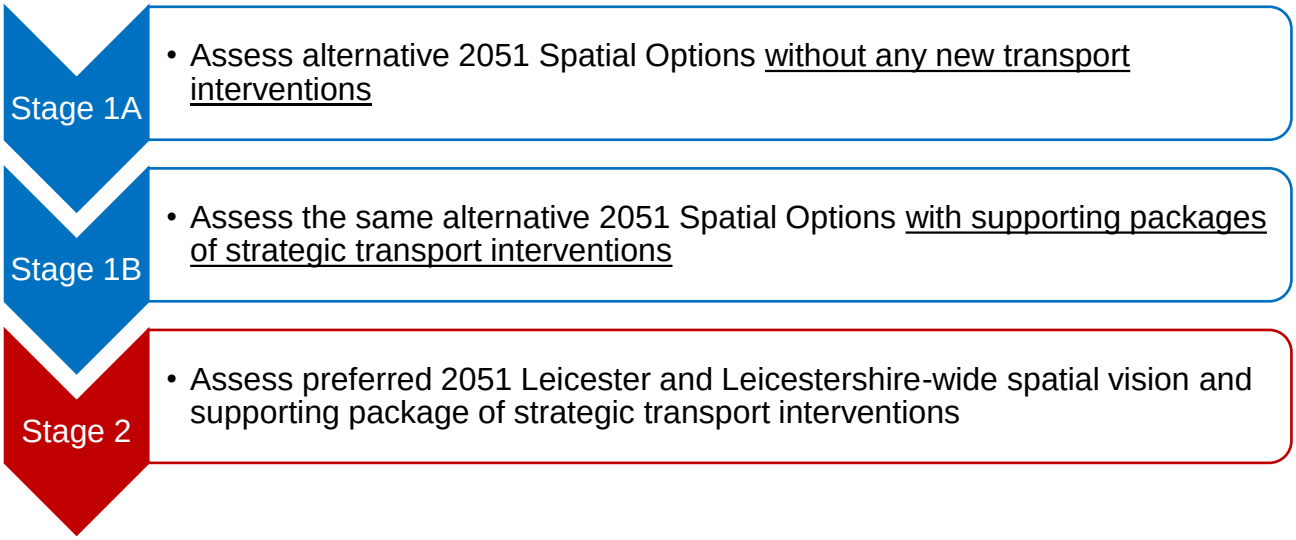
- Future Local Plans work extending beyond 2036, particularly for areas where the current (2018) SGP spatial vision has the most bearing – e.g. around the south and east of the Leicester Urban Area and East Midlands Airport.

- Development of more detailed strategies and schemes arising from the preceding points.

1.3. Process and Stages

1.3.1. The STA is being undertaken in stages, as set out through Figure 1 below.

Figure 1 – Overview of STA Process and Stages



1.3.2. Stage 1 (encompassing both Stages 1A and 1B as set out in Figure 1) has been completed, with the key findings of, and conclusions drawn from, Stage 1 being reported in this and the technical report.

1.3.3. Due to the potential scale and nature of growth and its associated impacts on the existing transport network, the Partnership decided to consider potential new and enhanced accompanying strategic transport infrastructure requirements as part of the optioneering process during Stage 1.

1.3.4. The split of Stage 1 into parts A and B illustrates the iterative approach that was followed to assess the transport impacts of each spatial option – to identify a bespoke package of high-level strategic transport interventions to support each spatial option, and then reassess each spatial option with the packages of strategic interventions in place.

1.3.5. Stage 2 of the STA will commence once a preferred HMA-wide growth strategy has been identified by the Partnership. Whilst currently unknown, it is expected that the preferred strategy will either be a refined version of one of the scenarios, or a combination of elements of several of the scenarios (a 'hybrid' scenario) tested during Stage 1 of the STA. Stage 2 is likely to follow an iterative process similar to that followed for Stage 1, but with only one, preferred growth scenario (as opposed to the range of alternative growth scenarios tested during Stage 1).

1.3.6. The process and stages followed for the STA are broadly analogous to those that would typically be followed for Local Plan transport evidence work, but at a larger scale (HMA-wide) and over a longer timescale (to 2051).

1.4. Relationship with Other Strategic Transport Projects

1.4.1. The STA is one component of a wider suite of transport work and evidence that will be required to support the SGP's delivery in practice, at both HMA-wide and Local Plan-making levels.

1.4.2. At the HMA-wide level, it is planned to undertake a Leicester and Leicestershire Strategic Passenger Transport Study (SPTS) in parallel with Stage 2 of the STA. The SPTS will effectively be a 'sister study' to the STA, with the purpose of elevating the Partnership's understanding of potential long-term, HMA-wide passenger transport requirements to an equivalent level to its understanding of potential comparable scale highway requirements (recognising that understanding of such passenger transport requirements is currently much more limited). The County and City highway authorities are jointly progressing the initial stages of the SPTS on behalf of the Partnership.

1.4.3. The step immediately down from this is Local Plan-level transport evidence, which up until now has been undertaken on a 'district by district' (i.e. corresponding to individual LPA areas) basis. However, given both the future scale of growth that will need to be accommodated across the HMA and the proposed distribution of this growth under the SGP, a continuation of this approach is unlikely to be sufficient to address the transport impacts of most Local Plans across the HMA going forward. This includes the next round of Local Plans, which will extend into the period 2036-2041 and as such will need to take account of the SGP. Instead, future Local Plan evidence gathering would likely benefit from being carried out over broader cross-boundary areas aligned with potential growth zones/clusters and likely patterns of impact (and associated strategic interventions) arising from these zones/clusters.

1.4.4. The key differences between the HMA-wide and Local Plan-level transport evidence can be summarised as follows:

- Study areas – the HMA-wide evidence (including the STA and SPTS) identifies broad impacts and requirements across Leicester and Leicestershire as a whole, whereas the Local Plan-level evidence identifies more detailed, 'granular' impacts and requirements within specific areas of the HMA (whether district-wide, more localised/intra-district or cross-boundary/multi-district).

- Timescales – the HMA-wide evidence (including the STA and SPTS) is focussed on impacts and requirements arising over the lifetime/by the end date of the SGP (currently 2050), whereas the Local Plan-level evidence is focussed on impacts and requirements arising from the relevant Local Plans (the next round of which are likely to run to around 2041).

1.5. Alternative Housing Distribution Scenarios (Stages 1A and 1B)

1.5.1. The alternative HMA-wide housing distribution options assessed through Stage 1 of the STA are summarised within Table 1 and displayed diagrammatically in Figures 2, 3, 4

and 5 (all below). The coloured areas shown in Figures 2 to 5 correspond to individual zones within the Leicester and Leicestershire Pan-Regional Transport Model (PRTM), which was used to undertake the STA Stage 1 modelling work. A more detailed overview of the key inputs and assumptions made for each scenario are provided within Chapter 3 of the accompanying technical report.

Table 1 – Summary of Alternative Housing Distribution Scenarios

Scenario	Description
Option 1 – Existing Spatial Pattern	A continuation of the current HMA pattern/distribution, which has been implemented for Local Plans over the last 20-30 years (at least) and was also the basis of the old/superseded East Midlands Regional Spatial Strategy. Reliant on incremental growth of existing settlements, with around 1/3 of growth located in the Near Leicester area, 1/3 in the County's six main market towns (Coalville, Hinckley, Loughborough, Lutterworth, Market Harborough and Melton Mowbray) and 1/3 in other settlements across the County. Within the Near Leicester area, future growth is more heavily concentrated on the north and west quadrants of this area, with relatively lower levels of growth in the south and east quadrants, again in line with current/historic trends.
Option 2 – Current SGP Spatial Pattern	Broadly reflects the HMA distribution of growth set out through the current SGP spatial vision. Seeks to focus most growth at large strategic site opportunities, substantially reducing the requirement for incremental growth of existing settlements. Most of these strategic sites are located within the three main growth areas identified through the current SGP: the "Priority Growth Corridor" to the South and East of Leicester, the "Leicestershire International Gateway" at the northern edge of the County, and the "Hinckley Cluster" area in the southwest of the County respectively. Growth allocated to the Near Leicester area (44%) is substantially greater than under Scenario 1, and most of this growth is located in the south and east quadrants of this area (at strategic sites within the Priority Growth Corridor), with reduced growth in the north and west quadrants relative to Scenario 1. The remainder of growth is split between Market Towns (28%) and other settlements (28%).

Option 3 – Majority Near Leicester	Compared with all other scenarios this comprises the greatest concentration (over 50%) of HMA growth within the Near Leicester Area and lowest levels of growth across the remainder of the County. Within the Near Leicester area, future growth is more evenly spread around all four quadrants than under either Scenario 1 or 2, with higher levels of growth in the east and west quadrants of the area than any other option, but slightly lower levels of growth in the north (compared to 1) and south (compared to 2). In the south and east quadrants of the Near Leicester area, growth is concentrated primarily at large strategic site opportunities (as with Scenario 2), whereas in the north and west quadrants and elsewhere in the County this option relies on incremental growth of existing settlements/suburbs.
Option 4 – New Market Towns	Focusses most future HMA growth at 4 new 'free standing' market towns of around 10,500 dwellings each (approximately the size of Market Harborough), with reduced levels of growth (less than 25%) in the Near Leicester area compared to all other options and similar levels of growth elsewhere in the County compared to Scenario 3. The new market towns are located at key crossroads in the north (A46/B676), south (A5199/A4304), east (A47/B6047) and west (A447/B585) of the County respectively, in the gaps between the six main existing market towns. This is the most theoretical of all the options assessed through the STA. Outside of the new market towns, this scenario relies on incremental growth of existing settlements.

Figure 2 – Scenario 1 (Existing Spatial Pattern) Housing Distribution

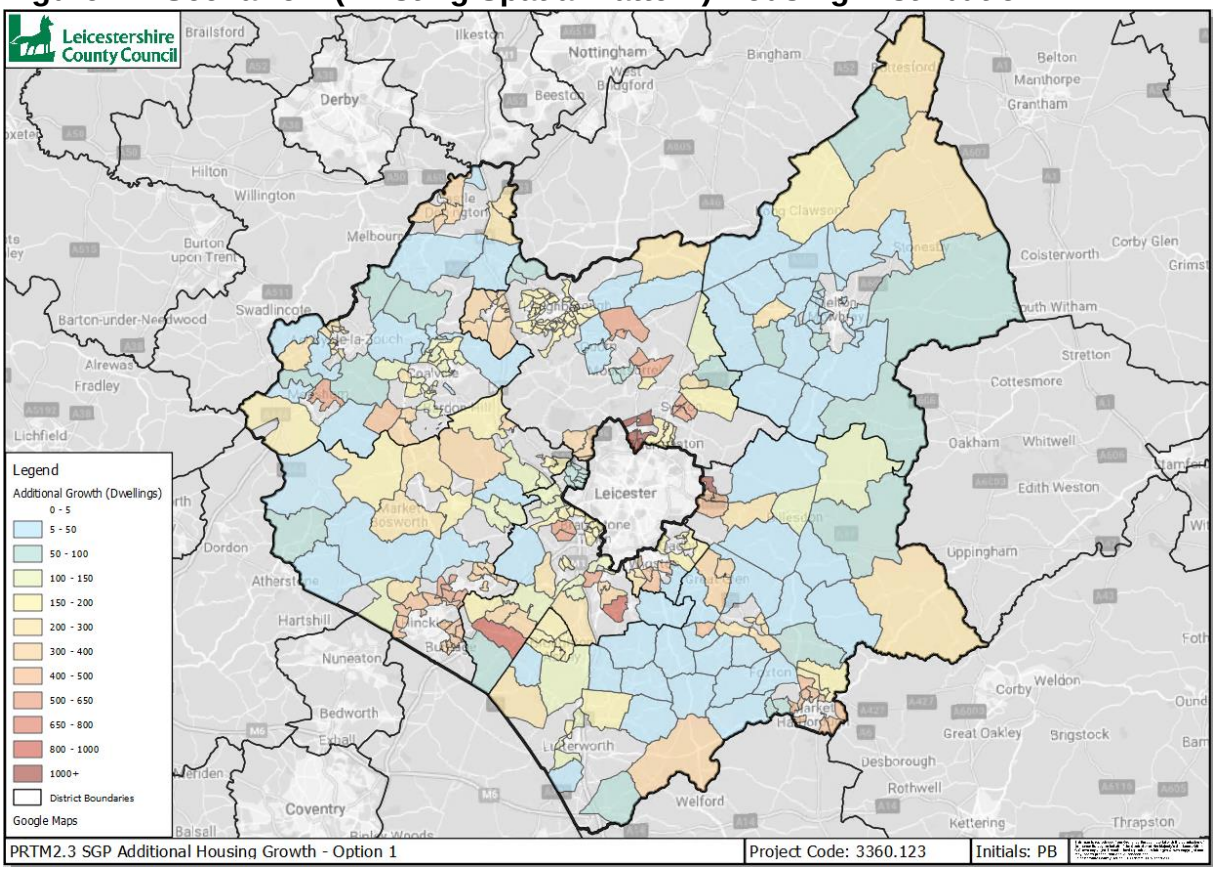
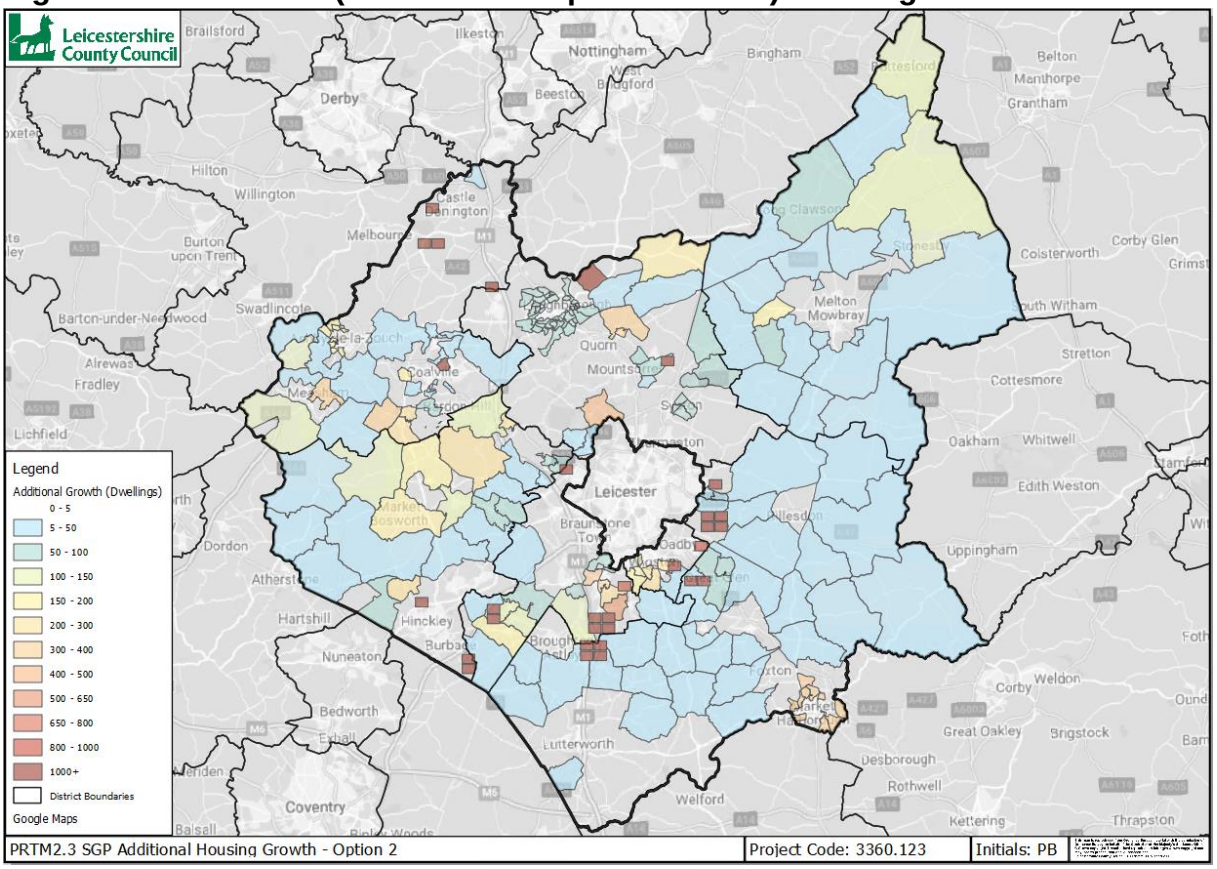
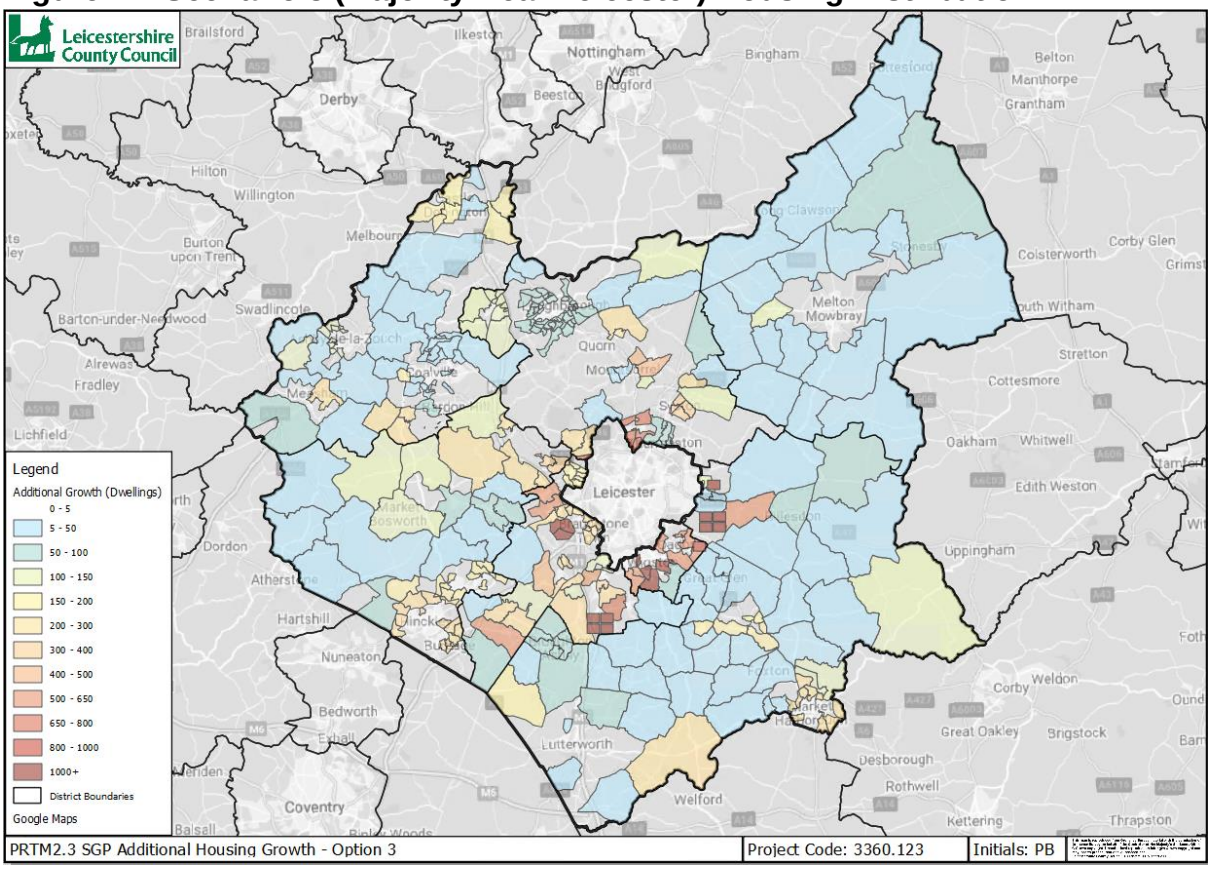


Figure 3 – Scenario 2 (Current SGP Spatial Pattern) Housing Distribution



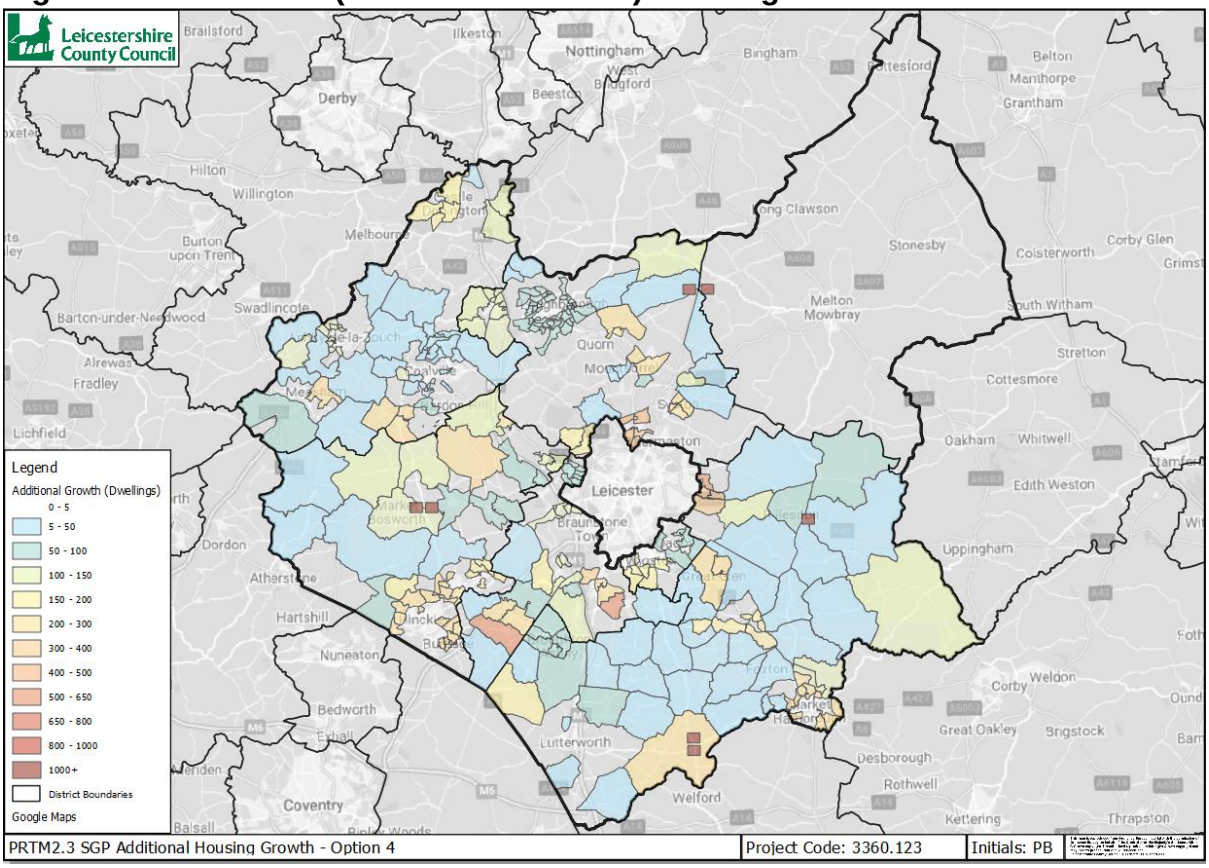
NB – the red squares shown on this diagram represent new strategic sites that were included in Scenario 2.

Figure 4 – Scenario 3 (Majority Near Leicester) Housing Distribution



NB – the red squares shown on this diagram represent new strategic sites that were included in Scenario 3.

Figure 5 – Scenario 4 (New Market Towns) Housing Distribution



NB – the red squares shown on this diagram represent the four new market towns that were included in Scenario 4.

1.5.2. The four scenarios taken forward for testing were developed from an initial “long list” of HMA spatial distribution options. Each scenario is effectively a “composite” of options put forward as part of the long-list, capturing the breadth of these options as far as possible whilst ensuring the resulting transport assessment was of a proportionate scale.

1.5.3. The strategic site locations included in Scenarios 2 and 3, as well as the new market town in the north of the County within Scenario 4, were derived from the *Strategic Growth Options and Constraints Mapping for Leicester and Leicestershire* (SGO) Study undertaken on behalf of the Partnership in parallel with STA Stage 1. Those SGO sites that aligned with the overarching spatial philosophy and distribution of each scenario were selected for inclusion in the relevant scenario(s). Table 2 below sets out the specific SGO sites that were included in each scenario.

Table 2 – Inclusion of SGO Study Strategic Sites in each STA Stage 1 Scenario

Scenario	SGO Sites Included in Scenario
Option 1 – Existing Spatial Pattern	None
Option 2 – Current SGP Spatial Pattern	1a – Whetstone Pastures 1b – West of Stoney Stanton 1d – Land at Hospital Lane, Blaby 1e – Land North of Glenfield 2b – Cotes 3a – Land East of Scraptoft 3b – Farmcare Stoughton/Stretton Hall 3c – Whetstone Pastures Plus 3d – Newton Harcourt 4a – Soarbrook, South of Burbage 4d – Hinckley North 6c – Land North and South of Park Lane, Castle Donington 6d – Land South of Isley Walton & East Midlands Airport 6h – Land North of Shepshed 7a – Land South of Wigston/West of the A6 7b – Land East of Oadby
Option 3 – Majority Near Leicester	1a – Whetstone Pastures 3a – Land East of Scraptoft 3b – Farmcare Stoughton/Stretton Hall 7a – Land South of Wigston/West of the A6 7b – Land East of Oadby
Option 4 – New Market Towns	The new market town in the north of the County (A46/B676 crossroads) was located in the broad vicinity of the following SGO sites: 2c – Seagrave 5c – Six Hills

1.6. Strategic Interventions (Stage 1B)

1.6.1. The remit of the STA is limited to considering major strategic (so-called 'big ticket') transport interventions, proportionate with the HMA-wide scale of the assessment and associated spatial housing distribution scenarios. Such interventions are primarily targeted at catering for longer-distance movements within the HMA, as well as between the HMA and wider regional and national destinations (as opposed to more local movements within, to and from settlements – both new and existing – within the HMA). As such, the STA does not provide a comprehensive, all-encompassing transport mitigation strategy for Leicester and Leicestershire-wide growth to 2051, which would have been disproportionate to the scale of the assessment and current stage in the STA process.

1.6.2. More detailed, localised (non-strategic) transport mitigation requirements will need to be looked at through separate, more focussed work aligned with the STA. This includes studies to inform the preparation of the Local Plan as referred to in Section 1.4 above.

1.6.3. For Stage 1B of the STA, a bespoke package of strategic transport interventions was selected for each of the four 2051 spatial distribution scenarios (albeit with significant crossover between scenarios in terms of specific interventions), tailored to addressing each scenario's respective strategic impacts and requirements. The long-term outlook and highly conceptual nature of Stage 1 of the STA enabled the study to consider interventions of a more ambitious scale than would be possible for most other transport evidence gathering work (e.g. for Local Plans). Each package comprised the following elements:

- ***HMA-wide or inter-regional rail enhancements:*** based on proposed concepts or schemes that (at the point of decision-making) were being actively investigated or developed through Government, strategic agency and/or sub-national transport body programmes (such as Midlands Connect's "Midlands Rail Hub" and the Government's "Restoring your Railway" process)[1]. The same set of rail enhancements were included in all four Stage 1B packages/scenarios due to their predominantly inter-urban and inter-regional focus.

- ***New "high quality" passenger transport links between proposed strategic development sites (Options 2 and 3)/new market towns (Option 4) and key "parent" settlements:*** the specific links being bespoke to each scenario (based on the specific strategic sites included in that scenario). This sought to reflect the potential demand and opportunities for new "step-change" passenger transport provision arising from such strategic sites[2]. No such interventions were included for Option 1, due to the lack of strategic sites included in that scenario.

[1] It should be noted that all of these interventions were 'supply-side' (i.e. new or improved services/routes) rather than 'demand-side' (i.e. measures to reduce cost/improve the convenience of passenger transport and/or increase the cost/reduce the convenience of car travel) and that further work (including the planned SPTS) will need to explore both 'supply-side' and 'demand side' interventions in more detail to get a better understanding of the full potential to encourage mode shift to sustainable forms of travel.

[2] See previous footnote.

- ***Strategic highway interventions:*** potential major new highway connections (such as a "link road", bypass or new junction on the Strategic Road Network/SRN) or "step-change" enhancements to existing roads (such as dualling or major widening of existing motorways, trunk A-roads or major local roads and/or grade separation of existing junctions). Most of the interventions were based on/influenced by proposed concepts or schemes that had been identified through previous studies and/or were (at the point of decision-making) being actively investigated or developed through Government, strategic agency and/or sub-national transport body programmes (such as National Highways Road Investment Strategy Pipeline). The specific combinations of strategic highway interventions were bespoke to each scenario, albeit with some of the individual interventions featuring in the package for multiple scenarios.

1.6.4. The selection of the packages for each scenario was informed by key outputs and analysis of the Stage 1A model runs, albeit applying professional judgement to ensure that the specific interventions identified for each scenario formed a cohesive and geographically appropriate package in each case. A more detailed outline of the process and key considerations involved in selecting the packages is provided within Chapter 6 of the technical report.

1.6.5. The final packages of interventions for each scenario were jointly agreed with National Highways (NH) and Leicester City Council (LCiC) and then confirmed by the Partnership before testing of these packages (Stage 1B) began. The definitive packages are set out side-by-side in Table 3 below. More detailed descriptions and accompanying illustrative diagrams of the various interventions and packages are provided in sections 6.3 and 6.4 and Appendix D of the technical report.

Table 3 – Summary of Stage 1B Strategic Interventions Packages

Intervention Name/Description	**Spatial Scenario**			
	1	**2**	**3**	**4**
HMA/Regional Rail Enhancements				
Birmingham – Leicester – Stansted Passenger Rail Services	Y	Y	Y	Y
Coventry – Leicester – Loughborough Passenger Rail Services	Y	Y	Y	Y
Nottingham to Leicester Passenger Rail Services	Y	Y	Y	Y
Derby to Leicester Passenger Rail Services	Y	Y	Y	Y
Burton to Leicester Passenger Rail Services	Y	Y	Y	Y
Melton to Nottingham Passenger Rail Services	Y	Y	Y	Y
Strategic Site Passenger Transport Links				
New PT links between Leicester city centre and strategic site locations in the "near Leicester" area.	N	Y	Y	N
New PT links from strategic site locations in the "International Gateway" area to EMA/EMG, L'boro, Derby and Notts.	N	Y	N	N

New PT links from strategic site locations in the “Hinckley cluster” area to Hinckley town centre.	N	Y	N	N
New PT links between new market towns and Leicester city centre.	N	N	N	Y
Strategic Highway Interventions				
M1 from Junction 21 to Junction 21a[3]	Y	Y	Y	Y
M1 Junction 21	Y	N	N	Y
A46 from M1 to Hobby Horse roundabout	Y	N	Y	Y
A46 from Groby Rd to Anstey Ln junctions	Y	N	Y	Y
A46 Hobby Horse Roundabout	Y	N	Y	Y
New West of Leicester link road	Y	N	Y	N
New M1 Junction 20a	N	Y	Y	N
New South and East Leicester Orbital Route	N	Y	Y	N
New East of Leicester link road	N	N	N	Y
A563 Leicester Outer Ring Road	N	Y	Y	Y
M1 Junction 21a to Junction 23a[4]	Y	Y	Y	Y
A42 Junction 14	N	Y	N	N
New A42 to A50 link road	N	Y	N	N
New Kegworth eastern bypass	N	Y	N	N
New A6 Hathern bypass	Y	Y	N	N
M69 Junction 2	Y	Y	N	N
New A47 to M69 link road	N	Y	N	N
New A47-M69-B4114 link road	Y	N	N	N
New M69 to M1 Link Road	N	Y	N	N
A5 from M69 Junction 1 to M42 Junction 10[5]	Y	Y	Y	Y
New A6 Kibworth bypass	Y	Y	Y	N
New Loughborough eastern bypass	Y	Y	N	Y
New A50 Bradgate Hill bypass	Y	N	Y	Y
B582/B585 bypasses	N	N	N	Y
A46 North of Syston	N	N	N	Y
A5199 bypasses	N	N	N	Y
New B582 to A46 link road	N	N	N	Y
B676 upgrades	N	N	N	Y
A4304 upgrades	N	N	N	Y

1.6.6. The strategic interventions packages were tested iteratively, with an initial focus on strategic passenger transport interventions, then adding in strategic highway interventions. The purpose of this approach was to prioritise sustainable interventions as far as possible (within the high-level scope of the assessment) and provide an opportunity to review and refine the package of strategic highway interventions for each scenario based on the outputs of the initial “with passenger transport interventions” model runs.

[3] Intervention based on notional RIS3 pipeline scheme (as announced through RIS2). More information on the basis for including this scheme across all scenarios is provided in section 6.4 of the technical report.

[4] Intervention based on notional RIS3 pipeline scheme (as announced through RIS2). More information on the basis for including this scheme across all scenarios, and subsequent circumstantial changes to the RIS Programme affecting this pipeline scheme (SMART Motorways programme cancellation) is provided in section 6.4 of the technical report.

[5] Intervention based on notional RIS3 pipeline scheme (as announced through RIS2). More information on the basis for including this scheme across all scenarios is provided in section 6.4 of the technical report.

2. Stage 1 Findings

2.1. Overview

2.1.1. Chapter 2 of this report provides a summary of the key outputs and findings from the Stage 1 modelling runs that have informed the broader analysis and conclusions drawn within Chapter 3.

2.1.2. The key outputs and findings encompass the following four topics, covered through sections 2.2 to 2.5 below:

- Overall network performance
- Potential for sustainable travel
- Impact on key junctions and congestion hotspots
- Impact on traffic flows and routeing

2.1.3. Subsequent sections of Chapter 2 of this document include references to Chapters 5, 6, 7 and 8 of the technical report (or specific sections of these chapters where appropriate), to highlight the detailed evidence and analysis that sits behind the key findings.

2.2. Overall Network Performance

2.2.1. The summary statistics set out and analysed in Sections 5.2, 7.2 and 8.2 of the technical report demonstrate the impacts of each spatial scenario on overall performance of the highway network within and immediately surrounding the HMA, providing an aggregate perspective of levels of congestion and delays, as well as the distance travelled by road users on the network. This aggregate perspective is especially useful as a comparative tool for exercises such as STA Stage 1, where different spatial distributions of growth, with correspondingly different geographical patterns of impact on the network, are being assessed side-by-side. The key findings from the summary statistics are set out below.

2.2.2. Change in network performance between the present day and 2036:

There is a clear and substantial deterioration in performance of the highway network between 2021 (as proxy for the present day within the STA Stage 1 model runs) and 2036 (which is common to all four scenarios and represents the watershed/end date of most existing Local Plans and development commitments). This highlights the extent of the impacts that already-planned/committed developments are likely to have on the network (based on a continuation of current societal, economic and travel behaviours and trends), even allowing for committed transport investments over the same period.

2.2.3. Change in network performance between 2036 and 2051 in the absence of any strategic transport interventions ('do minimum')

There is a substantial deterioration in highway network performance between 2036 and each of the four 2051 spatial scenarios. Whilst there are small differences in performance between the four 2051 scenarios in this regard, these differences are insignificant when compared with the 'across the board' deterioration from 2021 to 2036 (as set out in 2.2.2. above) and 2036 to 2051 referred to above.

This indicates that long-term growth, at least at the levels currently envisaged to be necessary, will have major strategic transport impacts over and above those arising from already planned/committed developments regardless of where such growth is distributed within the HMA (based on a continuation of current societal, economic and travel behaviours and trends). By extension, it is strongly suggestive of the need for a package of strategic-scale transport interventions to accommodate long-term growth, again regardless of where such growth is distributed within the HMA.

Key Message: *There is no spatial distribution for meeting the HMA's future growth requirements that would be 'simple' or even relatively 'straightforward' to accommodate from a transport perspective.*

2.2.4. Impact of passenger transport interventions

The introduction of passenger transport interventions to the 2051 scenarios results in a modest improvement in highway network performance and reduced highway travel distance across the board. In all cases, this falls well short of addressing the deterioration in network performance, both from 2036 and from the present day. This demonstrates that the identified packages of strategic passenger transport interventions alone would not be sufficient to accommodate long-term growth (acknowledging that further work is needed to explore and develop strategic passenger transport opportunities in more detail through the planned SPTS) and is strongly suggestive of the need for an accompanying package of strategic highway interventions, regardless of where such growth is distributed within the HMA.

Key Message: *Regardless of spatial distribution, major additions and enhancements to the highway network will be needed, even once realistic opportunities for sustainable travel have been exhausted.*

2.2.5. Impact of strategic highway interventions

The introduction of strategic highway interventions to the 2051 scenarios (in addition to the passenger transport interventions) results in a marked improvement in overall network performance across the board. This indicates that the bespoke packages of highway interventions introduced for the various scenarios are all effective in reducing the key strategic impacts arising under each scenario. However, none of the packages are sufficiently effective to return network performance to 2021 or 2036 levels.

Key Message: *Given the scale of future growth, it will not be possible to keep network performance at present day levels, even with a step-change in the level and nature of investment from that experienced historically.*

The addition of the strategic highway interventions also appears to lead to a more significant variation in overall network performance between the various 2051 scenarios, with Scenario 2 (current SGP spatial pattern) appearing to perform better than the other three scenarios in this regard. This suggests that the growth strategy and accompanying strategic interventions included in Scenario 2 provide the most cohesive overall approach of the four options tested.

Key Message: *Scenario 2 (Current SGP Spatial Pattern) appears to represent the most cohesive overall approach to meeting the HMA's future growth requirements when considered in combination with accompanying strategic transport interventions.*

2.3. Potential for Sustainable Travel

2.3.1. The detailed outputs and analysis provided within section 5.3 of the technical report indicates that spatial distributions based on scenarios 1, 2 and 3 would have broadly similar theoretical potential for encouraging sustainable travel behaviour. Conversely, it suggests that Scenario 4 (new market towns) is likely to pose much greater challenges in this regard, due to the much more dispersed pattern of new trips and correspondingly lower proportion of short distance trips (which are most conducive to using sustainable forms of travel) arising through this scenario (due to the isolated locations of the new market towns, coupled with significant demand for travel from these new towns to Leicester and other key existing settlements in and around the HMA).

Key Message: *Scenario 4 (New Market Towns) is much less conducive to maximising sustainable travel than the other three scenarios.*

2.3.2. As set out in Chapter 7 of the technical report, the passenger transport interventions introduced for each scenario result in a reduction in highway trips across the board.

However, in all cases this reduction only represents a very small proportion of overall highway travel demand across the HMA (around 1%) and has a marginal impact on overall network performance and travel behaviour (as set out within paragraph 2.2.4 above).

2.3.3. Nevertheless, there is a noticeable difference between the various scenarios, with the greatest reductions in highway trips occurring for Scenarios 2 (current SGP Spatial Pattern) and 3 (Majority Near Leicester) and the smallest reductions occurring for Scenario 1 (Existing Spatial Pattern). This generally corresponds to the varying extent of strategic passenger transport interventions introduced in combination with strategic site opportunities for each scenario (as set out in paragraph 1.6.3 and Table 3 above).

2.4. Impact on Key Junctions and Congestion Hotspots

2.4.1. The analysis of congested junctions (those junctions at 85%+ capacity; provided within sections 5.4-5.7, 7.3 and 8.3 of the technical report) correlates very closely with the analysis of overall network performance summarised in section 2.2 above. The key statistics underpinning this analysis have been drawn together in Table 4 below.

Table 4 – Number of Congested (85%+) Junctions by Scenario

Scenario	2021	2036	2051 Do-Min	2051 PT-only	2051 PT + Hwy
1 – Existing Spatial Pattern	272	425	578	573 (-5 vs do-min)	516 (-62)
2 – Current SGP	272	425	576	558 (-18)	482 (-94)
3 – Majority Near Leicester	272	425	595	584 (-11)	498 (-97)
4 – New Market Towns	272	425	572	561 (-11)	489 (-83)

NB – Figures in this table are derived from Tables 5.4, 5.5, 5.6, 5.7, 7.3 and 8.2 of the technical report.

2.4.2. The outputs show a substantial increase in congested junctions from 2021 to 2036, followed by a further substantial increase from 2036 for all four of the 2051 spatial scenarios in the absence of strategic interventions (do minimum). The extent of the increase in congested junctions across all four scenarios provides further evidence of the need for strategic scale transport interventions to accommodate long-term growth, regardless of where it is located.

2.4.3. The number of 'do minimum' congested junctions is noticeably greater within Scenario 3 (Majority Near Leicester) than the other three scenarios. This is due to the greater concentration of HMA-wide growth in the near Leicester area under this scenario, which is where the greatest concentrations of already and near congested junctions (pre-additional 2036-51 growth) are located.

2.4.4. The introduction of strategic passenger transport interventions results in a modest reduction in the number of congested junctions across the board, further supporting the analysis provided in paragraph 2.2.4 above in respect of these interventions.

2.4.5. The introduction of the strategic highways interventions packages for each 2051 scenario result in more significant reductions in the number of congested junctions in all cases. The most impactful packages appear to be those introduced for Scenarios 2 (Current SGP Spatial Pattern) and 3, albeit in the case of Scenario 3 this is coming from a higher number of congested junctions to start with. Furthermore, Scenario 2 is clearly the most impactful when considered purely in terms of the reduction in severely congested junctions (only those at 100%+ capacity) as opposed to all congested junctions (all those at 85%+ capacity). Conversely, the package introduced for Scenario 1 (Existing HMA Spatial Pattern) appears to be the least impactful in respect of reducing the number of congested junctions.

2.4.6. Notwithstanding the apparent differences in performance of the various spatial options and accompanying strategic interventions packages, it should be noted that none of the interventions packages are sufficient to reduce the number of congested junctions back to 2036 levels.

2.4.7. Alongside the overall, HMA-wide analysis of congested junctions, Section 8.4 of the technical report provides a more detailed analysis of delays at three of the HMA's key Strategic Road Network (SRN) junctions: M1 Junction 21, M1 Junction 24 and the A46 Hobby Horse Roundabout respectively. The purpose of including the additional analysis for the three SRN junctions is to provide an evidential starting point for consideration of potential future requirements and investment opportunities at these locations rather than as an additional point of comparison between the scenarios (on the basis that using these outputs as an additional standalone comparator would effectively be double counting the impacts at these junctions when combined with the HMA-wide analysis).

2.4.8. As with the wider congested junction analysis, the detailed analysis for the SRN junctions shows a substantial increase in delays at all three junctions between 2021 and 2036, and a further substantial increase in delays between 2036 and each of the 2051 scenarios. Overwhelmingly, it also shows the full packages of interventions to be effective in reducing delays at these junctions, in some cases to below 2036 or even 2021 levels. The varying levels of impact and relief provided at the three SRN junctions across the four scenarios can be explained by the differing spatial strategies and packages of interventions assessed under each scenario. In particular:

- The interventions packages for Scenarios 1,3 and 4 include direct improvements to the A46 Hobby Horse Roundabout, whereas Scenario 2 forgoes any improvements to this junction in favour of alternative interventions elsewhere on the network.

- Likewise, Scenarios 1 and 4 include direct improvements to M1 Junction 21, whereas Scenarios 2 and 3 forgo improvements to this junction in favour of alternative interventions elsewhere on the network.

2.5. Impact on Traffic Flows and Routeing

2.5.1. The 'flow-difference' outputs and analysis set out in Chapters 5, 7 and 8 of the technical report provide the basis for considering the traffic flow and routeing impacts of the four scenarios and accompanying packages of strategic interventions.

2.5.2. The outputs displayed in Chapter 5 of the technical report show how growth results insubstantial increases in traffic flows across most of the HMA's existing highway network between 2021 and 2036, and further substantial increases between 2036 and each of the 2051 scenarios. The flow-difference plots demonstrate that, in the absence of any interventions and irrespective of 2051 scenario, minor/lower-order routes accommodate much of this increase in traffic flow, with some of the major existing routes (on both the local and strategic road networks) experiencing more limited increases, or in some cases even decreases in traffic flow (e.g. the A50 between Leicester and the M1). Broadly, this can be attributed to:

- Increased congestion and delays on major routes, leading traffic to re-route to more minor roads in search of faster journey times.

- Growth in locations where there is currently no existing 'higher-order' route to accommodate new journeys (for instance orbital journeys to the south and east of Leicester), meaning such journeys have no choice but to use existing 'lower-order' routes to reach their destinations.

2.5.3. However, the spatial pattern/footprint of traffic flow and routeing impacts for each of the 2051 scenarios differs significantly in general accordance with the distribution of 2036-51 growth under that scenario:

- In Scenario 1 (existing HMA spatial pattern), impacts are relatively widespread across the entire HMA, with a degree of concentration around the north and west sides of the Leicester urban area and existing market towns.

- In Scenario 2 (current SGP spatial pattern), there is a much stronger focus of impacts around the south and east of the Leicester urban area, the Hinckley area and around the East Midlands Airport/Gateway area.

- In Scenario 3 (Majority Near Leicester), impacts are more heavily focussed on the hinterlands on all sides of the Leicester urban area.

- In Scenario 4 (New Market Towns), there is a relatively dispersed pattern of impacts, albeit emanating predominantly from the four new market town locations.

2.5.4. Notwithstanding these differences, a broad pattern common to all scenarios is an increase in orbital traffic movements around the edge of the Leicester urban area using lower-order/minor routes. This is indicative of a key gap in existing orbital transport

infrastructure in the near Leicester area, regardless of how long-term growth is distributed across the HMA.

Key Message: *Irrespective of how future growth is distributed across the HMA, significant investment should be focussed on improving orbital transport connectivity in the vicinity of Leicester.*

2.5.5. The outputs displayed in Chapter 7 show the impact of the passenger transport intervention packages on traffic flows and routeing within each of the four 2051 scenarios. Broadly speaking, the impacts are relatively limited and localised across the board, further supporting the analysis provided in paragraph 2.2.4 above in respect of these interventions.

2.5.6. All scenarios show a reduction in flows within the City of Leicester and northwards along the Soar Valley, through Loughborough and up to the East Midlands Airport/Gateway area as a result of the common/shared rail interventions package, with the reductions being slightly more pronounced in Scenarios 2, 3 and 4 as a consequence of the additional inclusion of new strategic site passenger transport links within these scenarios. Within Scenarios 2 and 4, there are also some notable localised flow changes in the vicinity of the strategic sites/new market towns included in these scenarios as a result of the additional passenger transport links associated with these sites.

2.5.7. The outputs displayed in Chapter 8 of the technical report show the impact of the strategic highway interventions packages on traffic flows and routeing within each of the 2051 scenarios. For all four scenarios, the outputs show that the corresponding highway interventions packages are generally effective in drawing traffic away from lower-order/minor routes and onto new and existing major/higher-order routes across the HMA.

2.5.8. The packages introduced for Scenarios 2 and 3 appear to provide the largest and most widespread relief to lower-order routes, with flow reductions apparent across all areas of the HMA. Conversely, the relief provided to lower-order routes provided by the packages introduced for Scenarios 1 and 4 appears to be relatively more contained to the north and western areas of the HMA. Additionally, the pattern of traffic flow impacts resulting from the Scenario 4 highway interventions appears to be more sporadic and less conclusively beneficial than the other three scenarios, suggesting that the individual interventions introduced for Scenario 4 work together less coherently as a package.

Key Message: *Scenarios 2 and 3 provide the greatest relief to lower-order roads (and communities located on these roads) at the HMA-wide scale*

2.5.9. Amongst the interventions variously included in the packages for the four scenarios were a new “west of Leicester link road” (included in Scenarios 1 and 3) and new “south and east of Leicester orbital road” (included in full in Scenarios 2 and 3 and in part in Scenario 4). Given the scale and step-change nature of the connectivity improvements

provided by these new links, more detailed analysis was undertaken to understand the nature of the travel demand and patterns of movement they are likely to cater for. The outputs of this analysis, displayed in Sections 8.5, 8.6 and 8.7 of the technical report, demonstrate that both of these interventions are catering overwhelmingly for 'local' traffic accessing and/or egressing locations within the HMA, as opposed to longer-distance regional and national traffic passing through the HMA en route to destinations further afield (which overwhelmingly continues to use the existing SRN). This finding correlates with the conclusions of the earlier A46 Stage 2 Study undertaken by Midlands Connect.

Key Message: *New highway links proposed as part of the strategic transport interventions packages predominantly serve 'local' (HMA-based) rather than 'longer-distance' (regional and national) travel demand. If taken forward, these interventions are therefore most likely to be locally led.*

2.6. Summary of Key Findings

2.6.1. The four 2051 scenarios have been ranked based on key statistical outputs associated with the findings summarised in sections 2.2 (overall network performance), 2.3 (potential for sustainable travel) and 2.4 (impact on congested junctions) of this report. The key outputs used to derive these rankings, and the corresponding figures and tables within the technical report, are set out in Table 5 below.

Table 5 – Outputs used to Rank the Scenarios by Topic

Topic	Key output(s) used as basis for ranking	Relevant Figures and Tables within the technical report
Overall network performance	• Average speeds • Aggregate congestion/ delays • Aggregate travel time	Figure 8.1. Table 8.1.
Potential for sustainable travel	• Aggregate travel distance • Vehicle trip length distribution • Change in vehicle trips due to sustainable interventions	Figures 5.2, 7.1 and 8.1. Tables 5.2, 7.1, 7.2 and 8.1.
Impact on congested junctions	• Number of congested junctions (>85% capacity)	Tables 5.3, 5.4, 5.5, 5.6, 7.3 and 8.2 NB – key outputs brought together in Table 4 of this report.

2.6.2. The results of the ranking exercise, set out in Table 6 below (and described in more detail within Chapter 9 of the technical report), indicate Scenario 2 (Current SGP Spatial Pattern) to be the best performing option overall ahead of Scenario 3 (Majority Near Leicester), with Scenarios 1 (Existing HMA Spatial Pattern) and 4 (New Market Towns) performing comparatively less well.

Table 6 – Ranking of Scenarios based on STA Stage 1 Modelling Outputs

Topic	**Ranking by Scenario**			
	1 – Existing HMA Spatial Pattern	**2 – Current SGP Spatial Pattern**	**3 – Majority Near Leicester**	**4 – New Market Towns**
Overall network performance	4	1	2	3
Potential for sustainable trav.	=2	=2	1	4
Impact on congested junct.	=3	1	2	=3
Average Score	**3**	**1.3**	**1.7**	**3.3**
Overall Ranking	**3**	**1**	**2**	**4**

2.6.3. The scenarios have not been ranked based on the key findings outlined in section 2.5 on the basis that the interpretation of the outputs relating to traffic flows and routeing[6] is a more qualitative, judgement-based exercise drawing on local knowledge and policy concerning the management of the HMA's road network. However, the section 2.5. findings closely align with the scores outlined in Table 6, with Scenarios 2 and 3 appearing to provide significantly better outcomes than Scenarios 1 and 4 in respect of traffic flow and routeing impacts, but relatively little to choose between 2 and 3 in this regard.

[6] In particular the outputs displayed in Figures 5.5, 5.7, 5.9, 5.11, 8.3, 8.6, 8.10 and 8.16 of the technical report.

3. Analysis and Conclusions

3.1. Overview

3.1.1. This chapter sets out the overall conclusions that have been reached on the relative merits of the four alternative spatial scenarios from a transport perspective.

3.1.2. These conclusions have been reached by undertaking a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of the four scenarios. The SWOT analysis draws the key findings from the STA Stage 1 modelling assessments (as summarised in Chapter 2 of this report) together with professional judgements on key wider considerations that have not been possible to assess or fully capture through the transport modelling process at this stage in the process, including:

- Broad scale of investment likely to be required in the transport network.
- Potential ability to secure developer funding and delivery of required transport infrastructure.
- Reliance on enhancements to national networks (SRN and rail) and thereby future policy decisions and/or investment opportunities relating to these.
- Alignment with HMA partners' wider policies and investment priorities
- Potential for self-containment and/or co-location of new housing and employment developments.
- Potential to achieve growth in accordance with net zero requirements.
- Potential to secure political and public support.

3.2. Conclusions Common to All Scenarios

3.2.1. The key findings from the STA Stage 1 model runs demonstrates that there is no 'silver bullet' long-term HMA-wide spatial strategy that results in significantly reduced transport impacts and requirements . This is unsurprising given the scale of forecast population growth/change and the attendant housing and job growth that it drives. Wherever growth takes place across the HMA, the headline scale and nature of resulting transport impacts are likely to be broadly the same and there will be a need for major transport investment and a package of strategic-scale transport interventions of one form or another, including non-SRN interventions (with the caveat that this is based on an assumed continuation of current societal and economic models and behavioural trends).

3.2.2. In general, the packages of strategic interventions assessed through 'Stage 1B' of the STA all appear to be effective in addressing the transport impacts of the corresponding 2051 growth scenarios (albeit there are apparent differences in the relative effectiveness of

these packages, as set out within Chapter 2 of this document and sections 3.3-3.6 below), and therefore provide a good first indication of the potential scale, nature and likely specific components of the strategic transport package that would need to be taken forward to facilitate the delivery of each growth scenario (or a combined/hybrid variation of these) in practice. This point is explored further in Chapter 4 of this document (Recommendations and Next Steps).

3.2.3. That said, the modelled effects of applying the strategic transport packages to all four 2051 growth scenarios shows that these packages alone are insufficient to return network performance to forecast 2036 core scenario (let alone 2021) levels. Correspondingly, the strategic transport packages assessed through Stage 1 of the STA do not represent a complete picture of the transport investment/interventions likely to be required in conjunction with any of the four growth scenarios, with a suite of further, more granular work needed to explore:

- The precise nature/form of the strategic interventions identified through the STA Stage 1 work.

- The full extent of opportunities for sustainable travel interventions – both at the strategic/HMA-wide scale (e.g. new rail or inter-urban bus connections) and more localised/smaller-scale levels (e.g. Local Cycling and Walking Infrastructure Plans – LCWIPs – and incremental passenger transport improvement packages), which could give rise to additional strategic interventions and/or reduce the need for some of the strategic highway interventions.

- More localised/smaller-scale highway interventions (e.g. 'pinch point'-style junction improvements, traffic calming packages) that may be needed to supplement the strategic interventions packages.

3.2.4. Notwithstanding the specific outcomes of the further work referred to above, none of the four scenarios are likely to be deliverable without providing major new road links in one form/location or another to overcome fundamental accessibility/connectivity gaps that currently constrain strategic development in some areas of the county. Conversely, these constraints will not realistically be possible to overcome through sustainable travel interventions alone – even with a very high level of uptake of sustainable modes, the scale of growth is such that there will be significant overall volumes and concentrations of new vehicular trips (including essential vehicular journeys which cannot realistically be transferred to sustainable modes, such as service/delivery trips), with appropriate routes/infrastructure needed to accommodate these journeys.

3.2.5. Whilst it is possible that there may be some differences in the quantum of costs between the potential strategic transport packages associated with each of the four scenarios, this is unlikely to be to a degree that is sufficient to be able to say that one or more of the scenarios is 'affordable' under current funding and investment models. To accommodate the level of population growth/change forecast, it is extremely likely to

require a level of investment (transport or otherwise) well beyond that experienced historically overall.

3.2.6. The identification of specific opportunities and mechanisms for securing the required transport investment are beyond the scope of this study, however, it is clear that a combination of both public and/or private funding sources will be required to achieve this level of investment, regardless of whether the specific infrastructure required is locally or nationally led. On that front, various Government funding pots have come and gone over the years associated with enabling the delivery of growth (e.g. Growth Deals and the Growth and Housing Fund) and supporting infrastructure requirements, including enhancements to both 'local' and 'strategic' transport networks (an example of a 'locally led' transport scheme within the HMA that has secured Government funding in recent years is the Melton Mowbray North and East Distributor Road). The same is likely to hold true for the future, and it is anticipated that such funding opportunities would be pursued wherever appropriate.

3.2.7. By extension, whilst the evidential findings are important, there needs to be a degree of subjective consideration, in particular with regard to whether one scenario is more or less deliverable in practice than another (including in respect of the funding and delivery of supporting strategic transport interventions for each scenario, noting that deliverability assessments have yet to be undertaken for any of the interventions) and whether a scenario has the potential to offer wider HMA benefits.

3.2.8. Whilst a relatively detailed point, nonetheless it is important to note that under all scenarios tested, 2051 traffic flows along the A50 corridor between the A46 and M1 (to the north west of Leicester) are suppressed beneath 2036 levels, whilst conversely there is an increase in traffic using lower-order routes running parallel to this corridor. This corroborates evidence from other sources (including the new Charnwood Local Plan and previous transport work undertaken by Hinckley and Bosworth Borough Council) indicating that further investment (i.e. above and beyond the A50/A511 Major Road Network scheme) is required to ensure that this important corridor continues to function effectively in the future.

3.2.9. The key commonalities between the four 2051 growth scenarios (and associated packages of strategic transport interventions) are set out in Table 7 below.

Table 7 – STA Stage 1 SWOT Analysis: Key Commonalities between Scenarios

Strengths: • All four 2051 growth scenarios represent a planned way to deal with the future needs of the HMA's forecast growing and changing population. • The accompanying packages of strategic transport interventions for each scenario are all effective in significantly improving overall network performance relative to the "do minimum" outcome.

Weaknesses:

- For all 2051 scenarios, transport network performance remains worse than the 2036 core scenario even after the application of strategic transport interventions.
- Strategic passenger transport measures have only very marginal impacts on HMA-wide traffic flows and congestion/delays.
- All of the scenarios would have major cumulative and cross-boundary impacts (both within and without Leicester and Leicestershire) that would require a strategic, cross-boundary approach and solutions to address.

Opportunities

- If planning reforms bring in a new form of HMA-wide 'developer levy', this might make it easier to secure 'developer contributions' in general.

Threats:

- Regardless of the preferred scenario, implementing a package of strategic transport interventions may not be universally supported by some local communities , especially where completely new (as opposed to upgraded existing) routes/infrastructure are required.
- All scenarios are (to varying extents) likely to require major additional investment in/additions to the existing SRN (over and above the RIS3 pipeline schemes), which may not align with current wider National Highways/central Government objectives for the SRN, impeding deliverability.
- Linked to the preceding point, there is a lack of certainty as to whether any of the RIS3 pipeline schemes (M1 Leicester western access; M1 Leicester north additional capacity; A5 Tamworth to Hinckley) will proceed.
- Whichever scenario is chosen, further work will be needed to establish how (from a transport perspective) it could be delivered in a way that fully aligns with climate change/net zero objectives, albeit some scenarios may offer greater benefits than others in this regard (as explored further in sections 3.3 to 3.6 below).

3.3. Scenario 1 (Continuation of Existing HMA Spatial Pattern) Conclusions

3.3.1. Scenario 1 reflects a known proposition that has underpinned HMA plan-making for some time now, albeit this should not lead to an assumption that it would be an easy approach to continue with going forwards (either by intent or default). Conversely, based on the evidence produced through Stage 1 of the STA, it appears likely that a step-change in the nature and scale of transport interventions would be required to accommodate a continuation of the existing HMA spatial pattern in comparison to historic implementation. However, the Stage 1 outputs (especially those summarised in section 2.5) suggest that there is a risk that the potential interventions identified for Scenario 1 would do little more

than enable the growth, and would provide fewer wider connectivity benefits to the HMA than those identified for other scenarios.

3.3.2. Under Scenario 1, the key concentrations of growth and potential strategic transport interventions would be relatively well related locationally, and certainly more so in this regard than Scenario 4 (New Market Towns), which is likely to aid the process of securing 'developer contributions' (especially compared to Scenario 4). That said, this could be counteracted somewhat by the reliance on piecemeal, smaller scale developments as opposed to larger strategic sites with greater infrastructure delivery potential, particularly in comparison to scenarios 2 (Current SGP Spatial Pattern) and 3 (Majority Near Leicester). Compared with Scenario 2, Scenario 1 is also likely to be more reliant on major enhancements to the existing SRN, with the potential risk that the specific measures needed to facilitate HMA growth do not align with wider national objectives and priorities for those parts of the SRN.

3.3.3. In conclusion, no compelling case has been identified for pursuing Scenario 1 in preference to the current Strategic Growth Plan spatial strategy from a transport perspective. The full range of points underpinning this conclusion are set out in Table 8 below.

Table 8 – STA Stage 1 SWOT Analysis: Scenario 1 (Continuation of Existing HMA Spatial Pattern)

Strengths: • Scenario 1 is a continuation of what has been done previously within the HMA. • Avoids the harder conversations related to collectively meeting HMA housing need. • Theoretical potential for sustainable travel is comparable to Scenarios 2 and 3 and notably better than Scenario 4. • Required interventions may be somewhat less controversial than for Scenarios 2, 3 and 4, as they primarily comprise upgrades rather than entirely new transport corridors and infrastructure.
Weaknesses: • The transport interventions required to perpetuate the existing HMA spatial pattern are much greater this time around. • More reliant on upgrades to the existing Strategic Road Network than Scenario 2. • Very limited benefits for traffic levels in the City of Leicester • The dispersed growth pattern – both in terms of the spread across settlements and reliance on smaller scale sites – would make it more difficult to secure and coordinate the funding and delivery of the required transport measures.

• The expenditure on transport measures will only accommodate the impact of growth, with fewer if any wider connectivity benefits across the HMA when compared with Scenarios 2 and 3.
Opportunities • The main concentrations of growth within this scenario are relatively close to areas where necessary transport measures are anticipated, which is likely to aid the process of securing 'developer contributions', especially compared to Scenario 4.
Threats: • Notwithstanding the corresponding strength, there is still potential controversy arising from the supporting package of strategic transport interventions, especially where completely new (rather than upgraded) routes/infrastructure are required. • The required extent of upgrades to the existing SRN as part of the above may not align with wider National Highways/central Government objectives for the SRN, impeding deliverability. • Given that Scenario 1 comprises a relatively more scattered, piecemeal and small-scale site-based pattern of development in comparison to the other scenarios, further work may be needed to establish how (from a transport perspective) this scenario could be delivered in a way that fully aligns with climate change/net zero objectives.

3.4. Scenario 2 (Current SGP Spatial Pattern) Conclusions

3.4.1. Scenario 2 closely reflects the spatial philosophy of the existing SGP, adopted by the Partnership in 2018.

3.4.2. Overall network performance under this scenario is not markedly different from Scenarios 1 (Existing HMA Spatial Pattern) and 3 (Majority Near Leicester), albeit this conclusion is built on the assumption of the provision of 'strategic' scale transport infrastructure currently lacking to the south and east of the Leicester urban area and the provision of further interventions to address constraints in the M1 Junction 24 area.

3.4.3. The funding and delivery of such interventions is likely to be aided by the fact that they would be relatively well related to the key concentrations of growth in locational terms, and certainly more so in this regard than Scenario 4 (New Market Towns), which is likely to aid the process of securing 'developer contributions' (especially compared to Scenario 4). Furthermore, Scenario 2 is likely to be less reliant on major upgrades to the existing SRN than any of the other options, with proposed new highway links overwhelmingly catering for traffic 'local' to the HMA (as opposed to regional and national through-traffic). This indicates that any new highway links would most likely be taken forward as local schemes (as per the example of the North and East Melton Mowbray Distributor Road described in paragraph 3.2.6 above) rather than SRN schemes, providing greater flexibility to tailor any such

interventions towards HMA-level priorities and benefits (in terms of design, phasing and timing).

3.4.4. Nevertheless, the required investment footprint is spread over a larger geographic area than Scenario 3 (albeit less so than Scenario 4), which could, potentially, make it more complex to coordinate the delivery of growth across the HMA than in comparison to Scenario 3. Conversely, the relative spatial spread of growth and transport infrastructure in comparison to Scenario 3 appears better placed to provide flexibility and avoid excessive reliance on any one area/piece of infrastructure (i.e. 'putting all your eggs in one basket') to accommodate such growth.

3.4.5. Without concentrating growth quite as heavily in the near Leicester area as Scenario 3, Scenario 2 is nevertheless likely to offer significant opportunities for more 'local' trips to take place by sustainable modes by focussing growth on strategic scale sites in three strategic locations (i.e. the south and east of Leicester 'Priority Growth Corridor', the 'Hinckley Cluster' and the 'International Gateway'). In that regard, Scenario 2 appears likely to offer greater potential to achieve net zero commitments/requirements than either Scenarios 1 or 4, with a less clear-cut balance of advantages and disadvantages compared to Scenario 3.

3.4.6. In conclusion, a pattern of growth as identified in the Strategic Growth Plan performs comparatively well when compared to the other tested scenarios. . The full range of points underpinning this conclusion are set out in Table 9 below.

Table 9 – STA Stage 1 SWOT Analysis: Scenario 2 (Current SGP Spatial Pattern)

Strengths: • Scenario 2 is a known proposition, the scenario reflecting a pattern of growth included in the published SGP as approved by the L&L Partnership. • Theoretical potential for sustainable travel is comparable to Scenarios 1 and 3 and notably better than Scenario 4. • The strategic transport interventions package introduced for Scenario 2 has more widespread (beneficial) impacts on traffic flows and routeing than Scenarios 1 and 4, and broadly similar impacts to Scenario 3. • The strategic transport interventions required to support scenario 2 will likely be less reliant on upgrades to the existing SRN than any of the other scenarios. This minimises potential conflicts with central Government/ National Highways objectives for the SRN and maximises the potential to tailor completely new infrastructure (in terms of design, phasing and timing) to meet HMA objectives, including accommodating growth.
Weaknesses: • Current lack of strategic transport infrastructure to the south and east of the Leicester urban area, where proposed growth is most heavily concentrated within this scenario.

- Focusses significant growth in the area around M1 Junction 24, which is already under significant transport pressures (albeit pressures are likely to increase in any event due to planned strategic employment developments in this area – as explored further under Scenario 2 'opportunities' below).

Opportunities

- In the event that National Highways' RIS3 pipeline project "M1 Leicester western access" does not proceed (as raised as a potential threat to all scenarios in Table 7 above), a proposal for a new M1 Junction 20a (as included in this scenario) could offer an alternative solution to current and future issues in and around M1 Junction 21, and thus offer some wider HMA benefits.

- The main concentrations of growth within this scenario are relatively close to areas where necessary transport measures are anticipated, which is likely to aid the process of securing 'developer contributions', especially compared to Scenario 4.

- Increased concentration of growth close to Leicester (as key provider of jobs and services to the HMA) relative to Scenarios 1 and 4 is likely to provide greater opportunities for 'local', shorter-distance trips to take place by sustainable modes than these scenarios.

- Heavy emphasis on strategic sites (especially those in the 'near Leicester' area) is likely to provide the greatest opportunities for major new/step-change in passenger transport provision, with the STA Stage 1 outputs suggesting this would result in additional sustainable travel and network performance benefits over other Scenarios.

- Provided that new strategic sites are comprehensively masterplanned, Scenario 2 offers the greatest potential to secure onsite employment opportunities and services, and thereby the internalisation of trips, especially compared to Scenarios 1 and 3.

- Strategic sites included in scenario 2 would be more accessible to higher order job opportunities and services in existing settlements than the new standalone settlements included in scenario 4 would be.

- Focussing significant proportions of growth around the "Leicestershire International Gateway" and "Hinckley Cluster" would co-locate housing with emerging strategic employment proposals in these areas. Given the plans for the Gateway and Cluster are independent of the SGP, Scenario 2 increases the opportunities to encourage sustainable travel to/from these proposals.

- Based on the preceding points, scenario 2 may offer greater scope to achieve climate change/net zero commitments and requirements, than scenarios 1 or 4.

Threats:

- To achieve their envisaged functions/roles in the HMA, the new strategic sites would require a significant scale and range of on-site employment and services/facilities.

This would include creating sustainable travel connections to key "parent" settlements, to be brought forward alongside new homes.

- The package of strategic transport interventions required to support this scenario may be more controversial than other scenarios (especially Scenario 1), especially where completely new routes/infrastructure are required (in contrast to upgrading the existing network).

- The potential need for new road building within the Leicester urban area – i.e. to complete the 'missing link' in the Leicester Outer Ring Road – may be challenging to align with the City of Leicester's wider approach to managing its transport network.

- Uncertainty resulting from the cancellation of HS2 eastern leg and the implications for East Midlands Parkway.

3.5. Scenario 3 (Majority Near Leicester) Conclusions

3.5.1. Scenario 3 builds on known propositions by combining key elements of Scenarios 1 and 2 (by focussing growth on all sides of the 'near Leicester' area.

3.5.2. Broadly speaking, the key strengths of and opportunities arising from Scenario 3 are similar to those for Scenario 2. By placing a larger proportion of development close to Leicester than all other scenarios, Scenario 3 is thus likely to provide the most significant opportunities for more 'local' trips to take place by sustainable modes. In that regard, Scenario 3 appears likely to offer greater potential to achieve net zero commitments/requirements than either Scenarios 1 or 4, with a less clear-cut balance of advantages and disadvantages compared to Scenario 2 due to the reduced emphasis on strategic sites under Scenario 3 compared to Scenario 2.

3.5.3. However, Scenario 3 is likely to be reliant on a 'double dose' of highway investment in the Leicester area (i.e. a new route to south and east of Leicester and a new West of Leicester link road and strategic upgrades to the existing A46 corridor). This could potentially make it more complex to coordinate the delivery of growth around Leicester in comparison to Scenario 2. By extension, Scenario 3 is likely to be more reliant on major enhancements to the existing SRN than Scenario 2, with the potential risk that the specific measures needed to facilitate HMA growth do not align with wider national objectives and priorities for those parts of the SRN.

3.5.4. Of the four scenarios assessed through the STA, Scenario 3 is most reliant on the delivery of growth and accompanying strategic transport infrastructure in a single area of the HMA (i.e. it comes closest to an 'all eggs in one basket' approach), with associated risks. In conclusion Scenario 3 performs well compared to Scenario 4 and whilst to a lesser degree, also performs well compared to Scenario 1. On balance, Scenario 3 performs less well than Scenario 2 overall. The full range of points underpinning these conclusions are set out in Table 10 below.

Table 10 – STA Stage 1 SWOT Analysis: Scenario 3 (Majority Near Leicester)

Strengths:

- Scenario 3 builds on known propositions, i.e. combining certain elements of the existing HMA spatial pattern with certain elements of the current SGP spatial pattern.
- Theoretical potential for sustainable travel is comparable to Scenarios 1 and 2 and notably better than Scenario 4.
- The strategic transport interventions package introduced for Scenario 3 has more widespread (beneficial) impacts on traffic flows and routeing than Scenarios 1 and 4, and broadly similar impacts to Scenario 2.
- Provides the most compact investment footprint of the four scenarios (i.e. strategic transport interventions are focussed largely around the near Leicester area), benefitting the potential to collect developer contributions towards such investment.

Weaknesses:

- Current lack of strategic transport infrastructure to the south and east of the Leicester urban area, where proposed growth is heavily concentrated within this scenario.
- By extension, Scenario 3 is likely to be reliant on a 'double dose' of highway investment in Leicester area, i.e.: a route to the south and east of the Leicester urban area (on a similar scale to that proposed for Scenario 2) whilst also requiring a West of Leicester link load and strategic upgrades to existing A46 corridor.
- More reliant on upgrades to the existing SRN than Scenario 2, with accompanying risks/threats (see below).

Opportunities

- In the event that National Highways' RIS3 pipeline project "M1 Leicester Western Access" does not proceed (as raised as a potential threat to all scenarios in Table 7 above), a proposal for a new M1 Junction 20a (as included in this scenario) could offer an alternative solution to current and future issues in and around M1 Junction 21, and thus offer some wider HMA benefits.
- The main concentrations of growth within this scenario are relatively close to areas where necessary transport measures are anticipated, which is likely to aid the process of securing 'developer contributions', especially compared to Scenario 4.
- Of the four scenarios, places the greatest level of growth close to Leicester (as key provider of jobs and services to the HMA) and is therefore likely to provide the most significant opportunities for 'local', shorter-distance trips to take place by sustainable modes.
- Greater emphasis on new strategic sites than Scenario 1 which, if comprehensively masterplanned, would increase the ability compared with Scenario 1 to secure onsite

employment opportunities, services and sustainable travel links, as well as new high-quality passenger transport links to key wider destinations.

- Strategic sites included in Scenario 3 would be more accessible to higher order job opportunities and services in existing settlements than the new standalone settlements included in Scenario 4 would be.

- Based on the preceding points, this scenario may offer the greatest scope to achieve climate change and net zero commitments/requirements of all the scenarios assessed through the STA, albeit the advantages over Scenario 2 are less clear-cut, given the relatively lesser emphasis on strategic sites and co-location of growth with major economic/employment opportunities away from the Leicester Urban Area, than under Scenario 2.

Threats:

- To achieve their envisaged functions/roles in the HMA, the new strategic sites would require a range of large scale on-site employment and services/facilities. This would include creating sustainable travel connections to key "parent" settlements, to be brought forward alongside new homes.

- It may ultimately be more challenging to address residual impacts of this scenario to the same extent as other scenarios, given the relative intensity and concentration of impacts within the Leicester urban area, and greater physical constraints within this area.

- The package of strategic transport interventions required to support this scenario may be more controversial than other scenarios (particularly compared to Scenario 1), especially where completely new routes/infrastructure are required (in contrast to upgrading the existing network).

- The required extent of upgrades to the existing SRN as part of the above may not align with wider National Highways/central Government objectives for the SRN, impeding deliverability.

- The potential need for new road building within the Leicester urban area – i.e. to complete the 'missing link' in the Leicester Outer Ring Road – may be challenging to align with the City of Leicester's wider approach to managing its transport network.

3.6. Scenario 4 (New Market Towns) Conclusions

3.6.1. Scenario 4 represents the most radical departure from known propositions of all options tested through Stage 1 of the STA, seeking to concentrate growth at four new freestanding towns at various locations within the HMA.

3.6.2. Whilst there is the potential for some localised sustainable transport opportunities to be realised, the STA Stage 1 outputs indicate that there would be a large demand for travel between the new market towns and existing settlements (especially to Leicester and the

existing market towns within the HMA), resulting in a notably higher proportion of longer-distance car trips (>10km) than all other scenarios. This is unlikely to be offset by any limited additional self-containment benefits such new settlements may have over alternative approaches in practice, certainly in comparison to Scenarios 2 (Current SGP Spatial Pattern) and 3 (Majority Near Leicester) which also seek to concentrate growth at large strategic sites to varying degrees. By extension, Scenario 4 does not appear well placed to support the realisation of net zero commitments/requirements in comparison to other scenarios and especially Scenarios 2 and 3. The scale of development required to achieve a high degree of self-containment (i.e. a critical mass of housing, plus sufficient scale and breadth of onsite job opportunities and facilities) is also likely to be a major deliverability challenge, at least within the timescales of the SGP.

3.6.3. The pattern of impacts arising from this scenario is relatively dispersed (especially compared to Scenarios 2 and 3) and is likely to require transport interventions in areas much further removed from the key growth locations (i.e. the new market towns) than under Scenarios 1, 2 and 3, which is in turn likely to make the securing of 'developer contributions' towards these interventions comparatively less easy to achieve than under the other scenarios. Furthermore, the impacts of the resulting Scenario 4 strategic interventions package appear to be more sporadic and less conclusively beneficial than the equivalent packages for the other three scenarios, suggesting that the individual interventions introduced for Scenario 4 work together less coherently as a package.

3.6.4. By extension, the package appears to provide fewer wider connectivity benefits to the HMA than the equivalent investment for Scenarios 2 and 3. Whilst it appears possible that the overall cost of required 'off-site' transport investment could be lower than for other scenarios, there is a risk/threat that this could be offset by higher costs of establishing all infrastructure required to deliver the new freestanding settlements. Additionally, compared with Scenario 2, this scenario is likely to be more reliant on major enhancements to the existing SRN, with the potential risk that the specific measures needed to facilitate HMA growth do not align with wider national objectives and priorities for those parts of the SRN.

3.6.5. In conclusion, Scenario 4 performs less well in comparison to the other scenarios and is potentially the most complex and challenging of the four scenarios to deliver from a transport perspective (and potentially in other respects too), with the associated inherent risks were this to be chosen as a replacement for the current Strategic Growth Plan spatial strategy. The full range of points underpinning this conclusion are set out in Table 11 below.

Table 11 – STA Stage 1 SWOT Analysis: Scenario 4 (New Market Towns)

Strengths: • The overall quantum of cost of the package of transport interventions could be less than some other scenarios.
Weaknesses: • Radical departure from both the existing HMA spatial pattern and the current SGP spatial pattern, which could add complexity and time to actual delivery.

- Theoretical potential for sustainable travel is notably worse than all other scenarios, with a significantly higher proportion of longer-distance trips (>10km) driven by demand for access to existing settlements across the HMA and beyond, especially Leicester, suggesting the scale of the new settlements proposed under this scenario are only likely to have limited self-containment benefits.

- Traffic impacts of growth are more dispersed across the HMA than other scenarios, but at a headline level are generally still of the same quantum and arise in many of the same key locations (especially around the Leicester urban area) as the other scenarios, despite the increased distance from strategic growth locations.

- Appears to have very limited benefits for traffic levels in the City of Leicester (albeit the focus of this work is at a very strategic level).

- Of the four scenarios, Scenario 4 has the greatest potential impact on lower category roads, even with strategic interventions in place, especially in Harborough District and the area between Loughborough and A46.

- The impacts of the Scenario 4 strategic interventions package appear to be more sporadic and less conclusively beneficial than the equivalent packages for the other three scenarios, suggesting that the individual interventions introduced for Scenario 4 work together less coherently as a package.

- By extension, the package appears to provide fewer wider connectivity benefits to the HMA than the equivalent investment for Scenarios 2 and 3.

- More reliant on upgrades to the existing SRN than Scenario 2, with accompanying risks/threats.

<u>Opportunities</u>

- Comprehensive, ‘market town scale’ new settlements could provide alternative locations for people living in the vicinity to access jobs and services nearby, potentially enabling shorter, local journeys to be made by modes other than car, to the potential benefit of net zero commitments/requirements. However, there are likely to be lower levels of internal trips and fewer opportunities for achieving significant changes in modal travel splits than for Scenarios 2 and 3.

<u>Threats:</u>

- Potential sensitivities arising from radical departure in the distribution of growth across HMA compared either to existing Local Plans or the established concept of the current SGP distribution approved in 2018.

- In order to realise the vision of self-contained new market towns, as opposed to isolated dormitory communities, a large scale and wide range of on-site employment and services/facilities commensurate with this would need to be brought forward

alongside new homes, which could be challenging to coordinate and deliver within the timeframes of the SGP.

- Any benefits of a lesser cost of 'off-site' transport measures (as referenced in "strengths" above) could be off-set by higher costs of establishing all infrastructure required to deliver new settlements, in comparison to other scenarios.

- The pattern of impacts arising from this scenario is relatively dispersed, especially compared to scenarios 2 and 3, and is likely to require transport interventions in areas much further removed from the key growth locations (i.e. the new market towns) than under scenarios 1, 2 and 3, which is in turn likely to make the securing of 'developer contributions' towards these interventions comparatively less easy to achieve than under the other scenarios.

- The supporting package of strategic transport interventions may be more controversial, especially where completely new routes/infrastructure are required, in comparison to upgrading the existing network.

- The required extent of upgrades to the existing SRN as part of the above may not align with wider National Highways/central Government objectives for the SRN, impeding deliverability.

- The potential need for new road building within the Leicester urban area – i.e. to complete the 'missing link' in the Leicester Outer Ring Road – may be challenging to align with the City of Leicester's wider approach to managing its transport network.

3.7. Summary

3.7.1. Overall, the conclusions reached through STA Stage 1 support a continuation of the current SGP spatial pattern as the basis for any reviewed and updated version of the SGP. The key aspects that set the current SGP spatial pattern apart from the various alternatives are:

- Opportunities to encourage sustainable travel.

- Ability to locate strategic growth and transport infrastructure requirements in close proximity to one another, such that developer funding and/or delivery of such infrastructure can be maximised.

- The relative effectiveness and wider benefits (i.e. over and above serving/accommodating new growth) of the supporting strategic transport infrastructure.

A summary of how the four scenarios assessed through STA Stage 1 compare in respect of these three aspects are provided in Table 12 below.

3.7.2. Whilst there is no ‘silver bullet’ HMA-wide spatial strategy that is capable of ‘easily’ and/or ‘cheaply’ accommodating the scale of envisaged population growth to 2051, it is clear that planning strategically across the HMA will deliver the best outcomes. Furthermore, the STA Stage 1 findings indicate that:

- focussing growth close to Leicester is generally more appropriate in transport terms than locating such growth across more rural areas of the HMA (either through a dispersed pattern or focussing growth at specific, isolated rural locations) and

- focussing growth at well-located, larger strategic sites as far as possible will create greater opportunities to mitigate transport impacts and secure wider transport connectivity benefits than more disparate patterns of growth, noting that Scenario 2 (current SGP Spatial Pattern) combined these two attributes to a greater extent than the other three scenarios.

3.7.3. The scale and nature of the strategic transport interventions/infrastructure required to support any of the scenarios would require a level of investment beyond that historically seen and is therefore not a significant differentiator between the various scenarios. However, that investment will not be required all in one go and upfront: it will instead need to be prioritised/phased and secured over the lifetime of the SGP, with a planned and coordinated approach presenting the greatest opportunities to achieve this.

Table 12 – Summary of Key Transport Differentiators between STA Stage 1 Scenarios

Key Differentiator	Scenario 1 (Existing HMA Spatial Pattern)	Scenario 2 (Current SGP Spatial Pattern)	Scenario 3 (Majority Near Leicester)	Scenario 4 (New Market Towns)
Opportunities to maximise sustainable travel	MEDIUM - Sustainable travel improvements are likely to be more incremental/ piecemeal in nature than other scenarios	HIGH - Emphasis on strategic sites in specific growth clusters is likely to present the greatest opportunities for 'step change' investment in sustainable travel and reducing the need to travel	HIGH - Maximises growth around the HMA's main urban area, where there are opportunities to provide strong sustainable travel connections to employment, services etc.	LOW – new market towns would be heavily reliant on Leicester and existing Market Towns for jobs, services etc., generating more longer-distance trips that are harder to shift to sustainable modes of travel.
Ability to maximise developer funding/ delivery of strategic transport infrastructure	MEDIUM – Whilst strategic interventions are relatively well related to growth, relatively 'scattered', piecemeal growth pattern relative to other scenarios may make it more difficult to secure contributions	HIGH – Strategic interventions well related to key growth clusters, maximising scope for contributions. Emphasis on strategic sites creates greater opportunities for developer-led delivery of key components than other scenarios.	MEDIUM – As per Scenario 2, however the greater emphasis on the near Leicester area is likely to necessitate 'double dose' of strategic transport investment in Near Leicester area compared with Scenario 2 – i.e. danger of 'all eggs in one basket'.	LOW – Strategic interventions generally more distant from key growth areas than other scenarios, making developer funding/delivery more difficult to achieve.
Effectiveness and wider benefits of strategic transport infrastructure	LOW – Help to accommodate growth but with limited wider connectivity benefits compared to other scenarios.	HIGH – Provides greatest levels of relief and wider connectivity benefits for the HMA as a whole of all scenarios.	MEDIUM – Similar to Scenario 2, but with connectivity benefits more tightly focussed on Near Leicester area.	LOW – Most fragmented package of all scenarios, albeit still has some limited wider connectivity benefits.

4. Recommendations and Next Steps

4.1. Using the Key Findings and Conclusions of STA Stage 1

4.1.1. The various outputs, analysis and conclusions presented within both this report and the more detailed accompanying 'technical report' are intended to inform future decisions of the Leicester and Leicestershire Strategic Planning Partnership regarding the preferred HMA-wide spatial distribution to 2051, which will in turn form the basis for the SGP and Local Plans across the HMA going forward. It should be noted, however, that the analysis and conclusions provided within this report are from a transport perspective and will need to be drawn together and considered in conjunction with wider strategic factors, drawing on wider strategic work undertaken to support the SGP (such as the *Strategic Growth Options and Constraints Mapping for Leicester and Leicestershire* (SGO) Study referenced in section 1.5 above) as appropriate.

4.1.2. Once the preferred approach to HMA-wide spatial distribution is decided by the Partnership, it is assumed that this will be used as a basis for strategic planning through future local plans across the HMA, and that the STA Stage 1 reports will be part of the evidence used to support this approach. Conversely, it is assumed that it will thereafter not be necessary to further test the principle (at least in transport terms) of the approach to HMA-wide spatial distribution through Local Plans.

4.1.3. If one of the four scenarios assessed through Stage 1 of the STA is chosen by the Partnership as the preferred option in broad terms (i.e. either unamended, or with only relatively minor, strategically insignificant alterations to the distribution tested), it is recommended that the package of strategic transport interventions corresponding to that scenario should be adopted as the starting point for the HMA-wide transport mitigation strategy for either the current SGP spatial distribution or a subsequent revision thereof. Whilst further refinement of the package's content will be required and work will also ultimately be needed to reach definitive conclusions about the need for each intervention and the specific form they might take, the STA Stage 1 provides evidence to support proceeding on this basis.

4.1.4. Conversely, if a hybrid/composite scenario is chosen by the Partnership as the preferred scenario (i.e. combining different elements of the four scenarios and/or other significant alterations, such that the chosen strategy is a significant departure from any of them), further analysis of the STA Stage 1 outputs will likely be needed to identify the package of strategic transport interventions that should be adopted as a starting point for the HMA-wide transport mitigation strategy.

4.1.5. Whichever HMA-wide spatial distribution is chosen, the accompanying package of strategic transport interventions will need to be taken into account through future Local Plans, to identify;

- Any “early priority” components of the strategic package that will need to be delivered to support growth during the next local plan period (i.e. Local Plans extending into the period 2036-41) and therefore included in local plan infrastructure schedules.

- Longer-term elements of the strategic package that will not be necessary (or in some cases possible) to deliver during the next local plan period, but where policies may need to be included in emerging local plans to safeguard their potential longer-term delivery.

4.2. Proposed Future Work

4.2.1. As set out previously in section 1.3. of this report, the planned Stage 2 of the STA will assess the strategic transport impacts and requirements arising from the preferred long-term HMA spatial distribution. However, this can only progress once the Partnership has agreed the details of the preferred scenario and associated assumptions to include in the Stage 2 transport modelling.

4.2.2. Whilst the STA (both Stages 1 and 2) is intended to provide a robust high-level transport evidence base, either to support the principle of the current SGP spatial distribution or an agreed alternative long-term HMA spatial distribution, it will not provide the level of detail required to support the SGP’s delivery. To this end, a suite of more granular work will be required to explore the forecast transport impacts in more detail: identify the precise nature/form of the strategic transport interventions identified through the STA, including their deliverability, viability and possible funding routes; assess the full extent of opportunities for sustainable travel interventions and; identify additional requirements for more localised/smaller-scale highway interventions. This more granular work will need to be progressed incrementally (as resources and wider decision-making allows) and in some cases in parallel with Stage 2 of the STA. The various levels and types of work include:

- Further HMA-wide studies such as the proposed Strategic Passenger Transport Study (as described in paragraph 1.4.2), which is expected to progress in parallel with Stage 2 of the STA.

- Work undertaken as part of Local Plans. As set out in paragraph 1.4.3, it is likely that most future work at this level will need to be carried out on a cross-boundary basis.

- Development of area transport strategies to support Local Plan delivery.

- Development of Local Cycling and Walking Infrastructure Plans (LCWIP).

- Relevant work undertaken by national and regional partners – e.g. Midlands Connect, National Highways.

- Relevant work undertaken by developers in support of planning applications and local plan promotions.

4.2.3. It will be necessary to ensure that the various levels and types of work referred to above have full regard to and are consistent in their approach, inputs and assumptions in respect of the SGP's spatial distribution. To this end, it is recommended that such work should be aligned with the most recent (completed or ongoing) HMA-wide transport evidence.

4.2.4. A key area where Stage 1 of the STA will feed into the more granular transport studies outlined in paragraph 4.2.2 concerns the potential strategic transport interventions identified through this work. In particular, future Local Plan-level studies will need to identify which of these interventions will be required (in part or whole) to support growth during the next plan period and (by elimination) the remaining interventions that will need to be safeguarded through future rounds of Local Plan making to facilitate their potential delivery during subsequent plan periods/later stages of the SGP. In turn, this will inform the content and timing of further, even more focussed transport work required to support Local Plan delivery.

4.2.5. It is anticipated that the suite of more granular work will ultimately allow the potential scale of strategic highway interventions identified through Stage 1 of the STA to be reduced at least to some degree. Equally, it is possible that there will be significant societal/behavioural, economic and technological changes over the lifetime of the SGP that lead to changes in the precise nature/extent of transport interventions needed. However, the approach outlined above represents the most robust basis to plan for the future at this point in time.

Appendix A

Leicester and Leicestershire Strategic Growth Plan (SGP) Strategic Transport Assessment (STA) Stage 1: Assessment of Alternative Options – Technical Report

Leicestershire County Council

Environment and Transport Commissioning Framework

Leicester and Leicestershire Strategic Growth Plan – Strategic Transport Assessment, Stage 1

Final Technical Report

Date: October 2023
Project Code: 3360.123

Leicestershire County Council

Document Sign-off

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0.2	08/02/2023	First draft for Leicestershire County Council Transport Strategy and Policy Team review	JR/PCB	RJB		
0.3	15/03/2023	Second draft for further Leicestershire County Council Transport Strategy and Policy Team comments	JR/PCB	RJB		
0.4	24/03/2023	Final draft for further Leicestershire County Council Transport Strategy and Policy Team comments	JR/PCB	RJB		
1.0	26/04/2023	First draft for Leicester and Leicestershire Strategic Planning Partnership and wider stakeholder review	JR/PCB	RJB	RJB	RJB
1.1	13/06/2023	Second draft for further L&L Strategic Planning Partnership and wider stakeholder comments	PCB	JR/RJB	RJB	RJB
1.2	05/07/2023	Third draft for further L&L Strategic Planning Partnership and wider stakeholder comments	PCB	JR/RJB	RJB	RJB
1.3	31/08/23	Fourth draft for further L&L Strategic Planning Partnership and wider stakeholder comments	PCB			PCB
1.4	20/09/23	Fifth draft for further L&L Strategic Planning Partnership and wider stakeholder comments	PCB	JR		PCB
1.5	04/10/23	Final version	PCB	JR/RJB		PCB

Model Version

Model:	PRTM2.3
Constrained / NTEM minimum:	NTEM-Minimum
Planning Data:	HH50 Emp51
SATURN Version:	11.4.07H

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1. Introduction

1.1. Background

1.1.1. Leicestershire County Council's (LCC's) Network Data & Intelligence (NDI) consultants have been commissioned by the Leicester and Leicestershire Strategic Planning Partnership, hereafter referred to simply as "the Partnership", to provide transport evidence to inform the review and future development of the Leicester and Leicestershire Strategic Growth Plan (SGP).

1.1.2. This work relates to reports taken to the Partnership in July and September 2020 concerning the emerging work programme for the SGP. It forms part of a package of 'short term' high-priority transport project/tasks, which in the view of LCC, as the county Highway Authority, should be taken forward by Spring 2023 to support implementation of the initial phase of the SGP.

1.1.3. The current SGP, which was adopted by the Partnership in 2018, identifies a high-level spatial distribution for growth across the Leicester and Leicestershire Housing Market Area (HMA) out to 2051. In doing so, the SGP is intended to guide the development of Local Plans across the HMA and approaches to dealing with cross-boundary strategic matters arising from this.

1.1.4. At the time of writing, the Partnership are in the early stages of reviewing and updating the SGP, to ensure that it continues to represent an appropriate long-term growth strategy for the HMA (and if not, to identify an appropriate alternative strategy). To inform this process, the Partnership identified the need for additional evidence, including a HMA-wide Strategic Transport Assessment (STA) to compare the current SGP spatial distribution against a range of potential alternative HMA-wide spatial distributions to 2051.

1.1.5. Accordingly, this work – Stage 1 of the STA – is centred on assessing and comparing the respective transport implications of the four HMA-wide growth scenarios between 2036 and 2051, as follows:

Scenario 1: Continuation of existing HMA spatial pattern
Scenario 2: Current (2018) Strategic Growth Plan
Scenario 3: Majority Near Leicester
Scenario 4: New Market Towns

1.1.6. These scenarios have been identified to test different patterns of HMA growth involving a continuation of the Local Plan spatial patterns implemented over the past 20 to 30 years, adoption of the distribution associated with the 2018 Strategic Growth Plan, a majority concentration of growth in the near Leicester area and a growth focus in 4 new 'freestanding' market towns.

1.1.7. The study applies Leicestershire County Council's bespoke Pan Regional Transport Model (PRTM) to provide high-level 2051 transport forecasts of each development scenario from which a series of strategic passenger transport (PT) and highway interventions are defined and tested.

1.2. Model Overview

1.2.1. For this assessment it has been agreed that only the PRTM2.3 highway model needs to be used for the initial high-level sifting of growth scenarios during Stage 1 of the STA. Whilst the 'full' model is expected to be used to generate future forecast travel demand during Stage 2, the highway model was selected as the most appropriate and proportionate assessment tool for Stage 1, due to its relative expediency and transparency of both model inputs and outputs compared to the full model.

1.2.2. With regards to forecasting assumptions, the PRTM is available to use with either 'NTEM[1] Constrained' or 'NTEM Minimum' (previously called 'Unconstrained') planning data inputs.

- The 'NTEM Constrained' scenario has planning data which is capped to NTEM v7.2 growth rates for all districts within the County; this is largely used for funding bids/Business Cases, where there is a need for consistency of growth assumptions to allow a fair funding allocation process.
- The 'NTEM Minimum' version allows planning policy projections to be fully built out and is not capped to NTEM levels. However, if this level of projected growth is below the NTEM projected growth rate for a District within Leicestershire, then growth is uplifted to the NTEM 'minimum' level predicted. This is useful for testing highway impacts in a context where the Leicestershire Districts' growth plans are fully realised, and thus adds a higher amount of demand.

1.2.3. For this project, modelled data will be provided from the 'NTEM Minimum' version.

1.3. Report Structure

1.3.1. Section 2 details the calibration/validation of the model across Leicestershire and details the planning and infrastructure assumptions included in the modelling scenarios (based on information received in 2021 from the Local Planning and Highway Authorities). It also details amendments made to the existing Core scenarios.

1.3.2. Section 3 outlines the Stage 1 spatial options and the general location of the development in each scenario.

1.3.3. Section 4 details the outline methodology undertaken in extracting the 2021, 2036 and 2051 forecast information from PRTM.

1.3.4. Section 6 outlines the process of identifying and selecting the strategic interventions to be included in the various development options.

[1] The National Trip End Model (NTEM) provides the Government's projected growth to 2051 in trip origins-destinations (or productions-attractions) for use in transport modelling.

1.3.5. Sections 5, 7 and 8 detail an overview of the Do Minimum scenario (with the forecast travel demand from the additional housing growth proposed but without any PT or highway interventions), “with passenger transport interventions only” and “with strategic highway interventions” scheme results respectively.

2. Model Suitability

2.1. Overview

2.1.1. The suitability of any transport model for forecasting purposes is governed by the Department for Transport’s (DfT’s) Transport Appraisal Guidance (TAG). This covers how models are built, calibrated, validated, and applied for future forecasting.

2.1.2. The PRTM has been built to be compliant with TAG as is reported in its Local Model Validation Report (LMVR)[2] and Forecasting Report (FR)[3].

2.1.3. This section continues by summarising how well the model replicates observed traffic flows and journey times on key routes in the 2014 base year. It continues by briefly discussing how uncertainty in future model assumptions is handled, including those relating to supply (infrastructure) and demand (planning) effects.

2.2. Link Flow Validation

2.2.1. 2014 observed traffic count data at strategic points across the model area has been used to measure PRTM performance in accordance with TAG acceptability guidelines (unit M3.1)[4].

2.2.2. A local area review of the 2014 Base highway model for AM, PM and Inter-Peak hours is shown in Figure 2.1, Figure 2.2 and Figure 2.3 respectively where:

- Green links signify modelled flows compliant with TAG;
- Red links signify a TAG non-compliance where modelled flows are excessively higher than observed counts; and
- Blue links signify TAG non-compliance where modelled flows are excessively lower than observed counts.

[2] Pan-Regional Transport Model LMVR, V2.0, May 2021.

[3] Pan-Regional Transport Model V2.1, Forecasting Report, August 2021.

[4] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938864/tag-m3-1-highway-assignment-modelling.pdf

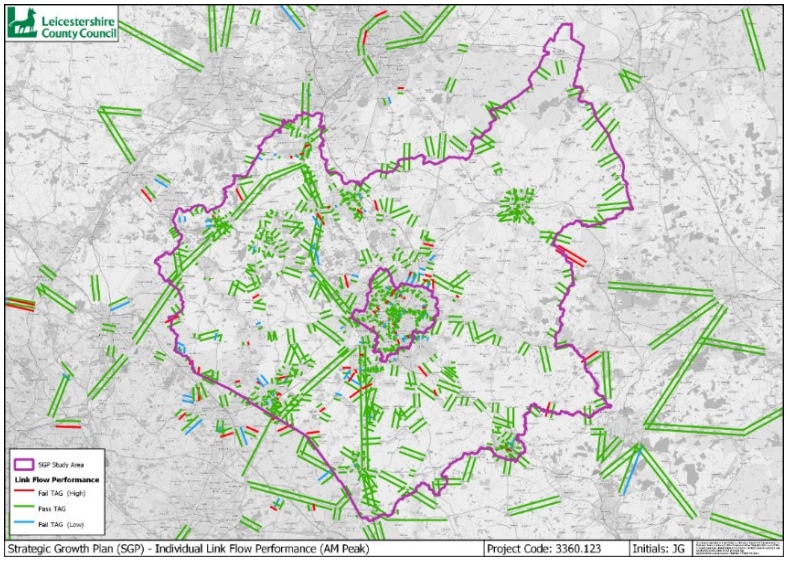


Figure 2.1: PRTM Base (2014) Link Flow Performance – AM Peak

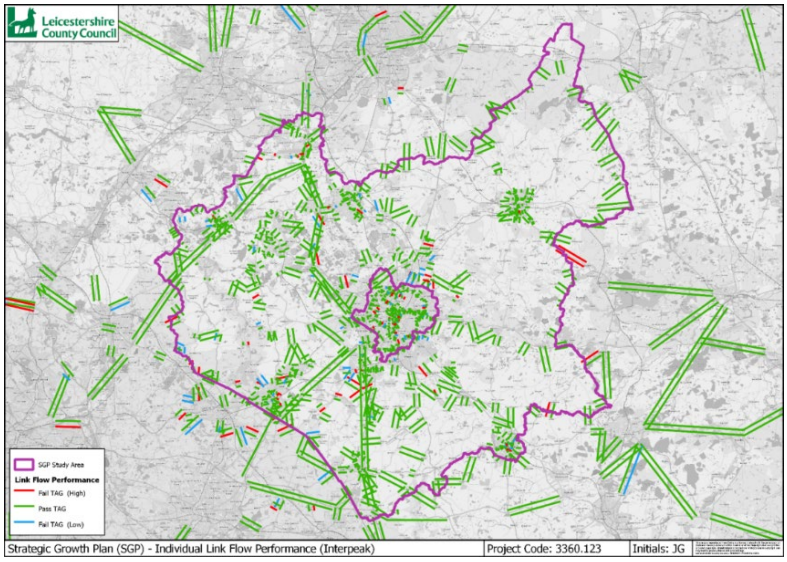


Figure 2.2: PRTM Base (2014) Link Flow Performance - Inter-Peak

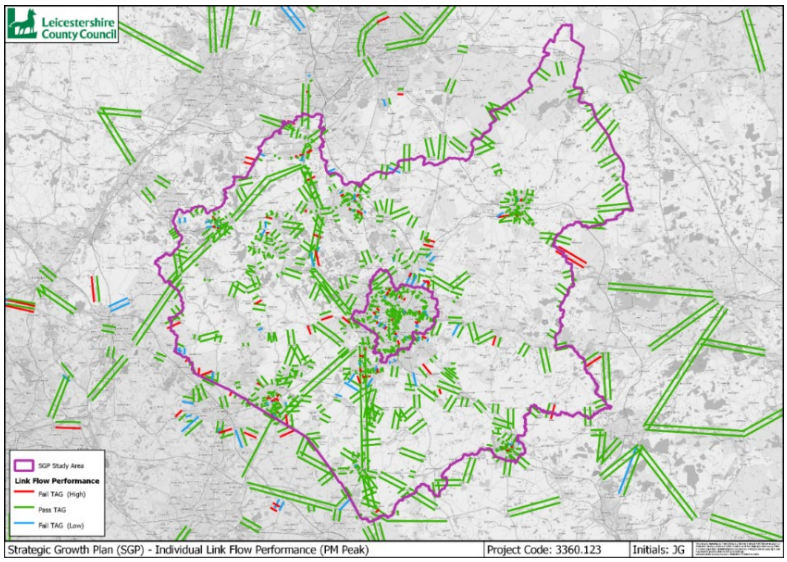


Figure 2.3: PRTM Base (2014) Link Flow Performance - PM Peak

2.2.3. TAG compliance for traffic flows is governed by meeting the following acceptability rules in at least 85% of cases:

- Individual flows within 100 veh/hour of counts for flows less than 700 veh/hour
- Individual flows within 15% of counts for flows from 700 to 2,700 veh/hour; or
- Individual flows within 400 veh/hour of counts for flows more than 2,700 veh/hour; and,
- GEH values of <5 for individual flows.

2.2.4. These plots indicate a good level of model flow validation in Leicestershire and the adjoining counties; Table 2.1 summarises and further segments the link performance for Leicester City, Leicestershire, and the Strategic Road Network across PRTM's full model area.

		AM Peak			IP Peak			PM Peak		
Location	**Counts** (Screen Lines)	**Pass** (Screen Lines)	**%Links** (include duplicates)	**%Links** (exclude duplicates)	**Pass** (Screen Lines)	**%Links** (include duplicates)	**%Links** (exclude duplicates)	**Pass** (Screen Lines)	**%Links** (include duplicates)	**%Links** (exclude duplicates)
Leicester City	**329**	**94%**	**85%**	**84%**	**100%**	**95%**	**94%**	**94%**	**89%**	**88%**
NW Leics	120	100%	93%	94%	100%	98%	98%	100%	89%	89%
SW Leics	140	100%	89%	88%	100%	98%	98%	100%	87%	87%
S. Leics	209	96%	90%	89%	100%	95%	95%	100%	90%	89%
NE Leics	89	100%	99%	99%	100%	98%	98%	100%	93%	92%
N. Leics	135	100%	87%	86%	100%	93%	93%	100%	82%	81%
Leicestershire	**693**	**99%**	**92%**	**91%**	**100%**	**97%**	**97%**	**100%**	**88%**	**88%**
Strategic Road Network (SRN)	**32**	**94%**	**99%**	**99%**	**100%**	**100%**	**100%**	**91%**	**100%**	**100%**

Table 2.1: PRTM Base (2014) Year Model Link Validation Statistics

2.2.5. The table shows how well the PRTM replicates observed traffic flows in terms of both, sectoral movements across screenlines/cordons and the percentage of component counts along them that meet DfT TAG criteria.

2.2.6. There are 2 areas falling below the desired acceptability criteria. These relate to Leicester City in the AM peak and North Leicestershire in the PM peak. Neither are regarded as 'showstoppers' but are principally due to:

A. Within Leicester City AM peak:
Complex routeing, large number of low flowing sites and unobserved traffic signals.

B. Within North Leicestershire in the PM peak:
Under representation of delay in Loughborough on Epinal Way, Forest Road and Old Ashby Road/Alan Moss Road.

2.3. Journey Time Validation

2.3.1. The performance of the PRTM Highway Model is measured against 2014 observed journey times on 99 key routes (see Annex A – Journey Time Routes (PRTM Validation)) across the modelled area. This equates to 198 two-way observations by time-period within Leicester City, Leicestershire, and the SRN.

2.3.2. TAG compliance for journey time validation is governed by meeting the following acceptability rules in at least 85% of cases:

- Modelled times along routes should be within 15% of observed times (or within 1 minute, if higher than 15%).

2.3.3. Table 2.2 summarises the PRTM's journey time route performance for the 3 modelled hours broken down by sub-area and for the SRN both, within, and beyond Leicestershire. The SRN routes within Leicestershire include the M1, M69, M42/A42, M6, A46, A5, A453 and the A14.

Area	No. Routes	AM (% Pass)	IP (% Pass)	PM (% Pass)
Leicester City	32	94%	81%	91%
North Leicestershire	18	83%	94%	83%
North-East Leicestershire	12	92%	100%	100%
South Leicestershire	18	100%	100%	94%
South-West Leicestershire	24	100%	100%	92%
North-West Leicestershire	24	96%	100%	100%
SRN (Internal)	10	100%	100%	100%
Leicestershire	**138**	**95%**	**95%**	**93%**
SRN (External)	12	83%	100%	92%
East Midlands	10	100%	100%	100%
South-West	6	100%	100%	100%
West Midlands	32	100%	100%	94%

Table 2.2: PRTM Base (2014) Year Model Journey Time Route Performance

2.3.4. For the journey times routes defined in Leicestershire, 95%, 95% and 93% of these routes meet TAG criteria for the AM Peak, Inter-Peak and PM Peak, respectively. These are all above the 85% threshold set out in TAG Unit M3.1 and therefore demonstrate that the model performs well against observed journey time data in Leicestershire.

2.3.5. To assess whether there is any bias in the modelled journey times a comparison is made to establish whether the model forecasts are slower or faster than observed data. Figure 2.4 shows the distribution of journey time routes for each of the three modelled hours.

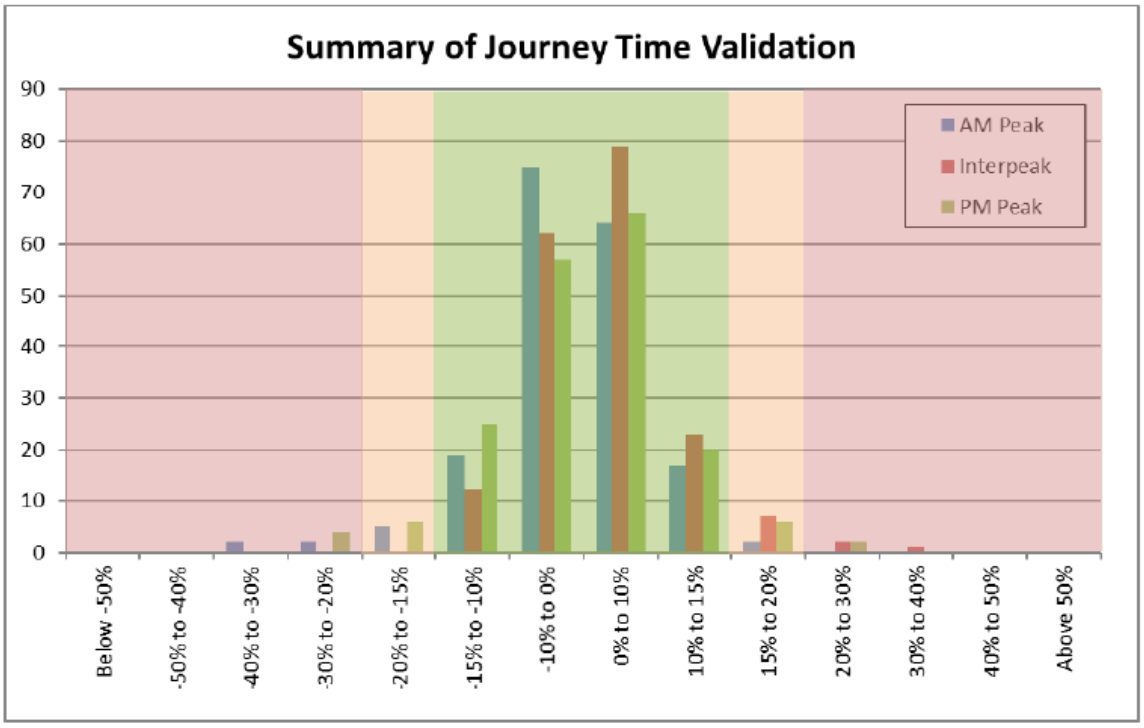


Figure 2.4: PRTM Base (2014) Year Model Journey Time Route Performance

2.3.6. In this figure the green shaded area represents those journey times passing the TAG ±15% criteria, the orange area shows those marginally failing this criterion but are within ±20%, with the red shaded area being those beyond ±20% of the observed data.

2.3.7. Figure 2.4 shows that most journey time routes fall within the green shaded area, as reported in Table 2.2, with a limited number of routes outside ±20% of the observed data. This figure also shows the results to be broadly evenly distributed meaning the model is not biased towards overly quick or slow journey time forecasts.

2.3.8. The good fit of modelled link flow and journey times with observation means that the PRTM's base year highway component is deemed fit for purpose for this project.

2.4. Forecasting & Uncertainty

2.4.1. As defined in the DfT TAG Uncertainty toolkit, uncertainty can be defined broadly as limited knowledge about past, current and future events, and the systems in which these events occur. A key consideration when making future predictions is how *uncertainty* in the forecasting process is handled to best provide credible evidence for informed decision making.

2.4.2. The specific detail on how forecasting and uncertainty in transport modelling is dealt with can be found in DfT guidance[5]. Without delving into unnecessary detail, the terms 'core scenario' and 'uncertainty log' are defined and developed further below with respect to this project.

- The **Core Scenario** is a central forecast based on the most unbiased and realistic set of assumptions against which alternative scenarios are measured.
- An **Uncertainty Log** is a record of the assumptions made in the model affecting travel demand and supply.

2.4.3. The Core Scenario provides travel forecasts that represent a future year 'base case' against which other scenarios are compared. In the context of this project the alternative planning scenarios build from the 2036 core scenario to produce 4 versions of what a 2051 future year might look like. These 2051 alternative scenarios, both with and without transport interventions, are then compared against the 2021 and 2036 Core Scenarios.

2.4.4. The Uncertainty Log (as set out in Annexes B and C of this report) provides the detail of the model assumptions used for the Core Scenario, and some of those rejected, but which may be subsequently used in sensitivity testing. The uncertainty log was reviewed by all relevant Local Planning Authorities (in particular the seven Leicestershire Districts and the City of Leicester) and Highway/Transport Authorities (in particular those with responsibility for the networks within the Leicester and Leicestershire housing market area - Leicestershire County Council, Leicester City Council and National Highways) and updated where necessary to reflect comments and additional information received

2.4.5. With respect to future planning applications and infrastructure schemes, decisions may already have been made, or are 'pending', implying a level of understanding of the future. This is dealt with in Government TAG by classifying such future inputs in the Uncertainty Log.

2.4.6. This section continues by summarising the future planning and infrastructure detail contained in the Uncertainty Log and how this is used in the PRTM up to 2051.

2.5. Uncertainty Log: Planning Assumptions (Core Scenario)

2.5.1. A key driver of demand for travel is land-use, as people and commodities move between origins and destinations to satisfy the needs of day-to-day life. Instrumental to this is the location of housing, employment, retail, leisure, schools, etc., and the travel generated between them in supporting the wider economy and requirements of the travelling public.

2.5.2. Whilst the detail of existing land-use can be 'observed'; it is also possible to have some knowledge of what, and where, future development prospects might be through adopted Local Plans (where available), various approvals and further insight from the Local Planning Authorities (LPA's).

[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938878/tag-m4-forecasting-and-uncertainty.pdf

2.5.3. LCC periodically approaches LPAs across the county and surrounding areas to obtain the latest detail on such future development coming forward to improve future travel forecasting using the PRTM. As part of this project the latest data was provided by all the Leicestershire LPA's, including Leicester City, together with neighbouring Authorities abutting critical points in the network.

2.5.4. External LPAs, where the latest planning information was sought, included parts of Derbyshire, Nottinghamshire, and Warwickshire. For South Derbyshire and Nottinghamshire their proximity to future considerations relating to the East Midlands Freeports and HS2, coupled with the already congested highway network around M1 junctions 24 and 24a, were all important considerations. For Warwickshire the interaction between Nuneaton and Hinckley in Leicestershire, together with the influence of development straddling the strategic A5 separating the counties, needed to be suitably reflected in the PRTM.

2.5.5. Table 2.3 below shows the future planning data incorporated within the PRTM for this project and the date it was received. Those areas highlighted represent the most up to date data for housing and employment. It should be noted that the planning data is obtained a year in arrears, covers a financial year (1st April to 31st March) and usually becomes available in the autumn-winter period.

2.5.6. The geographical location of this future housing and employment data is shown below in Figure 2.5 and Figure 2.6 respectively. It currently relates to what is known about future planning prospects although how far into the future can vary by LPA; in general, the range is between 2036 and 2041.

County	District	Housing			Employment		
		Model Version	Date	Latest Data Received	Model Version	Date	Latest Data Received
Leicestershire	Blaby	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Charnwood	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Harborough	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Hinckley and Bosworth	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Leicester City	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Melton	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	North-West Leicestershire	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Oadby and Wigston	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
Rutland	Rutland	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
Warwickshire	North Warwickshire	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Nuneaton and Bedworth	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Rugby	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
Coventry	Coventry District	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
Staffordshire	Tamworth	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	East Staffordshire	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	Lichfield	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
Derbyshire	South Derbyshire	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	City of Derby	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	Erewash	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
Nottinghamshire	Rushcliffe	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	City of Nottingham	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	Broxtowe	SGP (50)	Apr-20	Apr-20	SGP (51)	Apr-20	Apr-20
	Gedling	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	Newark and Sherwood	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
Lincolnshire	South Kesteven	LLITM2014	Jun-16	Jun-16	LLITM2014	May-16	May-16
Northamptonshire	Corby	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	East Northamptonshire	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	Kettering	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	Daventry	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16
	Northampton	LLITM2014	May-16	May-16	LLITM2014	May-16	May-16

Table 2.3: Planning Data Received from Local Planning Authorities

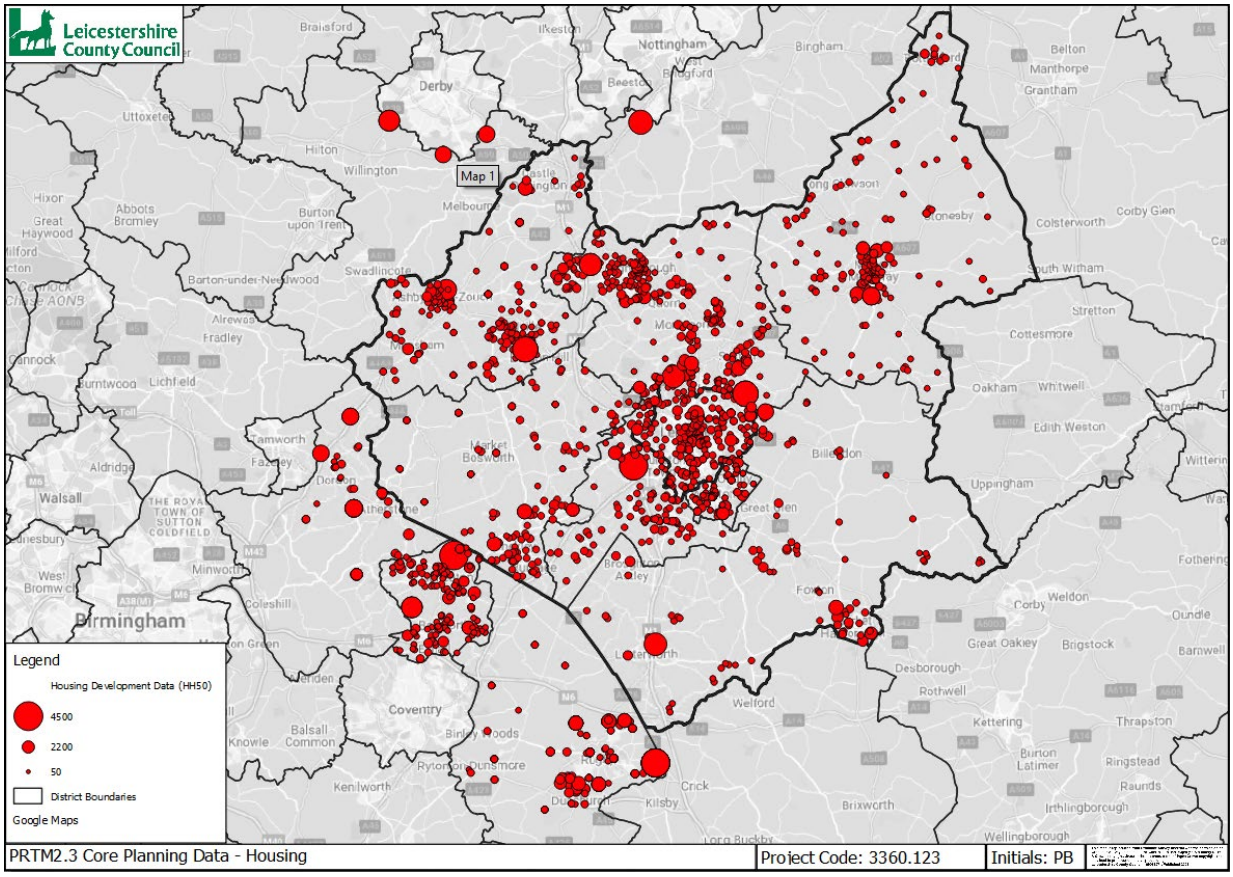


Figure 2.5: 'Known' Future Housing Developments

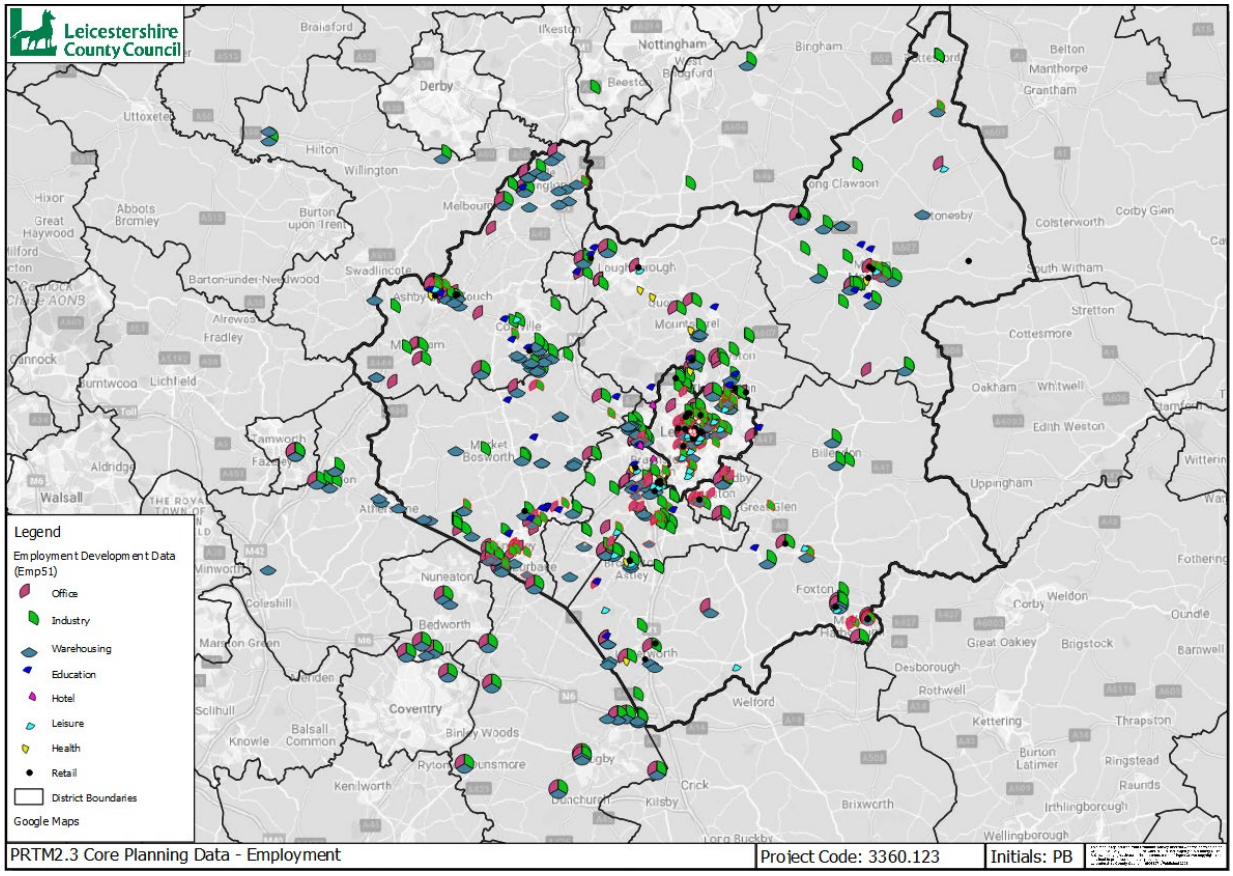


Figure 2.6: 'Known' Future Employment Developments

2.5.7. It should also be emphasised that the planning forum is continually evolving meaning that any forecast assumptions can quickly get outdated. The forecasting undertaken here, therefore, represents a snapshot in time based on what was known about the future at project inception.

2.5.8. In the modelling undertaken transport forecasts are required for a 2051 future year and yet the detailed background growth provided by the LPA's above, at best, is available to 2041. The 'missing' 10 years is resolved by matching Government growth estimates[6] across the PRTM area from the model base year.

2.5.9. The Government's growth estimates account for national projections of future population, housing, employment, car ownership and trip rates. Their application helps to ensure a reasonable balance between trip origins and destinations is maintained and is particularly relevant where imbalances in prospective future land-use assumptions could distort trip patterns. This would occur, for example, if LPA housing growth assumptions across Leicestershire were far higher than their employment equivalent, in which case the model would forecast a higher flow of employment trips seeking destinations outside of the county.

2.6. Uncertainty Log: Infrastructure Assumptions (Core Scenario)

2.6.1. Annex B and Annex C contain the respective highway and passenger transport schemes contained in the Uncertainty Log. These are comprehensive listings showing both, those accepted and rejected, for the Core Scenario.

2.7. PRTM Suitability for the Leicester and Leicestershire STA

2.7.1. The PRTM2.3 used for this project has been built, calibrated and validated in accordance with Government TAG. The 2014 base year highway model is shown to validate well with respect to observed traffic flow and journey times across the study area whilst future forecasts benefit from an up-to-date uncertainty log containing the latest understanding of future planning and infrastructure proposals.

2.7.2. It should be stated that the PRTM (v2.3) is an old model having been developed 8 years ago and exceeds the TAG preference for models up to 5 years old. Whilst many assumptions get updated with time the main limitation relates to base year trip patterns and whether older versions remain valid today.

2.7.3. The use of an ageing PRTM is a legacy of the COVID pandemic which forced the deferral of the scheduled 2021 model revision to 2023 with its subsequent availability likely by spring/summer 2024.

[6] Use is made of the DfT's growth forecasts from their National Trip End Model 7.2 (NTEM72). NTEM forecasts the growth in trip origin-destinations (or productions-attractions) up to 2051 for use in transport modelling.

2.7.4. Last year LCC took the decision to commission an interim 2019 update to PRTM in recognition of the limitations imposed by continued use of the current model. This interim model was first available for use in Spring 2023 and will be used for Stage 2 of the STA where more detailed modelling will be carried out on the preferred option/s.

2.7.5. This revision to the PRTM also includes the recent update to future Government growth projections associated with population, household and employment[7] together with the inclusion of the TAG Databook (May 2022).

2.7.6. For the purposes of this project, and its high-level assessment of the prospective direction of Leicestershire's future housing growth to 2051, the use of PRTM2.3 is deemed suitable for providing meaningful forecast transport evidence.

[7] NTEM8.0 released in June 2022.

3. SGP Planning Options

3.1. Overview of Planning Options

3.1.1. The Partnership identified four Leicester and Leicestershire Housing Market Area (HMA) wide spatial options to 2051 that they wanted to assess comparatively, from a transport perspective, through Stage 1 of the STA. The growth assumptions underpinning each spatial option were conceptual and less detailed than would typically be input for either Local Plan or planning application-level transport assessments, albeit to varying extents built from an understanding of potential site availability. The options were designed to be meaningfully different in nature and, as far as possible, represent 'bookends' for the full range of spatial distribution approaches that could theoretically be pursued by the Partnership to provide a basis for comparing the current SGP spatial distribution with potential alternatives. It is anticipated that this comparison will inform any future review of the SGP and subsequently, the selection of a “preferred” SGP spatial distribution going forward. Once a preferred spatial distribution is identified, this is expected to be further tested through the planned ‘Stage 2’ of the STA, which is not covered in this report.

3.1.2. All four spatial options tested through Stage 1 of the STA follow a common distribution of growth until 2036, driven by existing Local Plans and the apportionment of the City of Leicester’s unmet housing need up to this point – as set out through the Partnership-wide Statement of Common Ground relating to this matter. Thereafter, the distribution of growth between options diverges in accordance with the differing spatial and functional philosophies underpinning each of these options.

3.1.3. The purpose of Stage 1 of the STA was to assess the comparative transport implications of this divergence in the distribution of growth between 2036 and 2051, focussing on the 2051 “end-state” for each spatial option to help identify the most advantageous spatial distribution to pursue over the lifetime of the SGP. By extension, the four spatial options tested through Stage 1 of the STA have been assessed exclusively within PRTM’s 2051 forecast year. The focus on 2051 is proportionate to the ‘high-level’ nature of this stage of assessment and is comparable to the approach undertaken for most Local Plan options testing work (albeit the STA covers a much longer timescale and wider geographical area than equivalent Local Plan work).

3.1.4. An overview of the options identified for testing is detailed in Table 3.1 below.

Option	Description	Overview
1	Existing Spatial Pattern	A continuation of the current HMA pattern/distribution, which has been implemented for Local Plans over the last 20-30 years (at least) and was also the basis of the old/superseded East Midlands Regional Spatial Strategy. Reliant on incremental growth of existing settlements, with around 1/3 of growth located in the Near Leicester area, 1/3 in the County's six main market towns (Coalville, Hinckley, Loughborough, Lutterworth, Market Harborough and Melton Mowbray) and 1/3 in other settlements across the County. Within the Near Leicester area, future growth is more heavily concentrated on the north and west quadrants of this area, with relatively lower levels of growth in the south and east quadrants, again in line with current/historic trends.
2	Current SGP Spatial Pattern	Broadly reflects the HMA distribution of growth set out through the current SGP spatial vision. Seeks to focus most growth at large strategic site opportunities, substantially reducing the requirement for incremental growth of existing settlements. Most of these strategic sites are located within the three main growth areas identified through the current SGP: the "Priority Growth Corridor" to the South and East of Leicester, the "Leicestershire International Gateway" at the northern edge of the County, and the "Hinckley Cluster" area in the southwest of the County respectively. Growth allocated to the Near Leicester area (44%) is substantially greater than under Scenario 1, and most of this growth is located in the south and east quadrants of this area (at strategic sites within the Priority Growth Corridor), with reduced growth in the north and west quadrants relative to Scenario 1. The remainder of growth is split between Market Towns (28%) and other settlements (28%).
3	Majority Near Leicester	Compared with all other scenarios this comprises the greatest concentration (over 50%) of HMA growth within the Near Leicester Area and lowest levels of growth across the remainder of the County. Within the Near Leicester area, future growth is more evenly spread around all four quadrants than under either Scenario 1 or 2, with higher levels of growth in the east and west quadrants of the area than any other option, but slightly lower levels of growth in the north (compared to 1) and south (compared to 2). In the south and east quadrants of the Near Leicester area, growth is concentrated primarily at large strategic site opportunities (as with Scenario 2), whereas in the north and west quadrants and elsewhere in the County this option relies on incremental growth of existing settlements/suburbs.
4	New Market Towns	Focusses most future HMA growth at 4 new 'free standing' market towns of around 10,500 dwellings each (approximately the size of Market Harborough), with reduced levels of growth (less than 25%) in the Near Leicester area compared to all other options and similar levels of growth elsewhere in the County compared to Scenario 3. The new market towns are located at key crossroads in the north (A46/B676), south (A5199/A4304), east (A47/B6047) and west (A447/B585) of the County respectively, in the gaps between the six main existing market towns. This is the most theoretical of all the options assessed through the STA. Outside of the new market towns, this scenario relies on incremental growth of existing settlements.

Table 3.1: SGP Options Overview

3.1.5. It is important to recognise that, whilst the options are meaningfully different in how and where housing need is accommodated across the HMA between 2036 and 2051, the overall quantum of housing need to be accommodated is the same for each option, enabling a consistent and cohesive analyses to be conducted.

3.1.6. Table 3.2 below details housing growth, in dwellings, by option and LPA disaggregation from the present-day reference year (2021) through to 2036 and 2051 PRTM forecast years. Each column builds cumulatively off its predecessor until reaching the option's additional growth column from where each option builds from "36 to 51 Core Growth".

Local Planning Authority	2021 Dwellings	21 to 36 Core Growth	36 to 51 Core Growth	51 to Op1 Additional Growth	51 to Op2 Additional Growth	51 to Op3 Additional Growth	51 to Op4 Additional Growth
Leicester City	136,534	16,568	-	-	-	-	-
Charnwood	78,126	18,751	1,860	22,958	10,595	13,561	14,856
Melton	24,218	7,830	76	2,029	808	464	5,254
Harborough	39,835	8,484	145	14,511	19,240	17,695	28,396
Oadby & Wigston	23,543	2,079	-	3,138	4,201	11,280	1,412
Blaby	45,058	5,499	466	9,037	16,700	20,292	3,755
Hinckley & Bosworth	51,620	4,227	2,390	14,219	12,780	8,334	18,003
North-West Leicestershire	46,524	8,066	184	9,982	11,549	4,247	4,198
Leicestershire	308,923	54,935	5,121	75,874	75,874	75,873	75,873

Table 3.2: District Apportionment of Housing (Dwellings) Growth within each Option

3.1.7. Each Option has a consistent additional growth of 75,874 dwellings (give or take one dwelling) applied to the existing Core growth in the PRTM's 2051 forecast.

3.1.8. The quantities of additional housing growth applied to each LPA area between 2036 and 2051 under the various spatial options was based on the corresponding option's overarching spatial and functional philosophy. Visually, these options are shown at a PRTM zonal level in Figures 3.1-3.4 below. The rudimentarily defined rectangles correspond to indicative locations where strategic sites reside and where PRTM "development zones" have been utilised.

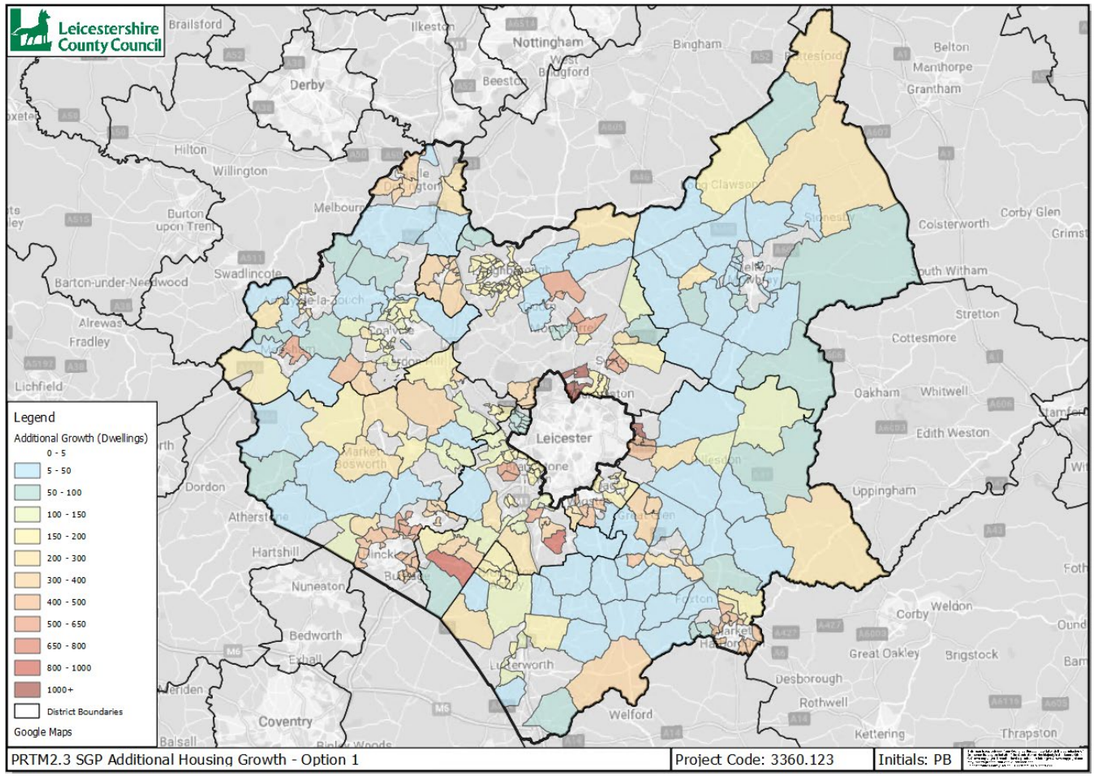


Figure 3.1: Option 1 Additional Housing Growth

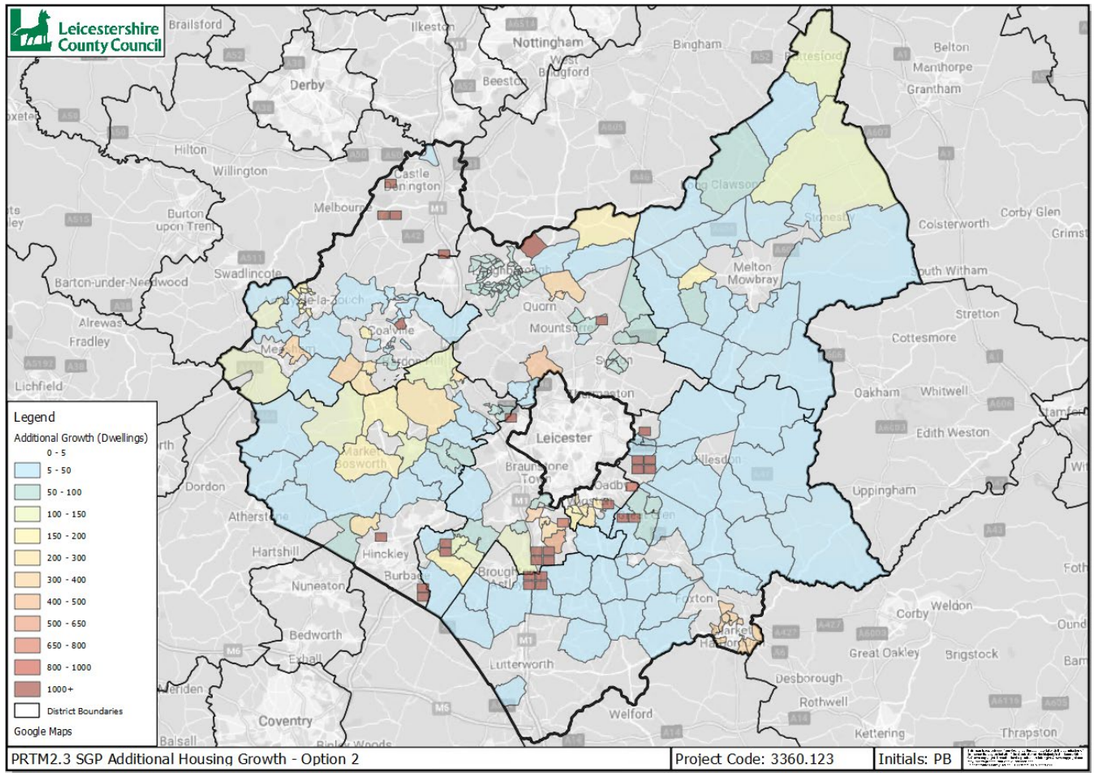


Figure 3.2: Option 2 Additional Housing Growth

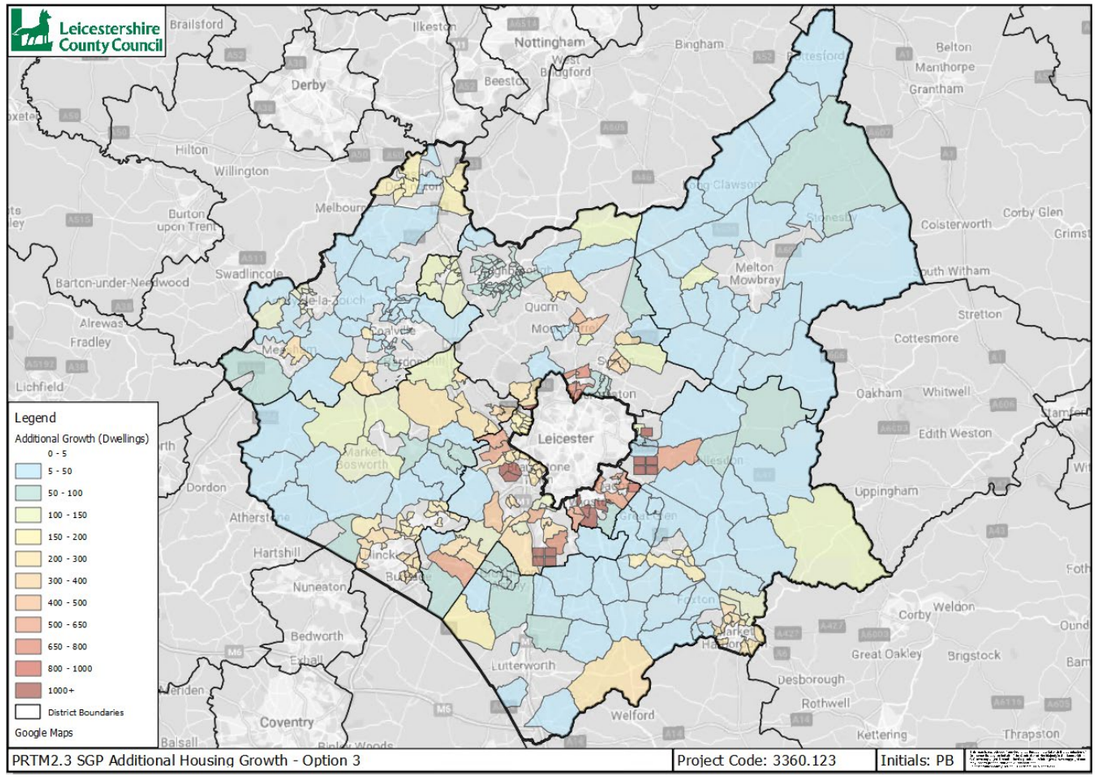


Figure 3.3: Option 3 Additional Housing Growth

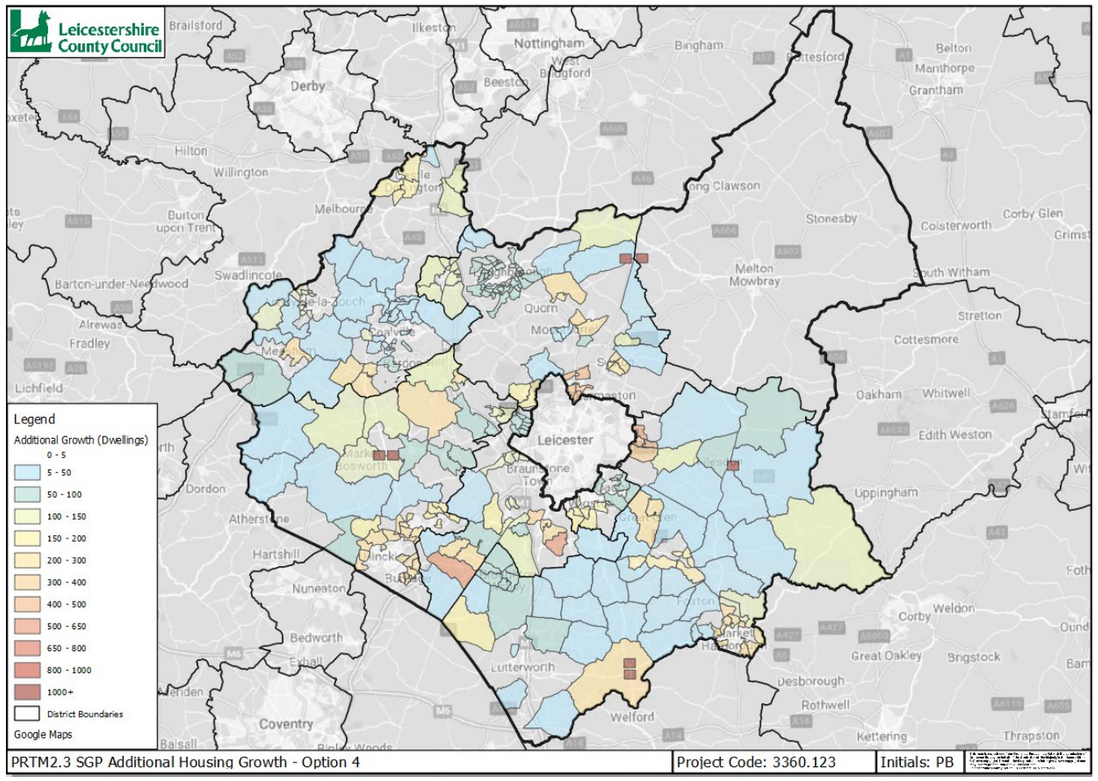


Figure 3.4: Option 4 Additional Housing Growth

3.2. Generation of Future Travel Demand

3.2.1. The generation of future travel demand builds from PRTM's 2014 base year using a combination of 'known' future land-use prospects and Government growth projections.

3.2.2. The advantage of using detailed known future land-use prospects means the model forecasting better reflects their location, characteristics and resulting impacts on the transport network. This contrasts with simpler alternatives, such as factoring growth uniformly across a wider area, which tends to dilute any local impact.

3.2.3. When using such detailed land-use data there is a risk that distortions can inadvertently be introduced if 'known' prospects are understated amongst land-use types. This can lead to problems such as divergence from Government growth projections and/or creating an imbalance between trip origins and destinations.

3.2.4. To assist in overcoming these limitations the PRTM can, if necessary, use Government growth projections[8] to underpin the planning data. The assumption is that growth across Leicestershire cannot drop below the government projections but can exceed it. This approach allows planning policy projections to be fully built out and is useful to test highway impacts based on fully realised Local Planning Authority growth plans which is relevant to this study.

3.2.5. A graphical comparison of modelled versus Government (NTEM7.2) projected household and employment growth for Leicestershire is shown in Figure 3.5 and Figure 3.6 respectively over the period 2014 to 2051.

3.2.6. The land-use data informing the modelling is comprised of the latest future planning prospects received from the LPA's (purple) combined with the additional 73,600 houses (green) associated with the STA Stage 1 spatial scenario optioneering.

3.2.7. From the land-use data used there are three observations worthy of note. Firstly, the sudden 'step-up' in housing demand (Figure 3.5) shown between 2046 and 2051, is due to expediency with the additional SGP housing contribution being included in the 2051 model only. Although not affecting the forecasting undertaken here, such growth would be expected to be phased in over the period 2036 to 2051.

[8] Constrained to National Trip End Model 7.2 (NTEM7.2).

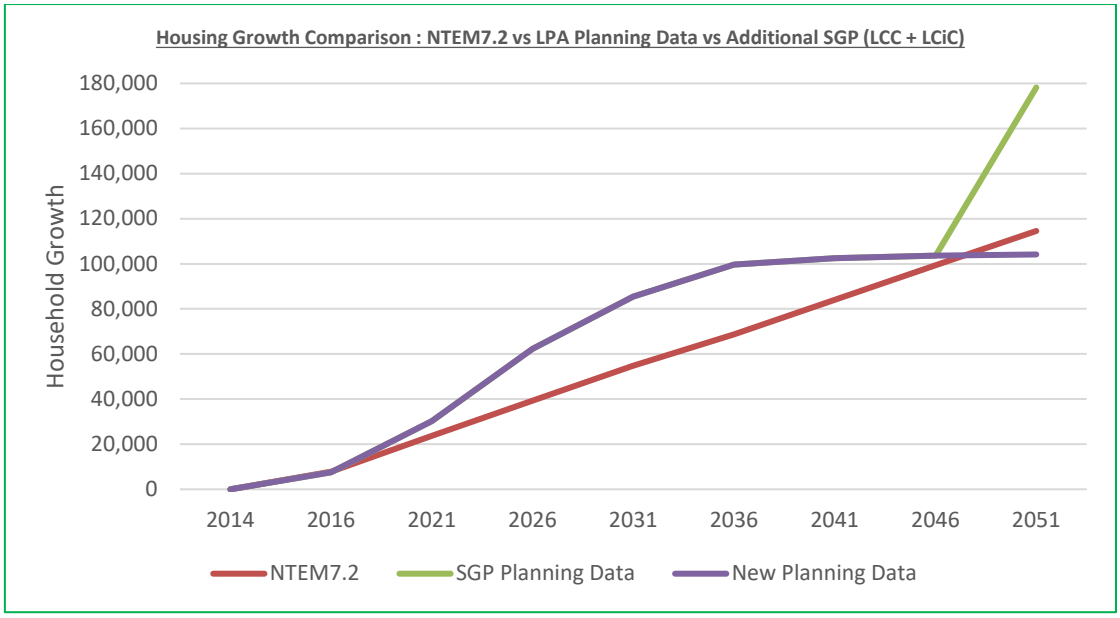


Figure 3.5: Comparison of Modelled vs Government Projected Future Housing Growth (2014 to 2051)

3.2.8. Secondly, a significant proportion of Leicestershire's employment growth (Figure 3.6) to 2031 is due to the East Midland Gateway portion of the proposed East Midlands Freeport[9]. It should be noted that the other two Freeport sites reside outside of Leicestershire and are not part of Figure 3.6.

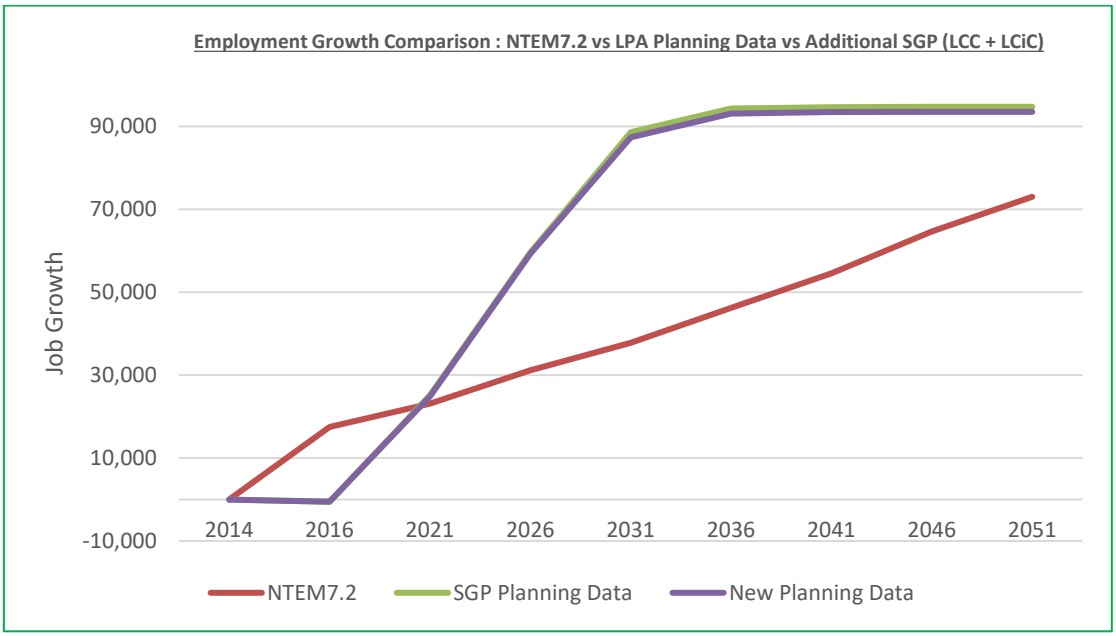


Figure 3.6: Comparison of Modelled vs Government Projected Future Employment Growth (2014 to 2051)

3.2.9. Thirdly, for the 2051 modelling, Leicestershire household and employment growth rates are above government projections meaning that no uplift of land-use input was necessary.

[9] The East Midlands Freeport is comprised of 3 sites: East Midlands Airport and Gateway Industrial Cluster (Leics); East Midlands Intermodal Park (Derbys); Ratcliffe-on-Soar Power Station (Notts).

4. The PRTM Forecasting Process

4.1.1. The transport forecasting process used to assess the four prospective growth options is summarised in Figure 4.1 below.

4.1.2. This process incorporated the Partnership's requirement for all four spatial options to be comparatively assessed, both *without,* and then *with,* accompanying packages of strategic transport interventions, to help address the major (HMA-wide) impacts and connectivity requirements of each option. The basis for doing so was that such interventions were identified by the Partnership as an important factor in the selection of a preferred spatial distribution going forward. More details of the approach and accompanying packages of interventions are set out in Chapter 6 of the report.

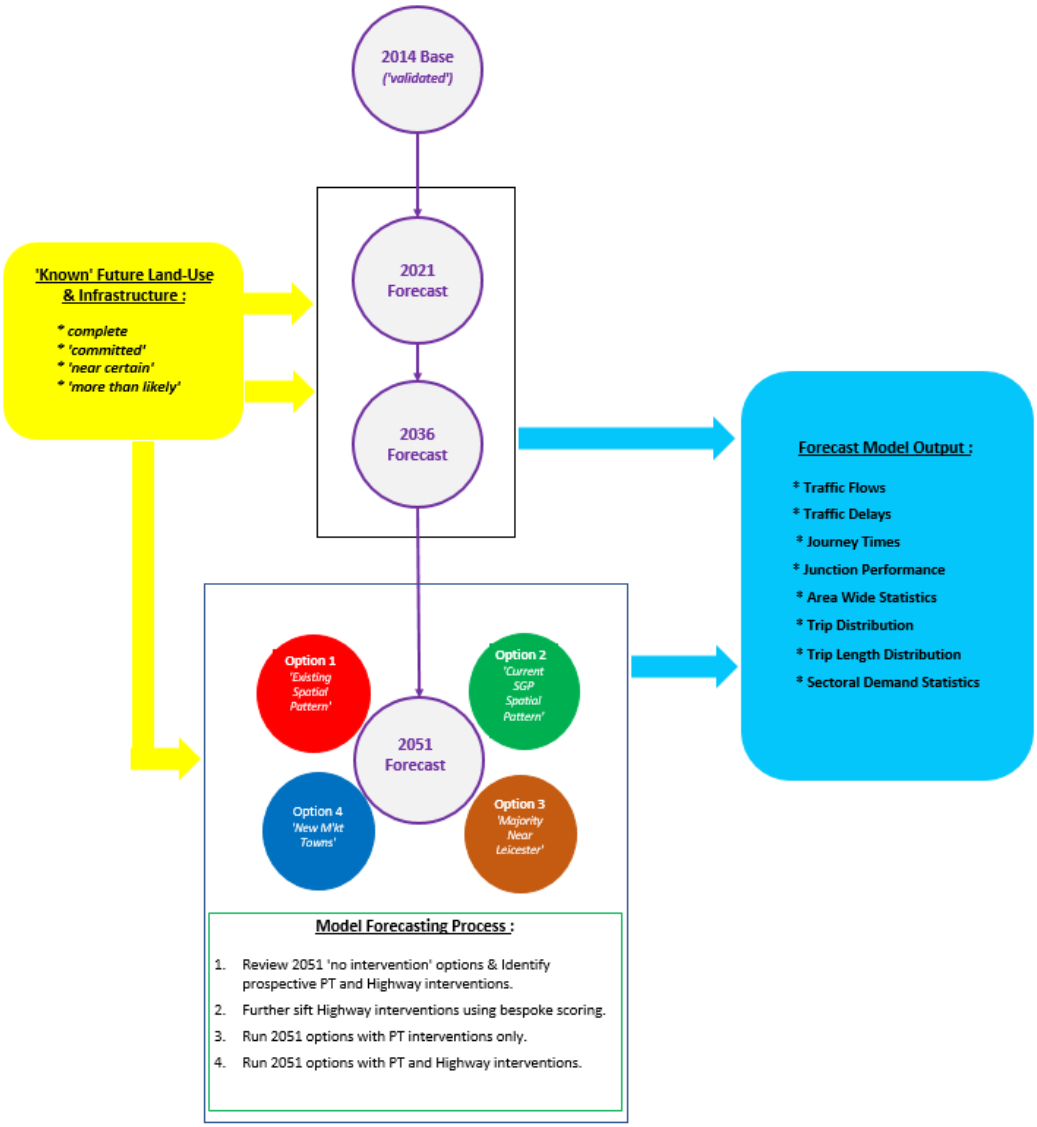


Figure 4.1: Forecasting Process using the PRTM

4.1.3. Procedurally future transport scenarios are built up cumulatively from the PRTM's 2014 base year using 'known' future planning, infrastructure and Government guidance on economic prospects. In this context the term 'known' refers to the DfT's definition when dealing with model uncertainty (see Section 2) and is represented by the yellow box of Figure 4.1.

4.1.4. The 2021 and 2036 intermediate forecast years provide indicative transport information representing *'the present day'* and, typically, the end of the current local planning period respectively (i.e., all adopted or currently emerging Local Plans across the HMA end before or around 2036). Their inclusion provides useful benchmarks against which the 2051 forecast scenarios can be compared and measured.

4.1.5. The 2051 forecasting initially tested each of the four spatial options without any infrastructure interventions to establish their impact on the existing network. This is regarded as the *'worst-case'*, or *"Do Minimum"*, scenario. This element of the work is hereafter referred to as 'Stage 1A' of the STA.

4.1.6. Outputs from the Stage 1A model runs, shown in the blue box of Figure 4.1, were interrogated and used to inform the identification of packages of prospective strategic passenger transport and highway interventions for further testing for each spatial option.

4.1.7. Further model runs were then undertaken for each spatial option to forecast how successful the identified interventions might be at mitigating the 2051 travel demand by option. This element of the work is hereafter referred to as 'Stage 1B' of the STA.

4.1.8. Stage 1B followed an iterative approach, testing strategic passenger transport interventions only at first, and thereafter adding in strategic highway interventions on top. Consideration of the more environmentally friendly bus and rail travel modes prior to identifying highway interventions was a logical first step that allowed the impact of the passenger transport interventions to inform the final step of 'fine-tuning' which highway interventions might be required for each option. These were then incorporated into the final set of model runs for each option, alongside the PT interventions.

4.1.9. Throughout the process, including the final reporting, various model output was extracted to provide a thorough assessment of the forecast impacts at each stage of the option testing. This was achieved by building up an understanding of both area wide statistics and more localised metrics.

4.1.10. Area wide statistics, such as 'average vehicle travel time, total vehicle travel times and trip length distributions, were used to understand network performance and forecast travel behaviour across an 'identified' area of influence and were particularly useful for comparing the transport options. For Stage 1 of the STA, the PRTM simulation area (approximate area shown in Figure 4.2) was used as the area of influence, comprising the entirety of the Leicester and Leicestershire HMA and its immediate hinterlands.

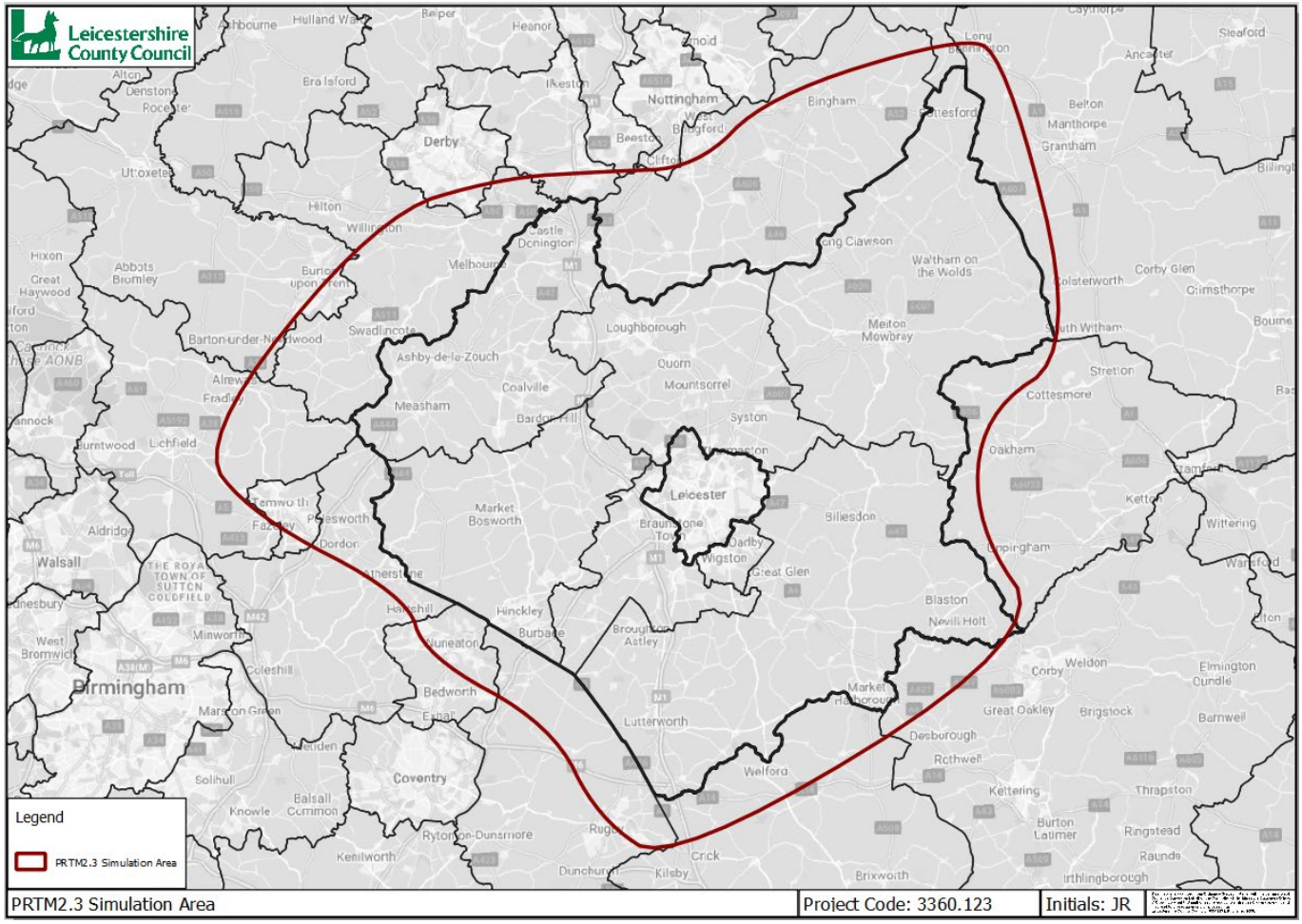


Figure 4.2: PRTM2.3 Simulation Area

4.1.11. More localised metrics, such as junction performance (volume/capacity), link flow and delay comparisons, were used to inform the local impact across the wider area and allowed a greater understanding of the forecasts.

4.1.12. By considering these metrics together leads to the emergence of an informed narrative explaining the transport forecasts and the prospective implications of proceeding with each spatial option.

4.1.13. Although part of the process, the bespoke scoring methodology developed to assist the Partnership in identifying a package of option specific strategic highway interventions, is explained later in Section 6.2.

5. STA Stage 1A (2051 Spatial Option 'Do-Minimum' / 'Worst Case') Results

5.1. Background

5.1.1. The first step involved in assessing the impact of the four 2051 spatial options was to consider their 'worst-case' scenario, in which forecast travel demand from the additional housing growth proposed for each was applied to the 2051 transport network without any supporting transport interventions. These scenarios are referred to throughout the remainder of this report as the "Do Minimum" scenarios.

5.1.2. The "Do Minimum" scenarios for each spatial option provided quantitative evidence to inform the identification of strategic transport interventions for each option. They also provided a basis for initial comparison of the spatial options to one another, and thereafter a suitable benchmark for assessing the absolute, and relative effectiveness of the package of supporting strategic transport interventions identified for each option.

5.1.3. Due to similarities in forecast model output between AM and PM peak hours, only the AM results are reported in the main body of this report. This avoids repetition and duplication, although the PM results are available in 'Annex E – PM "Do Minimum" Results', for scrutiny if required.

5.2. Summary Statistics

5.2.1. A proxy boundary for the Leicester and Leicestershire HMA is the PRTM's simulation area (shown in Figure 4.2), itself the area where detailed junction modelling is undertaken. Although the area also includes those parts of neighbouring administrative areas adjoining the HMA, the impacts of all the proposed spatial options will extend here, meaning their inclusion in this work (including summary statistics) is relevant and appropriate.

5.2.2. The summary statistics reported include average speed (kph), over-capacity queues (pcu-hrs [10]) together with indexed travel time and travel distance. Whilst average speed is self-explanatory, over-capacity queues is a measure of congestion, and the indexed travel time and distance metrics benchmark how total network times and distances relate to the 2021 base year (index = 100). Thus, in a subsequent year, should the index rise to 105 this would equate to a 5% increase in the relevant metric. Conversely, should the index fall to 95 this would mean a 5% drop.

5.2.3. Figure 5.1 and Table 5.1 show the summary statistics for the simulation area across all four 2051 "Do Minimum" scenarios together with 2021 and 2036 Core scenario forecasts.

[10] In the PRTM, traffic flow is expressed in passenger car units per hour (pcus/hr). The concept of the pcu is used to convert different vehicle types into a standard passenger car unit for ease and accuracy of assessment.

5.2.4. The inclusion of these earlier PRTM forecast years provide useful benchmarks against which each option can be compared. They represent “present day” traffic conditions and the end of the period to which most current adopted and emerging Local Plans apply, respectively.

5.2.5. It should be noted that the summary statistics, whilst being useful high-level comparators, can in some instances be misleading when taken in isolation. The various summary statistic metrics should therefore be used together to provide a more complete picture of network conditions.

5.2.6. However, this should not detract from these metrics, or indeed the scale of impacts that they represent. A seemingly insignificant change in one metric has larger ramifications when considered in the context of the area it is covering.

5.2.7. For example, across Leicestershire there are ~240,000 trips originating or terminating their trips within the border of the summary statistics. A 0.1kph difference in average speed would subsequently result in ~1000 days of added travel time across the highway network assuming route choice, and link flows, remained consistent.

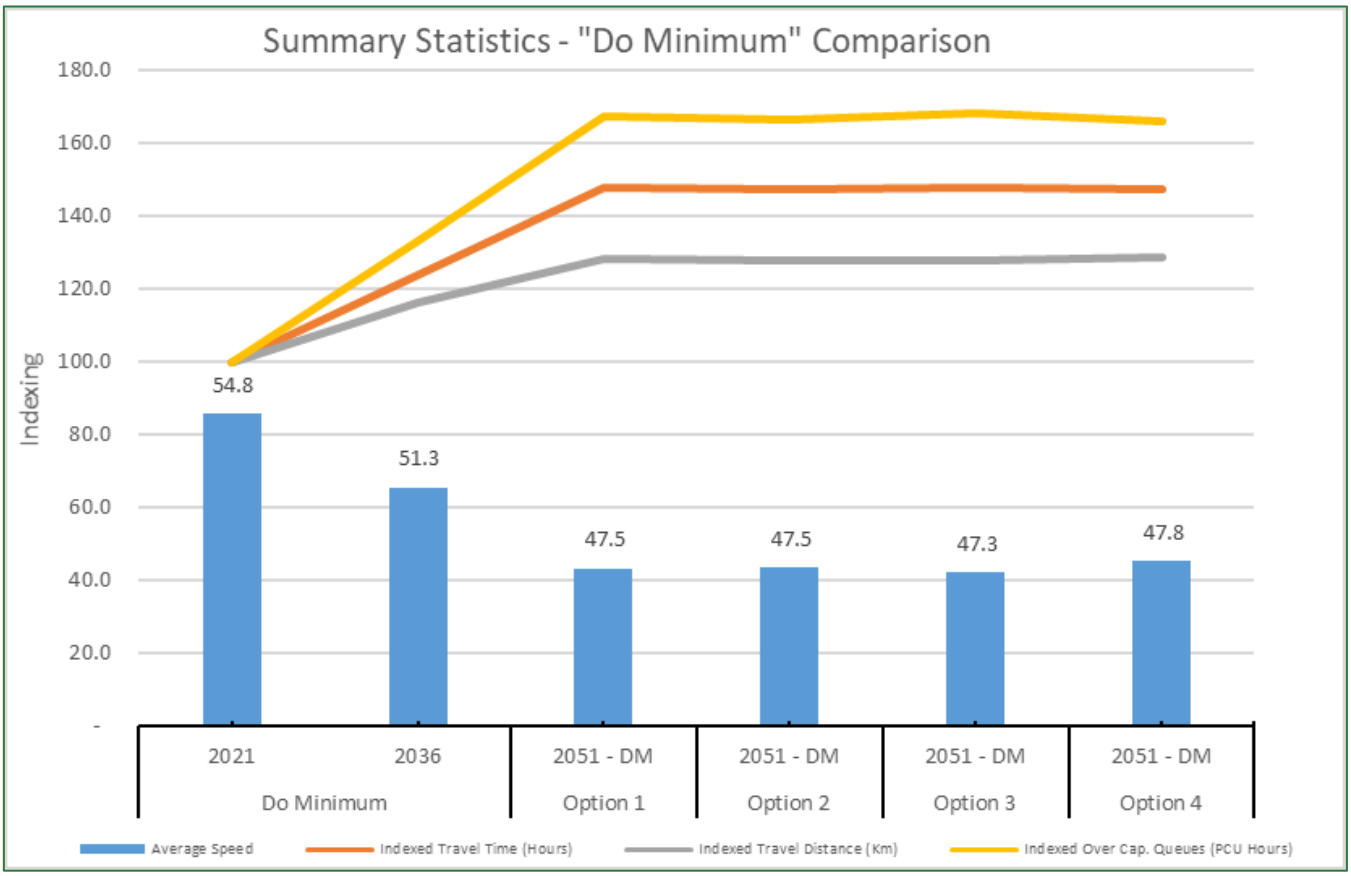


Figure 5.1: Summary Statistics - "Do Minimum" Option Comparison

	2021	2036	2051			
	Core	Core	Option 1	Option 2	Option 3	Option 4
			"Do Minimum" Scenario			
Average Speed (kph)	54.8	51.3	47.5	47.5	47.3	47.8
Over Capacity Queues (PCU Hours)	14,240	18,966	23,830	23,691	23,949	23,621
Indexed Travel Time (Hours)	100	124	148	147	148	147
Indexed Travel Distance (Km)	100	116	128	128	128	129

Table 5.1: Summary Statistics - "Do Minimum" Comparison

5.2.8. Across all four of the 2051 "Do Minimum" options, the summary statistics presented show a worsening of conditions compared to both the 2021 and 2036 Scenarios. This is expected and a legacy of increased travel activity associated with future projections relating to changes in population, socio-economic structure, land-use and the economy over the period; together with the additional SGP housing growth (circa 73,00 houses) presented in Table 3.2.

5.2.9. The summary statistics show very little difference between growth scenarios but do highlight the need for care to be taken when interpreting metrics in isolation. Taken at 'face value', the average speed metric shows the '*new market town*' Option 4 to be superior (47.8kph) and yet the indexed time is relatively consistent amongst options. The reason for this apparent anomaly is that trips from the market towns are travelling further on less congested parts of the network until they reach more congested areas. This is borne out by slightly higher distances travelled in this option.

5.2.10. By contrast, the '*majority near Leicester*' (Option 3) suffers from the slowest average network speed (47.3kph), worst over capacity queues (23,949 pcu-hrs) and yet indexed travel time is commensurate with the other options. This is predominantly a consequence of locating the majority of SGP growth close to the already congested Leicester Urban Area (LUA) but has the advantage of shorter average trip lengths as intimated by the indexed travel distance metric. This is expanded in the next section by graphing and comparing the trip-length distribution of each growth option.

5.3. Trip-Length Distributions

5.3.1. Figure 5.2 shows the difference in trip length distribution (%) for the four "Do Minimum" Options. The graph plots the distance travelled against the percentage of cars travelling these distances for the additional growth only.

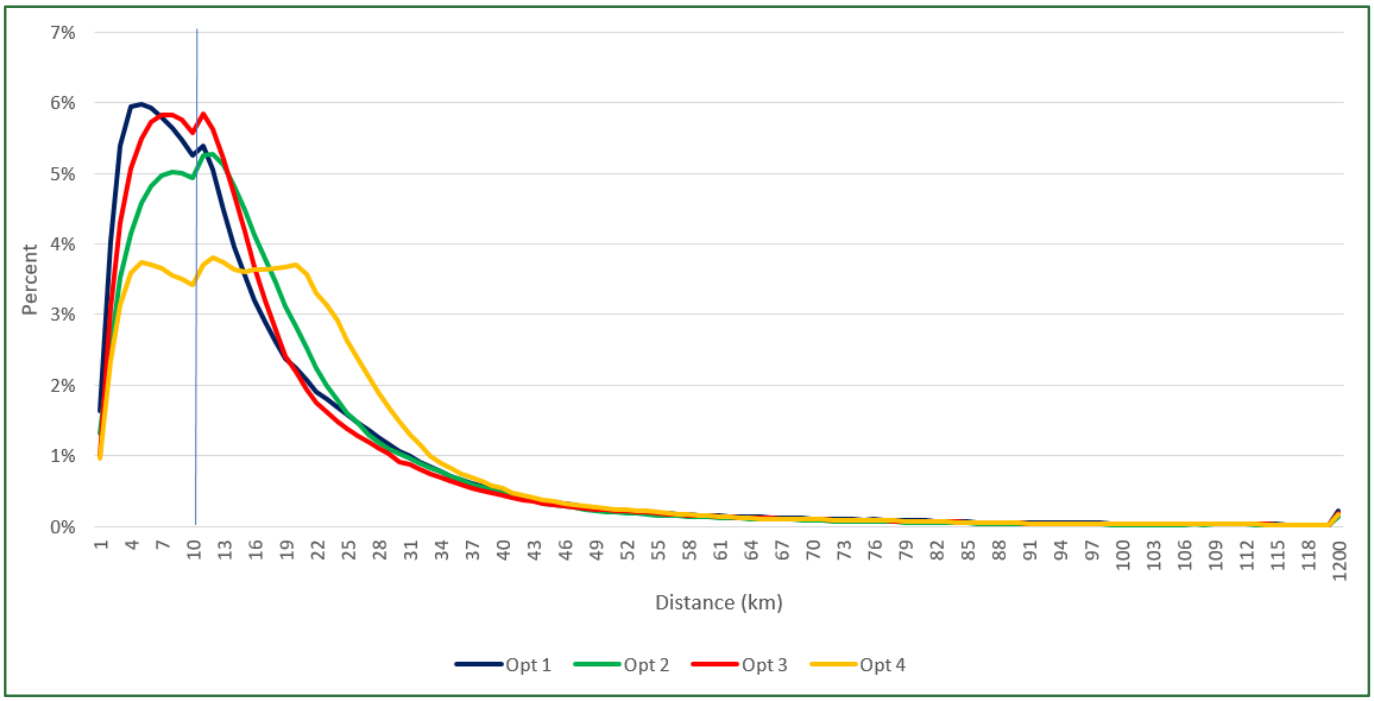


Figure 5.2: Trip Length Distribution, Growth Option Comparison

5.3.2. An appreciation of the trip-length distribution is useful to understand the relationship between short and longer distance trips and how this might relate to national, regional and local initiatives such as climate change, planning policy, sustainability, etc.

5.3.3. Car trips travelling less than 10km are highlighted on the graph as these are considered to have the most scope for modal shift to more sustainable modes of transport, such as cycling and walking. Visually it is clear that Options 1, 2 and 3 have a higher proportion of such shorter distance trips than Option 4.

5.3.4. Table 5.2 shows the actual forecast percentage of trips that are less than 10km by growth option. Options 1, 2 and 3 have similar magnitudes of 52%, 49% and 56% respectively and exhibit superior potential for targeted modal shift. This reflects much of the additional growth being located near large established conurbations with existing amenities, work locations and services.

	Trips < 10km (Cumulative %)
Option 1 ***'Continuation of Existing HMA Spatial Pattern'***	52%
Option 2 ***'Current (2018) Strategic Growth Plan'***	49%
Option 3 ***'Majority Near Leicester'***	56%
Option 4 ***'New Market Towns'***	34%

Table 5.2: Portion of Trips less than 10Km in Leicestershire

5.3.5. By contrast growth Option 4, with its new market town focus, has only 34% of trips travelling less than 10km and is a legacy of people having to travel further to access many activities unavailable in their locality.

5.3.6. The trip-length distributions reported in Figure 5.2 and Table 5.2 show trips which are forecast to leave/enter the designated growth areas and which could be targeted for sustainable modal shift. They do not contain those trips forecast to remain within these sites meaning the potential shift to active forms of transport will be underestimated for each option.

5.3.7. This issue is more prevalent, to varying degrees, for Options 2 and 4 where a 75% and 55% of the additional 2036-51 growth is allocated to large strategic sites or new market towns respectively, which would expect to have greater internalisation. By contrast, Options 1 and 3 rely more heavily on incremental growth to existing conurbations (with 0% and 27% of growth allocated to large strategic sites respectively) where the likelihood of on-site access to jobs and services is less.

5.3.8. Figure 5.3 shows how the forecast car journeys travelling less than 10km are distributed by growth option. Options 2 and 3 show a high intensity of short distance trips interacting with the southern edge of the Leicester PUA. By contrast, Option 1 interacts more with the north and eastern edges of the Leicester PUA with more intensity also associated with Loughborough and Hinckley. This all contrasts with Option 4 where the number of affected trips is lower and more diffuse in nature although there is some activity noted with Hinckley and Loughborough.

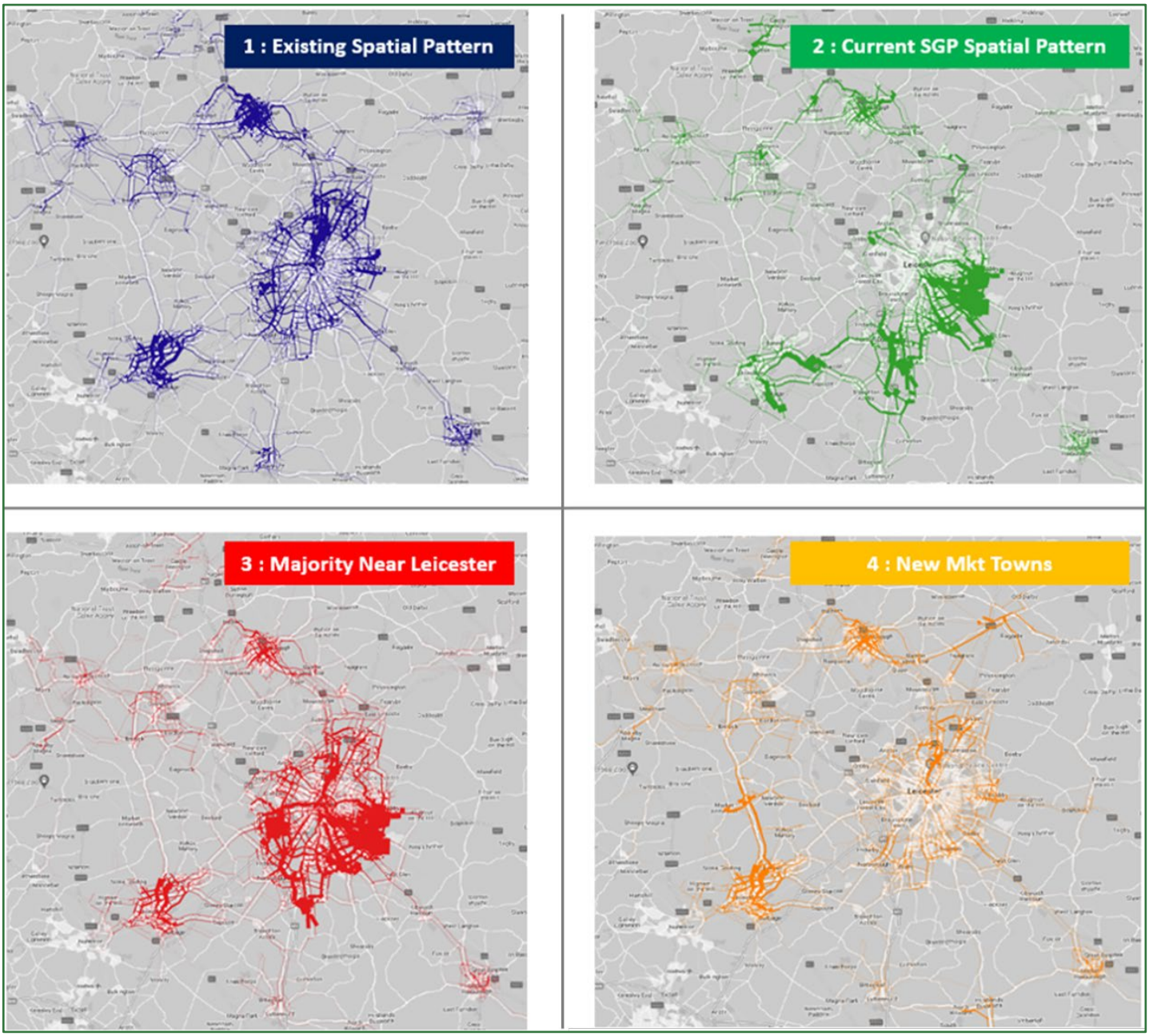


Figure 5.3: Highway Trip Lengths <10Km, Growth Option Comparison

5.3.9. Reflecting on the area wide evidence presented it is notable that Option 4 is less attractive when scrutinising the trip distances travelled, their associated origins/destinations and potential for transfer to other travel modes. This is in contrast with the summary statistics of Table 5.1 where apparent superiority over the other growth options was noted. On closer inspection (Figure 5.4), this is because such trips are travelling further on less congested routes before reaching more congested areas of the network. Furthermore, the relative 'remoteness' of the new market towns is likely to lead to increased levels of trips choosing less suitable rural routes as part of their journey.

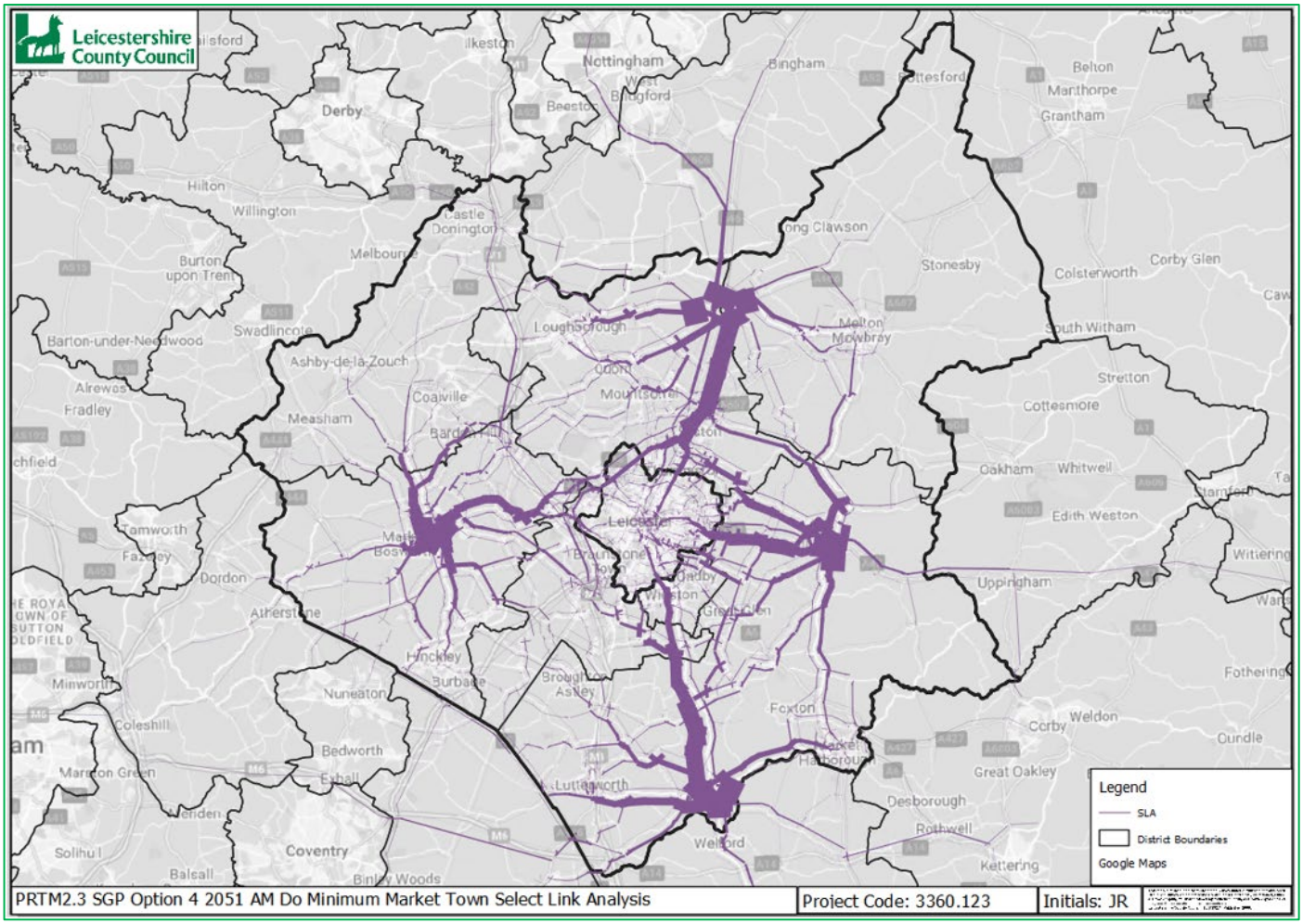


Figure 5.4: Routeing 2051 Growth Trips To/From New Market Towns

5.3.10. Section 5 continues by looking at each "Do Minimum" option in more detail by reviewing AM peak hour flow differences between 2051 and 2036 forecast years.

5.4. Option 1 (Continuation of Existing Spatial Pattern) "Do Minimum"

5.4.1. Figure 5.5 shows the change in traffic flow associated with the housing growth of Option 1 (*'continuation of existing spatial pattern'*) over the period 2036 to 2051. Those links experiencing a flow increase are coloured red with decreases coloured blue.

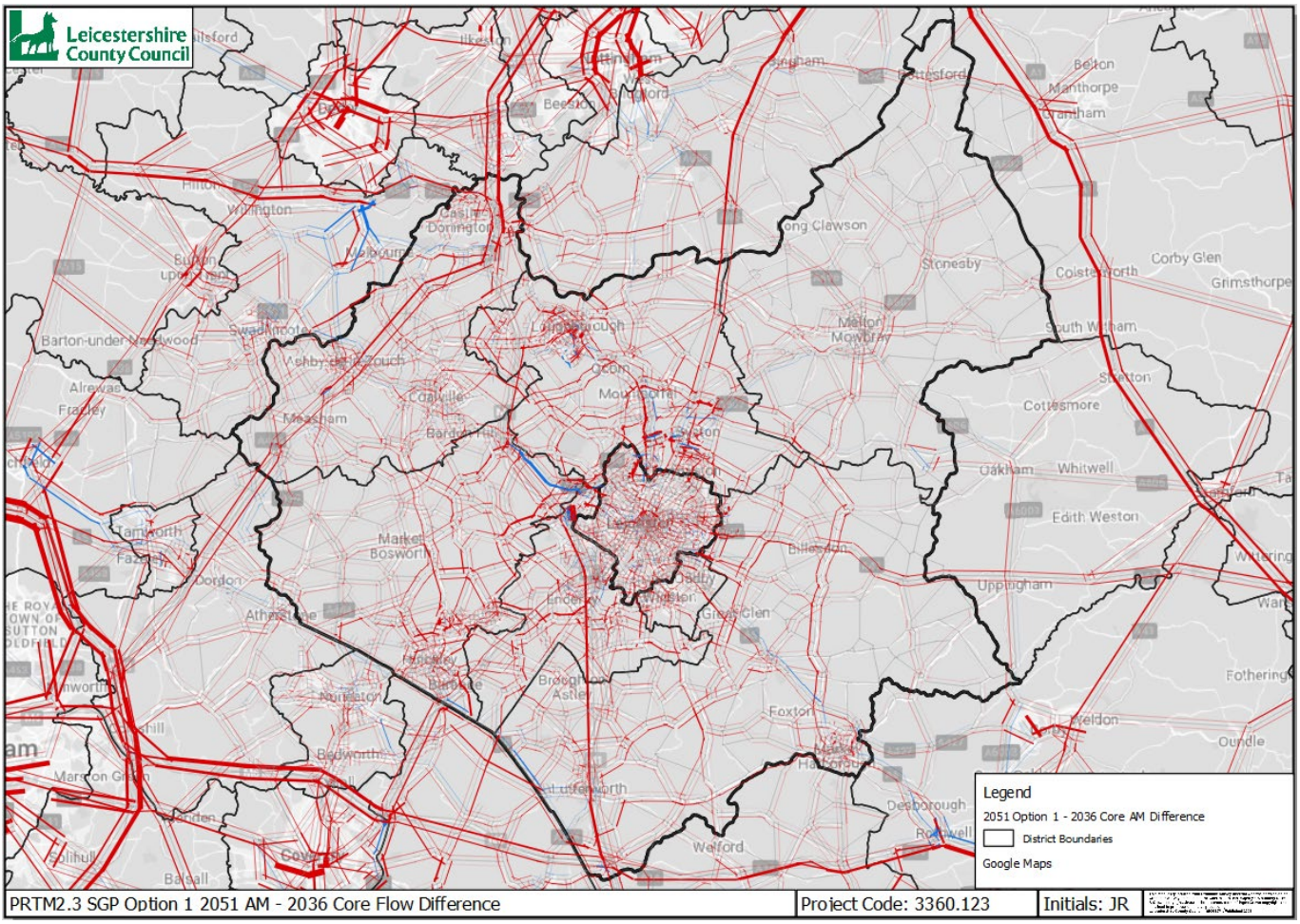


Figure 5.5: Option 1 "Do Minimum" - 2036 Core, Flow Difference

5.4.2. Whilst most of the network experiences increased traffic there are some roads forecast to see reductions. The most notable of these is the A50 stretch between the outskirts of Leicester and M1 Junction 22 where the performance of the Field Head junction at Markfield is predicted to become prohibitive.

5.4.3. The additional trips are distributed in line with Option 1's spatial plan and its emphasis more towards the north and west of the county. Whilst there is an increase in the use of the major and strategic road networks (MRN and SRN respectively) there is also an increase on more rural roads as congestion levels rise on these higher-order routes.

5.4.4. An indication of 'why' and 'where' congestion levels are rising because of this additional growth is captured in Figure 5.6. Here the deterioration in junction performance arising from the increased demand is shown by consideration of the volume over capacity (VoC) metric.

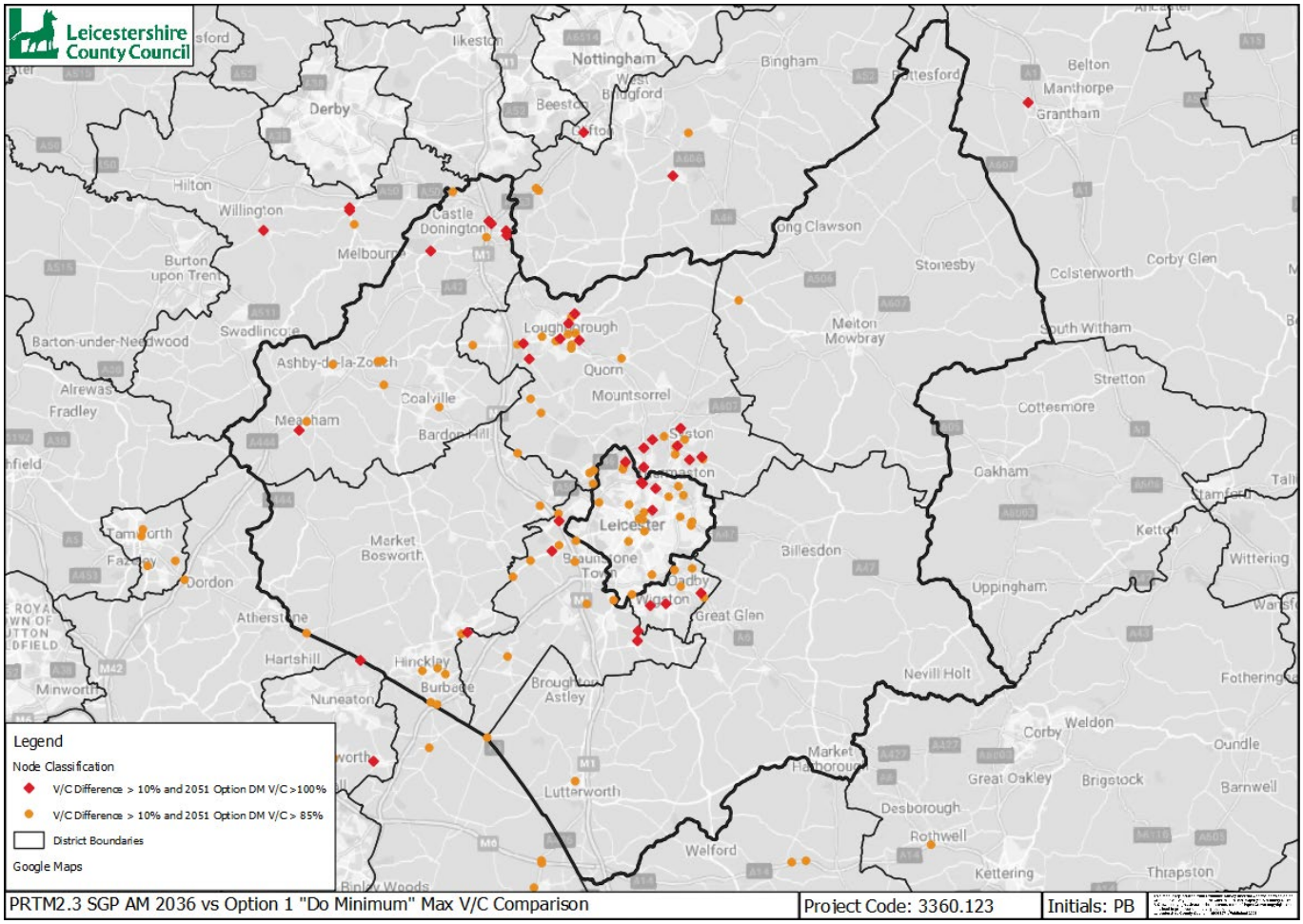


Figure 5.6: 2036 vs. Option 1 "Do Minimum" Maximum V/C Comparison

5.4.5. The *'onset of junction congestion'* is categorised for VoC values between 85% and 100% whilst *'severe congestion'*, associated with excessive delays and queueing, occurs once volume exceeds capacity (VoC values greater than 100%).

5.4.6. To capture the impact of Option 1's growth on the network and the area of the network most affected, only the junctions falling into these categories after experiencing at least a 10% change in VoC are plotted in Figure 5.6. This filtering of the forecast data is to assist with clarity but it's important to emphasise there will be more junctions falling into these categories than plotted.

5.4.7. The model forecasts clusters of worsening junction performance for Loughborough, Syston, Oadby & Wigston, the north-east and west of Leicester and in the vicinity of M1 J24.

5.4.8. For completeness, and to highlight the deterioration of junction performance compared to the present day, Table 5.3 shows the total number of junctions whose VoC exceeds 85% for 2021, 2036 and 2051 (Option 1) future years.

	2021 DM 85%+	2036 DM 85%+	2051 Op1 DM 85%+
LCiC	112	158	216
LCC	160	267	362
CBC	51	85	117
MBC	5	3	4
HDC	11	21	23
OWBC	7	10	16
BDC	39	59	77
HBBC	19	29	41
NWL	28	60	84
Total	272	425	578

Table 5.3: 2021 vs. 2036 vs. Option 1 "Do Minimum" Maximum V/C Comparison

5.4.9. As well as being broken down by District across the county, the figures are also aggregated to provide insight into the cumulative effect for the County, Leicester City and both combined.

5.4.10. Across the combined area the number of congested junctions is forecast to increase by 56% (272 to 425) in 2036 from the present day and by an additional 36% (425 to 578) from 2036 to 2051 (Option 1).

5.5. Option 2 (Current SGP Spatial Pattern) "Do Minimum"

5.5.1. Figure 5.7 shows that there is an increase in traffic flow across the whole of Leicestershire and Leicester City with the introduction of the additional growth associated with Option 2, but not as evenly spread as Option 1.

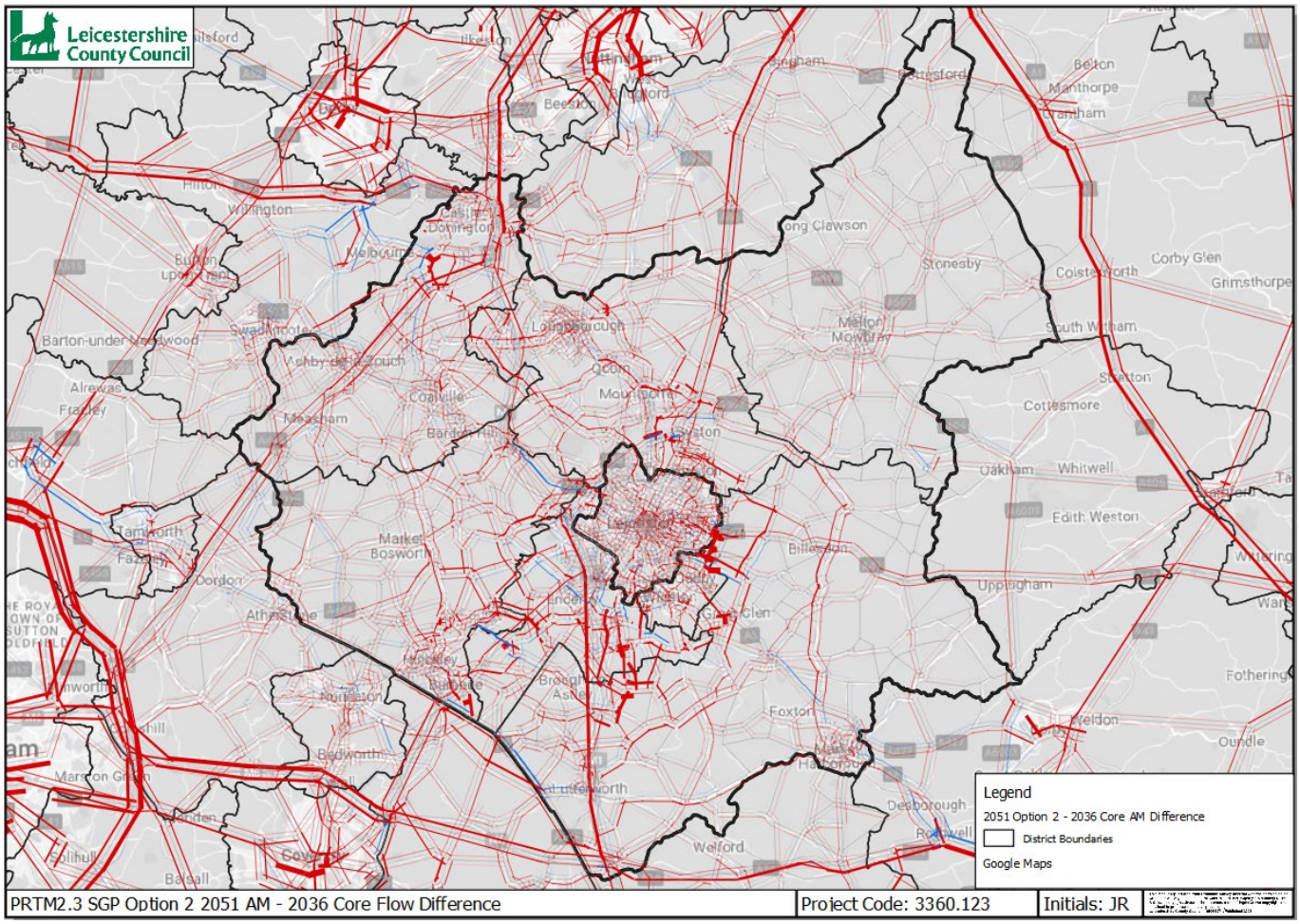


Figure 5.7: Option 2 "Do Minimum" - 2036 Core, Flow Difference

5.5.2. Whilst most of the network experiences increased traffic there are some roads forecast to see reductions. As with Option 1 the Field Head junction at Markfield remains an issue for the A50 between Leicester and M1 Junction 22. In addition, and due to the clustering of strategic sites to the south of the Leicester PUA, Option 2 is forecast to see reductions in flow on the B582 between the B4114 and Desford Cross-Roads, A47. This is due to a breakdown in performance at the Leicester Lane, B582 junction in Enderby.

5.5.3. The additional trips are distributed in line with Option 2's spatial strategy and its emphasis more towards the south and east of the Leicester Urban Area (LUA). Whilst there is an increase in the use of the MRN and SRN, there is also an increase on more rural roads as congestion levels rise on these higher-order routes.

5.5.4. An indication of 'why' and 'where' congestion levels are rising because of this additional growth is captured in Figure 5.8. Here the deterioration in junction performance arising from the increased demand is shown by consideration of the volume over capacity (VoC) metric.

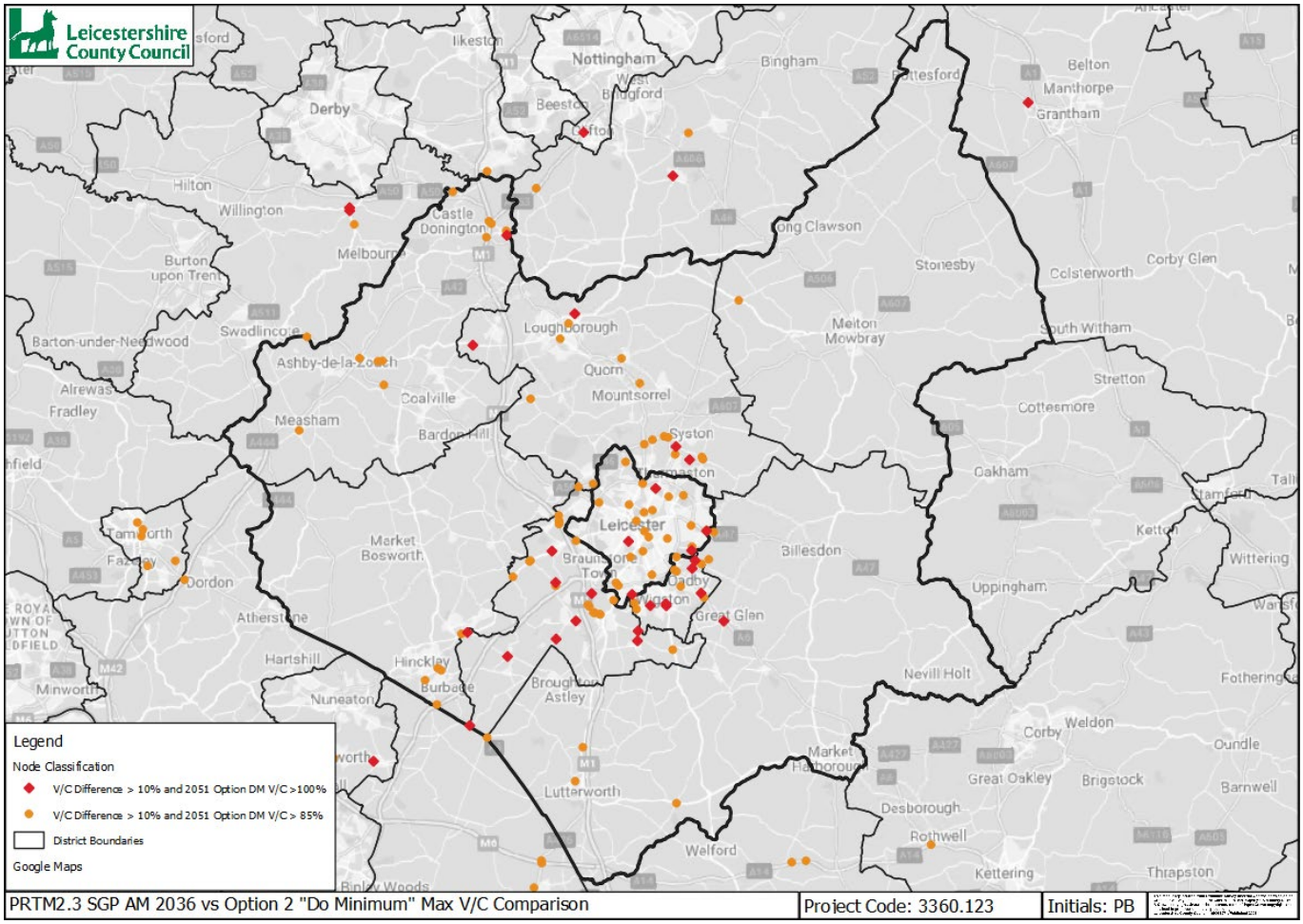


Figure 5.8: 2036 vs. Option 2 "Do Minimum" Maximum V/C Comparison

5.5.5. The model forecasts clusters of worsening junction performance for Syston, Oadby & Wigston and west of Leicester. Gone are the clusters seen for Option 1 around Loughborough whilst the reduction in growth to the north and west of the county has eased some of the forecast deterioration in the vicinity of M1 J24.

5.5.6. Table 5.4 shows the total number of junctions whose VoC exceeds 85% for the 2021, 2036 and 2051 (Option 2) future years.

	2021 DM 85%+	2036 DM 85%+	2051 Op2 DM 85%+
LCiC	112	158	219
LCC	160	267	360
CBC	51	85	108
MBC	5	3	4
HDC	11	21	26
OWBC	7	10	21
BDC	39	59	85
HBBC	19	29	35
NWL	28	60	81
Total	272	425	576

Table 5.4: 2021 vs. 2036 vs. Option 2 "Do Minimum" Maximum V/C Comparison

5.5.7. As well as being broken down by District across the county, the figures are also aggregated to provide insight into the cumulative effect for the County, Leicester City and both combined.

5.5.8. Across the combined area the number of congested junctions is forecast to increase by 56% (272 to 425) in 2036 from the present day and by an additional 36% (425 to 576) from 2036 to 2051 (Option 2). For the full area these figures are virtually the same as Option 1 although there is some variation by district due to differences in the direction of growth.

5.6. Option 3 (Majority Near Leicester) "Do Minimum"

5.6.1. Figure 5.9 shows the change in traffic flow associated with the housing growth of Option 3 (*'majority near Leicester'*) over the period 2036 to 2051. Those links experiencing a flow increase are coloured red with decreases coloured blue.

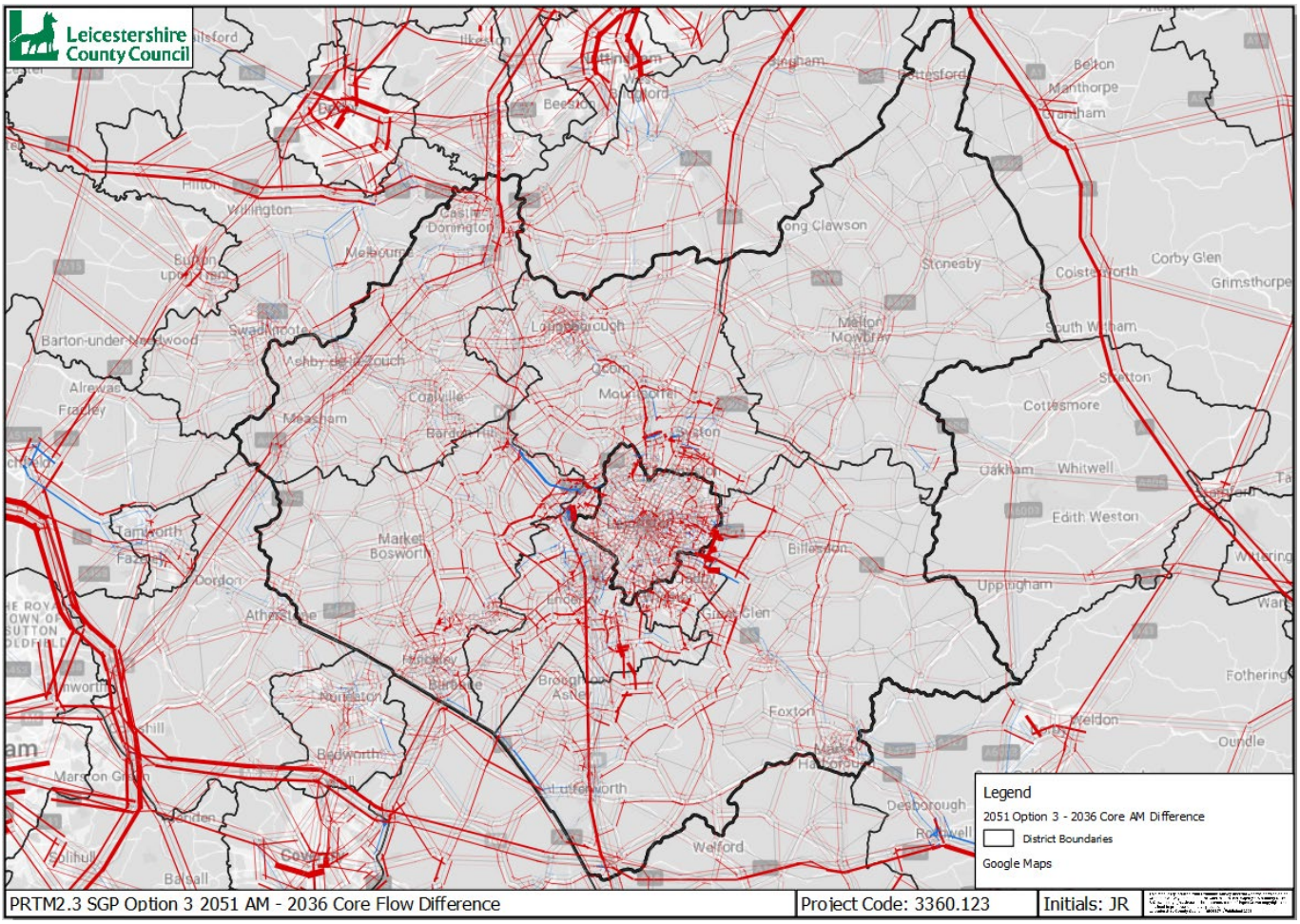


Figure 5.9: Option 3 "Do Minimum" - 2036 Core, Flow Difference

5.6.2. Whilst most of the network experiences increased traffic there are some roads forecast to see reductions. As observed in Option 1, the A50 between Leicester and M1 Junction 22 is forecast to be affected by a breakdown in performance at the Field Head junction, Markfield.

5.6.3. The additional trips are distributed in line with Option 3's spatial strategy and its concentration of future growth abutting the LUA, particularly towards the south and east.

5.6.4. The increase in flow to the West/North-West of the LUA is attributable to the additional growth at locations on this side of the LUA under Option 3, including New Lubbesthorpe, Kirby Muxloe and Ratby. Their need for access to the network and proximity to already congested areas, such as the A47 from Desford Crossroads to Braunstone Crossroads, leads to displacement of longer distance trips formerly using such routes.

5.6.5. An indication of 'why' and 'where' congestion levels are rising because of this additional growth is captured in Figure 5.10. Here the deterioration in junction performance arising from the increased demand is shown by consideration of the volume over capacity (VoC) metric.

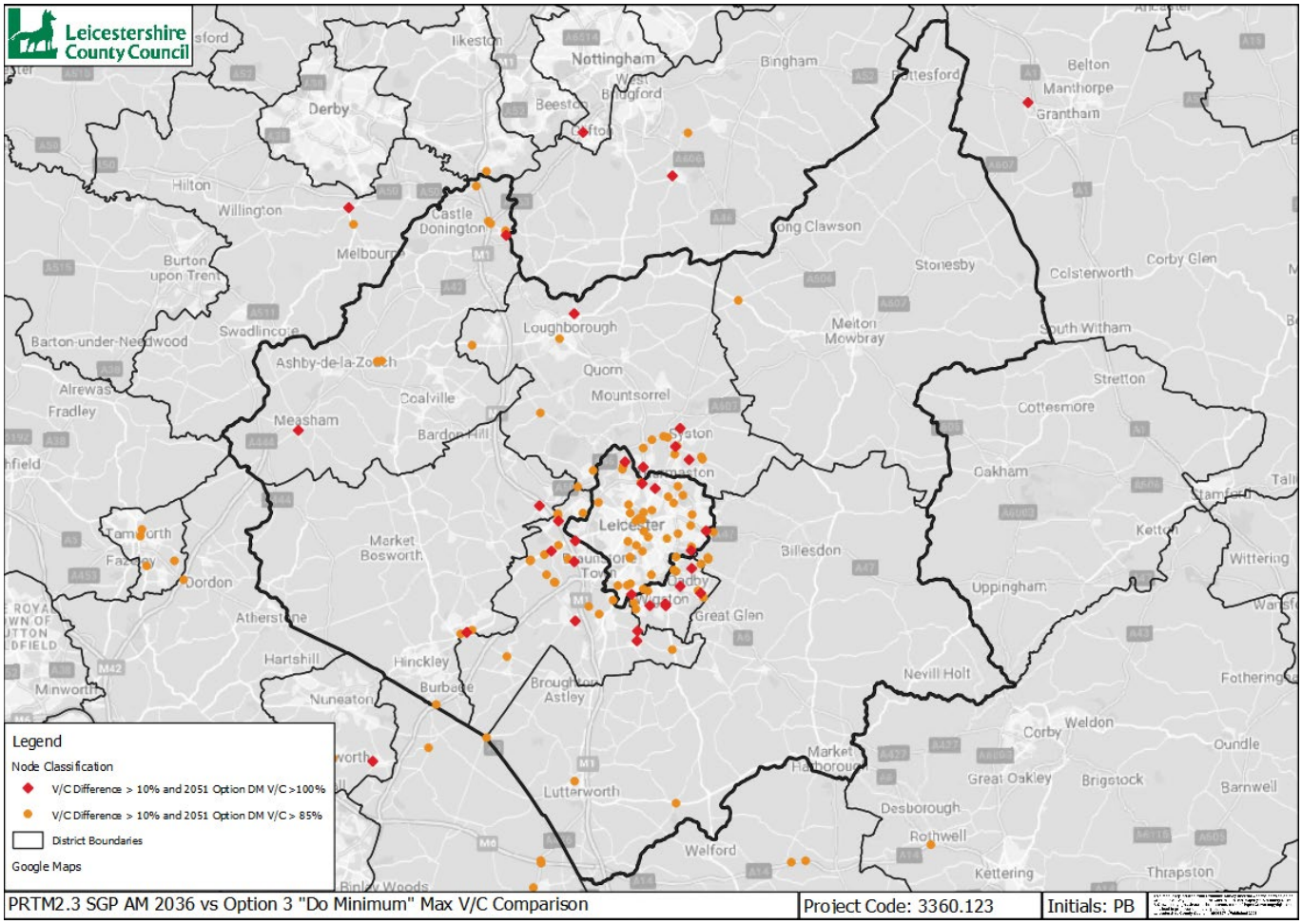


Figure 5.10: 2036 vs. Option 3 "Do Minimum" Maximum V/C Comparison

5.6.6. The model forecasts clusters of worsening junction performance for Syston, Oadby & Wigston and west of Leicester like that seen for Option 2. Across the rest of the county there are no clear clusters appearing which reflects the growth strategy being centred around the LUA.

5.6.7. Table 5.5 shows the total number of junctions whose VoC exceeds 85% for the 2021, 2036 and 2051 (Option 3) future years.

5.6.8. As well as being broken down by District across the county, the figures are also aggregated to provide insight into the cumulative effect for the County, Leicester City and both combined.

	2021 DM 85%+	2036 DM 85%+	2051 Op3 DM 85%+
LCiC	112	158	239
LCC	160	267	366
CBC	51	85	107
MBC	5	3	4
HDC	11	21	25
OWBC	7	10	23
BDC	39	59	89
HBBC	19	29	39
NWL	28	60	79
Total	272	425	595

Table 5.5: 2021 vs. 2036 vs. Option 3 "Do Minimum" Maximum V/C Comparison

5.6.9. Across the combined area the number of congested junctions is forecast to increase by 56% (272 to 425) in 2036 from the present day and by an additional 40% (425 to 595) from 2036 to 2051 (Option 3). For the full area these figures have risen by 4% from Options 1 and 2 due, predominantly, to increases across the LUA.

5.7. Option 4 (New Market Towns) "Do Minimum"

5.7.1. Figure 5.11 shows the change in traffic flow associated with the housing growth of Option 4 (*'new market towns'*) over the period 2036 to 2051. Those links experiencing a flow increase are coloured red with decreases coloured blue.

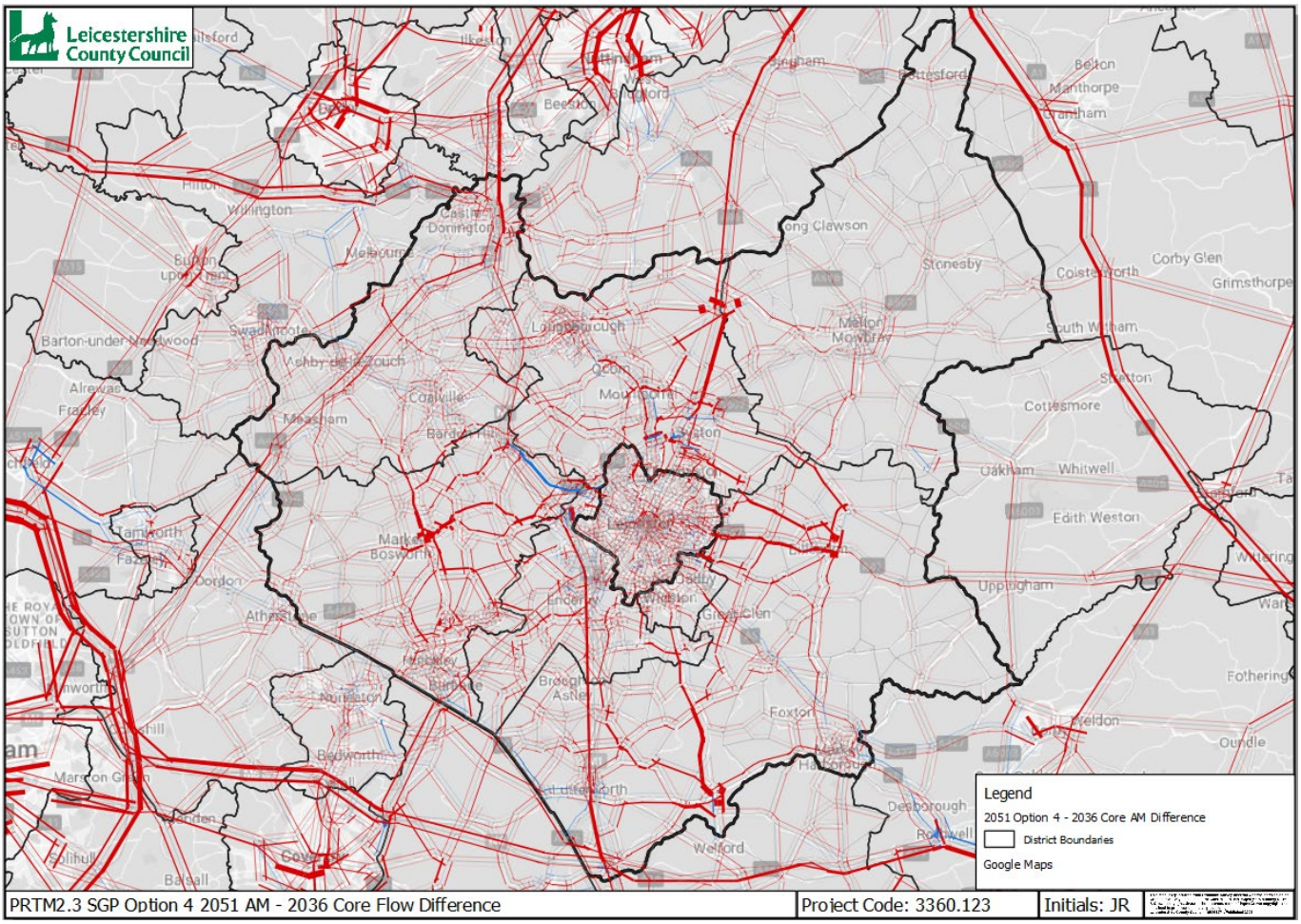


Figure 5.11: Option 4 "Do Minimum" - 2036 Core, Flow Difference

5.7.2. Whilst most of the network experiences increased traffic there are some roads forecast to see reductions. As observed in the previous options, the A50 between Leicester and M1 Junction 22 is forecast to be affected by a breakdown in performance at the Field Head junction, Markfield.

5.7.3. The additional trips are distributed in line with Option 4's spatial strategy and its concentration of future growth in 4 new market towns. The location of the market towns can be discerned from the intensity of the flow growth on nearby links and the 'Leicester-centric' direction of their movements.

5.7.4. Option 4 is characterised by more rural routeing compared to the other Options. The prime driver for this is the market town location in relation to where 'sought after' services and activities are available.

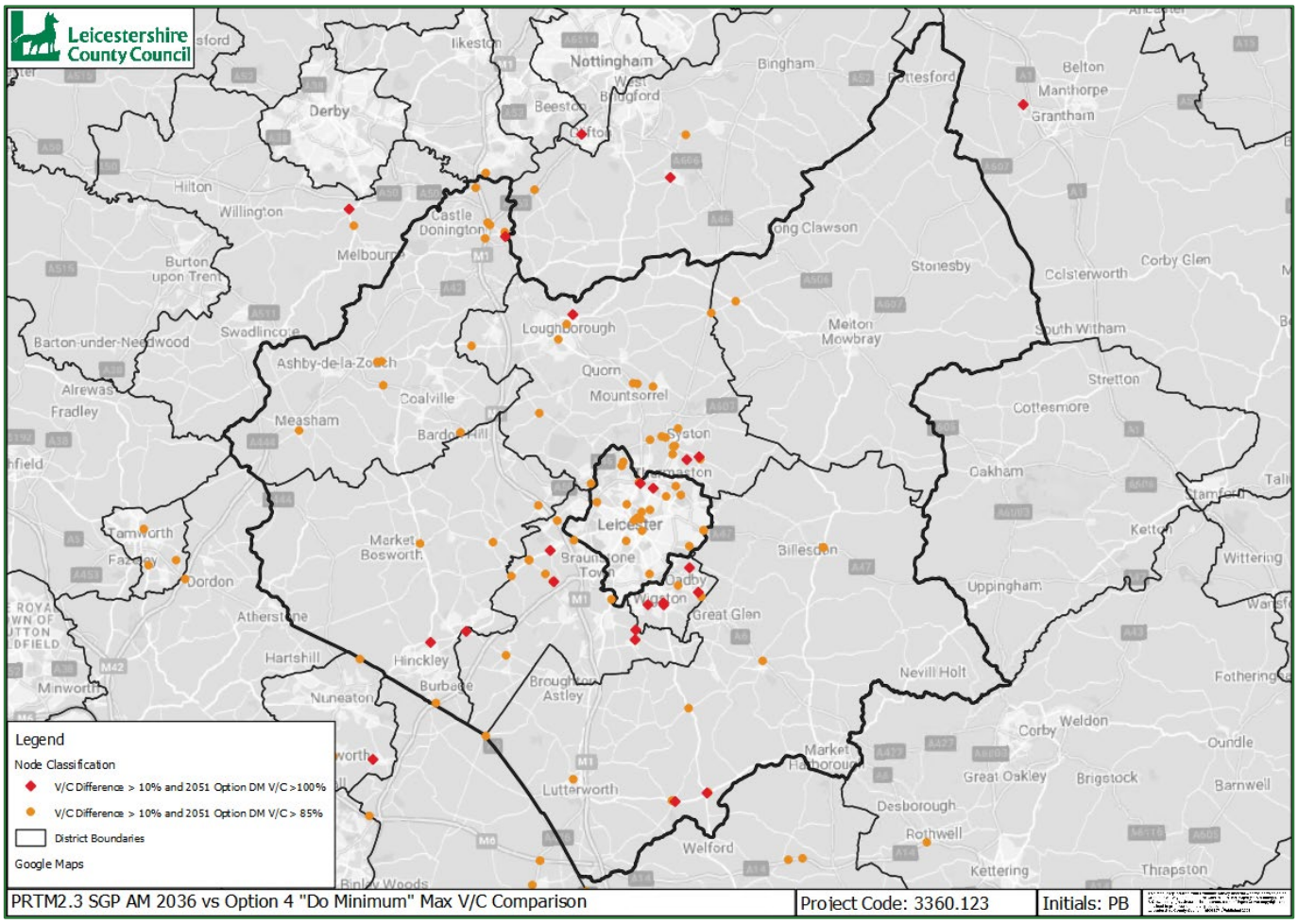


Figure 5.12: 2036 vs. Option 4 "Do Minimum" Maximum V/C Comparison

5.7.5. The model forecasts clusters of worsening junction performance for Syston, Oadby & Wigston, west of Leicester and in the vicinity of M1 J24, shown in Figure 5.12.

5.7.6. Table 5.6 shows the total number of junctions whose VoC exceeds 85% for 2021, 2036 and 2051 (Option 4) future years.

	2021 DM 85%+	2036 DM 85%+	2051 Op4 DM 85%+
LCiC	112	158	214
LCC	160	267	358
CBC	51	85	109
MBC	5	3	5
HDC	11	21	32
OWBC	7	10	16
BDC	39	59	75
HBBC	19	29	40
NWL	28	60	81
Total	272	425	572

Table 5.6: 2021 vs. 2036 vs. Option 4 "Do Minimum" Maximum V/C Comparison

5.7.7. As well as being broken down by District across the county, the figures are also aggregated to provide insight into the cumulative effect for the County, Leicester City and both combined.

5.7.8. Across the combined area the number of congested junctions is forecast to increase by 56% (272 to 425) in 2036 from the present day and by an additional 35% (425 to 572) from 2036 to 2051 (Option 4). For the full area these figures are of the same order as Options 1 and 2.

5.8. Stage 1A Key Outcomes

5.8.1. Across all four of the 2051 "Do Minimum" options, the summary statistics presented show a worsening of conditions compared to both the 2021 and 2036 Scenarios.

5.8.2. Options 1, 2 and 3 (52%, 49% and 56% respectively) have a higher proportion of trips less than 10km than Option 4 (34%).

5.8.3. In all 4 growth options there is an increase in traffic across the whole of Leicestershire and Leicester City.

5.8.4. The number of congested junctions in Leicestershire and Leicester City has increased when compared to the 2036 Core by 36%, 36%, 40% and 35% for Options 1, 2, 3 and 4 respectively.

5.8.5. All evidence from Stage 1A concludes that there is meaningful degradation in the performance of the network across all metrics meaning that some intervention will be necessary to minimise the impact of the forecast additional 2051 development being tested.

6. Identification and Selection of Strategic Interventions for STA Stage 1B (2051 Spatial Option 'With Strategic Interventions') Model Runs – Proposed Schemes and Scoring

6.1. Introduction

6.1.1. The remit of Stage 1B of the STA was limited to considering major strategic, 'big ticket' transport infrastructure requirements for each spatial option. It does not (in and of itself) seek to provide a comprehensive, all-encompassing transport mitigation strategy for Leicester and Leicestershire-wide growth to 2051, which would have been disproportionate to the scale of the assessment and current stage in the STA process. More detailed and localised[11] (non-strategic) transport mitigation requirements will need to be looked at through separate, more-focussed work at a later stage, following-on from the STA (including as part of future Local Plan evidence base work and/or strategic site planning applications).

6.1.2. Initially, seven key "areas of search" were identified (shown in Figure 6.1), with an eighth added after review of the preliminary outputs presented in Section 5. These areas correspond to movements or areas where one or more of the growth options were likely to have an impact. The "areas of search" identified were intended to provide a geographical 'framework' for which strategic infrastructure packages were defined. The areas are as follows:

A. **Leicester North and West Orbital**
B. **Leicester South and East Orbital**
C. **Leicester Urban Area Radials**
D. **International Gateway Links**
E. **Hinckley 'Cluster' Links**
F. **County Radials – NE/SE/SW/NW**
G. **County Radials – N/E/S/W**
H. **Outer County Orbitals**

[11] "localised" interventions include initiatives such as measures that aim to encourage active travel, (e.g. schemes proposed through LCWIPs), traffic calming/management initiatives or non-strategic junction enhancements.

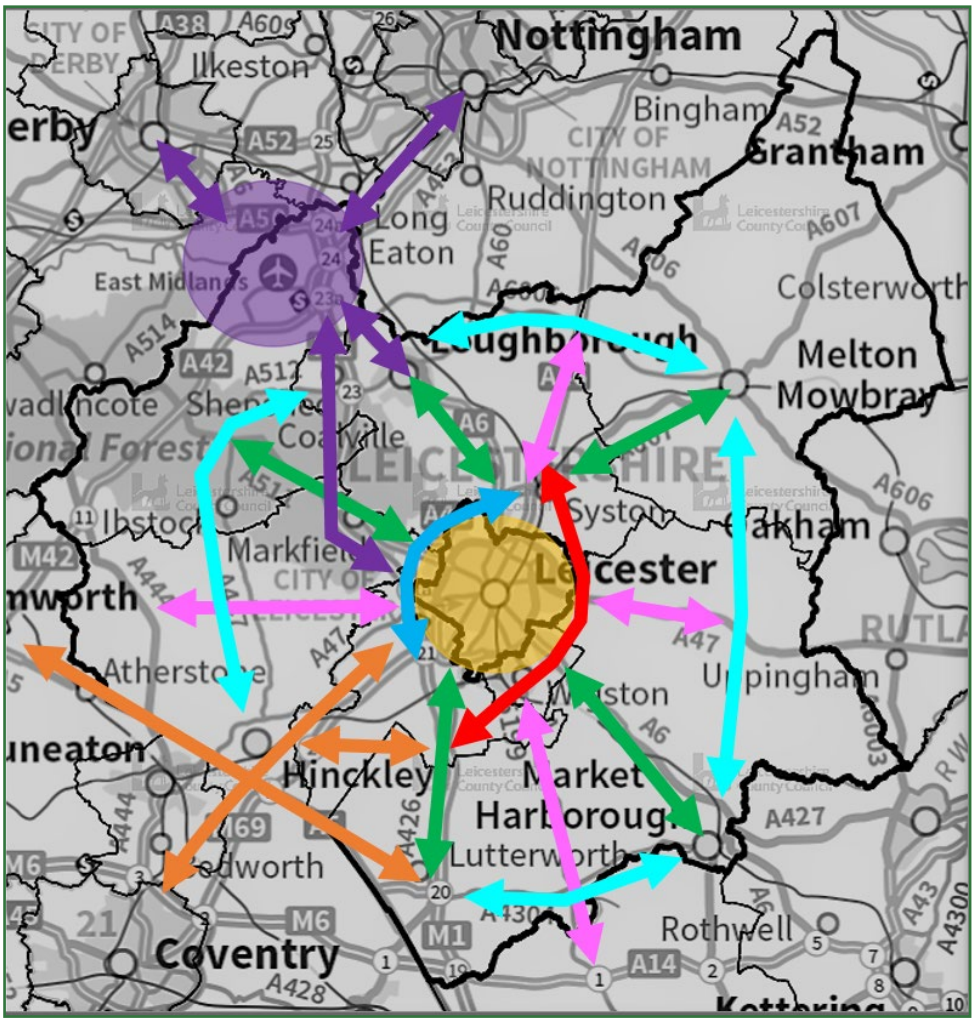


Figure 6.1: Proposed 'Areas of Search'

6.1.3. Transport interventions were planned holistically and across multiple stakeholders, namely Leicestershire County Council, Leicester City Council and National Highways (as the relevant local and strategic highway and transport authorities for the HMA); to ensure all authorities' views and objectives were considered.

6.1.4. An initial long list of prospective strategic measures (see Annex H – Full List of Potential Strategic Interventions) was identified for each of the eight "areas of search" defined above. From these long lists, a bespoke package of interventions was subsequently identified for each spatial option. This process was heavily informed by key outputs and analysis of the Stage 1A model runs, albeit applying professional judgement to ensure that the specific interventions identified for each spatial option formed a cohesive and geographically appropriate package in each case.

6.1.5. The decision to develop and assess bespoke packages tailored to each option was agreed by the partnership prior to the work commencing and was seen as a key part of giving each option a "fair hearing". Conversely, a single, generic, package of interventions applicable to all options could potentially be seen to be biased; inevitably suiting some options more than others.

6.1.6. It was agreed amongst the respective highway and transport authorities that the assessment of strategic interventions should be undertaken iteratively, with an initial round of testing focussing purely on strategic Passenger Transport (PT) measures, followed by a second round of testing incorporating strategic highway interventions on top of the PT measures to establish their combined effect. This approach reflected a desire to prioritise sustainable travel interventions as far as possible and allow the potential effectiveness of these measures to be assessed in isolation from any accompanying strategic highway interventions.

6.2. Strategic Intervention Scoring

6.2.1. As initial thoughts contained multiple ideas for PT and highway interventions within each "area of search"; a simplified, evidence-led, sifting exercise was developed using future 2051 with/without scenario growth output to provide a recommendation of suitable schemes for each growth scenario.

6.2.2. Central to the sifting was the derivation and subsequent application of a scoring array to assess the suitability of prospective schemes. Schemes were scored across an eclectic mix of metrics including some, but not all, from PRTM forecast output. The metrics used were:

- Does scheme lie within or near an AQMA area?
- Proximity of option development site and its impact on scheme.
- Is proposed intervention a new addition or upgrade to current network?
- Is scheme within an option's identified "area of influence"?
- Density of traffic in scheme's proximity (PRTM).
- Traffic flow in scheme's proximity (PRTM).
- Comparative traffic flow percentage difference ('with' vs 'without' option growth) (PRTM).
- Traffic delay difference in scheme proximity ('with' - 'without' option growth) (PRTM).
- Highway link volume/capacity ratios in scheme proximity (PRTM).
- Junction volume/capacity ratios in scheme proximity (PRTM).

6.2.3. The calculated mitigation scores are summarised in Annex I and were used in the decision-making process by highway stakeholders to finalise a list of component schemes for further testing by scenario.

6.2.4. This initial Strategic Intervention Scoring involved looking at interventions on a 'stand-alone' basis. This scoring was subsequently passed to the partner transport authorities (Leicestershire County Council, Leicester City Council and National Highways) who utilised this list during the assembly of scheme packages to accompany each spatial option.

6.2.5. The identification of the final scheme packages for testing required a level of professional judgement and/or moderation on the part of the transport authorities to, in particular:

- Consider where interventions have the potential to be grouped together to form holistic packages that could enhance their impact.
- Ensure they form cohesive, and geospatially appropriate when compared to the respective spatial distributions of growth, packages.

- Take forward interventions that were both technically feasible in principle and were sufficiently developed in practice, to be assessed through a strategic transport modelling exercise.

6.2.6. As a result of this process (and associated considerations), some relatively lower-scoring standalone interventions under the initial sifting exercise, were ultimately included in one, or more, of the final packages identified for testing alongside each spatial option (as identified through sections 6.3 and 6.4), and vice versa for certain relatively higher-scoring standalone interventions, under the initial sifting.

6.3. Strategic Passenger Transport Interventions

6.3.1. Consistent with the overall scope of STA Stage 1B, the strategic PT interventions introduced for each option were overwhelmingly focussed on HMA-wide, predominantly inter-urban (and in some cases inter-regional) journeys, rather than more local movements (which will need to be considered through more detailed assessments at a later stage).

6.3.2. The packages of PT interventions carried forward to the model runs comprised proposals or schemes that either had an established "status" within Government or Strategic Agency programmes (such as Midlands Connect's Midlands Rail Hub proposals and the Government's "Restoring your Railway" programme) or were considered to be likely components of the proposed strategic site opportunities/new market towns included in the various spatial options (i.e. high-quality passenger transport links to/from these locations to key "parent settlements"). All these interventions had a sufficiently defined concept on which to base model assumptions and/or were considered plausible for delivery within the period covered by the SGP (i.e., by 2051). Conversely, and whilst acknowledging any strategy needed to be ambitious, several other potential PT interventions identified at the initial long list stage were omitted on the basis that (at the point of decision) they did not meet one or both of these criteria.

6.3.3. To enable the assessment to be carried out in a proportionate and timely fashion, a simplified approach to estimating related PT modal shift was developed[12] in preference to the more detailed approach offered by full PRTM forecasting (such detailed forecasting will be more appropriate in later stages of the STA and through other work, once a preferred-SGP spatial distribution is confirmed).

6.3.4. The simplified approach involved the identification and application of suitable highway matrix reduction factors between sectoral movements expected to be served by a particular PT intervention. This approach has the advantage of its simplicity, transparency and proportionality with high-level spatial options testing exercises such as that undertaken through Stage 1 of the STA.

[12] High Level SGP – TN001: Evidencing Highway Reduction Factors associated with PT Measures (v3.0), LCC internal technical note, 22 August 2022

6.3.5. The prospective rail interventions are summarised in Table 6.1 below and depicted schematically in Figure 6.2. Due to their scale, required level of investment and predicted regional impacts, they were included in all 4 spatial option tests.

No.	Option Name	Description/Notes
R1	Birmingham – Leicester – Stansted Passenger Rail Services	- Doubling of frequency between Birmingham, Nuneaton, Hinckley and Leicester from current 2tph to 4tph. - Doubling of frequency between Leicester, Melton Mowbray and Stansted from current 1tph to 2tph. - Service frequency to Narborough and S Wigston unchanged from current levels. - Part of Midlands Connect's 'Midlands Rail Hub' proposals.
R2	Coventry – Leicester – Loughborough Passenger Rail Services	- New service between Coventry, Nuneaton, Hinckley, Narborough, South Wigston, Leicester and Loughborough. - 2tph (NB this is over any existing/new Birmingham to Leicester services). - Requires new chord(s) south of Nuneaton Station to connect Coventry and Leicester lines. - Part of Midlands Connect's 'Midlands Rail Hub' proposals.
R3	Nottingham to Leicester Passenger Rail Services	- Increase frequency of local/ 'stopping' services between Nottingham and Leicester via East Midlands Parkway, Loughborough, Barrow, Sileby and Syston to 5tph (from current 3tph). - Comprises additional 2tph in each direction: one stopping at all intermediate stations and one stopping at East Midlands Parkway and Loughborough only.
R4	Derby to Leicester Passenger Rail Services	- Increase frequency of local/ 'stopping' services between Derby and Leicester via Long Eaton, East Midlands Parkway and Loughborough to 5tph (from current 3tph). - Comprised additional 2tph in each direction, both stopping at the intermediate stations described above.
R5	Burton to Leicester Passenger Rail Services	- New passenger rail service on currently freight-only route connecting Burton and Leicester, with new intermediate stations at Swadlincote (Castle Gresley), Moira, Ashby, Coalville, Ellistown, Meynell's Gorse and South Leicester (Freemen's Common). - 2tph at peak times and 1tph at other times. - Would require new chord south of Leicester railway station to allow direct trains between Leicester and the rest of the route. - Currently being investigated in more detail through the Government's 'Restoring your Railway' fund/programme.
R6	Melton to Nottingham Passenger Rail Services	- New regular direct passenger rail service between Melton Mowbray and Nottingham (via Syston north chord) via Sileby, Barrow, Loughborough and East Midlands Parkway. - 1tph. - Currently being investigated in more detail through the Government's 'Restoring your Railway' fund/programme.

Table 6.1: Description of Tested Rail Interventions

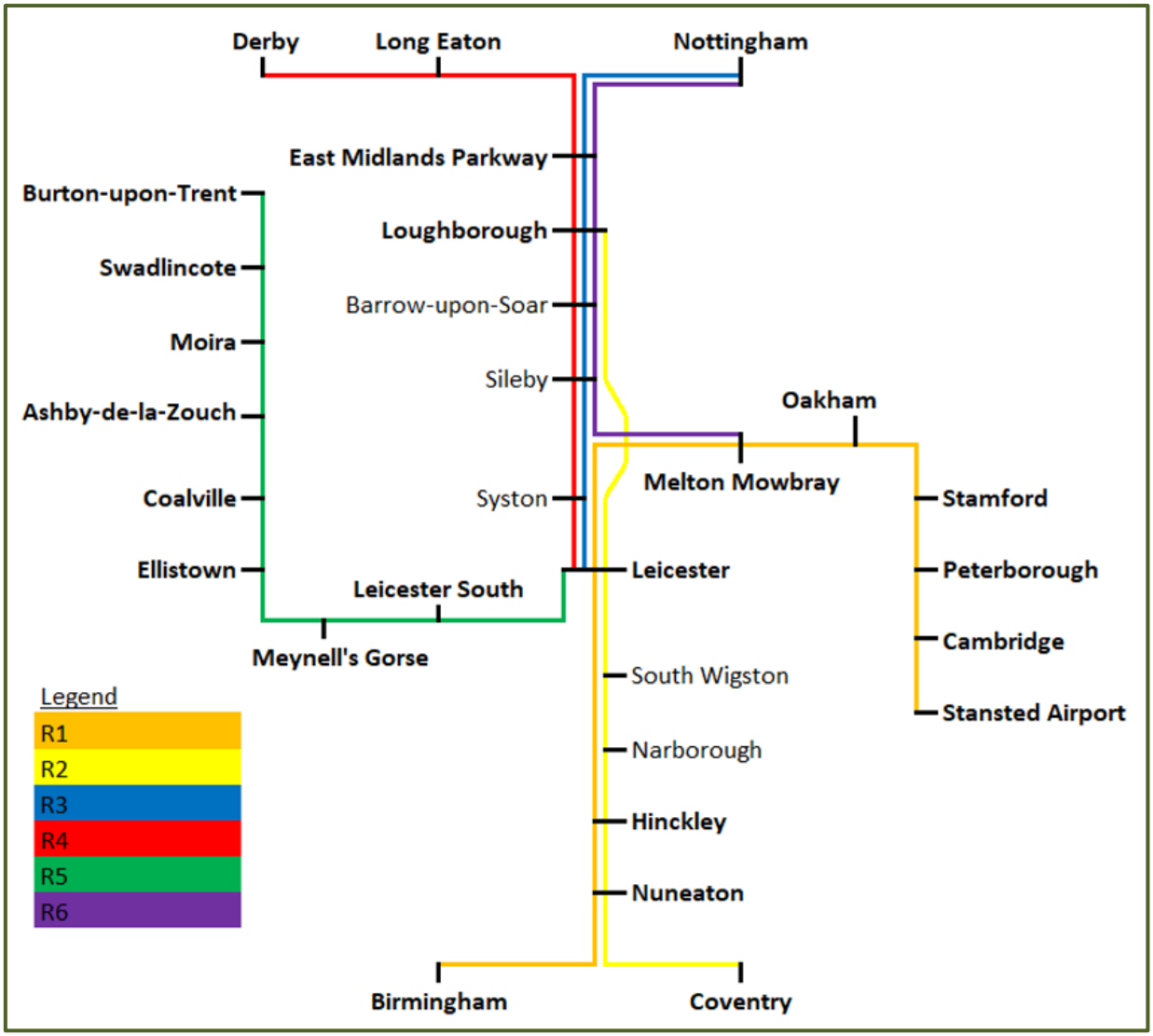


Figure 6.2: Detail of Tested Rail Lines

6.3.6. By contrast, the proposed bus interventions were somewhat smaller in scale and unlikely to require the same level of national support and funding. These interventions were targeted at smaller sub-areas and hence were more option specific, as outlined in Table 6.2 and Figure 6.3 below.

No.	Option Name	Description/Notes
C4	New/enhanced PT links between Leicester city centre and 'near Leicester' strategic site locations.	- Applicable to spatial Options 2 (Current SGP spatial pattern) and 3 (Majority Near Leicester). - Assume minimum of half-hourly frequency for new/enhanced routes.
D9	New/enhanced PT links from 'International Gateway' strategic site locations to EMA/EMG, L'boro, Derby and Notts.	- Applicable to spatial Option 2 (Current SGP spatial pattern). - For sites, the range of destinations served, and quality/frequency of these links should be modelled on/mirror the local conurbation (Castle Donington/Shepshed etc.)
E6	'New/enhanced PT links from 'Hinckley Cluster' strategic site locations to Hinckley town centre.	- Applicable to spatial Option 2 (Current SGP spatial pattern). - Assume minimum of half-hourly frequency for new/enhanced routes.
G5	New/enhanced PT links between new market towns and Leicester city centre.	- Applicable to spatial Option 4 (New Market Towns Focus). - Specifically applies to the 4 new market town locations (as shown on the adjacent plan – pink circles). - Assume minimum of half-hourly frequency for new/enhanced routes.

Table 6.2: Detail of Short-Listed Bus Schemes

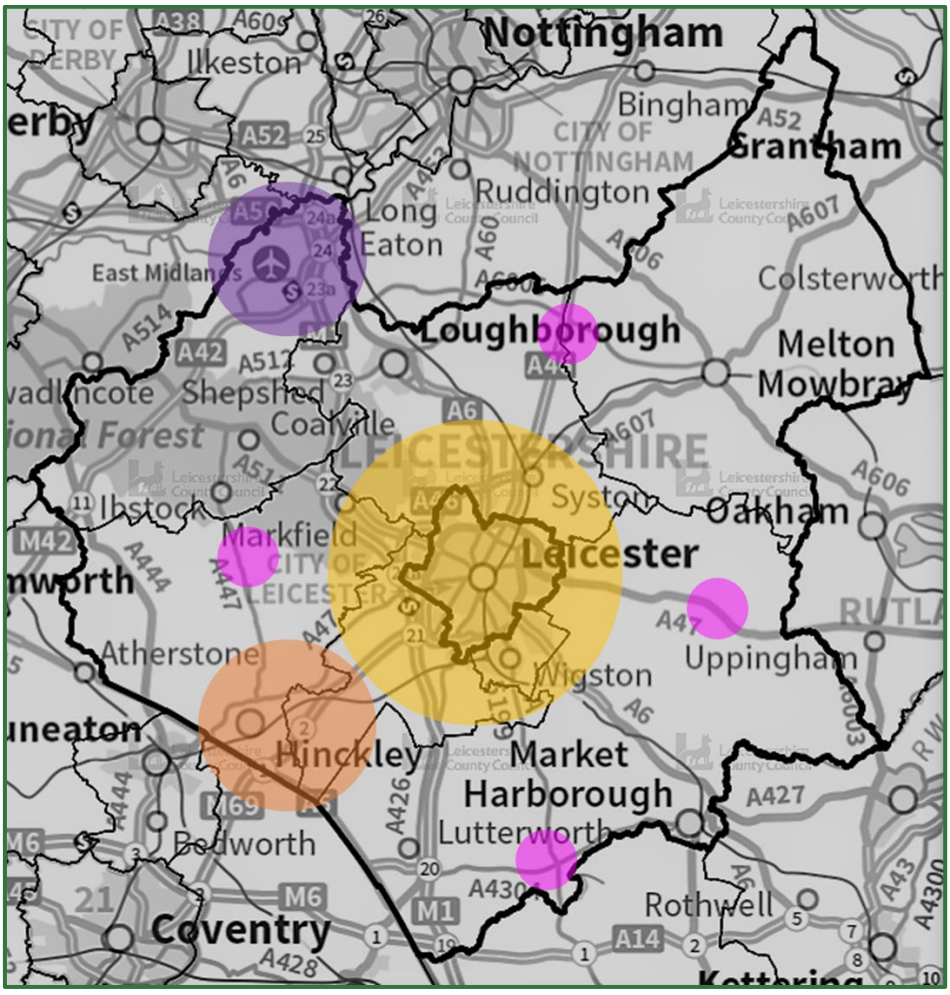


Figure 6.3: Areas of Influence of Short-Listed Bus schemes

6.3.7. Considering these rail and bus interventions, a holistic passenger transport package was finalised for each spatial option. Table 6.3 concludes on the component measures agreed for each Option's package of interventions. More detail on how this is applied is discussed in Section 7.1.

Scheme		Op1	Op2	Op3	Op4
C4	New/enhanced PT links between Leicester city centre and strategic site locations.		Y	Y	
D9	New/enhanced PT links from strategic site locations to EMA/ EMG, L'boro, Derby and Notts.		Y		
E6	New/enhanced PT links from strategic site locations to Hinckley town centre.		Y		
G5	New/enhanced PT links between new market towns and Leicester city centre.				Y
R1	Birmingham – Leicester – Stansted Passenger Rail Services	Y	Y	Y	Y
R2	Coventry – Leicester – Loughborough Passenger Rail Services	Y	Y	Y	Y
R3	Nottingham to Leicester Passenger Rail Services	Y	Y	Y	Y
R4	Derby to Leicester Passenger Rail Services	Y	Y	Y	Y
R5	Burton to Leicester Passenger Rail Services	Y	Y	Y	Y
R6	Melton to Nottingham Passenger Rail Services	Y	Y	Y	Y

Table 6.3: Passenger Transport Scheme Overview

6.3.8. Under Option 1, 2036-51 growth is assumed to be distributed entirely to existing settlements, with the growth adopting the pre-existing level of PT connectivity in the relevant settlement/location. By comparison, the new strategic sites and market towns included in Options 2, 3 and 4 are, by definition, situated outside existing settlements in locations with no pre-existing PT connectivity; and, therefore, assumed to have no PT links under "do minimum" conditions.

6.3.9. It was considered that, in practice, if the strategic sites and/or new market towns of the scale and nature included in Options 2, 3 and 4 were to be brought forward; it would be reasonable to assume that they would require accompanying new passenger transport links to nearby 'parent settlements' (e.g., to provide access to higher-order jobs and services) and would be more capable of providing such new PT links than dispersed growth (by concentrating additional PT demand and investment more heavily on certain key corridors). The additional strategic PT measures agreed for inclusion for Options 2, 3 and 4 sought to represent and mimic the impacts of such new PT links/focussed investment at a high-level.

6.3.10. However, as set out in Sections 6.1 and 6.3 of this report, it would not be proportionate to model more granular PT interventions through the STA and would require attention through more detailed studies.

6.4. Strategic Highway Interventions

6.4.1. Consistent with the overall scope of STA Stage 1B, the strategic highway interventions included in the packages for each spatial option fell into one of the following categories:

1. Major new highway connections. For example, link roads, bypasses, or new junctions on the strategic road network, etc.
2. Drastic enhancements to existing highway infrastructure. For example, dualling or widening of existing major or strategic road network, grade separation of existing junctions etc.

6.4.2. Many of the specific interventions proposed as part of one or more of the packages are based on (or at least influenced by) schemes that have been explored or proposed as part of other work or proposals; for instance, known schemes that are currently under investigation as part of National Highways and/or Midlands Connect in connection with the Road Investment Strategy (RIS) process, and schemes that have indicatively arisen from work to explore the impacts of the proposed East Midlands Freeport.

6.4.3. The purpose of testing such strategic highway interventions was to identify and factor-in any 'big ticket' infrastructure scheme components that may be required to facilitate each of the SGP spatial options by 2051. The requirement for such interventions arises where existing routes are fundamentally unsuitable for providing access to key areas proposed for strategic scale development and/or where the impacts of growth on the existing transport network are unlikely to be satisfactorily addressed through sustainable measures and more localised, smaller-scale highway interventions alone.

6.4.4. The scale and nature of the strategic highway interventions tested through Stage 1B extend well beyond the types of interventions that have typically been considered in the past to support the delivery of Local Plans. However, these interventions are commensurate with the overall scale of growth proposed across the HMA, associated impacts/accessibility requirements arising from this, and potential funding and delivery opportunities that may emerge over the lifetime of the SGP to 2051. By extension, it is anticipated that most (if not all) of the interventions would, if taken forward, be delivered over multiple local plans; both spatially (i.e., cross-boundary/HMA-wide) and over time (i.e., across multiple/successive local plan periods out to 2051).

6.4.5. Tables 6.4-6.7 and Figures 6.4-6.7 summarise the definitive packages of strategic highway interventions that were tested for each spatial option as part of Stage 1B. Whilst the packages for each spatial option are bespoke, it should be noted that there is significant crossover between them, with some component schemes appearing in more than one option/package.

6.4.6. The package of strategic highway interventions for all four spatial options included improvements to the M1 between J21 and J21a and between J21a and J23a, as well as to the A5 between the M42 and M69. These three schemes were, at the point the Stage 1B modelling work was commissioned, amongst National Highways' ongoing programme of potential future RIS Pipeline Projects, the purpose of which is to identify and develop SRN schemes for delivery in RIS period 3 (2025-30) and beyond (i.e., potentially throughout the remainder of the period covered by the SGP). However, M1 J21a to J23a has since been dropped from the RIS Pipeline programme due to the Government's cancellation of the "smart motorway" upgrade programme. Pending the outcomes of the ongoing RIS pipeline project work for the two remaining schemes and their subsequent inclusion in future RIS programmes, it cannot be said for certain that these two schemes will ultimately be delivered through the RIS process.

6.4.7. Nevertheless, the inclusion of these three schemes in the RIS pipeline process at the point the Stage 1B modelling work was commissioned meant that they had (and for the remaining two schemes still have) a more definitive status than the various other strategic highway interventions identified for testing through Stage 1 of the STA, and therefore greater probability of coming forward within the timescales of the SGP (i.e., up to 2051) at that point in time. Furthermore, as these schemes would primarily be targeted at meeting national and regional travel requirements (notwithstanding any benefits they would have in accommodating Leicester and Leicestershire's growth), the choice of SGP spatial distribution is unlikely to have a significant bearing on whether they come forward for delivery as part of a future RIS. For these reasons, it was considered most appropriate to include the three RIS pipeline projects in the strategic highway interventions packages for all four spatial options.

6.4.8. Annex D contains the respective highway and passenger transport schemes contained within the various growth options, relating to both development sites and strategic highway mitigation. It also contains the specific detail assumed for coding the highway schemes into the PRTM.

Area of Search	Ref.	Intervention Name	Colour
A – Leicester North and West Orbital	A1	M1 from J21 to J21a	
A – Leicester North and West Orbital	A2	M1 Junction 21	
A – Leicester North and West Orbital	A4	A46 from M1 to Hobby Horse	
A – Leicester North and West Orbital	A5	A46 from Groby Rd to Anstey Ln Junctions	
A – Leicester North and West Orbital	A6	A46 Hobby Horse Roundabout	
A – Leicester North and West Orbital	A7	New West of Leicester link road	
E – Hinckley Cluster Links	E2	M69 Junction 2	
E – Hinckley Cluster Links	E3a	New A47-M69-B4114 link road	
E – Hinckley Cluster Links	E5	A5 from M69 J1 to M42 J10	
F – County Radials 1	F3	M1 J21a to J23a	
F – County Radials 1	F4	New A6 Kibworth Bypass	
F – County Radials 1	F5	New A6 Loughborough Eastern Bypass	
F –County Radials 1	F7	New A6 Hathern Bypass	
F – County Radials 1	F8	New A50 Bradgate Hill Bypass	

Table 6.4: Option 1 Selected Strategic Highway Interventions

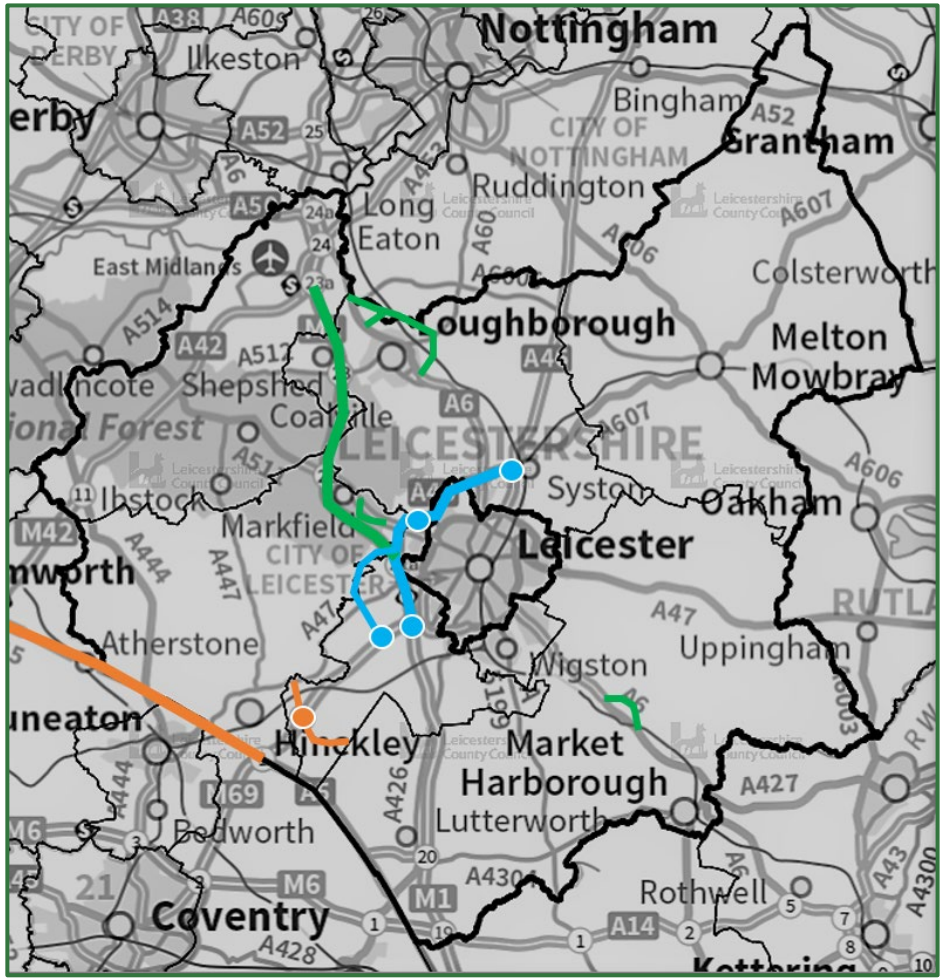


Figure 6.4: Option 1 Selected Strategic Highway Interventions

Leicestershire County Council

Area of Search	Ref.	Intervention Name	Colour
A – Leicester North and West Orbital	A1	M1 from J21 to J21a	
B – Leicester South and East Orbital	B1	New M1 Junction 20a	
B – Leicester South and East Orbital	B2a	New South & East Leicester Orbital Road	
B – Leicester South and East Orbital	B3	A563 Leicester Outer Ring Road	
D – International Gateway Links	D1	M1 J21a to J23a	
D – International Gateway Links	D2	A42 Junction 14	
D – International Gateway Links	D3	New A42 to A50 link road	
D – International Gateway Links	D4	New Kegworth Eastern Bypass	
D – International Gateway Links	D6	New A6 Hathern Bypass	
E – Hinckley Cluster Links	E2	M69 Junction 2	
E – Hinckley Cluster Links	E3	New A47 to M69 link road	
E – Hinckley Cluster Links	E4	New M69 to M1 link road	
E – Hinckley Cluster Links	E5	A5 from M69 J1 to M42 J10	
F – County Radials 1	F4	New A6 Kibworth Bypass	
F – County Radials 1	F5	New A6 Loughborough Eastern Bypass	

Table 6.5: Option 2 Selected Strategic Highway Interventions

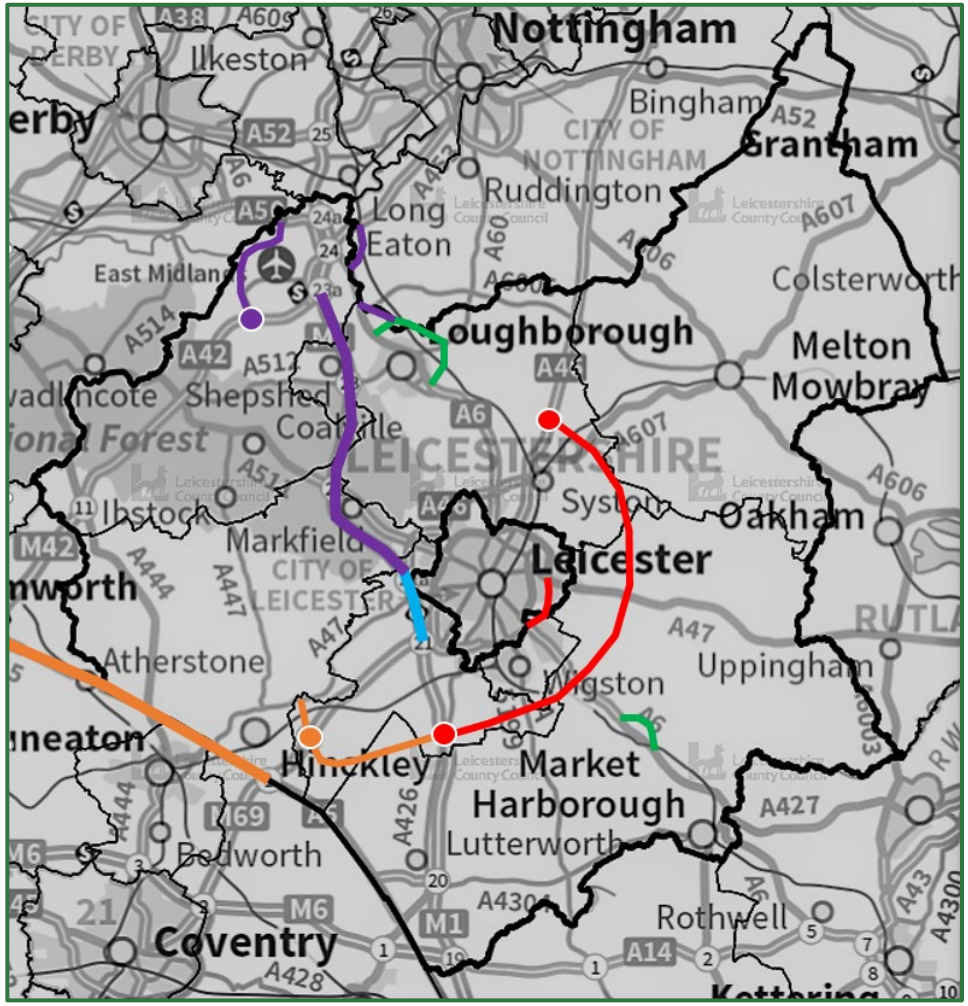


Figure 6.5: Option 2 Selected Strategic Highway Interventions

Leicestershire County Council

Area of Search	Ref.	Intervention Name	Colour
A – Leicester North and West Orbital	A1	M1 from J21 to J21a	
A – Leicester North and West Orbital	A4	A46 from M1 to Hobby Horse	
A – Leicester North and West Orbital	A5	A46 from Groby Rd to Anstey Ln Junctions	
A – Leicester North and West Orbital	A6	A46 Hobby Horse Roundabout	
A – Leicester North and West Orbital	A7	New West of Leicester link road	
B – Leicester South and East Orbital	B1	New M1 Junction 20a	
B – Leicester South and East Orbital	B2	New South & East Leicester Orbital Road	
B – Leicester South and East Orbital	B3	A563 Leicester Outer Ring Road	
D – International Gateway Links	D1	M1 J21a to J23a	
E – Hinckley Cluster Links	E5	A5 from M69 J1 to M42 J10	
F – County Radials 1	F4	New A6 Kibworth Bypass	
F – County Radials 1	F8	New A50 Bradgate Hill Bypass	

Table 6.6: Option 3 Selected Strategic Highway Interventions

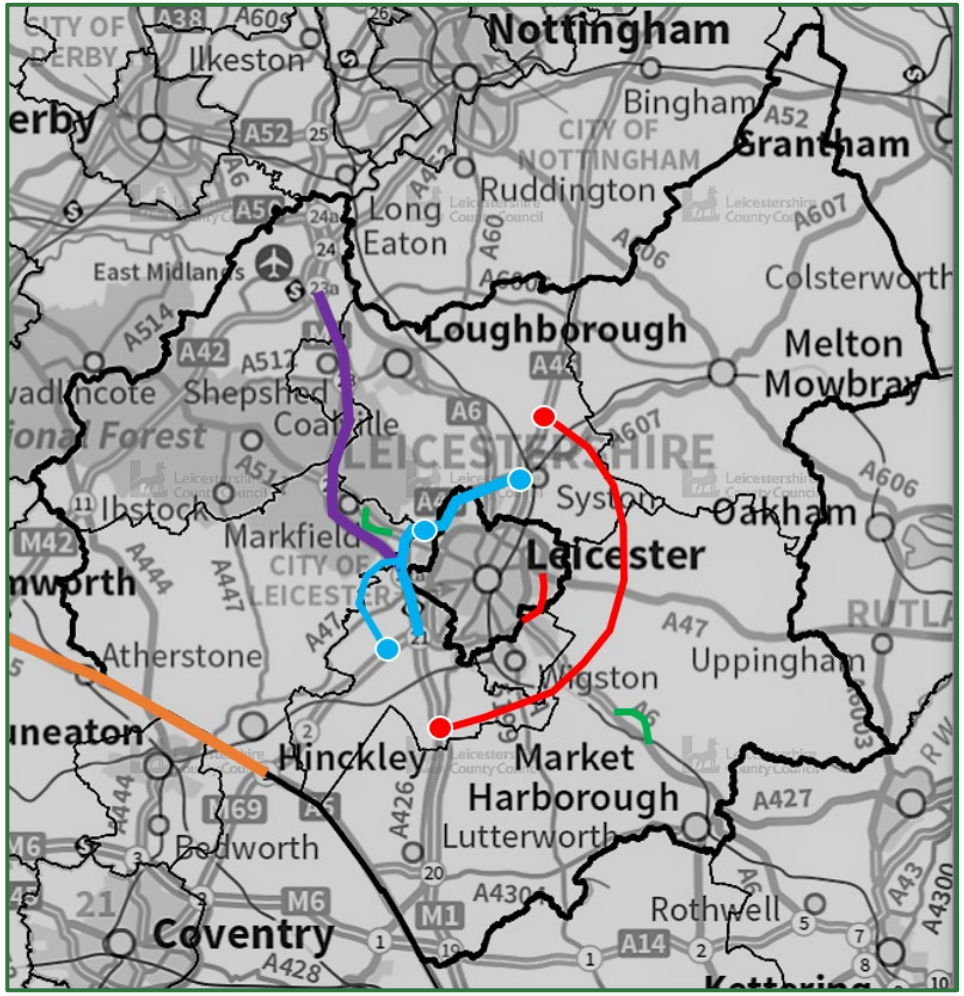


Figure 6.6: Option 3 Selected Strategic Highway Interventions

Area of Search	Ref.	Intervention Name	Colour
A – Leicester North and West Orbital	A1	M1 from J21 to J21a	
A – Leicester North and West Orbital	A2	M1 Junction 21	
A – Leicester North and West Orbital	A4	A46 from M1 to Hobby Horse	
A – Leicester North and West Orbital	A5	A46 from Groby Rd to Anstey Ln Junctions	
A – Leicester North and West Orbital	A6	A46 Hobby Horse Roundabout	
B – Leicester South and East Orbital	*B2a*	*New East Leicester link road*	
B – Leicester South and East Orbital	B3	A563 Leicester Outer Ring Road	
D – International Gateway Links	D1	M1 J21a to J23a	
E – Hinckley Cluster Links	E5	A5 from M69 J1 to M42 J10	
F – County Radials 1	F5	New A6 Loughborough Eastern Bypass	
F – County Radials 1	F8	New A50 Bradgate Hill Bypass	
G – County Radials 2	*G1a*	*B582/B585 Bypasses*	
G – County Radials 2	G2	A46 North of Syston	
G – County Radials 2	*G4a*	*A5199 Bypasses*	
G – County Radials 2	*G5*	*New B582 to A46 link road*	
H – Outer County Orbital (New AOS)	*H1*	*B676 Upgrades*	
H – Outer County Orbital (New AOS)	*H2*	*A4304 Upgrades*	

Table 6.7: Option 4 Selected Strategic Highway Interventions

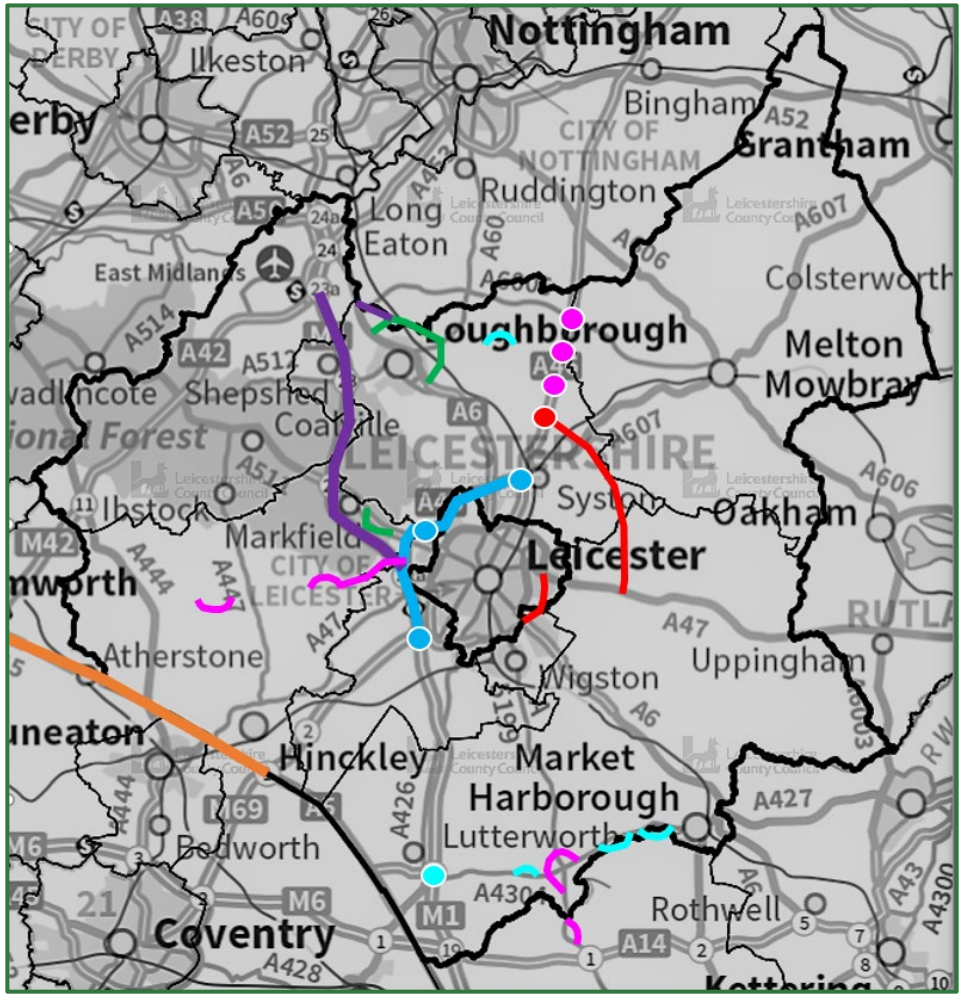


Figure 6.7: Option 4 Selected Strategic Highway Interventions

7. STA Stage 1B "With Passenger Transport Interventions Only" Results

7.1. Background and Methodology

7.1.1. The various option specific Passenger Transport (PT) interventions identified earlier (Table 6.3) were tested in PRTM to determine their prospective impact on the highway network. These 'with intervention' forecasts were tested against the corresponding 'without intervention' ('*Do Minimum*') scenarios produced for each spatial option through Stage 1A (the key outputs of which were set out in Section 5).

7.1.2. Whilst the PRTM has the capability to model passenger transport schemes using its integrated public transport model, a more expedient approach, involving the application of highway reduction factors, was adopted for this high-level assessment as explained previously in paragraphs 6.3.3 and 6.3.4.

7.1.3. Table 7.1 below shows the reduction in trips after the highway reduction factors associated with the PT interventions were applied across all four options. The values presented only include the reduction in movements affecting Leicestershire and Leicester City.

7.1.4. The largest reduction is seen for Option 2, with the smallest for Option 1, and is correlated with the number of component schemes and the scope of trips which can be targeted. In this regard, and by way of example, Option 2 contains multiple bus schemes which are proposed to serve strategic developments into Leicester City. Not only do these serve the strategic developments themselves, but additionally, any demand along the route to/from the city itself.

Matrix Differences	AM Difference		PM Difference	
	Absolute	Difference	Absolute	Difference
Option 1	-1,147	-0.5%	-1,319	-0.6%
Option 2	-2,294	-0.9%	-2,345	-1.0%
Option 3	-2,218	-0.9%	-2,273	-1.0%
Option 4	-1,939	-0.8%	-2,030	-0.9%

Table 7.1: "With PT interventions" – "Do Minimum" Trip Differences

7.1.5. Whilst the PT interventions see a reduction in car trips on the network, it should be noted that the percentage difference in all options is less than 1% of the travel demand for the HMA. The provision of supply side interventions, in the absence of any demand side policy restrictions, is therefore forecast to have a marginal effect on modal shift to more sustainable alternatives.

7.2. Summary Statistics

7.2.1. Figure 7.1 and Table 7.2 show the summary statistics for the simulation area across all 2051 "with PT intervention" scenarios, as well as the 2021 and 2036 Core scenarios. For ease of comparison the "Do Minimum" forecasts are also appended to Table 7.2 in red brackets.

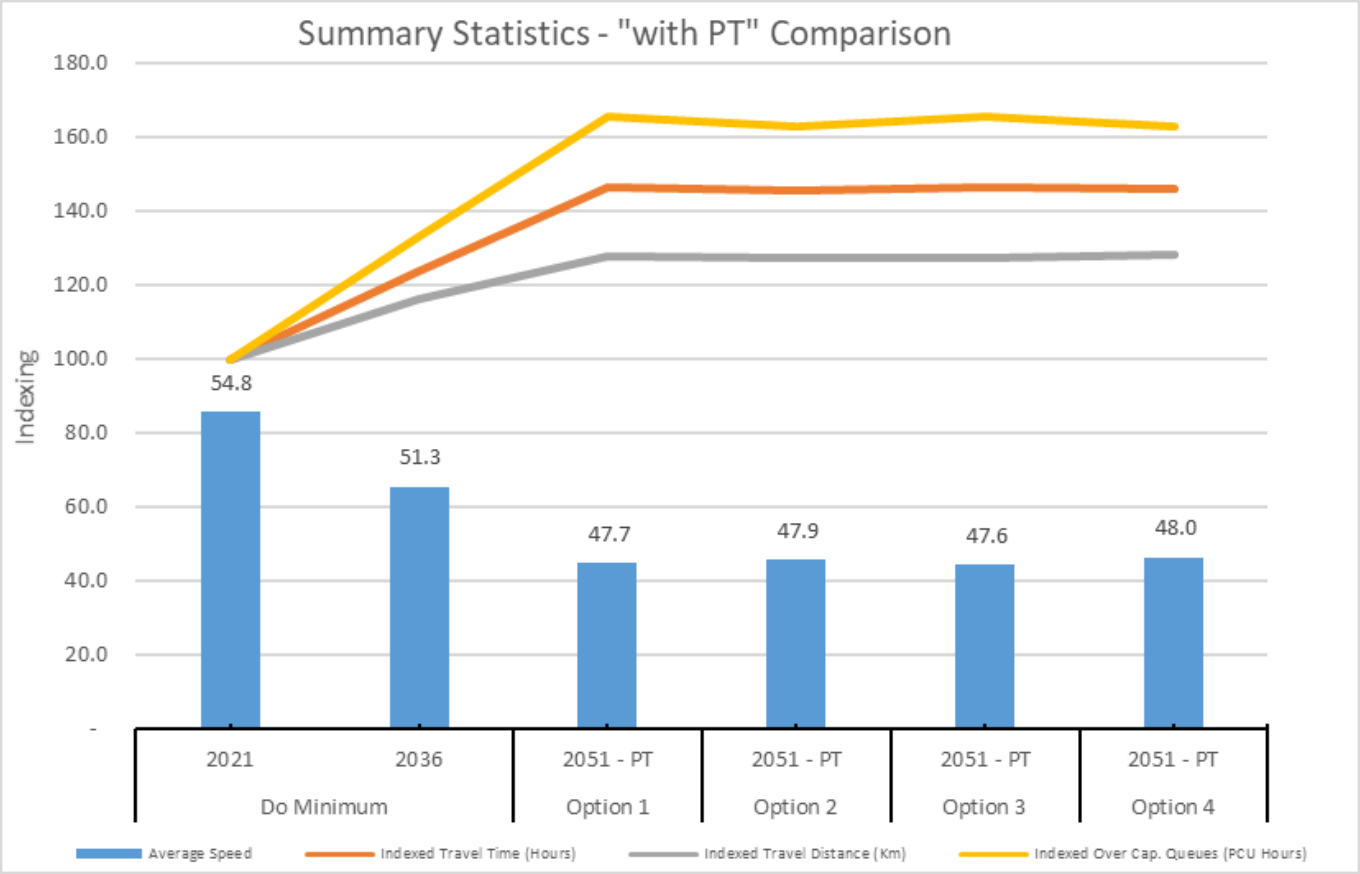


Figure 7.1: Summary Statistics - "with PT Interventions" Option Comparison

	2021	2036	2051			
	Core	Core	Option 1	Option 2	Option 3	Option 4
			"with PT Interventions" *('Do Minimum')*			
Average Speed (kph)	54.8	51.3	47.7 (47.5)	47.9 (47.5)	47.6 (47.3)	48.0 (47.8)
Over Capacity Queues (PCU Hours)	14,240	18,966	23,585 (23,830)	23,204 (23,691)	23,584 (23,949)	23,221 (23,621)
Indexed Travel Time (Hours)	100	124	147 (148)	146 (147)	146 (148)	146 (147)
Indexed Travel Distance (Km)	100	116	128 (128)	127 (128)	127 (128)	128 (129)

Table 7.2: Summary Statistics - "with PT Interventions" Growth Option Comparison

7.2.2. It's notable that across the four spatial options the forecast impact of passenger transport interventions only marginally improves highway network performance over the corresponding "Do Minimum" scenario. However, users are travelling a cumulatively smaller distance at an increased speed whilst queuing less, resulting in a lower combined total travel time across the study area.

7.2.3. Despite marginal improvements, the introduction of these PT interventions alone is not sufficient to adequately mitigate the impacts of growth for any of the four spatial options, which continue to fall well short of even 2036 levels of performance across the board.

7.2.4. As seen with the "Do Minimum" summary statistics, Option 4 appears the superior option when simply comparing average network speeds (48kph) whilst its performance with respect to over-capacity queuing (23,221pcu-hrs) comes a close second to Option 2 (23,204pcu-hrs). However, despite improvements to PT, the limitations of Option 4 described earlier, relating to growth in trips travelling further on rural roads and being less amenable to more sustainable travel modes, still applies here.

7.2.5. It is apparent that the measures introduced in Option 2 have had the greatest impact on the overarching highway network statistics. This is not a surprising conclusion, given that Table 7.1 shows that this Option benefits most in terms of modal shift away from cars.

7.3. Maximum Volume/Capacity

7.3.1. Figure 7.2 shows the maximum junction volume over capacity (VoC) for all four of the PT Options. It is comprised of junctions that are performing with a volume over capacity of 100% or more. These junctions are classed as 'severely congested' and act as a barrier to traffic with trips only routeing through them if necessary.

7.3.2. Junctions have been included in the figure based on the spatial option(s) they flag in and as a black diamond if they flag in all four options. Black diamonds are useful for identifying those areas potentially requiring the most attention with severe congestion forecast irrespective of the spatial distribution adopted.

7.3.3. As in reality, the PRTM seeks out the most 'efficient' routeing for trips to avoid exposure to excessive delays and queues. As growth induced travel demand increases, neighbouring junction VoC ratios increase as more users exploit the advantage of competing routes to avoid congestion. This effect can be seen in Option 1 ('*continuation of existing spatial pattern'*), around Syston, to the North-East of the LUA. Here, the cluster of growth associated with this option for Syston is causing accessibility issues highlighted by the ring of red quadrants surrounding the town.

7.3.4. More generally, the severely congested junctions are concentrated in the following areas:

- Loughborough
- Leicester City Centre
- M1 J21 Area

- Lutterworth
- A47, West of Leicester

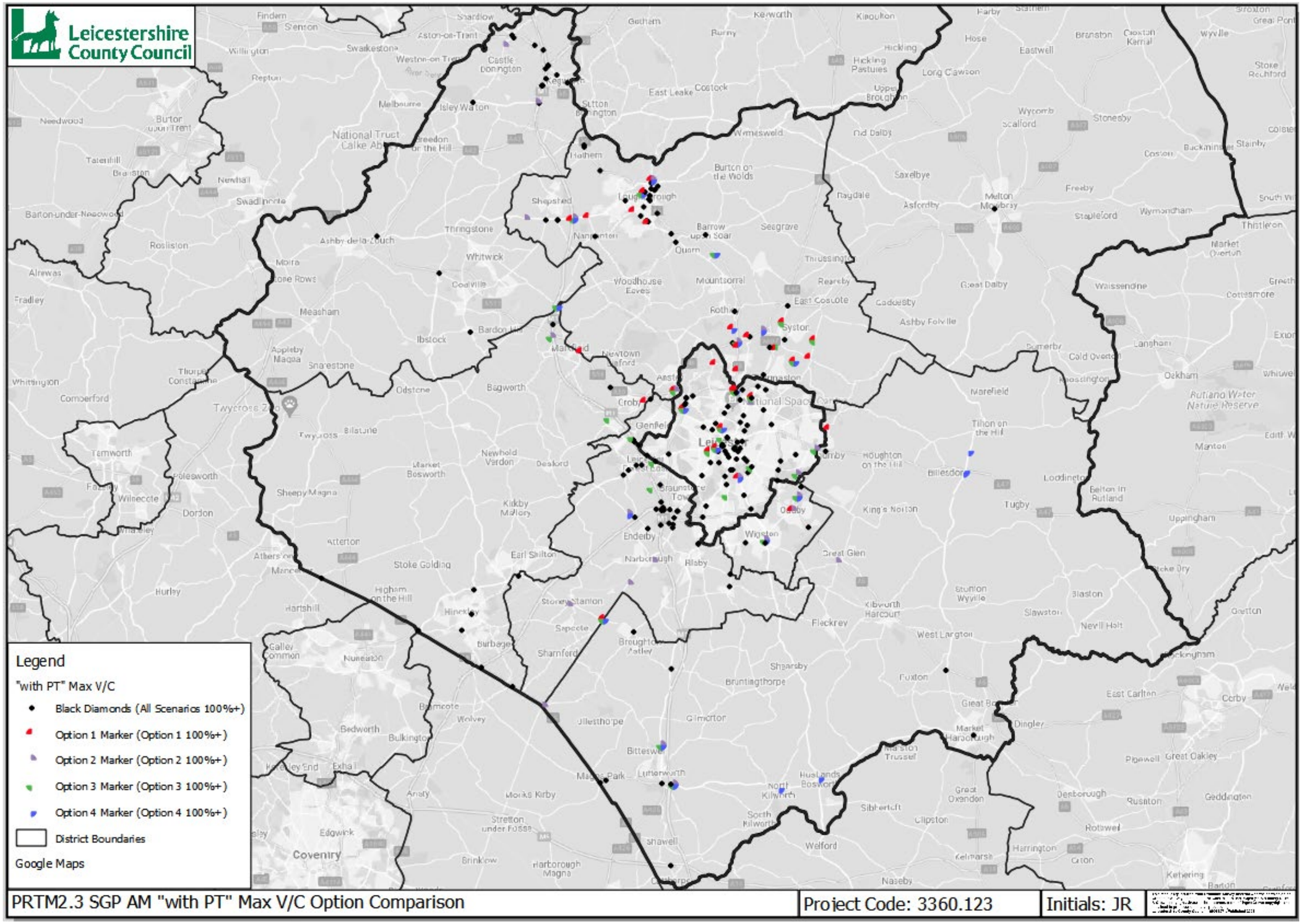


Figure 7.2: "With PT Interventions" Maximum V/C Option Comparison

7.3.5. Whilst those junctions with VoC exceeding 100% have been plotted it is worth stating that the onset of congestion, and hence routeing effects, starts to occur in the range 85% to 100%. In the interests of clarity, however, the junctions in this range have not been mapped but their numbers for Leicestershire, including Leicester City, are shown in Table 7.3 below together with those exceeding 100%.

		"Do Minimum"		With PT	
		85% to 100%	>100%	85% to 100%	>100%
1	Existing Spatial Pattern	363	215	+7	-12
2	Current SGP	365	211	-4	-14
3	Majority Near Leicester	373	222	+5	-16
4	New Mkt Towns	368	204	-4	-7

Table 7.3: Option Testing, Junction V/C's for 2051 "Do Minimum" vs. "with PT interventions" (LCiC & LCC)

7.3.6. Table 7.3 shows that the inclusion of the PT interventions reduces the number of 'severely congested' junctions for all growth scenario options. It appears that some of this relief may have been exported into the 'approaching congestion' (85-100%) category for options 1 and 3.

7.3.7. Overall, Option 2 is forecast to benefit the most from its PT intervention package with 3.1% of formerly congested junctions (-18) experiencing a reduction in VoC below 85%. This contrasts with 0.9% (-5), 1.8% (-11) and 1.9% (-11) for options 1, 3 and 4 respectively.

7.4. Option 1 "with PT Interventions"

7.4.1. Figure 7.3 shows the AM peak hour assignment flow difference between the 2051 Option 1 "with PT interventions" and the "Do Minimum" scenario. Red indicates an increase in PCUs and blue a decrease.

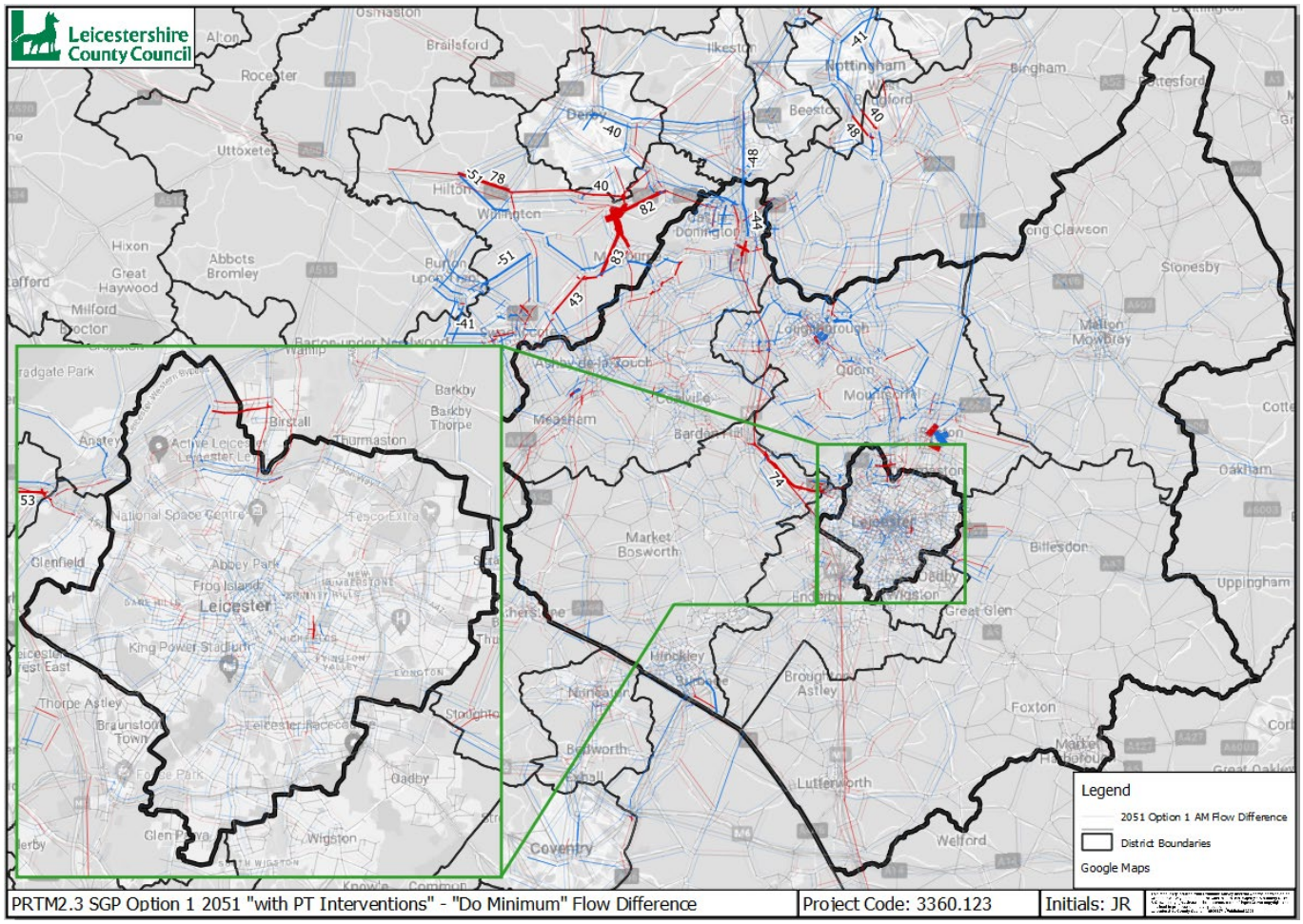


Figure 7.3: Option 1 "with PT Interventions" - "Do Minimum", Flow Difference

7.4.2. Option 1's passenger transport interventions consist of the six shared rail strategies only, with no supporting bus interventions proposed. The impact of these interventions can be seen in the small decrease between areas that are serviced by these rail improvements, such as Loughborough and Leicester City.

7.4.3. Other than routes between targeted sectors, there does not appear to be any meaningful change between the "Do Minimum" scenario.

7.5. Option 2 "with PT Interventions"

7.5.1. Option 2 AM (Figure 7.4) contains the most impactful PT intervention package, which results in the largest reduction of trips on the highway network. On top of the shared rail interventions, option two contains the most bus interventions which aim to increase the connectivity between the proposed strategic growth sites and their nearest conurbation. These schemes are detailed in Table 6.3 and shown in Figure 6.3.

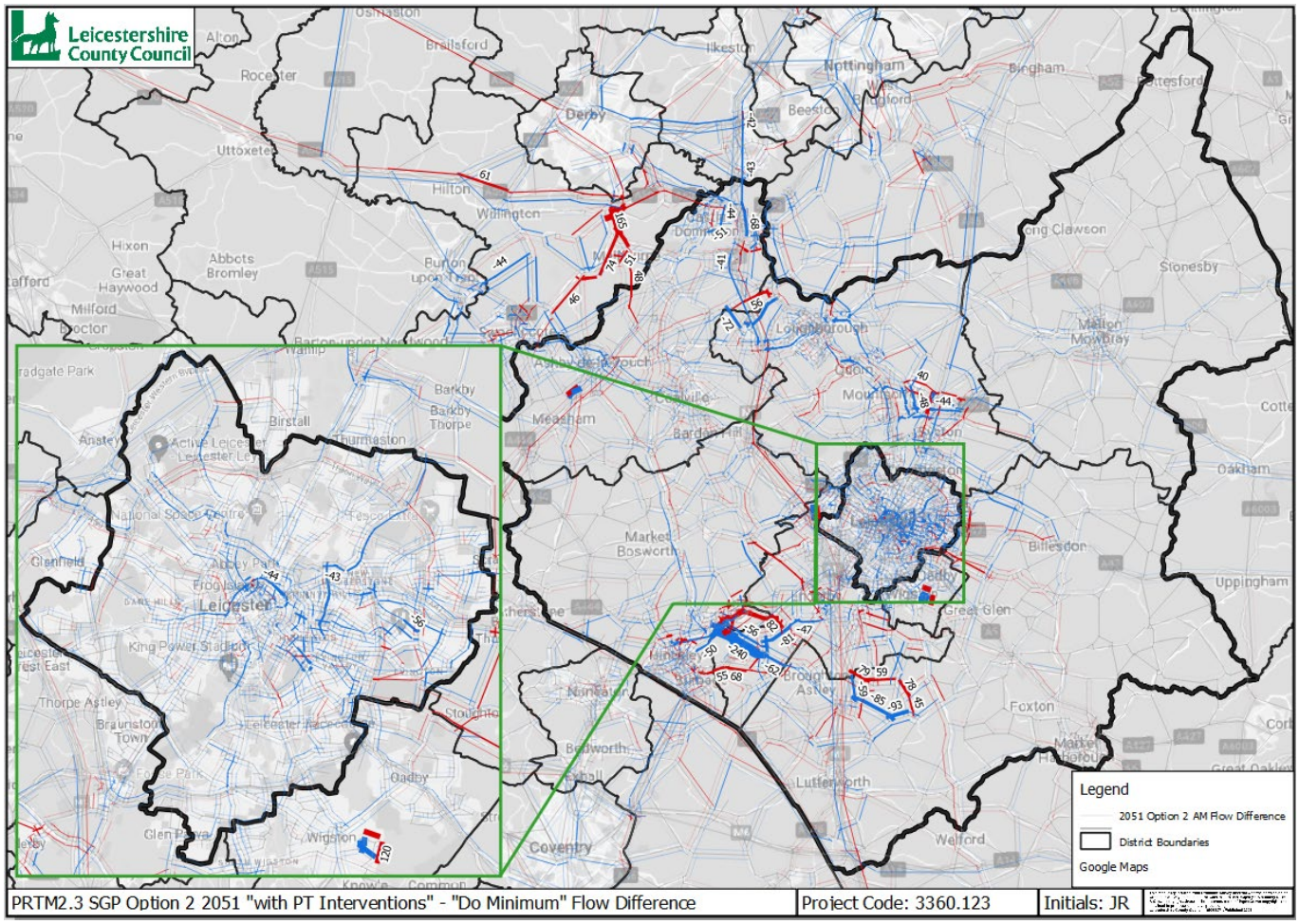


Figure 7.4: Option 2 "with PT Interventions" - "Do Minimum", Flow Difference

7.5.2. The most noticeable flow differences in Option 2 result from the bus interventions serving the Hinckley area and the benefits conferred to traffic exploiting congestion reductions in a sensitive part of the network. Although being clear to see, the change is very localised and predominantly relates to trips seeking alternative routes along an east-west axis towards the B4114. For onward trips beyond this point any relief is marginal.

7.5.3. Elsewhere, there are forecast traffic reductions in Loughborough, Syston and Leicester City, albeit at quite low levels.

7.5.4. The success of what is the most ambitious PT package of measures, is shown to have a limited impact on encouraging modal shift away from the motor car. Although showing some potential, in the absence of complementary transport policies seeking to reduce car travel, the modelling suggests that purely supply-side PT measures are unlikely to induce sufficient modal transfer by themselves.

7.5.5. Even under Option 2, it is clear that supporting strategic highway measures would likely be required to adequately accommodate the proposed scale and distribution of growth to 2051.

7.6. Option 3 “with PT Interventions”

7.6.1. The impact of the Option 3 PT interventions is shown in Figure 7.5 and continues the theme of limited success already observed for Options 1 and 2.

7.6.2. Across the LUA there is a general small decrease in traffic that is concentrated on the arterial routes from the County leading into the City Centre.

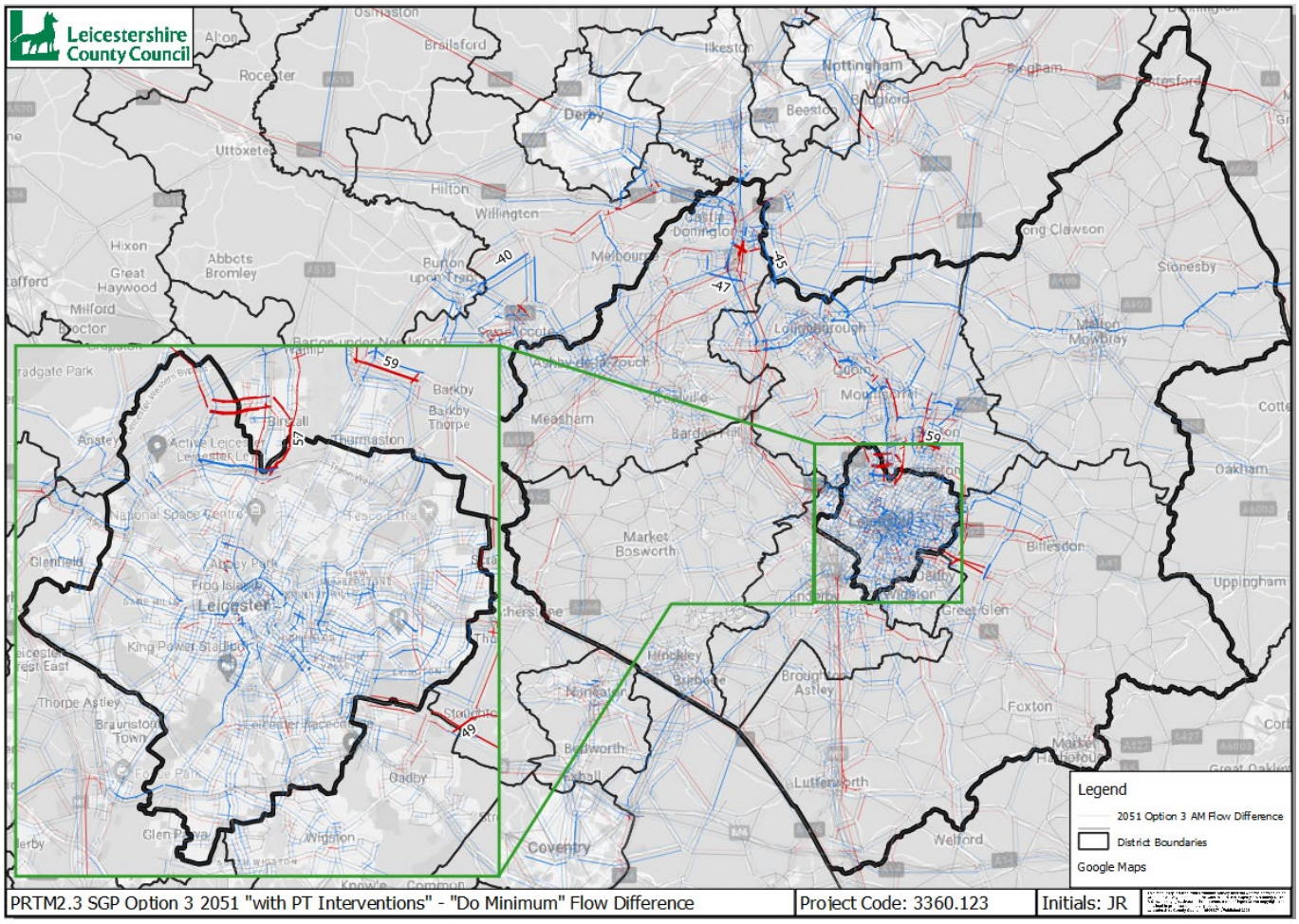


Figure 7.5: Option 3 "with PT Interventions" - "Do Minimum", Flow Difference

7.6.3. Most of the impact for the County is concentrated to the North, around the Charnwood and North-West Leicestershire Districts. A similar trend was noted for Option 1 (Figure 7.3) despite differences in the spatial allocations of growth with this option. This suggests that these minor decreases in flow are due to the impacts from the rail interventions.

7.6.4. The sole bus intervention proposed for Option 3 involves the provision of enhanced PT links between strategic sites in the near Leicester area and Leicester’s Central Business District (CBD). Their contribution to modal shift is shown by a marginal reduction in City Centre car trips when compared to Option 2 (Figure 7.4).

7.7. Option 4 “with PT Interventions”

7.7.1. Figure 7.6 shows the flow decrease across the network for Option 4 and its proposed passenger transport interventions. Other than the shared rail interventions, the single intervention proposed was connectivity between the proposed new market towns and Leicester City.

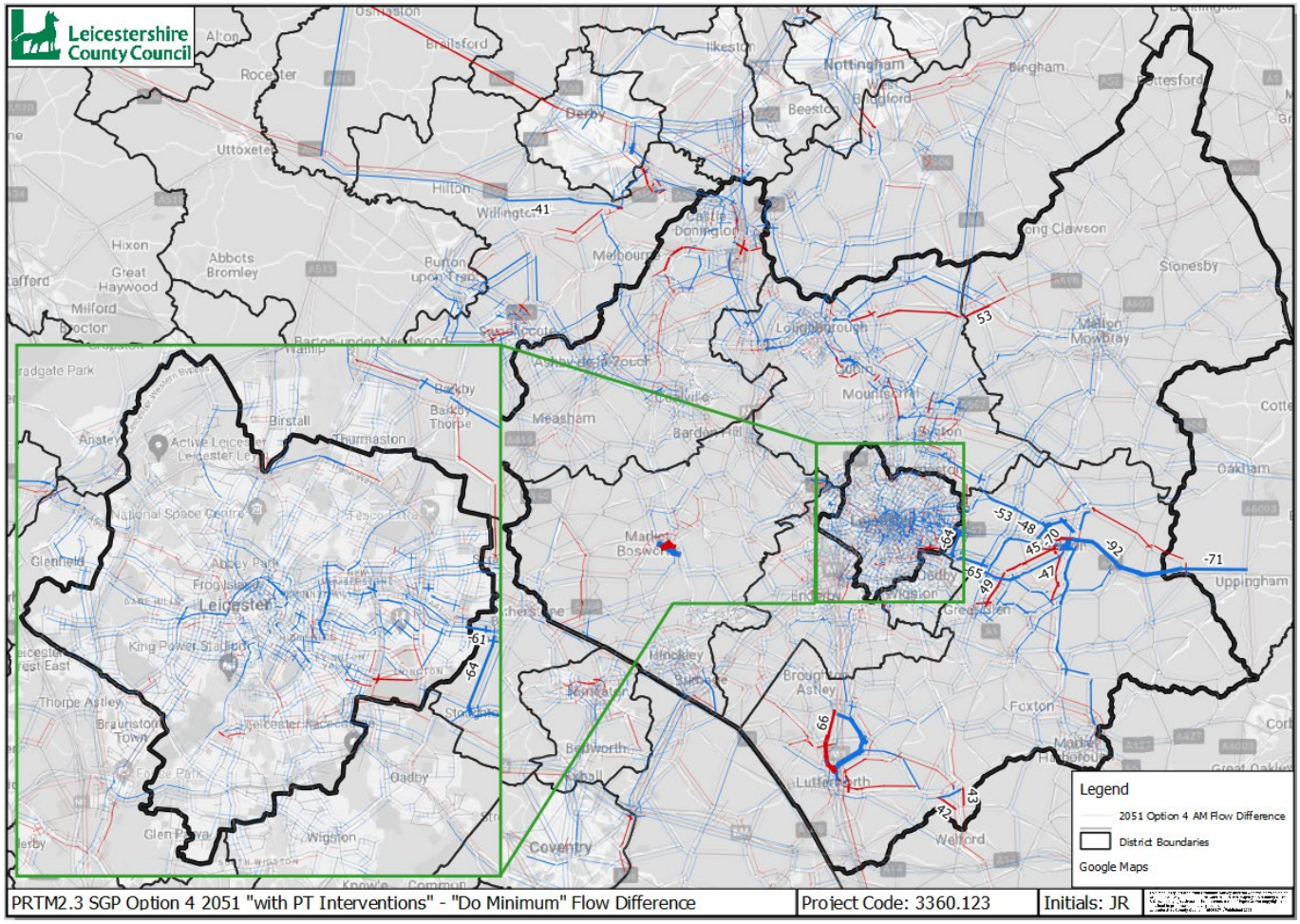


Figure 7.6: Option 4 "with PT Interventions" - "Do Minimum", Flow Difference

7.7.2. Limited flow reduction and rerouting of local traffic is predicted between the new market towns and Leicester City Centre. Of the four locations, PT interventions are predicted to have the greatest impact for the eastern market town, located close to the A47. This will be a legacy of its location and the fact that Leicester is the only large conurbation nearby with services and activities likely to be sought by significant numbers of its residents.

7.7.3. This contrasts with the other three sites that all have several alternatives available. In the north competition comes from Nottingham, Loughborough and Melton Mowbray; to the south there is Market Harborough, Northampton, Lutterworth and the accessibility offered by the motorway network; to the west there is Hinckley, Nuneaton, Coalville and the West Midlands.

7.7.4. For those market towns having more alternative destinations means a more diffuse distribution of trips, reducing the potential transfer of trips to PT resulting from provision of a new service to any one of these destinations.

8. STA Stage 1B "With Strategic Highway Interventions" Results

8.1. Background

8.1.1. As set out in the previous section, the PT intervention packages alone were forecast to have a limited impact on mitigating the additional SGP growth (Section 7), regardless of the spatial distribution of that growth. This confirmed the need to proceed with testing the packages of strategic highway interventions identified for each of the spatial options set out through Section 6.4.

8.1.2. From the initial scheme concept designs an iterative process was adopted to test each in the PRTM first to identify any performance issues relating to excessive delays/queuing. Where necessary, reasonable refinements were then applied until an acceptable level of performance was achieved. Once complete, each scheme was then added into the relevant intervention package(s)/spatial options scenarios for testing collectively.

8.2. Summary Statistics

8.2.1. Figure 8.1 and Table 8.1 contain the summary statistics for the 2051 forecast "with PT & highway interventions" scenarios, as well as the 2021 and 2036 Core scenarios. Also included in blue brackets, and for comparing relative performance, are the figures from the "with PT intervention" scenarios of Table 7.2.

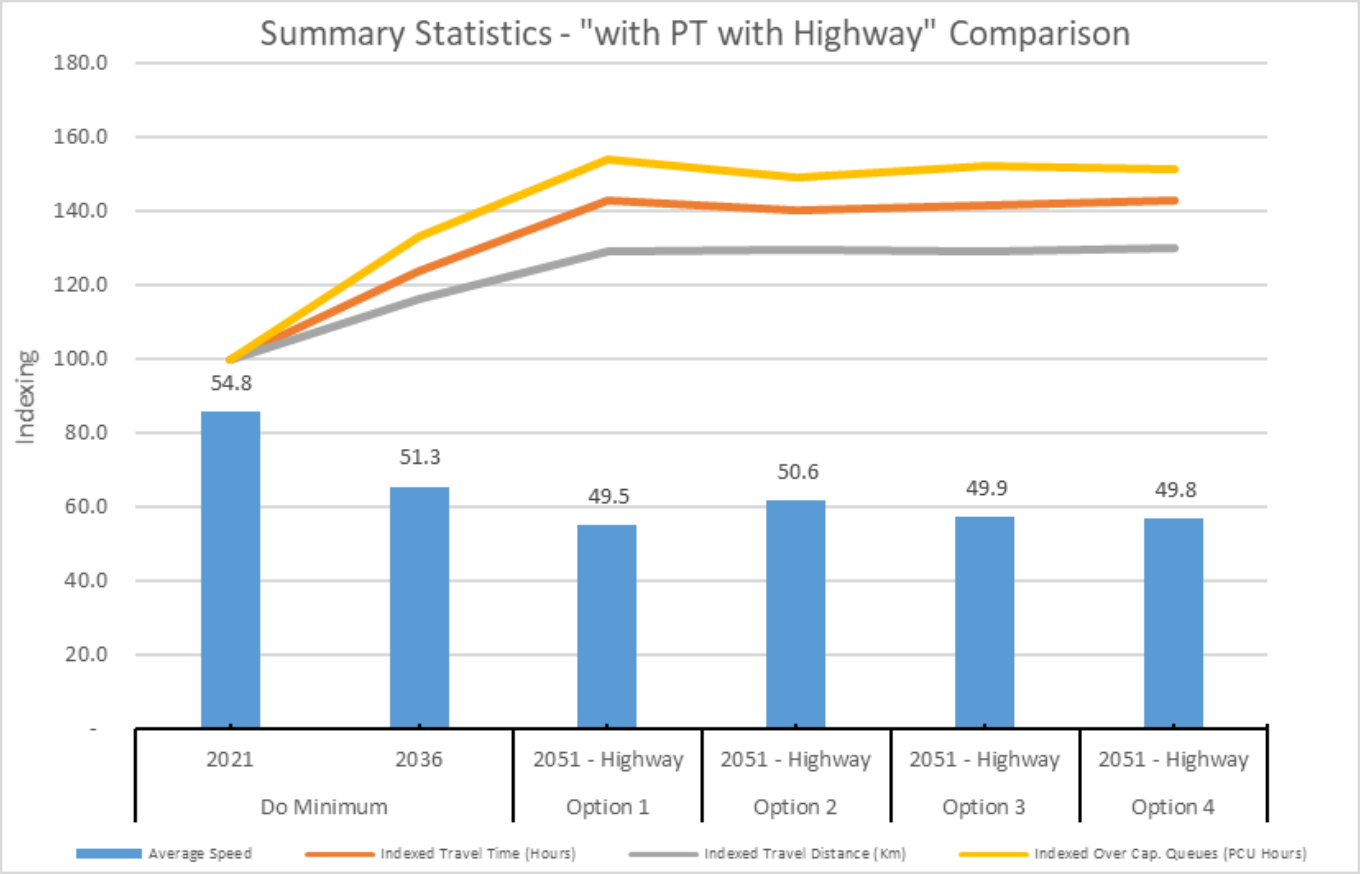


Figure 8.1: Summary Statistics - "with PT with Highway Interventions" Option Comparison

	2021	2036	2051			
	Core	Core	Option 1	Option 2	Option 3	Option 4
			"with PT with Highway interventions" ("with PT interventions")			
Average Speed (kph)	54.8	51.3	49.5 (47.7)	50.6 (47.9)	49.9 (47.6)	49.8 (48.0)
Over Capacity Queues (PCU Hours)	14,240	18,966	21,924 (23,585)	21,317 (23,204)	21,668 (23,584)	21,559 (23,621)
Indexed Travel Time (Hours)	100	124	143 (147)	140 (146)	142 (146)	143 (146)
Indexed Travel Distance (Km)	100	116	129 (128)	130 (127)	129 (127)	130 (128)

Table 8.1: Summary Statistics - "with PT with Highway Interventions"

8.2.2. The introduction of strategic highway measures has had a marked improvement on overall network performance against both the "with PT interventions" (Figure 7.1) and "Do Minimum" (Figure 5.1) scenarios. However, it is clear from network average speeds and over capacity queues that none of the options is forecast to return to 2021 and 2036 levels of performance.

8.2.3. In a differing narrative to the “Do Minimum” and “with PT interventions”, Option 2 replaces Option 4 as the ‘best’ performer having the highest average speed (50.6kph), lowest over-capacity queuing (21,317pcu-hrs) and indexed travel time (140). Options 2 and 3 see the greatest improvement whilst all four options are forecast to experience healthy increases in performance.

8.2.4. Whilst network travel times improve across the network, journey distances increase due to trip displacement caused by a combination of congestion and the proposed strategic highway interventions leading to more circuitous routeing in the interests of time saving.

8.2.5. Despite the benefits afforded by this improved package of interventions, present day levels of network performance across Leicestershire are unlikely to be achievable without a sizeable reduction in demand for road space.

8.3. Maximum Volume/Capacity Analysis

8.3.1. Figure 8.2 shows those junctions forecast to be most congested in each of the four ‘with PT and Highway’ Options. It is comprised of junctions classified as ‘severely congested’ meaning the maximum volume over capacity (VoC) exceeds 100% and follows a similar format to that presented previously for the ‘with PT’ case (Figure 7.2).

8.3.2. There is a near 40% reduction in the number of junctions flagged in all options (black diamonds) compared with the impact of ‘PT only’ interventions. Whilst some junctions remain problematic in some options there is a palpable improvement across the area. This is most discernible in the vicinity of M1 J21 where an intense cluster of black diamonds has been replaced by some option dependent relief.

8.3.3. The number of congested junctions forecast for each spatial option across Leicestershire is shown in Table 8.2 below with comparisons made between “Do Minimum”, “with PT” and “with PT & Highway” interventions. A further distinction is made between “heavily congested”, and “severely congested” junctions as follows:

Heavily Congested (%)	Severely Congested (%)
85 ≤ V/C < 100	100 ≤ V/C

8.3.4. Whilst Figure 8.2 simply plots “severely congested” junctions to avoid information overload, the extra detail afforded by including “heavily congested” junctions is relevant since the onset of congestion is the precursor to trips re-routeing.

Leicestershire County Council

Leicestershire County Council

Legend

"with PT with Highway" Max V/C

- Black Diamonds (All Scenarios 100%+)
- Option 1 Marker (Option 1 100%+)
- Option 2 Marker (Option 2 100%+)
- Option 3 Marker (Option 3 100%+)
- Option 4 Marker (Option 4 100%+)
- District Boundaries

Google Maps

PRTM2.3 SGP AM "with PT with Highway Interventions" Max V/C Option Comparison | Project Code: 3360.123 | Initials: PB

Figure 8.2: "With PT with Highway Interventions" Maximum V/C Option Comparison

		"Do Minimum"		"with PT "		"with PT & Highway"	
		85% to 100%	>100%	85% to 100%	>100%	85% to 100%	>100%
1	Existing Spatial Pattern	363	215	+7	-12	-23	-39
2	Current SGP	365	211	-4	-14	-23	-71
3	Majority Near Leicester	373	222	+5	-16	-38	-59
4	New Mkt Towns	368	204	-4	-7	-49	-34

Table 8.2: Option Testing, Junction V/C's for 2051 DM, "with PT", "with PT & HW Interventions" (LCiC & LCC)

8.3.5. The addition of the strategic highway interventions has significantly reduced the number of severely congested junctions. In combination with the PT packages, reductions have ranged between 17% (34) and 34% (71) for Options 4 and 2 respectively.

8.3.6. When combining "heavily" and "severely" congested junctions together (VoC > 85%) the range of reductions is 11% (62) for Option 1 and 16% (94,97) for Options 2 and 3 respectively.

8.3.7. In summary, Option 2 and its package of interventions has the biggest impact on reducing 'severely congested' junctions but when combining 'heavily' and 'severely' congested junctions together there is little to choose between Options 2 and 3.

8.4. Key SRN Junction Average Delay Comparison

8.4.1. Within Leicestershire there are three key pinch points identified on the strategic highway network that severely inhibit network performance in both the present and the forecasted future.

8.4.2. The first, and most prominent, is M1 J21 which is Leicester City's only direct *'all movement'* motorway access point characterised by high levels of congestion at peak times. The second pinch point is A46 Hobby Horse, which is a four-arm at-grade strategic junction having one free-flow movement and which serves as a major access point for the north of Leicester. The third is M1 J24; a seven-arm grade-separated junction, of which five arms lie on the strategic and major road network with a single free-flow movement.

8.4.3. Given the importance of these junctions to the network, further comparative analysis has been undertaken below to provide additional understanding of the impacts of each of the proposed spatial growth options.

8.4.4. Table 8.3, Table 8.4 and Table 8.5 detail the forecast, indicative average delay per PCU, a proxy for "user", across M1 J21, A46 Hobby Horse and M1 J24 respectively. Their inclusion is for comparative purposes representing a quick way of testing junction performance by option/scenario and should be used in conjunction with the analyses presented above.

8.4.5. It should be noted that, for M1 junctions 21 and 24, the average delay and throughput values exclude the 'unimpeded' trips associated with M1 mainline movements. This is because their magnitude, if included, would distort the underlying statistic being sought.

8.4.6. Table 8.3 shows a marked deterioration in current M1 J21 performance in the absence of any interventions to mitigate the growth forecast by 2051. Associated with a 10% increase in throughput, the delay per vehicle is projected to increase by over 2 minutes (or 80%) from the present day and represents a significant increase in congestion.

8.4.7. The impact of purely strategic PT interventions on M1 J21 is shown to be marginal and of the order of a few seconds reduction in delay. When combined with the highway interventions, however, there is a marked improvement across all options with Option 4 returning to present day performance levels and Options 1 and 3 only slightly worse. Option 2, the worst performer, broadly returns to forecast 2036 levels of performance.

8.4.8. Options 1 and 4 include the M1 J21 intervention in the form of a free-flow link from M1 Southbound to M69 Southbound. By comparison, Options 2 and 3, whilst not having any direct improvement to M1 J21, do contain the M1 J20a intervention which provides some relief to the reported area.

	"Do Minimum"	"with PT Interventions" (Difference to DM)	"with PT with highway interventions" (Difference to DM)
2021	161		
2036	223		
2051 Option 1	283	279 (-4)	182 (-101)
2051 Option 2	302	297 (-5)	233 (-69)
2051 Option 3	295	292 (-3)	185 (-110)
2051 Option 4	287	283 (-4)	163 (-124)

Table 8.3: M1 J21 Average Turn Delay Comparison

8.4.9. The performance of the A46 Hobby Horse junction is shown in Table 8.4. In the absence of any interventions, delay per vehicle, across all options, is forecast to increase by around half a minute because of a 10% increase in throughput by 2051.

	"Do Minimum"	"with PT Interventions" (Difference to DM)	"with PT with highway interventions" (Difference to DM)
2021	32		
2036	48		
Option 1	55	55 (0)	21 (-34)
Option 2	58	57 (-1)	42 (-16)
Option 3	55	55 (0)	19 (-36)
Option 4	62	60 (-2)	20 (-42)

Table 8.4: A46 Hobby Horse Average Turn Delay Comparison

8.4.10. The impact of the PT interventions is shown to have a negligible impact on junction performance regardless of the option and associated package of measures. The inclusion of their highway measures improves junction performance beyond present day levels for Options 1, 3 and 4 with Option 2 better than projected 2036 conditions.

8.4.11. This forecast improvement is principally due to the introduction of a free-flow, A46 Southbound-to-A46 Westbound slip, in all options except Option 2, paired with an increase in capacity for the existing free-flow slip.

8.4.12. The forecast impact at M1 J24 is shown in Table 8.5 below. In the absence of any interventions, there is a near 1 minute per vehicle increase in delay due to a 25% increase in throughput (excluding 'at grade' M1 mainline movements) predicted by 2051. Such increases are not unexpected given its existing performance and the cumulative impact of the East Midlands Freeport sites in its locale and other background growth.

	"Do Minimum"	"with PT Interventions" (Difference to DM)	"with PT with highway interventions" (Difference to DM)
2021	36		
2036	77		
Option 1	110	103 (-7)	110 (0)
Option 2	102	94 (-8)	89 (-13)
Option 3	100	94 (-6)	83 (-17)
Option 4	105	101 (-4)	107 (+2)

Table 8.5: M1 J24 Average Turn Delay Comparison

8.4.13. The strategic importance of M1 J24 into the future is emphasised from the optioneering undertaken here. Significantly, none of the PT and highway intervention packages tested is sufficient to return the junction to even forecast 2036 conditions. High level indications suggest a more equitable split between strategic passenger transport and highway interventions.

8.4.14. All options show a marginal improvement due to the PT interventions. Significantly, and due to highway interventions elsewhere, there is a slight deterioration in the PT results for Options 1 and 4. For Options 2 and 3, the inclusion of highway interventions has further improved the PT outcome by a similar margin.

8.4.15. The improvements associated with Option 2 are attributable to the enhanced PT links from strategic sites to EMA/EMG, Loughborough, Derby and Nottingham coupled with the highway intervention involving the completion of A42 J14 slips and accompanying A42 to A50 link road. Directly or indirectly, this is forecast to reduce approximately 500 trips entering M1 J24 compared to other spatial strategies.

8.4.16. Option 3 is predicted to reduce average delay per PCU more than for Option 2 at M1 J24. It appears this is due to the Southern circulating gyratory having a significant delay decrease on movements between Derby Road and the A453 (towards EMA) compared to the other options.

8.4.17. This chapter continues by looking at each Option in more detail from the PRTM output.

8.5. Option 1 (Continuation of Existing Spatial Pattern) "with Strategic Highway Interventions"

8.5.1. The traffic impact of the Option 1 highway measures can be obtained by subtracting the "PT only" from the "PT + Highway" model forecasts. Figure 8.3 shows the highway measures introduced together with the flow differences for the 2051 AM scenario where links experiencing a flow increase are coloured red whilst blue signifies a decrease. Some areas of notable change and interest have been highlighted within the figure accompanied by the forecast link flows to give an indication of their magnitude.

8.5.2. The consequences of the Option 1 intervention package are clear to see with large flow increases forecast to use its component schemes coupled with the relief afforded elsewhere in the network.

8.5.3. The introduction of south-facing slips at M69 J2 paired with the new A47-M69-B4114 link road shows relief to the local roads through Hinckley and Burbage as better access to the main routes draws demand away from less suitable alternatives. This extends into Blaby District where rural routes through villages such as Sharnford, Sapcote and Stoney-Stanton are also forecast to benefit from reduced traffic.

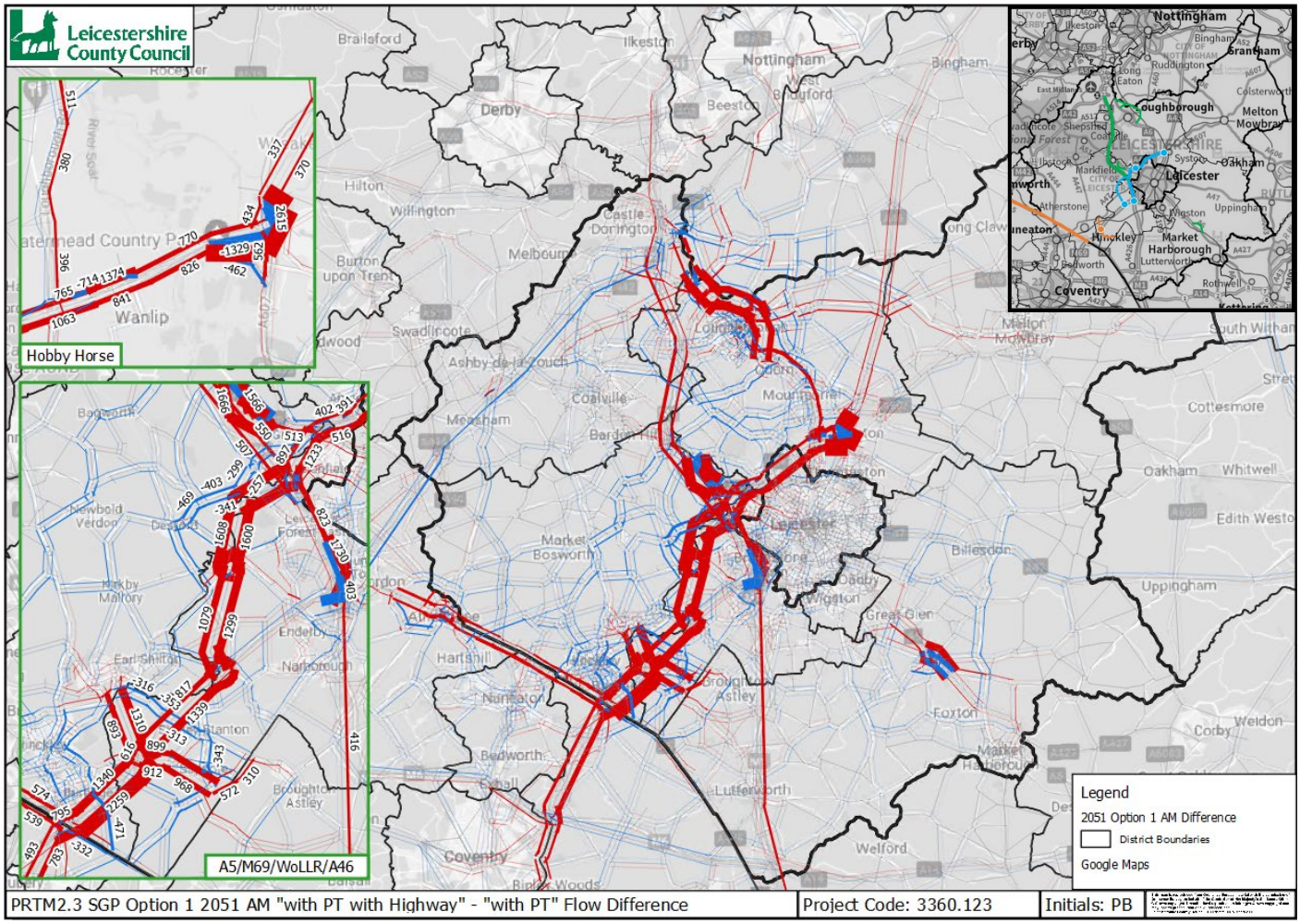


Figure 8.3: Option 1 "with PT with Highway interventions" - "with PT interventions", Flow Difference

8.5.4. Some highway measures draw more traffic on to the strategic/major road network. The combined effect of building the West of Leicester Link Road (WoLLR) with A46 improvements between Hobby Horse and the M1 is to attract traffic to the M69. The increase in traffic using the M69 is to the south of the new M69 junction 3 (which connects the WoLLR scheme to the M69) whilst flow remains largely unchanged north of J3 towards M1 J21.

8.5.5. Looking at the WoLLR model output in more detail reveals the trip routeings between origins and destinations likely to use the new scheme. Figure 8.4 shows the trip movements using two separate sections of the scheme in relation to the Desford Crossroads, A47 junction. The left portion shows the trips using the northern section and the right portion the southern section. The purple colouring shows northbound movements along the scheme whilst green shows southbound.

8.5.6. Although there is some through traffic traversing the scheme along its entirety the change in bandwidth at the A47 indicates the scheme acts more as a distributor road for the west of Leicester and county towards Enderby, Narborough, Earl Shilton and Kirkby Mallory.

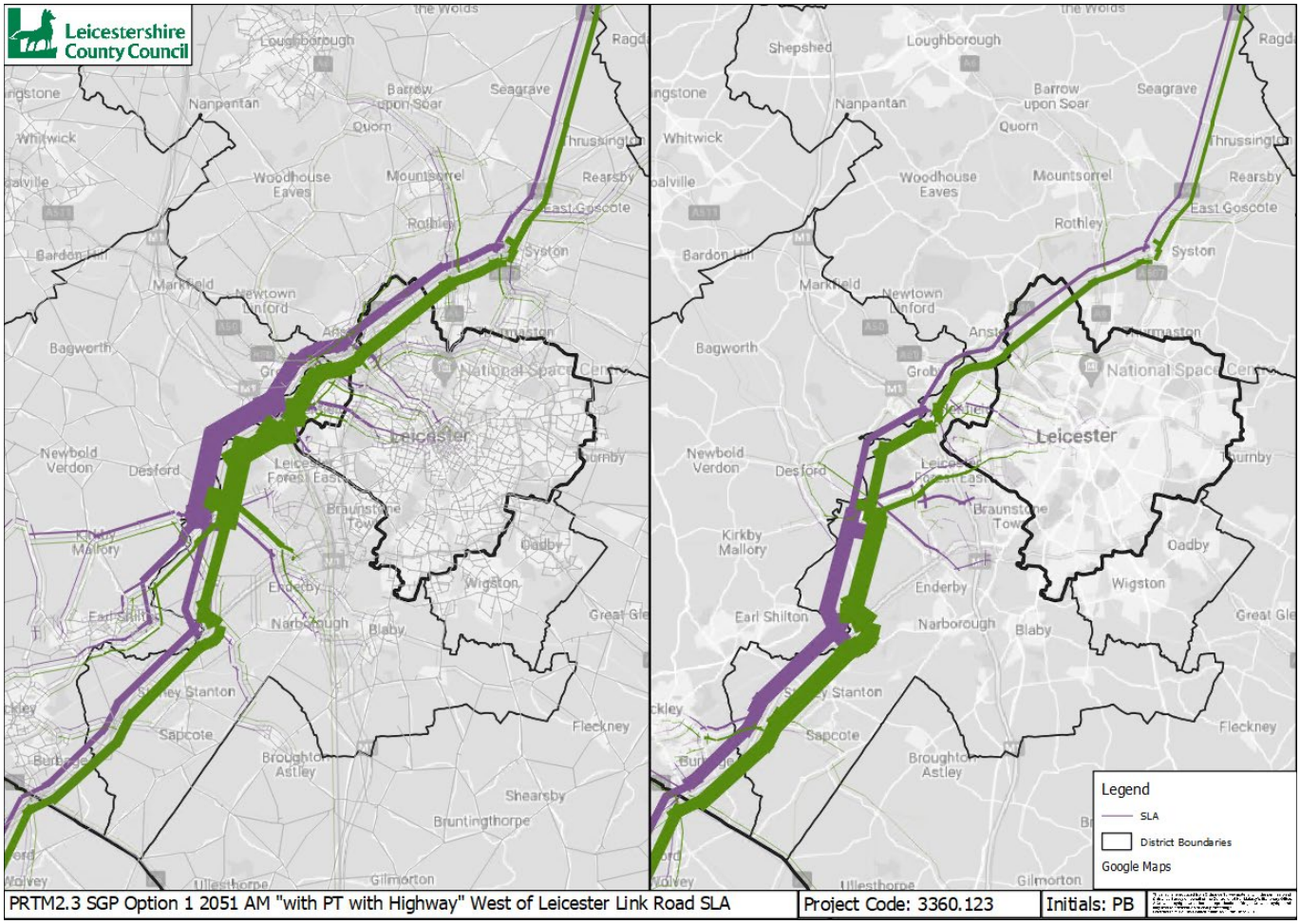


Figure 8.4: Option 1 "with PT with Highway interventions" West of Leicester Link Road SLA

8.5.7. Another standout increase in traffic flows relates to the combined Loughborough and Hathern bypass in Charnwood. Whilst effectively providing greater accessibility to the east of Loughborough and reducing AM peak hour congestion levels in the urban areas, the scheme exploits the A6's available arterial capacity with southbound movements towards Leicester City and the A46 forecast to increase.

8.5.8. Figure 8.5 shows how the inclusion of the highway interventions has affected vehicle delay across the network for 2051 AM Option 1. The delay differences between "with Highway and PT" minus "with PT" interventions are shown where red bandwidths indicate an increase in delay and blue a decrease.

8.5.9. Overall, unsurprisingly, there is a reduction in delay across the network as the extra capacity afforded by the schemes relieves congestion levels at the key locations.

8.5.10. Whilst some delay increases are observed, as with the flow difference plots, any link delay differences attributable on the new road infrastructure will always be positive due to the non-existence of a comparator in other scenarios. This is particularly noticeable on the new Loughborough bypass and new A47-M69-B4114 link road.

8.5.11. Delay decreases are concentrated around Hinckley, M1 J21 to J21a, Leicester Forest East, the A46 and A5, Hathern and Kibworth where congestion relief afforded by the intervention package is most keenly felt.

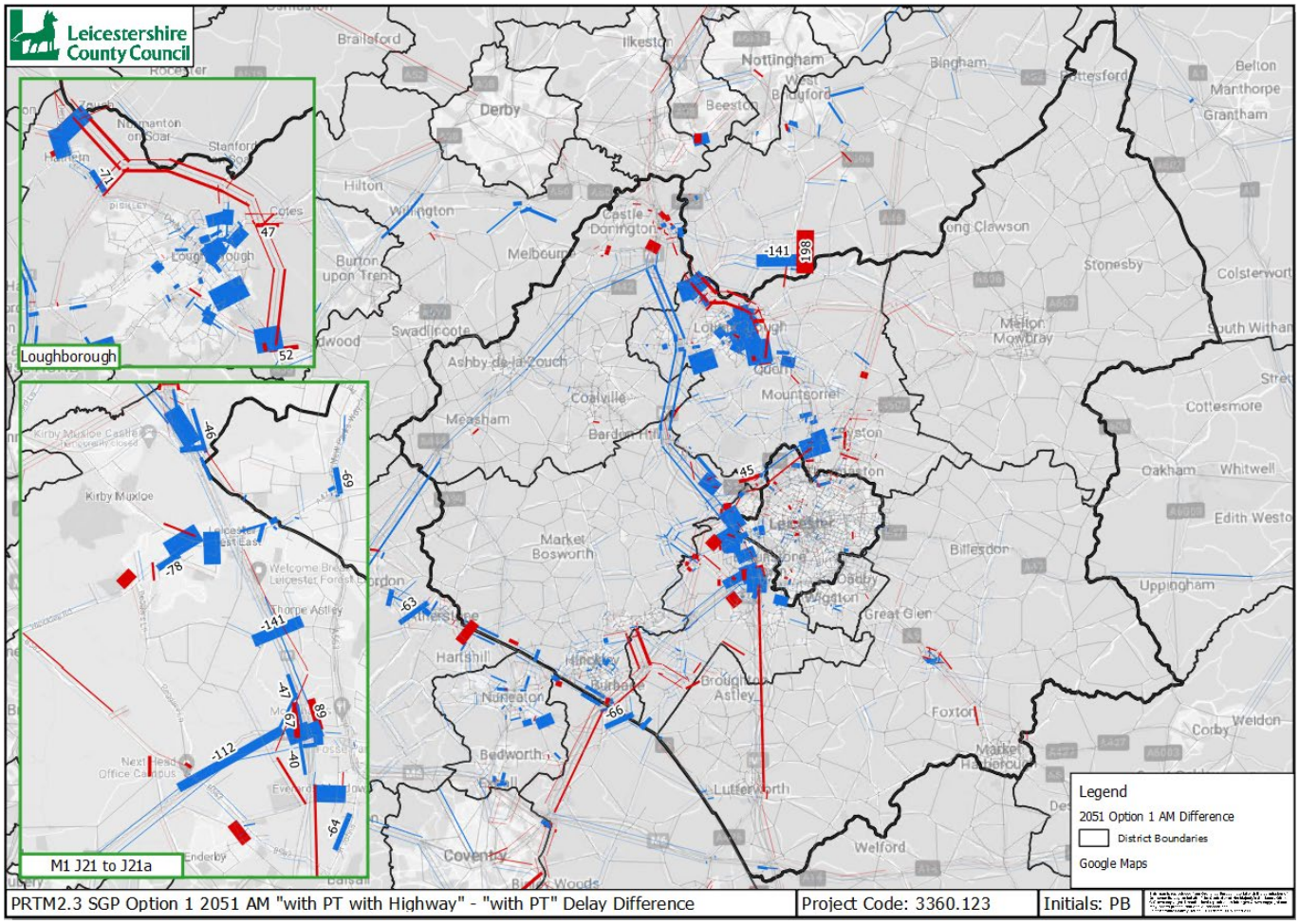


Figure 8.5: Option 1 "with PT with Highway interventions" - "with PT interventions", Delay Difference

8.6. Option 2 (Current SGP) “with Strategic Highway Interventions”

8.6.1. Figure 8.6 shows Option 2’s package of highway measures together with the forecast flow differences associated with them. Once again, areas of notable change have been included within the figure along with link flows to gauge the scale of forecast vehicle transfer.

8.6.2. The consequences of the Option 2 intervention package are clearly apparent, with large flow increases forecast to use its component schemes coupled with the associated relief afforded elsewhere in the network. When looking across the study area, the predicted impact of these interventions is more widespread across the County than Option 1.

8.6.3. The concentration of SGP growth and accompanying infrastructure to the south and east of the LUA effectively ‘opens-up’ the less accessible eastern side of the County providing better links towards Leicester City and onward movements via the Strategic Road Network (SRN).

8.6.4. The inclusion and extent of the 'Leicester, South and East Orbital' (including new grade separated junctions with the M1, i.e., "junction 20a" and A46) is the most significant intervention here, as it not only serves to accommodate more growth to the east of the LUA, but also acts more strategically as a wider distributor road for Leicester City and Leicestershire.

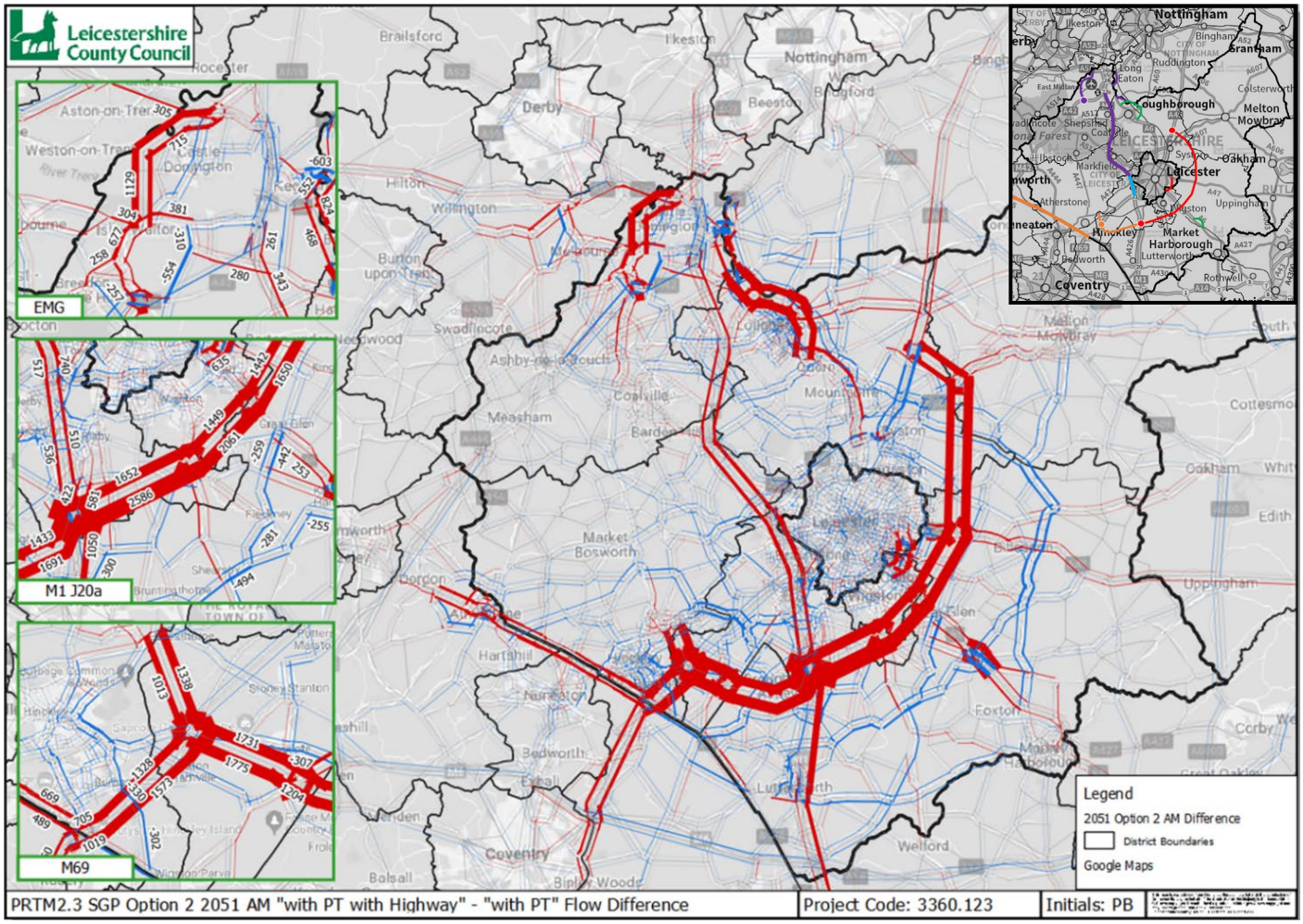


Figure 8.6: Option 2 "with PT with Highway interventions" - "with PT interventions", Flow Difference

8.6.5. Access is facilitated further to the South-and-East link by the inclusion of the M1 J20a to M69 J2 scheme, and its junction with the B4114, the South-facing slips at M69 J2 as well as the further new link from M69 J2 to the A47. The net effect is a reduction in demand on minor roads in Blaby, Hinckley and Burbage.

8.6.6. Better accessibility to the east of the LUA contributes to reductions in congestion levels in the city whilst the A563 Leicester Outer Ring Road scheme is included to facilitate Option 2's nearby SGP growth, in what is an already congested area.

8.6.7. Looking at the traffic forecasts for the South and East Orbital Link Road in more detail reveals the trip routeings between origins and destinations likely to use the intervention - Figure 8.7 shows the trip movements using two separate sections of the scheme. The left portion shows the trips using the southern section with the northern section shown to the right, whilst the purple colouring shows northbound movements along the scheme and green shows southbound.

8.6.8. Aside from its primary purpose of providing appropriate accessibility to key growth areas around the south and east of the LUA, these outputs show that the route also has the potential to act as a distributor road for the south and east of Leicester and Leicestershire more widely (as seen by the bandwidths on arterial routes that 'feed' the South-and-East link). To a lesser extent, the link road also appears to provide a viable alternative route around the LUA to existing strategic orbital routes for some traffic; with a limited number of trips routing to/from the A46, M1 and M69.

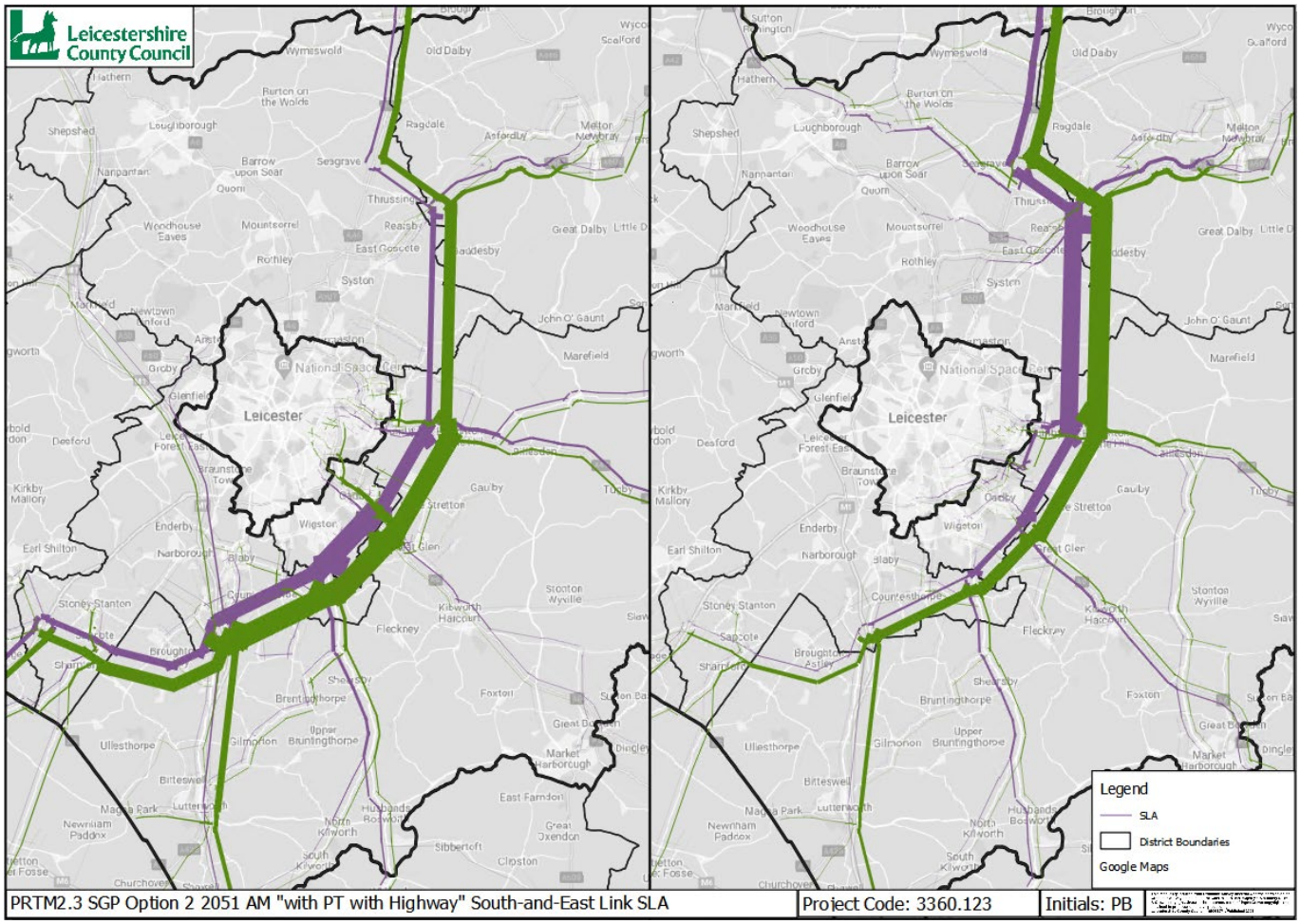


Figure 8.7: Option 2 "with PT with Highway interventions" South-and-East Link, Select Link Analysis

8.6.9. The Leicester S&E Orbital Road relieves the strategic road network around M1 J21 allowing it to cater better for longer distance movements and those seeking access to the Leicester central, south and east areas.

8.6.10. The extent of the relief in terms of predicted journey times in the M1 J21 area has also been extracted from the model output.

8.6.11. The journey times comparison is made between competing routes from PRTM forecasts using both, "with" and "without" Option 2's package of strategic highway interventions. The routes chosen are depicted in Figure 8.8 and have the common start/end points of north of M69 J1 and A46 Six Hills and north of M1 J20 and A46 Six Hills.

8.6.12. For the journey time route between the M69 J2 and A46 Six Hills, the red route passes through M1 J21 with directional journey times extracted for both, “with” and “without” highway interventions whilst the green route uses the Leicester S&E Orbital Road and so only the “with” scenario is relevant.

8.6.13. For the journey time route between the M1 J20 and A46 Six Hills, the blue route passes through M1 J21 with directional journey times extracted for both, “with” and “without” highway interventions whilst the orange route uses the Leicester S&E Orbital Road and so, again, only the “with” scenario is relevant.

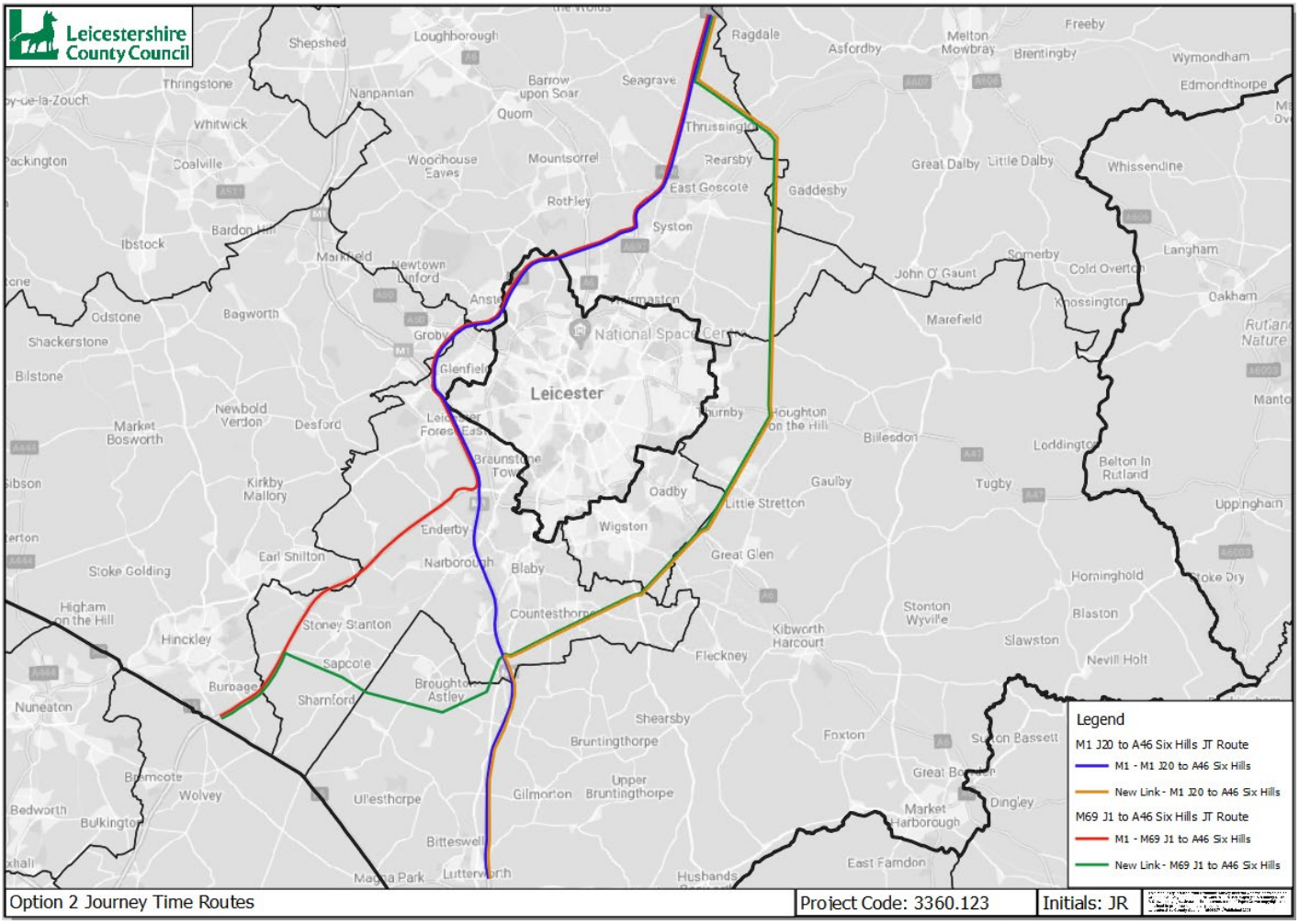


Figure 8.8 Primary Routeing Options from M1 J20 to A46 Six Hills and M69 J1 to A46 Six Hills

	M69 J1 to A46 Six Hills					
	Northbound			Southbound		
	DM	Current SRN	Leicester S&E Orbital	DM	Current SRN	Leicester S&E Orbital
Time (s)	2446	2249	2740	3047	2710	2961

Table 8.6 Option 2 M69 to A46 Six Hills Journey Time Comparison

	M1 J20 to A46 Six Hills					
	Northbound			Southbound		
	DM	Current SRN	Leicester S&E Orbital	DM	Current SRN	Leicester S&E Orbital
Time (s)	2370	2230	2481	2736	2456	2537

Table 8.7 Option 2 M1 J20 to A46 Six Hills Journey Time Comparison

8.6.14. It can be seen from Table 8.6 and Table 8.7 that there is a significant improvement in journey times on both routes through M1 J21 once the package of measures is included. The route between M69 J1 and A46 Six Hills sees a decrease of just over 3 minutes (197s) and a reduction of over 5 minutes (337s) southbound. The route between M1 J20 and A46 Six Hills sees a reduction of over 2 minutes (140s) northbound and over 4 minutes (280s) saved southbound.

8.6.15. Significantly, with the highway interventions package included, the Leicester S&E Orbital Road route is slower than traversing M1 J21 and emphasises its distributor road function. By contrast, more strategic journeys are forecast to remain using M1 J21, M1 J21A and the A46 due to its superior speed.

8.6.16. Better accessibility to the east of the LUA contributes to reductions in congestion levels in the city whilst the A563 Leicester Outer Ring Road scheme is included to facilitate Option 2's nearby SGP growth, in what is an already congested area.

8.6.17. Elsewhere, some interventions have similar impacts to those of Option 1 such as the A6, Kibworth Bypass and Loughborough and Hathern bypass schemes to the north and south of the county.

8.6.18. In the north of the County the introduction of a new link from the A42 to A50, paired with new West-facing slips at A42 J14, provides relief to Castle Donington, Diseworth and better access to East Midlands Airport from its western side (see 'EMG' highlight in Figure 8.6). It does, however, encourage trips to/from the south, and predominantly the Coalville area, to route via the less suitable rural network by offering an attractive alternative to the M1 between J23a and 24.

8.6.19. The most noticeable differences in Figure 8.6 result from scheme interventions spanning the County from South-West to North-East. Namely, starting in the South-East and working anti-clockwise, the A47-M69 link road, M69 J2 south-facing slips, the M69 to M1 link road, the new M1 J20a and the Leicester south and east orbital link road. Cumulatively, these highway measures provide much relief to minor roads in the vicinity of the schemes.

8.6.20. The forecast delay differences for 2051 AM Option 2 are shown in Figure 8.9 below. Large decreases are predicted across much of the County but most notably at M1 J21 where average delay per vehicle is forecast to reduce by about 1 minute and link flows maintained.

8.6.21. Other areas to benefit from noticeable congestion relief include Loughborough and Castle Donington, reflecting the forecast transfer of traffic to their respective bypasses.

8.6.22. Finally, it is worthy of note that, whilst the new South-and-East Orbital Link carries a large number of trips, the assumption that all intermediary junctions are 'at grade' is not forecast to cause any significant delay issues.

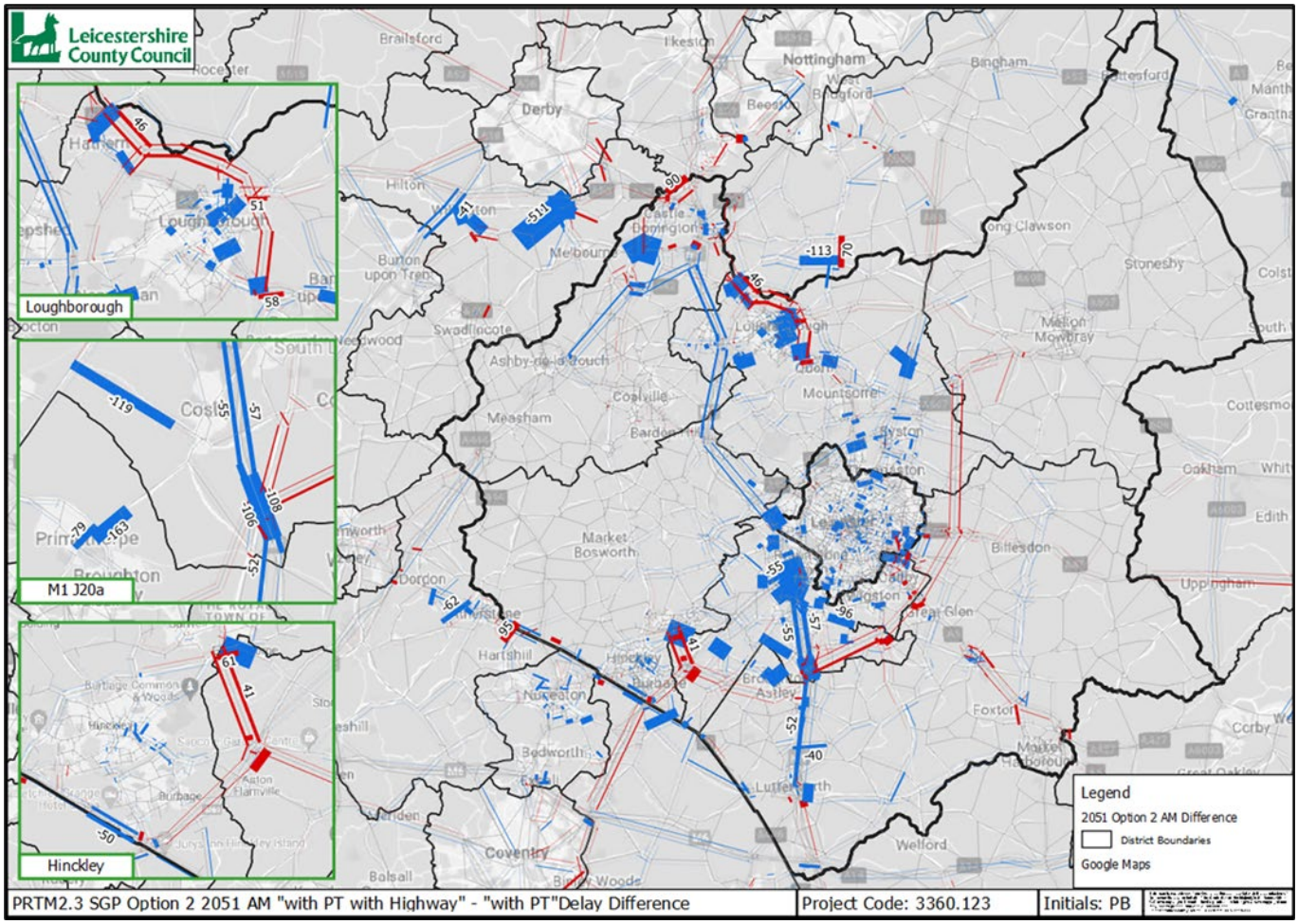


Figure 8.9: Option 2 "with PT with Highway interventions" - "with PT interventions", Delay Difference

8.7. Option 3 "with PT with Highway Interventions"

8.7.1. The focus of Option 3's package of strategic highway interventions is the accessibility and connectivity required to accommodate its growth housing allocations in the near Leicester area.

8.7.2. The package of interventions is shown in Figure 8.10 together with the forecast flow differences associated with their inclusion. Once again, areas of notable change have been included within the figure along with link flows to gauge the scale of forecast vehicle transfer.

8.7.3. The key consequences of the Option 3 intervention package are a combination of large flow transfers onto its component schemes coupled with the associated network relief afforded elsewhere. Across the county there are similarities with Option 2, albeit with a somewhat greater focus on the areas within, and immediately surrounding, the LUA. There are lesser differences around EMA, Loughborough and Hinckley given the absence of strategic interventions in these areas under Option 3.

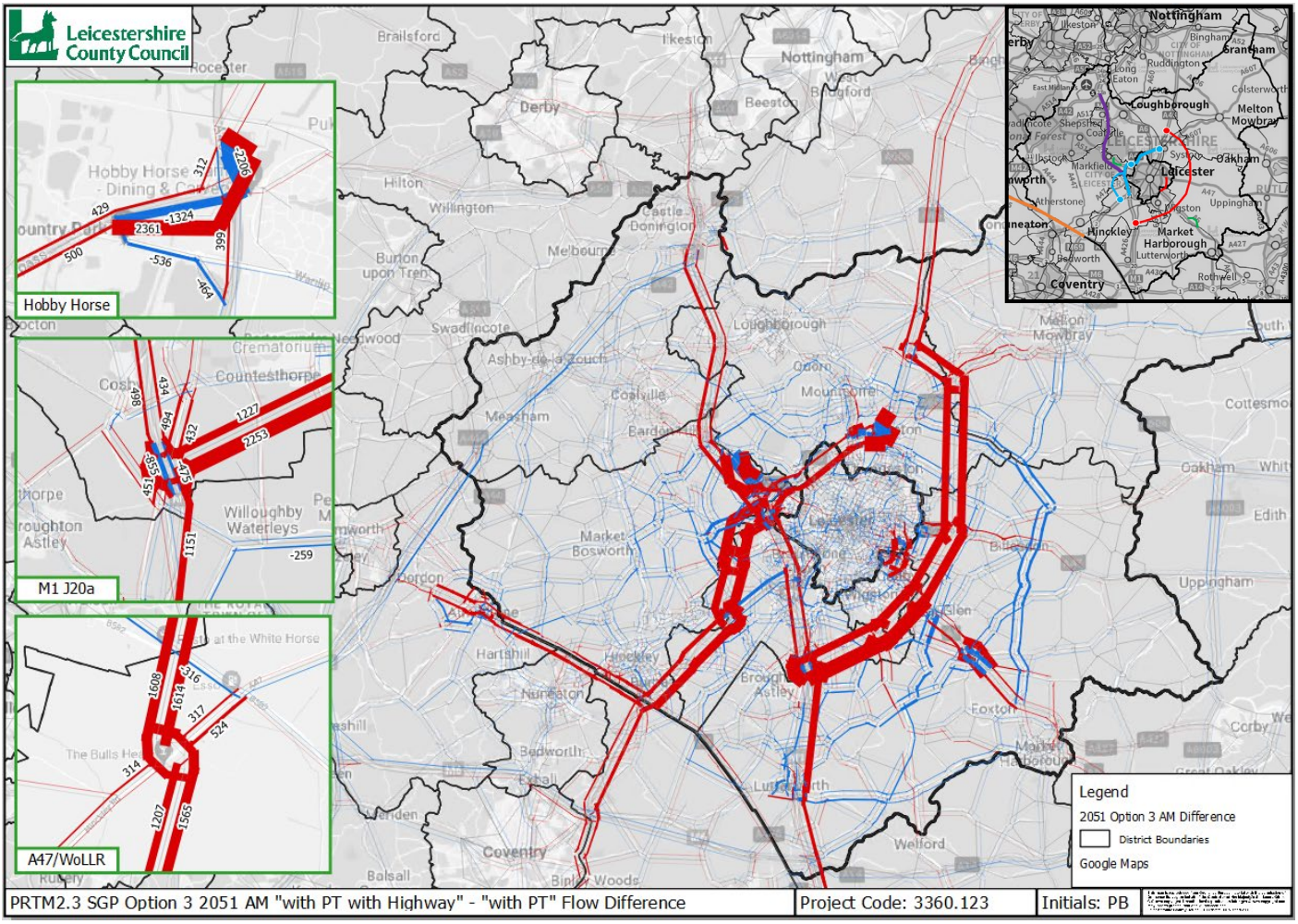


Figure 8.10: Option 3 "with PT with Highway interventions" - "with PT interventions", Flow Difference

8.7.4. The impacts of the Leicester South and East Orbital Link Road are comparable to those observed for Option 2, with benefits accruing to strategic north south movements, better accessibility on the eastern side of the County and Leicester City whilst accommodating the travel requirements of concentrated growth to the south and east of the LUA.

8.7.5. Looking at the traffic forecasts for the South and East Orbital Link Road in more detail reveals the trip routeings between origins and destinations likely to use the intervention. Figure 8.11 shows the trip movements using two separate sections of the scheme in relation to its junction with the A47 near Thurnby. The left plot shows the trips using the southern section with the northern section shown to the right, whilst the purple colouring shows northbound movements along the scheme and green shows southbound.

8.7.6. Aside from its primary purpose of providing appropriate access routes to key growth areas around the south and east of the LUA, these outputs (particularly the change in bandwidth at the A47) show that the route also has the potential to act as a distributor road for the south and east of Leicester and Leicestershire more widely (e.g., for journeys towards Market Harborough, Melton Mowbray and Rutland). To a more limited extent, the link road in its entirety also appears to provide a viable alternative route around the LUA to existing strategic orbital routes for some traffic.

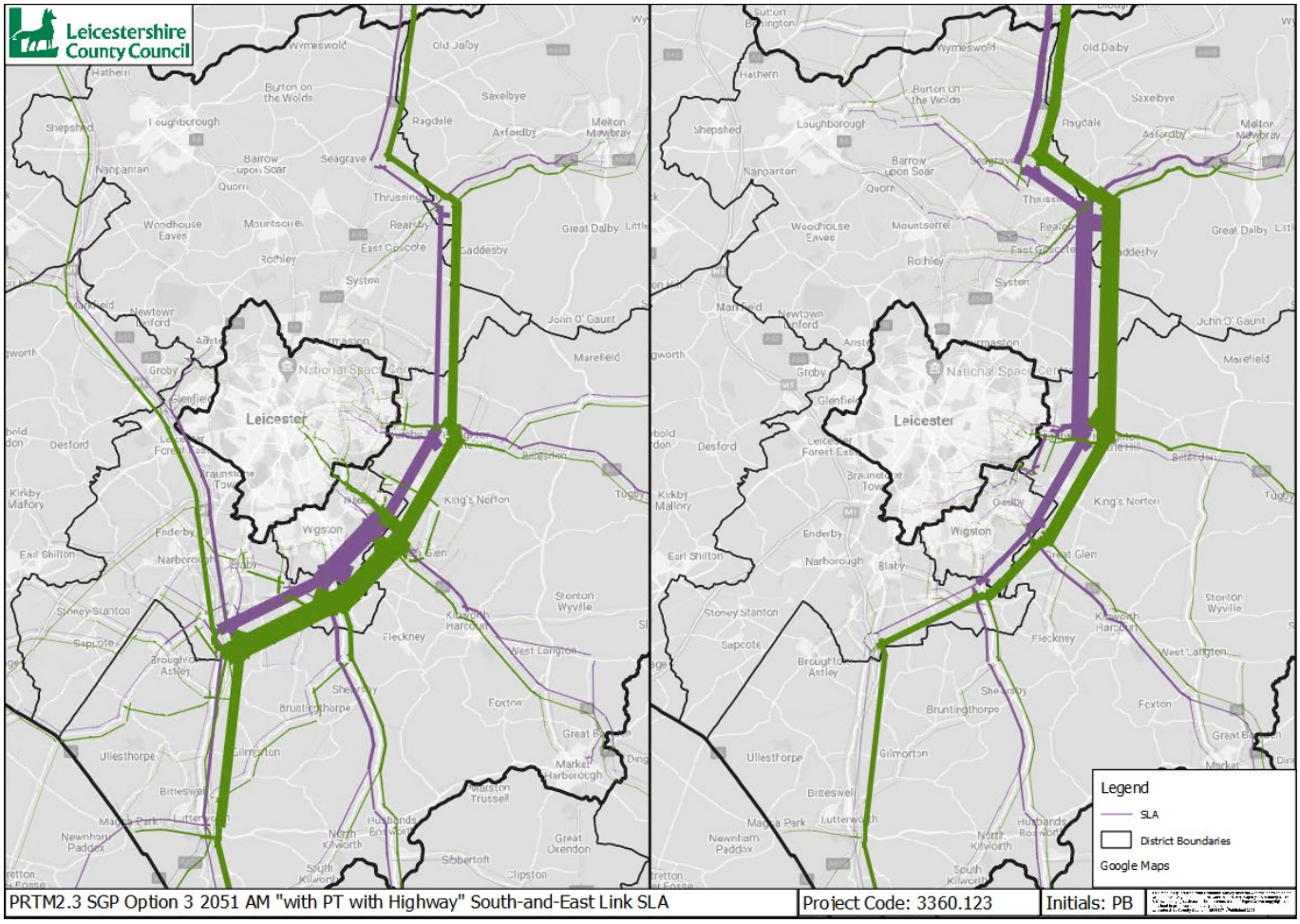


Figure 8.11: Option 3 "with PT with Highway interventions" South-and-East Link, Select Link Analysis

8.7.7. Some highway measures draw more traffic on to the strategic/major road network. The combined effect of building the West of Leicester Link Road (WoLLR) with A46 improvements between Hobby Horse and the M1 is to attract traffic to the M69. The increase in traffic using the M69 is to the south of the new junction 3 (which connects the WoLLR scheme to the M69) whilst the flow reduces north of J3 towards M1 J21.

8.7.8. As in Option 1, the WoLLR also acts as a distributor road but on a more localised level than the South-and-East Orbital Link Road. This is shown in Figure 8.11 where trip routeings, using two separate sections of the scheme either side of the A47, are looked at in detail. The left portion shows the trips using the northern section and the right portion the southern section whilst purple colouring shows northbound movements and green shows southbound.

8.7.9. Although there is some through traffic traversing the scheme along its entirety the change in bandwidth at the A47 indicates the scheme acts more as a distributor road for the west of Leicester and county towards Enderby, Narborough, Earl Shilton and Kirkby Mallory.

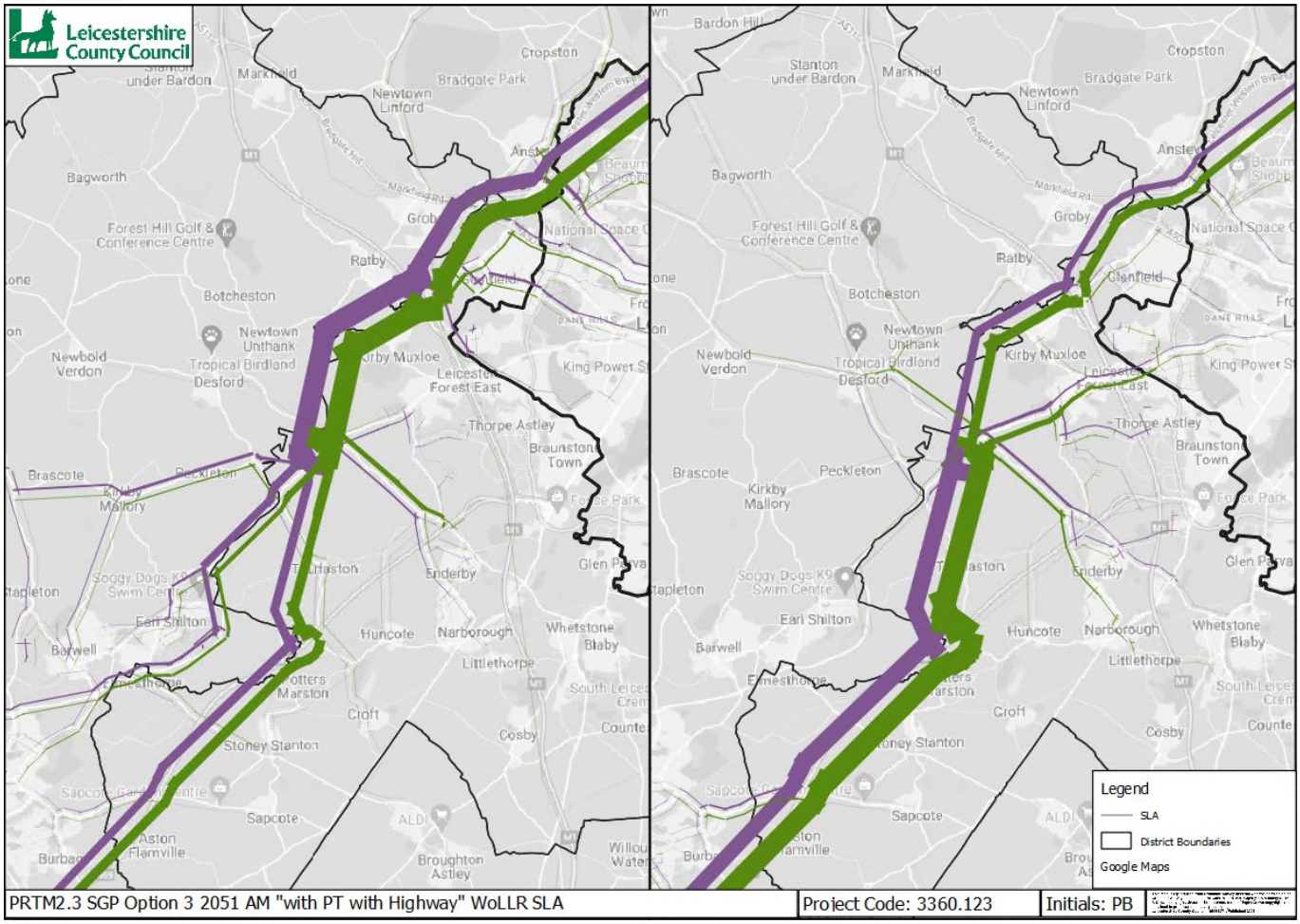


Figure 8.12: Option 3 "with PT with Highway interventions" West of Leicester Link Road SLA

8.7.10. The WoLLR relieves the strategic road network around M1 J21 allowing it to cater better for longer distance movements and those seeking access to the Leicester central, south and east areas.

8.7.11. The extent of the relief in terms of predicted journey times and delays in the M1 J21 area has also been extracted from the model output.

8.7.12. In terms of journey times a comparison is made between competing routes from PRTM forecasts using both, "with" and "without" Option 3's package of strategic highway interventions. The two routes chosen are depicted in Figure 8.13 and have the common start/end points of north of M69 J2 and north of A46 Kirby Interchange respectively.

8.7.13. The red route passes through M1 J21 with directional journey times extracted for both, "with" and "without" highway interventions whilst the blue route uses the WoLLR and so only the "with" scenario is relevant.

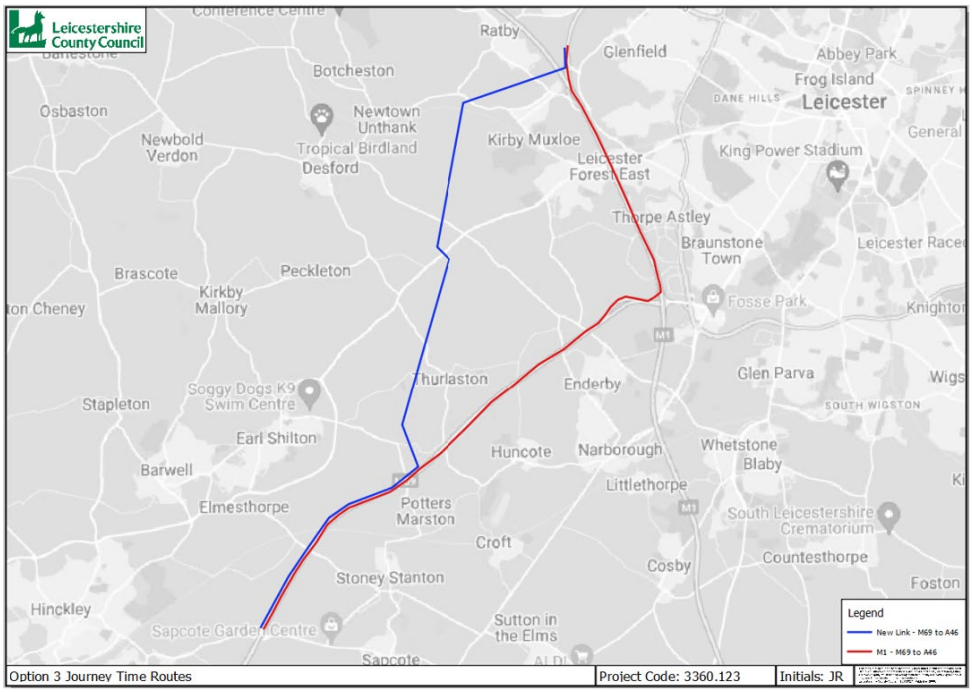


Figure 8.13: Primary Routeing Options from M69 J2 to A46 Kirby Interchange

	Northbound			Southbound		
	DM	M1	WoLLR	DM	M1	WoLLR
Time (s)	985	811	883	1383	935	991

Table 8.8: Option 3 M1 J21 Journey Time Comparison

8.7.14. It can be seen from Table 8.8 that there is a significant improvement in journey times on the route through M1 J21 once the package of measures is included. In the northbound direction there is a near 3-minute (174s) reduction with over 7 minutes saved southbound (448s).

8.7.15. Significantly, with the highway interventions package included, the WoLLR route is slower than traversing M1 J21 and emphasises its distributor road function. By contrast, more strategic journeys are forecast to remain using M1 J21 and M1 J21A due to its superior speed.

8.7.16. Two useful metrics for assessing and comparing junction performance are the throughput and the associated average delay per vehicle[13]. This forecast data has been extracted for M1 J21 in Table 8.9 from the present day (2021) through to 2051 and each of the Option scenarios.

8.7.17. For M1 J21 the M1 mainline flow is excluded from these calculations to avoid masking the underlying cause of the congestion.

[13] In the PRTM vehicles are replaced by the passenger car unit (pcu). The pcu reduces all vehicles to a passenger car equivalent and is used for modelling and junction design purposes.

8.7.18. The junction is forecast to have a near 10% increase in flow (12,097pcu) by 2051 without any package of interventions whilst the delay per vehicle increases by over 2 minutes (134s) or 83%.

8.7.19. The implication of such a modest increase in M1 J21 throughput coupled with a large delay increase per user suggests the junction is nearing, or indeed at, capacity by 2051 in this scenario.

8.7.20. Unsurprisingly, given its location on the SRN, the introduction of PT measures makes little difference to performance but is greatly improved once the highway package is included. Thus, the introduction of the West of Leicester Link Road, and other supporting measures such as M1 J20a, decrease the demand on M1 J21 to a level of use and performance which is comparable to 'present day' (2021) despite the addition of circa. 132,000 dwellings across the HMA.

	2021	2036	2051 "Do Minimum"	2051 "with PT"	2051 "with Highway"
Flow Into Junction (PCU)	11,027	11,946	12097	12079	11,105
Delay per PCU (s)	161	223	295	292	185

Table 8.9: Option 3 M1 J21 Flow and Delay Statistics, All Options

8.7.21. It should be stated that, although these metrics are useful for comparative purposes, they should be used in conjunction with other model evidence to build up a detailed 'cause-and-effect' understanding of what is happening. In this regard, for example, the pattern of trip movements through M1 J21 will have changed meaning that congestion effects change too around the junction.

8.7.22. Other strategic components of the highway package, such as the improvements at A46 Hobby Horse, A50 Bradgate Hill and the A6 Kibworth Bypass, serve to draw trips away from less suitable routes and on to the major and strategic road network.

8.7.23. The Leicester S&E Orbital Road also helps to relieve the strategic road network around M1 J21 allowing it to cater better for longer distance movements and those seeking access to the Leicester central, south and east areas.

8.7.24. The extent of the relief in terms of predicted journey times and delays in the M1 J21 area has also been extracted from the model output.

8.7.25. In terms of journey times a comparison is made between competing routes from PRTM forecasts using both, "with" and "without" Option 3's package of strategic highway interventions. The two routes chosen are depicted in Figure 8.14 and have the common start/end points of north of M1 J20 and north of A46 Six Hills respectively.

8.7.26. The blue route passes through M1 J21 with directional journey times extracted for both, "with" and "without" highway interventions whilst the orange route uses the Leicester S&E Orbital and so only the "with" scenario is relevant.

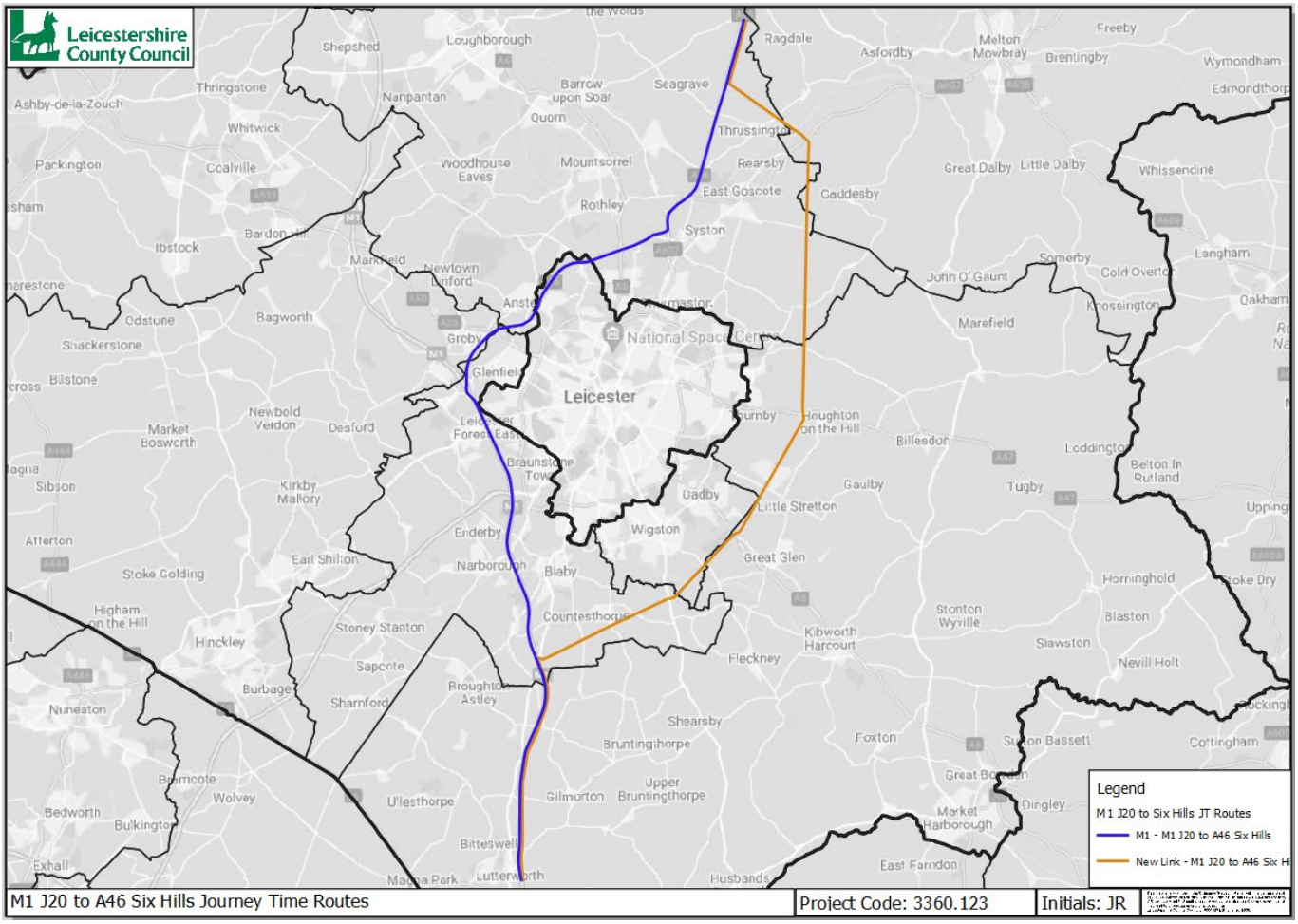


Figure 8.14 Primary Routeing Options from M1 J20 to A46 Six Hills

	Northbound			Southbound		
	DM	Current SRN	Leicester S&E Orbital	DM	Current SRN	Leicester S&E Orbital
Time (s)	2378	2155	2449	2795	2322	2429

Table 8.10 Option 3 M1 J20 to A46 Six Hills Journey Time Comparison

8.7.27. It can be seen from Table 8.10 that there is a significant improvement in journey times on the route through M1 J21 once the package of measures is included. In the northbound direction there is a near 4-minute (223s) reduction with over 6 minutes saved southbound (366s).

8.7.28. Significantly, with the highway interventions package included, the Leicester S&E Orbital route is slower than traversing M1 J21 and emphasises its distributor road function. By contrast, more strategic journeys are forecast to remain using M1 J21 and M1 J21A due to its superior speed.

8.7.29. The impact on forecast model delays associated with Option 3 resulting from the inclusion of its package of strategic highway interventions is shown in Figure 8.15 below. Overall, there is a reduction in delay across the study area with large reductions forecast at M1 J21 and Hobby Horse on the Strategic Road Network (SRN) as well as a large corridor-long reduction for the A47, west of Leicester, due to trips having better access to the SRN.

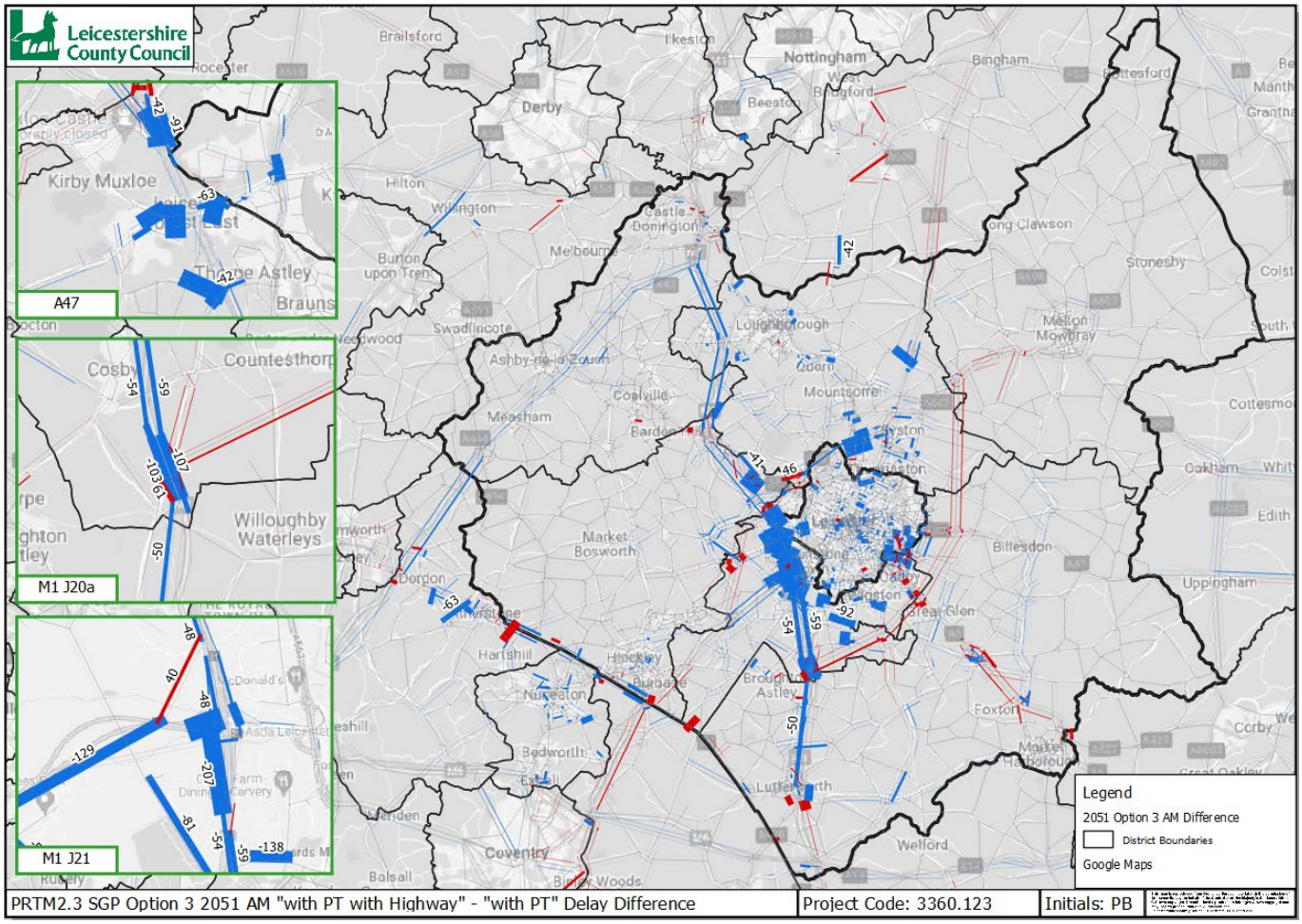


Figure 8.15: Option 3 "with PT with Highway interventions" - "with PT interventions", Delay Difference

8.8. Option 4 (New Market Towns) “with Strategic Highway Interventions”

8.8.1. The focus of Option 4’s package of strategic highway interventions is the accessibility and connectivity required to accommodate the concentration of growth under this spatial option at four prospective ‘free standing’ market town sites to the north, south, east and west of the County.

8.8.2. Figure 8.16 shows Option 4’s package of highway measures together with the forecast flow differences between 2051 AM “with PT & highway” and “with PT” interventions associated with them. Once again, areas of notable change have been included within the figure along with link flows to gauge the scale of forecast vehicle transfer.

8.8.3. It is apparent that the rural location of the market towns is causing there to be a greater reliance on rural routes even with the highway interventions in place. To the north, east and west of the County there are signs of relief on rural roads but, in the south, there is a general increase. Where there is relief, however, it tends to be at a much lower level than for the other Options.

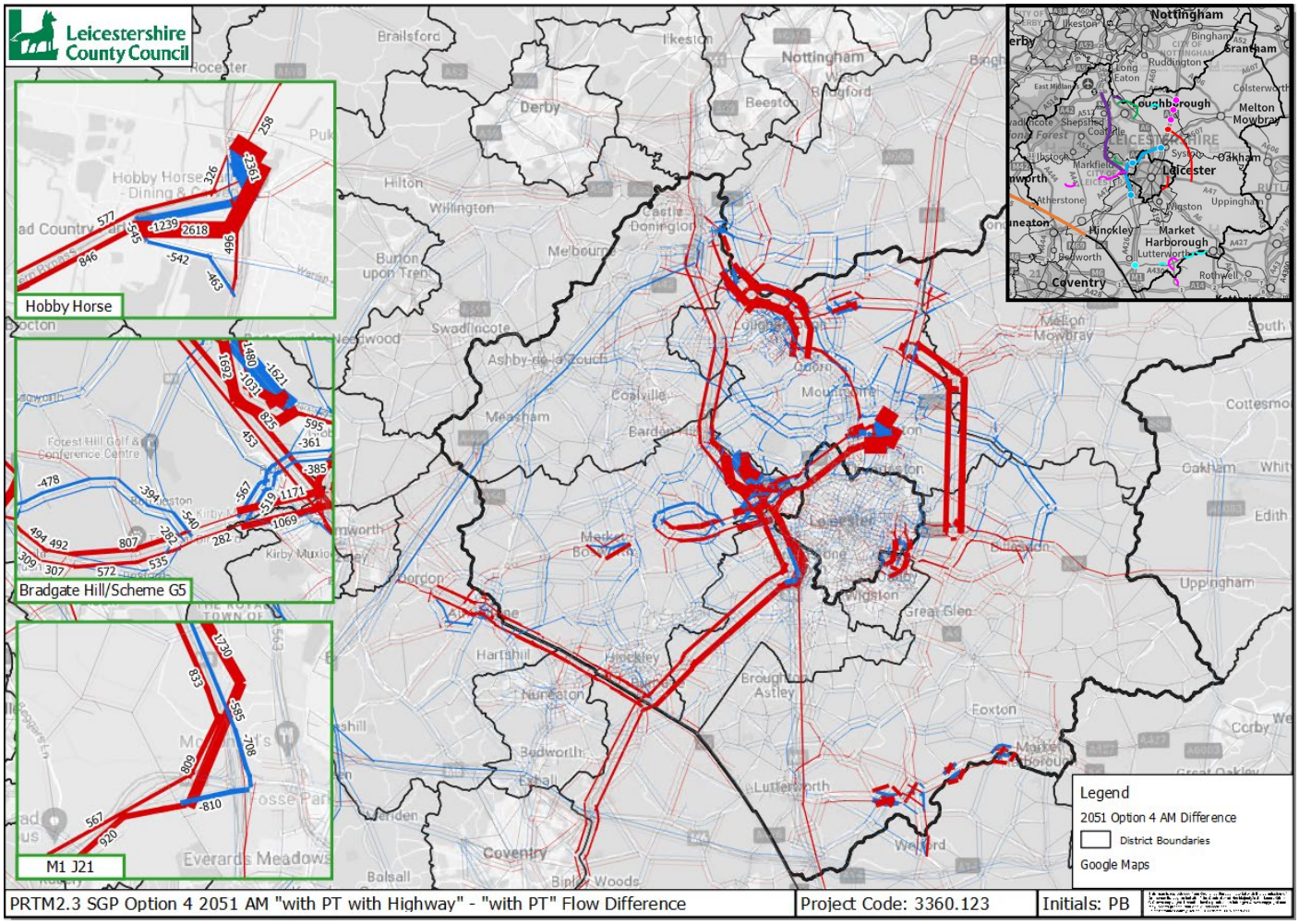


Figure 8.16: Option 4 "with PT with Highway interventions" - "with PT interventions", Flow Difference

8.8.4. The relative isolation of the southern settlement near Husbands Bosworth, with its general lack of connectivity to desired destinations, leads to increased traffic on surrounding rural routes. Even where other market towns reside close to the MRN/SRN there can be difficulties satisfying the diffuse nature of destinations being sought. For example, the northern settlement (in the rough vicinity of Six Hills) is located close to the A46, which serves those destinations to the north (e.g., Nottingham)-and south (e.g., Leicester) well. However, east-west movements are reliant on less suitable routes, which could be an issue here since Loughborough, to the west, is forecast to be an attractive destination.

8.8.5. The greater traffic relief on minor roads observed to the east, north and west of the LUA and wider HMA is unsurprising given that most of the larger scale highway interventions are located on these sides of the LUA. This in turn is linked to the generally greater density and connectivity of the existing major and strategic road networks in these areas, which provides greater potential scope for such larger scale interventions to be provided to support the proposed new market towns to the east, north and west than for the new market town in the south.

8.8.6. A large proportion of the highway measures proposed are bypasses of rural villages situated on the main routes between the proposed new market towns and the major, or strategic, road network. These schemes primarily redirect traffic from village centres to the new bypasses, but also draw slightly more trips onto these corridors.

8.8.7. The Desford bypass is one exception with an extension linking it through to the strategic road network at the A46 Kirby Interchange. The forecast benefits of this scheme are contained to the local area with minimal additional trips re-routing through minor roads to access the A46.

8.8.8. The Loughborough and Hathern bypasses benefit mostly local traffic with flow reductions predicted for Loughborough, A6 trips through Hathern and on adjacent rural roads. However, they also provide a much improved through route capacity for the A6 capable of relieving the M1 of journeys to/from Junction 24 from/to Loughborough and Leicester City.

8.8.9. The new East Leicester Link Road (ELR) and A563-ORR are two schemes which act locally and draw traffic away from nearby minor and rural roads. For the ELR this relates to trips across South Melton and North Harborough, whereas the ORR relieves local roads around Evington and Oadby.

8.8.10. The impact on forecast model delays associated with Option 4 and the inclusion of its package of highway interventions is shown in Figure 8.17 below. Delay decreases are concentrated around the M1 J21 & J21a, East Leicester (Evington/Stoughton), Loughborough, Hathern, Hobby Horse/A46 and North Kilworth/Husbands Bosworth.

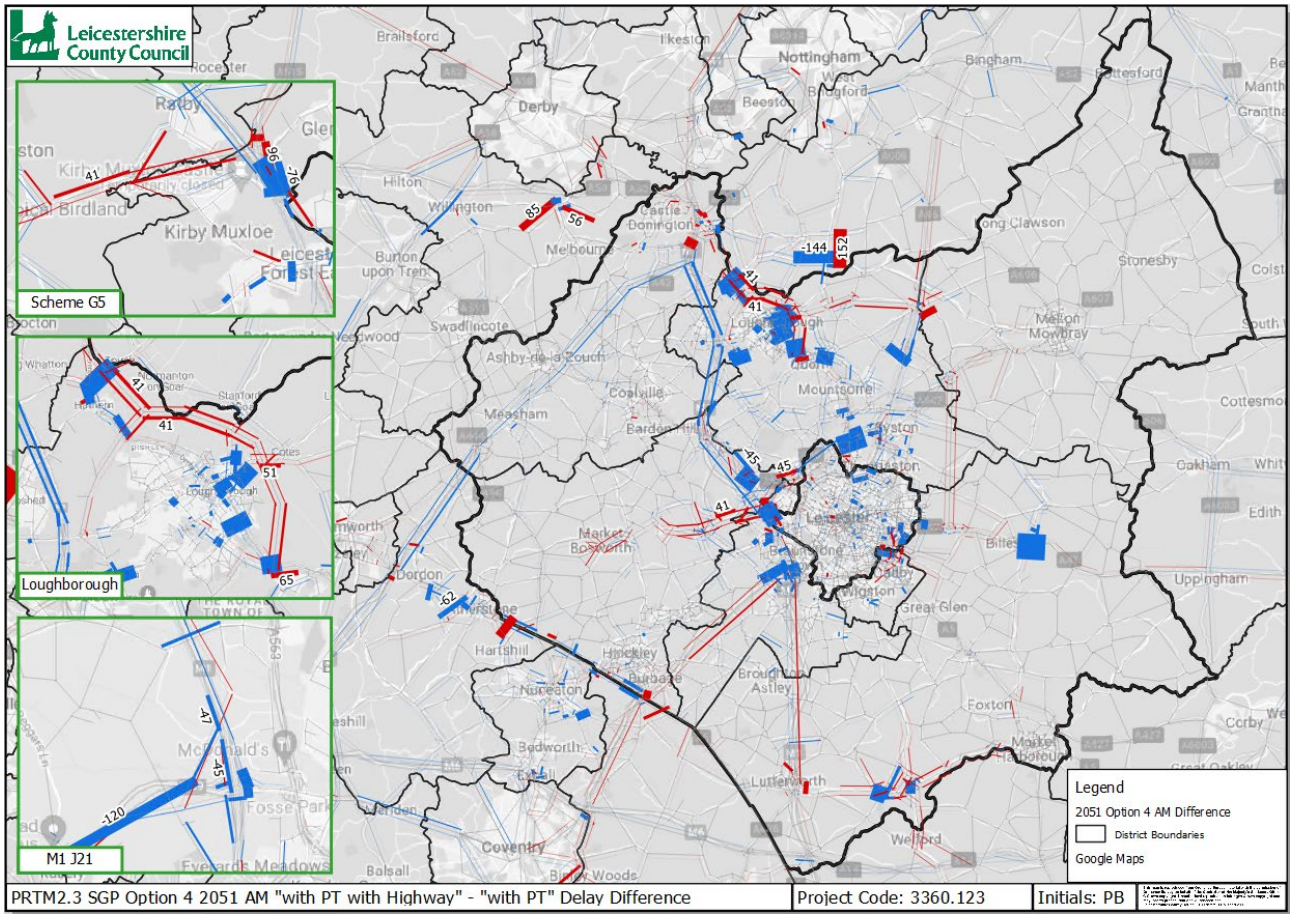


Figure 8.17: Option 4 "with PT with Highway interventions" - "with PT interventions", Delay Difference

9. Summary

9.1. Overview

9.1.1. The purpose of this project is to provide quantitative evidence, informing the decision-making process with regards to developing a future 2051 Strategic Growth Plan for Leicestershire. More specifically, this commission has focused on Stage 1, of a 2-stage process, assessing the demand for travel associated with 4 distinct spatial strategies and the level to which this could be met. This has involved considering their impact on the existing infrastructure prior to considering prospective strategic passenger transport and highway interventions, using LCC's Pan Regional Transport Model (PRTM).

9.1.2. Stage 2 of the process will follow once a decision is made on a preferred option and will involve a more detailed assessment. This will adopt a more rigorous approach utilising the PRTM's demand model and Public Transport capability together with a review of how the proposed development is phased between 2036 and 2051.

9.2. Stage 1a: Option Testing (no strategic interventions)

9.2.1. The Stage 1 work contained in this report has predominantly relied on PRTM's highway model component. By 2051, and in the absence of any associated interventions, each of the 4 spatial options (1. Existing strategy; 2. Current SGP; 3. Majority near Leicester; 4. New Market Towns) shows a marked deterioration from ambient present day highway congestion levels.

9.2.2. Although across the wider area there is very little difference between each option's network performance statistics, closer inspection of model output reveals two potentially useful distinguishing points. Firstly, the more rural locations of Option 4's market towns are forecast to produce a larger number of longer distance car trips as residents seek a wider variety of activities elsewhere. Secondly, Option 3 is forecast to see a 40% increase in congested junctions (volume/capacity >85%) compared to about 35% for the other options. This is likely to be due to the siting of large development sites close to the already congested network in the Leicester Urban Area.

9.2.3. Linked to this first point, Options 1, 2 and 3, and their proximity to larger conurbations, is flagged with around 50% of their car trips forecast to be less than 10Km in length compared with 35% for Option 4. Such proximity means that there is greater potential for such trips to transfer to more sustainable modes.

9.3. Stage 1b: Option Testing (with strategic interventions)

9.3.1. Having identified various strategic interventions the modelling suggests that, in the absence of any complementary policies, the inclusion of passenger transport measures has a marginal impact with a 'best case' reduction of about 1% in car trips for Options 2 and 3. This is not sufficient to make any significant improvement in future forecast congestion levels.

9.3.2. The inclusion of option specific highway interventions does have a significant impact on ambient network conditions, albeit not sufficient to bring them back to present day, or indeed 2036, levels. Option 2 appears to be the most successful combination of housing spatial strategy and intervention package, with results closest to forecast 2036 conditions.

9.4. General Commentary

9.4.1. It is important to emphasise that the evidence provided does not set out a policy position on a preferred SGP spatial option but informs the wider discussion from which the Leicester and Leicestershire Strategic Partnership will decide on a favoured option. From a transport perspective such a wider discussion is likely to include more qualitative/subjective considerations, such as potential funding and deliverability challenges and opportunities, etc.

9.4.2. The results provide a good indication of the likely scale and composition of the package of strategic interventions needed to support any of the four SGP spatial options to 2051. However, further work will be necessary to explore and develop specific interventions in more detail, including through the planned Stage 2 of the STA.

9.4.3. The results are intended to assess the "worst case" in respect of requirements for strategic highway interventions, and a key part of the further work needed will be to explore the potential for further strategic-level sustainable travel interventions, that could reduce this requirement as far as possible.

9.4.4. In summary, Table 9.1 below ranks each option within the 'with Strategic Interventions' scenario using the metrics available within this report. Based on this assessment, it is indicated that Scenario 2 (Current SGP Spatial Pattern) to be the best performing option overall over Scenario 3 (Majority Near Leicester); with Scenarios 1 (Existing HMA Spatial Pattern) and 4 (New Market Towns) considerably further in arrears.

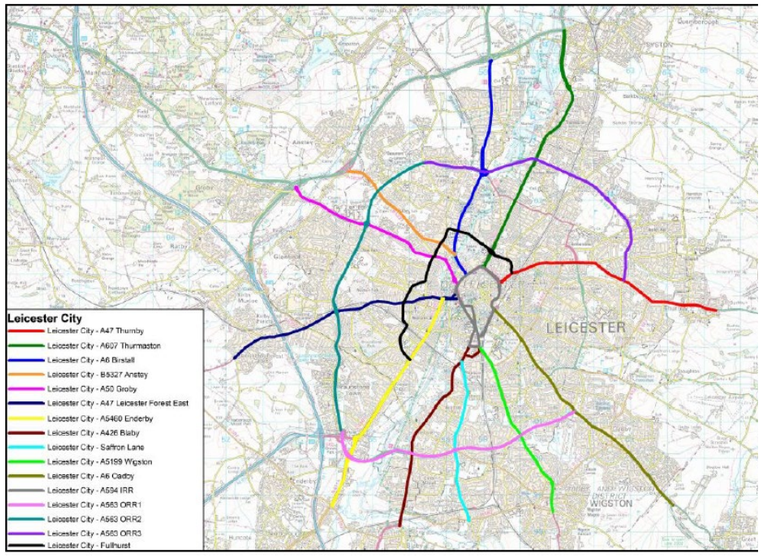
Topic	Metric	Report Reference	Option 1	Option 2	Option 3	Option 4
Overall Network Performance	- Average Speed - Aggregate Congestion/Delays - Aggregate Travel Time	Table 8.1 Figure 8.1	4	1	2	3
Potential for Sustainable Travel	- Aggregate Travel Distance - Trip Length Distribution - Vehicle trip total change due to sustainable interventions	Figures 5.2, 7.1 and 8.1 Tables 5.2, 7.1, 7.2 and 8.1	2	2	1	4
Impact on Congested Junctions	- Number of congested junctions (operating at over 85% capacity)	Tables 5.3, 5.4, 5.5, 5.6, 7.3 and 8.2	3	1	2	3
		Average Score	**3**	**1.3**	**1.7**	**3.3**
		Overall Ranking	**3**	**1**	**2**	**4**

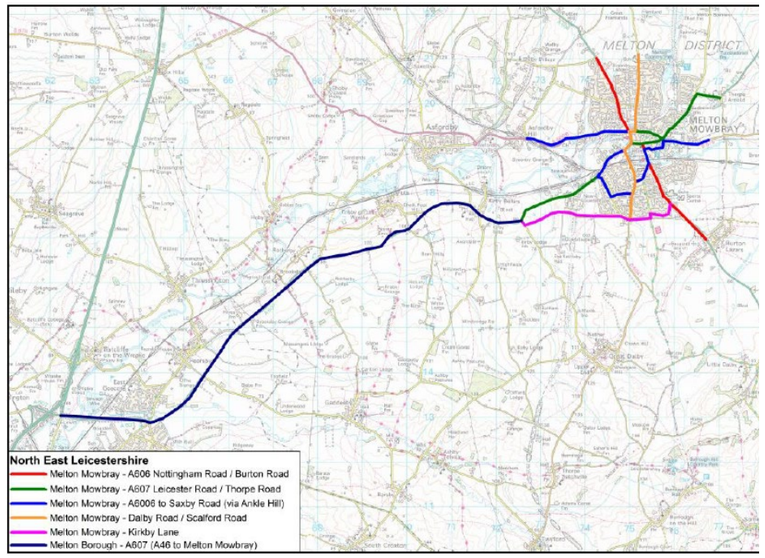
Table 9.1: Option Ranking

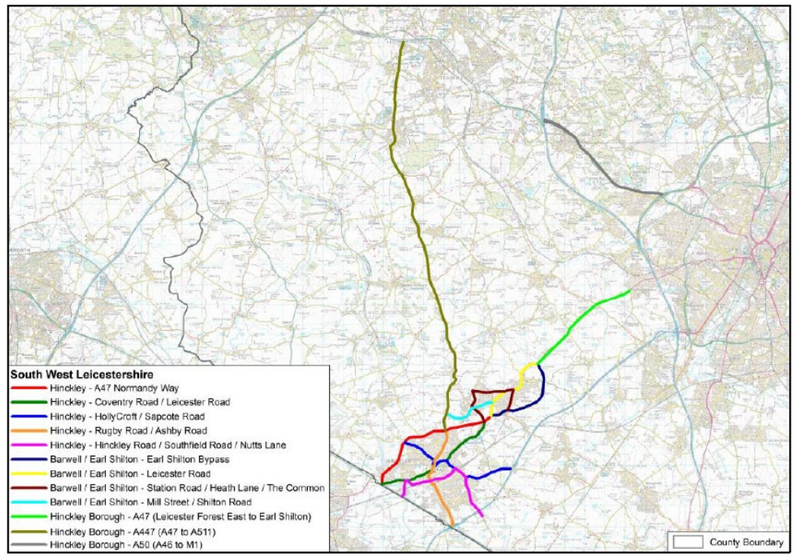
9.4.5. No attempt has been made to rank the options based on the key findings relating to traffic flow and routeing impacts, on the basis that the interpretation of the traffic flow and routeing outputs is a more qualitative, judgement-based exercise drawing on local knowledge and policy concerning the management of the HMA's road network. Nevertheless, the analysis of traffic flow and routeing impacts and key observations made in relation to this throughout the report are broadly consistent with the overall rankings set out in Table 9.1.

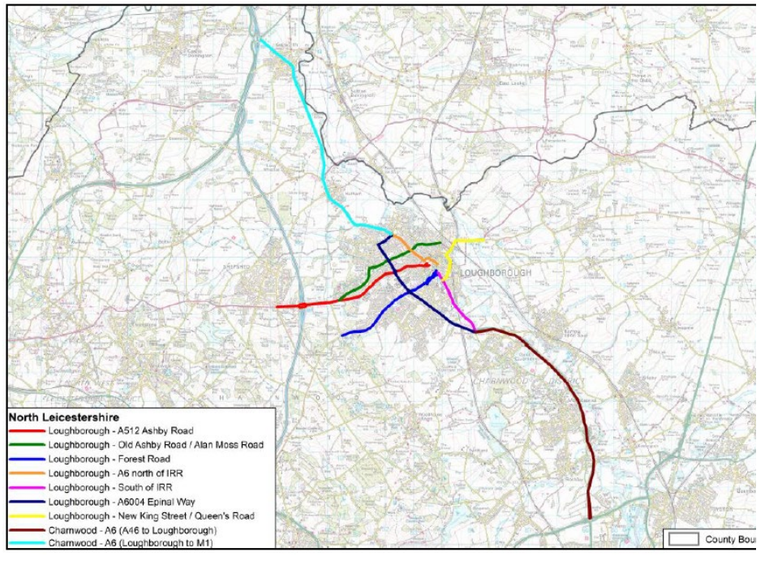
10. Annexes

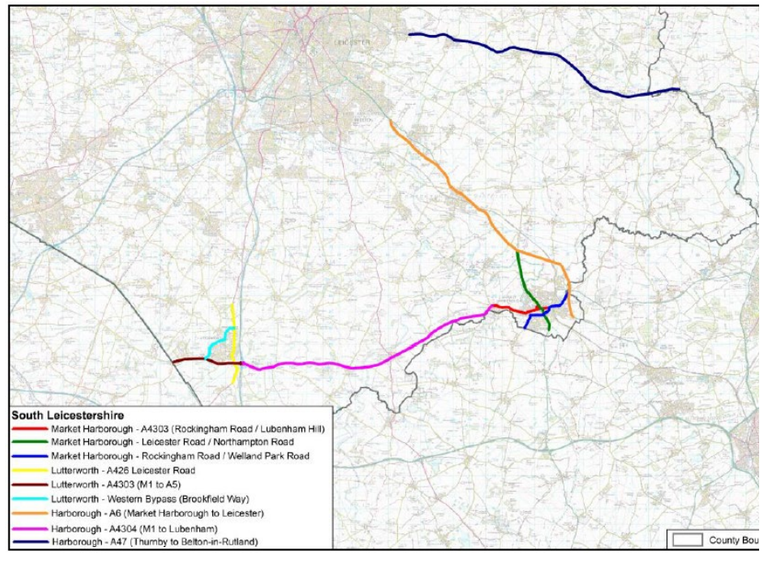
10.1. Annex A – Journey Time Routes (PRTM Validation)

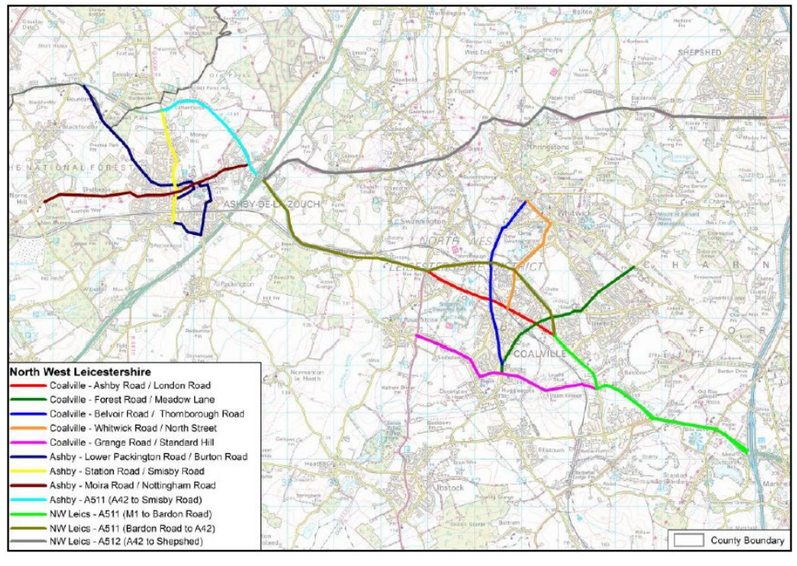












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10.2. Annex B – Core Model Uncertainty Log (Highway)

Location	Scheme Name	Certainty	Timescale	1st Forecast Year	Include?
Blaby	Lubbesthorpe SUE access & link to A563 Lubb. Wy	Near Certain	2017-2026	2021	Yes
Blaby	Lubbesthorpe M69 Bridge	More Than Likely	2026-2031	2031	Yes
Blaby	Lubbesthorpe SUE mitigation, Mill Hill, Enderby	Near Certain	2017-2023	2026	Yes
Blaby	Leicester North-West Phase 1	Complete	2016/2016	2016	Yes
Blaby	Desford Crossroads	More Than Likely	2021-2026	2026	Yes
Blaby	Glenfield Park/Optimus Point S278 works	Complete	2014-2016	2016	Yes
Blaby	Ratby Lane/Wembley Rd junction, LFE	Complete	2017/18	2021	Yes
Blaby	A47/Kirby Lane Tesco Express	Complete	2020	2021	Yes
Blaby	Highway Improvements for Lubbesthorpe SUE	Complete	2017-2021	2021	Yes
Blaby	Foxhunter Roundabout Eastbound Approach	Complete	2019	2021	Yes
Blaby	Everards Meadow Access	Complete	2018	2021	Yes
Blaby	Hastings Field (DPD Housing Allocation) Site Access	More Than Likely	2022	2026	Yes
Blaby	Enderby Hub (Land West of St.John's) Site Access	More Than Likely	2027	2031	Yes
Blaby	Everard Way Closure, Fosse-Park	Near Certain	2020	2020	Yes
Bolsover	M1 J28-31, Mansfield to Sheffield ALR	Complete	2016	2016	Yes
Broxtowe	HS2 Innovation Centre	More Than Likely	2030	2031	Yes
Charnwood	Loughborough Integrated Transport Scheme	Complete	2013	2014	Yes
Charnwood	A60 Nottingham Rd/Lboro Traffic Calming in Cotes	Complete	2016	2016	Yes
Charnwood	A512 Widening, B591 to M1 J23, Loughborough	Complete	2017-2020	2021	Yes
Charnwood	A512 Junction Improvements	Complete	2016-2021	2021	Yes
Charnwood	Kegworth Bypass	Complete	2017-2019	2021	Yes
Charnwood	West of Loughborough SUE A6 Access	More Than Likely	2022	2026	Yes
Charnwood	North of Leicester SUE (Broadnook)	Near Certain	2021-2026	2026	Yes
Charnwood	Mountsorrel Lane, Rothley Link Rd	Complete	-2021	2021	Yes
Charnwood	Thurmaston SUE (Site Link & S.Access–575 dwells)	Near Certain	2025	2026	Yes
Charnwood	Thurmaston SUE (N.Link to A607–2,355 dwells)	Near Certain	2035	2036	Yes
Charnwood	A6 Lboro Rd Bus Lane & Parking Controls	Complete	2016	2016	Yes
Charnwood	Alan Moss Rd, Loughborough	Complete	2017	2021	Yes
Charnwood	West of Loughborough SUE, A512 Access	More than Likely	2036	2036	Yes
Charnwood	Loughborough Science Park Access	Near Certain	2031	2031	Yes
Coventry	A46, Toll Bar End/Stonebridge	More Than Likely	2021	2021	Yes
Daventry	DIRFT3–Daventry International Rail Frght Terminal	Complete	2016	2016	Yes
Harborough	M1 J19 – Catthorpe Interchange	Complete	2016/17	2021	Yes
Harborough	Harborough SDA – Airfield Farm	Near Certain	-2021	2021	Yes
Harborough	Frank Whittle Roundabout Approaches, Lutterworth	Complete	2018-2020	2021	Yes
Harborough	Magna Pk Extn Access – Mere Lane, Lutterworth	Complete	2021	2021	Yes
Harborough	Magna Pk Extn Access – A5, Lutterworth	Near Certain	2026	2026	Yes
Harborough	B4114/B591 Signal Improvement, Broughton Astley	Complete	2023	2026	Yes
Harborough	Wigston Direction for Growth Site Access	Near Certain	2026	2026	Yes
Harborough	Kettering Rd Shuttle Traffic Lights, Mkt Harborough	Complete	2020	2021	Yes
Harborough	Lutterworth East Development Network (Phase 1)	More Than Likely	2021-2026	2026	Yes
Harborough	Lutterworth East Spine Rd	More Than Likely	2021-2026	2031	Yes
Harborough	Lutterworth East Development Network (Phase 2)	More Than Likely	2021-2026	2026	Yes
W.Nthants	M1 J16 to J19	Complete	2019	2021	Yes
Hinckley&Boswth	RGF/MIRA, A5 Redgate Jnc, A444-Higham Ln Jnc	Complete	2015	2016	Yes
Hinckley&Boswth	A5 Dodwells & Longshoot Junctions	Complete	2016	2016	Yes
Hinckley&Boswth	A5 Dualling between Dodwells & Longshoot	Hypothetical	2020-2023	-	Yes
Hinckley&Boswth	Earl Shilton SUE Access & Highway Improvements	Near Certain	2023-2035	2026	Yes
Hinckley&Boswth	Barwell SUE Access and Highway Improvements	Near Certain	2023-2035	2026	Yes
Hinckley&Boswth	Ashby Rd/Nrmndy Wy Improvement, E.Shilton/Barwell SUE	More Than Likely	2023-2035	2026	Yes
Hinckley&Boswth	Hinckley Area Project Phase 1-3	Complete	2014-2017	2021	Yes
Hinckley&Boswth	Hinckley Rugby Rd Corridor Improvements–Phase4	Near Certain	2022	2026	Yes
Hinckley&Boswth	DPD A5 Access, Hinckley	Complete	2017	2021	Yes
Hinckley&Boswth	Hinckley NRFI	Reasonably Forseeable	2026	-	No
Leicester City	Removal of Belgrave Flyover	Complete	2014/15	2016	Yes
Leicester City	Saffron Lane – Old Velodrome Improvements	Complete	2016	2016	Yes

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Location	Scheme Name	Certainty	Timescale	1st Forecast Year	Include?
Leicester City	End of Hamilton Development Improvements	Complete	2016	2021	Yes
Leicester City	Pedestrianisation of Hotel St. & St. Martins	Complete	2016	2016	Yes
Leicester City	Haymarket/Charles St. Bus Station Development	Complete	2016	2016	Yes
Leicester City	Existing & Proposed 20mph Schemes	Complete	2012-2016	2016	Yes
Leicester City	St. Nicholas Circle	Complete	2015	2016	Yes
Leicester City	Welford Rd Cycle Path	Complete	2018	2021	Yes
Leicester City	Waterside Development	More Than Likely	-2025/26	2026	Yes
Leicester City	Belgrave Gate South	Complete	2019	2021	Yes
Leicester City	Belvoir Street	Complete	2017	2021	Yes
Leicester City	York Rd/Bonners Ln/Grange Rd	Complete	2019	2021	Yes
Leicester City	King Street Traffic Flow Reversal	Complete	2018	2021	Yes
Leicester City	Lancaster Rd Cycle Improvements	Complete	2019	2021	Yes
Leicester City	Mansfield Street & Church Gate	Complete	2020	2021	Yes
Leicester City	St. Margaret's Bus Station Access to Burleys Way	Complete	2019	2021	Yes
Leicester City	Vaughan Way Super-Crossing & Highway Widening	Complete	2019	2021	Yes
Leicester City	Ashton Green SUE (Various Infrastructure)	Near Certain	2021-2031	2021	Yes
Leicester City	London Rd (Granby St. to Mayfield Roundabout)	Complete	2019	2021	Yes
Leicester City	Savoy St. (Belgrave Gate to Mansfield Street)	Near Certain	2020	-	Yes
Leicester City	Belgrave Gt/Haymkt/Church Gt. Pedestrianisation	Near Certain	2020	-	Yes
Leicester City	Leicester NW 2, Ravensbridge Dr/Blackbird Rd	Complete	2019	2021	Yes
Leicester City	Beaumont Leys Anstey Lane Improvements	Complete	2019	2021	Yes
Leicester City	Putney Rd West Improvement	Near Certain	2021/22	2026	Yes
Leicester City	Granby St/Halford St. Improvements	Complete	2017	2021	Yes
Leicester City	Abbey Pk Rd Cycle Provision	Complete	2020	2021	Yes
Leicester City	Leicester TCF2 Schemes	Reasonably Forseeable	2022	-	No
Leicester City	Abbey Street	Complete	2021	2021	Yes
Leicester City	A50 Groby Rd Bus Lane	Complete	2022	2026	Yes
Leicester City	Buckminster Rd Safer Streets	Complete	2022	2026	Yes
Leicester City	A50 Bus Gate	Complete	2015	2016	Yes
Leicester City	Western Pk Golf Course Access	More Than Likely	2029	2031	Yes
Leicester City	A607 Bus Lane	Reasonably Forseeable	2022	-	No
Leicestershire	M1 Junctions 19-23A (SMART Motorway)	Reasonably Forseeable	2022-2025	-	No
Lincoln	A15-A158	Complete	2020	2021	Yes
Lincoln	A158-A46; North Hykenham relief Rd	More Than Likely	2027	2031	Yes
Melton	MMDR Northern Section	Near Certain	2024-2026	2026	Yes
Melton	MMDR Eastern Section	Near Certain	2024-2026	2026	Yes
Melton	MMDR Southern Section	More Than Likely	2025	2026	Yes
Melton	Gladman's Site (Leicester Rd & Kirby Lane Access)	Complete	2018-2020	2021	Yes
W.Nthants	M1 J13 to J16, Milton Keynes South – J16 ALR	Near Certain	2022	2026	Yes
Newark&Sherwood	Newark Northern Bypass	More Than Likely	2026	2031	Yes
Newark&Sherwood	A1-A46 Link South of Newark	More Than Likely	2027	2031	Yes
North Warks	B5000 Market St/Bridge St. Signals	More Than Likely	2026	2026	Yes
North Warks	A5 Dualling, Grendon & Dordon	More Than Likely	2026	2036	Yes
North Warks	A5 Dualling, Grendon to Atherstone	More Than Likely	2031	2031	Yes
North Warks	M42 J10	Reasonably Forseeable	2031	-	No
NW Leics	M1 J24	Complete	2013	2016	Yes
NW Leics	SRFI – EMG, Southern Access	Complete	2016-2018	2021	Yes
NW Leics	Bardon Link Road – Southern Section, Coalville	Near Certain	2024-2026	2026	Yes
NW Leics	Castle Donnington Western Link Rd	Complete	2020	2021	Yes
NW Leics	Highway Improvements for SRFI - EMG	Complete	2016-2019	2021	Yes
NW Leics	M1 J22	Complete	2016	2016	Yes
NW Leics	A42 J13	Complete	2017	2021	Yes
NW Leics	Interlink Way East Junction, Bardon Hill	Complete	2016	2016	Yes
NW Leics	Bardon Hill Link Rd – North Section	More Than Likely	2021-2026	2026	Yes
NW Leics	Hoo Ash Roundabout, Coalville	More Than Likely	2024	2026	Yes
NW Leics	Thornborough Rd Roundabout, Coalville	More Than Likely	2024	2026	Yes
NW Leics	Thornborough Rd to Whitwick Rd Dualling, Coalville	More Than Likely	2024	2026	Yes
NW Leics	Whitwick Rd Roundabout, Coalville	More Than Likely	2024	2026	Yes
NW Leics	Broom Leys Rd Junction, Coalville	More Than Likely	2024	2026	Yes
NW Leics	Bardon Link Rd Junction, Coalville	More Than Likely	2024	2026	Yes

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Location	Scheme Name	Certainty	Timescale	1st Forecast Year	Include?
NW Leics	Charnwood Arms Roundabout, Coalville	Hypothetical	Unknown	-	No
NW Leics	Flying Horse Roundabout, Coalville	More Than Likely	2024	2026	Yes
NW Leics	Fieldhead Roundabout, Markfield	More Than Likely	2024	2026	Yes
NW Leics	Mercia Park Access	Complete	2020	2021	Yes
NW Leics	M1 J23A to Jnc25 Smart Motorway	Complete	2018	2021	Yes
Nuneaton&Bedwth	Coton Arches	More Than Likely	2021	2021	Yes
Nuneaton&Bedwth	A4254 Eastboro Way P1, Nuneaton	Near Certain	2024	2026	Yes
Nuneaton&Bedwth	College Street/A444, Nuneaton	Near Certain	2023	2026	Yes
Nuneaton&Bedwth	Transforming Nuneaton	More Than Likely	2026	2026	Yes
Nuneaton&Bedwth	Croft Rd/Greenmoor Rd Priority	More Than Likely	2031	2031	Yes
Nuneaton&Bedwth	A47 Old Hinckley Rd	Near Certain	2023/24	2026	Yes
Nuneaton&Bedwth	Coventry Rd/Gipsy Lane	More Than Likely	2026	2026	Yes
Nuneaton&Bedwth	A4254/B4114/Eastboro Way	Near Certain	2026	2026	Yes
Nuneaton&Bedwth	Nuneaton Northern Sites Link Rd	Near Certain	2026	2026	Yes
Nuneaton&Bedwth	A444 Bedworth Bypass Junction Improvements	Reasonably Forseeable	2026	-	No
Nuneaton&Bedwth	Callendar Farm Phase 2	Near Certain	2031	2031	Yes
Nuneaton&Bedwth	Bermuda Connectivity Project	More Than Likely	2022	2026	Yes
Rugby District	Padge Hall Development Access	Reasonably Forseeable	Unknown	-	No
Rugby District	M6 J2 to J4 SMART Motorway	Complete	2017-2020	2021	Yes
Rugby District	Rugby Radio Station – A428 Access	Complete	2016-2019	2016	Yes
Rugby District	Rugby Radio Station – A5 Access	Near Certain	2022	2026	Yes
Rugby District	A5/A426 Gibbet Ln Roundabout (also in Lutt SDA)	Near Certain	2021	-	Yes
Rugby District	A426/A4071 Avon Mill R'abt/Newbold Rd/Hnters Ln	Near Certain	2026	2026	Yes
Rugby District	Ashlawn Rd/Hillmorton Rd	Near Certain	2021	2021	Yes
Rugby District	DIRFT3 – A5 Northern Access	More Than Likely	2021	2021	Yes
Rugby District	DIRFT3 – A5/A428 Halfway House Roundabout	More Than Likely	2026	2026	Yes
Rugby District	M1 J18	More Than Likely	2031	2031	Yes
Rugby District	M6 J1 to Coton House	Complete	2021	2021	Yes
Rugby District	DIRFT3 – A5 Southern Access	Complete	2021	2021	Yes
Rugby District	M6 J2 Signalisation	Complete	2020	2021	Yes
Rugby District	A46 (A45 – M6) to 'Expressway Standard'	More Than Likely	2026	2026	Yes
Rushcliffe	A453 upgrade + removal of temp 40mph speed limit	Complete	2016	2016	Yes
Rushcliffe	Clifton South SUE	Near Certain	2022	2026	Yes
Rushcliffe	Ratcliffe-on-Soar Power Station	Reasonably Forseeable	2030	-	No
South Derbys	A50 J3A	More Than Likely	2030	2031	Yes
South Derbys	EMIP	Reasonably Forseeable	2030	-	No
Sth Kesteven	A1-A52 Link to Bypass Grantham	Near Certain	2016-2023	2026	Yes
South Staffs	M54-Stafford ALR (M6 J10-13)	Near Certain	2021	2021	Yes
South Staffs	M54-M6 Toll	More Than Likely	2024	2026	Yes
Stafford Dist.	M6 J13-16, Stafford South to Stoke ALR	Near Certain	2022	2026	Yes
Strtfrd-Upon-Avon	M40 J16-M42 J3 ALR	More Than Likely	2026	2026	Yes
Walsall Dist.	Walsall M6 J10 Issues	Complete	2014	2014	Yes

10.3. Annex C – Core Model Uncertainty Log (Passenger Transport)

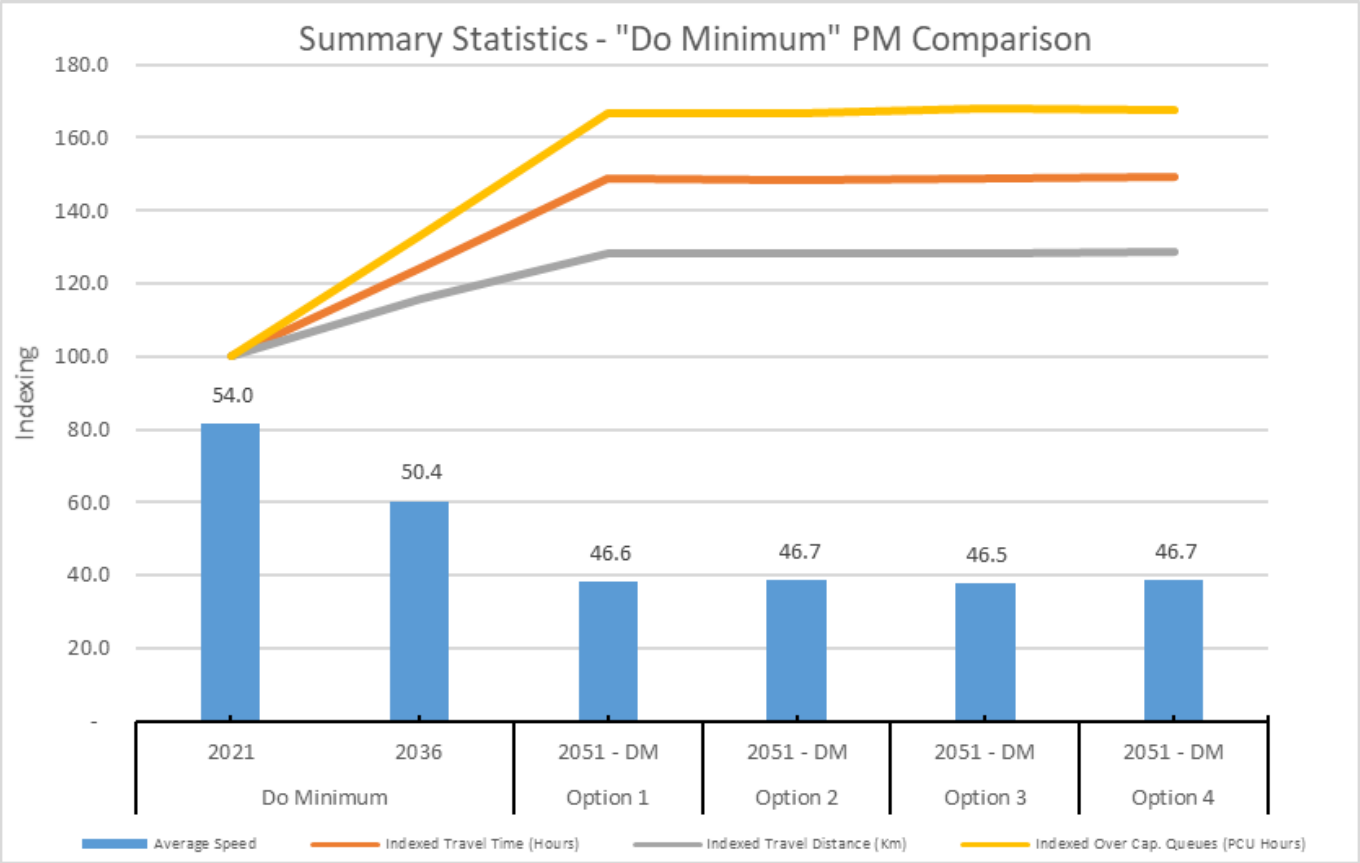
Location	Scheme Name	Certainty	Timescale	1st Forecast Year	Include?
Blaby	Leicester North-West Project Phase 1	Complete	2015-2016	2016	Yes
Charnwoood	A6 L'boro Rd Bus Lane & Parking Controls	Complete	2016	2016	Yes
East Mids	East Midlands Railway Frequency Changes	Complete	2021	2026	Yes
East Mids	Ivanhoe Line	Reasonably Forseeable	2026	2031	No
East Mids	Enhanced Connectivity; Melton to Nottingham	Reasonably Forseeable	2031	2031	No
East Mids	Direct Rail Services; Coventry to Nottingham via Leicester	Reasonably Forseeable	2031	2031	No
Garendon	New Services for Garendon, Loughborough	More Than Likely	2022-2026	2026	Yes
Hinckley	Hinckley Area Project Phases 1 to 3	Complete	2016	2016	Yes
Kegworth	East Mids Gateway-Strategic Rail Freight Interchange	Complete	2017-2020	2021	Yes
Leicester	Ashton Green Bus Services	More Than Likely	2021-2031	2026	Yes
Leicester	NE Leicester SUE Bus Measures	Complete	2013-2016	2016	Yes
Leicester	NE Leicester SUE–Misc Services (Charnwood/Thurmaston)	Complete	2013-2016	2016	Yes
Lubbesthorpe	Service to Accommodate SUE	Complete	2018	2021	Yes
London-Mids	HS2 (Phase 1, London-Birmingham)	More Than Likely	2027	2031	Yes
London-Mids	HS2 (Phase 2a, Birmingham-Crewe)	More Than Likely	2031	2036	Yes
London-Mids	HS2 (Phase 2b, Birmingham-E.Mids Pkway-Leeds)	Reasonably Forseeable	2027	2041	No
London-Mids	HS2 (Phase 2b, Crewe-Manchester)	More Than Likely	2027	2041	Yes
Midlands	Midlands Rail Hub	Reasonably Forseeable	2036	2036	No
Midlands	Midland Mainline Electrification (London-Mkt Harb)	Complete	2021	2021	Yes
Midlands	Midland Mainline Electrification (Mkt Harb-L'boro)	Reasonably Forseeable	2031	2031	No
Midlands	Midland Mainline Electrification (L'boro-Derby)	Reasonably Forseeable	2031	2031	No

10.4. Annex D – Strategic Highway Intervention Coding Assumptions

Scheme		Scheme Description and Coding Logic	Option 1	Option 2	Option 3	Option 4
A1	M1 from J21 to J21a	5 lane, 60mph to mimic same speed coded for previous SMART motorway scheme. To mimic the most likely form of potential future "M1 Leicester Western Access" RIS upgrade.	Y	Y	Y	Y
A2	M1 J21	Single lane M1 southbound to M69 free-flow slip road, additional lane on M69 Northbound to M1 slip.	Y			Y
A4	A46 from M1 to Hobby Horse	3 lane, 50mph to mimic "A1 Coal House to Metro Centre" (RIS1 scheme) style improvement	Y		Y	Y
A5	A46 from Groby Rd to Anstey Lane interchanges	Single lane direct "collector/distributor" links from Groby Road to Anstey Lane interchanges, 50mph to match scheme A4. Similar to A1 J68-69 c/d links introduced as part of "A1 Coal House to Metro Centre" RIS1 scheme.	Y		Y	Y
A6	A46 Hobby Horse Roundabout	A46 southbound free-flow slip to A46 Westbound, bypassing Hobby Horse. 1 lane, 70mph, but speed is limited by the Speed-Flow Curve in the model to a maximum of 45mph.	Y		Y	Y
A7	New “West of Leicester” link road	New road from a new M69 J3 (grade separated) to A46 Kirby Interchange, with at-grade roundabout on the A47 between Desford crossroads and Dans Lane. Coded as dual carriageway 70mph link to act as strategic-route alternative to M1 J21.	Y		Y	
B1	New M1 Junction 20a	Grade separated from M1 and at-grade for A426. 3-lane gyratory, 35mph circulatory speed.		Y	Y	
B2	New South and East Leicester orbital link road	Dual carriageway, 70mph. At grade, signalised, junctions at: A5199, A6, A47, A607 (speed is 35mph through at-grade junctions). Grade separated on either end at M1 J20a and A46.		Y	Y	
B2a	New East Leicester orbital link road					Y
B3	A563 Leicester Outer Ring Road	Single carriageway 40mph link between the A6 and Main Street/Church Road junction. New junction with ORR and Gartree Road, and following similar trajectory as Shady Lane.		Y	Y	Y
D1	M1 J21a to J23a	Additional lane added to the M1. To mimic the most likely form of potential future "M1 North Leicestershire Extra Capacity" RIS upgrade.	Y	Y	Y	Y
D2	A42 J14	Addition of East-facing slips.		Y		
D3	New A42 to A50 link road to west of Castle Donington and East Midlands Airport	Removal of Walton Hill signalised junction and replaced with large roundabout; 50mph dual carriageway bypass around Castle Donnington feeding in to Trent Ln/Station Rd roundabout. As per scheme tested through East Midlands Freeport Strategic Modelling work.		Y		
D4	New Kegworth Eastern Bypass	Bypass to the North of Kegworth, same standard as the A6 before speed limit change for Kegworth. As per scheme tested through East Midlands Freeport Strategic Modelling work.		Y		
D6	New A6 Hathern Bypass	Starts/ends at Garendon SUE access roundabout on A6, bypasses to A6 north of Hathern with junction with Zouch Road. Coded as 60mph single carriageway road.	Y	Y		Y
E2	M69 Junction 2	Introduction of South-facing slips.	Y	Y		
E3	New A47 to M69 link	Single carriageway 60mph road from A47 Clickers Way/Leicester Rd roundabout to new M69 J2(grade separated).		Y		
E3a	New A47-M69-B4114 link road	Building upon the description for E3, 60mph dual carriageway from M69 to B4114.	Y			
E4	New M69 to M1 link	70mph dual-carriageway from M69 J2 (grade separated) to new M1 J20a (grade separated) with a grade separated junction also with B4114.		Y		
E5	A5 from M69 J1 to M42 J10	Mainline upgrade of A5. Additional lane added from M69 J1 to M42 where the A5 is not dualled in PRTM forecasts already. Junctions along A5 upgraded following current "as-built" status to account for the additional lane. Speed limits mostly retained, 40mph segments upgraded to 50mph as a minimum. To mimic the most likely form of potential future "A5 Hinckley to Tamworth" RIS upgrade.	Y	Y	Y	Y
F4	New A6 Kibworth Bypass	Single carriageway 50mph bypass with intermediate junctions on Carlton Road and Kibworth Road.	Y	Y	Y	
F5	New A6 Loughborough Eastern Bypass	Bypass from A6 to A6/Garendon Access, with intermediatory junctions with the A60 and Meadow Lane. Coded as 60mph single carriageway road.	Y	Y		Y
F8	New A50 Bradgate Hill Bypass	70mph dual-carriageway with roundabouts at either side of bypass. Downgrade existing road through built up area to 40mph single carriageway.			Y	Y

Scheme		Scheme Description and Coding Logic	Option 1	Option 2	Option 3	Option 4
G1a	B582/B585 Bypasses	Bypass of Market Bosworth and Desford, coded to the same standard as the B582/B585 before speed limit changes for those settlements.				Y
G2	A46 North of Syston	Upgrade to A46/Six Hills and A46/Paddys Lane junctions to higher standard grade separated junctions to accommodate traffic joining/leaving A46 from new market town at Six Hills (option/scenario 4 only). Whilst at-grade A46/Seagrave Crossroads was highlighted to be improved to the same (grade separated) standard as above junctions this scheme would be for highway safety rather than connectivity/capacity purposes, and therefore unnecessary to include within this assessment.				Y
G4	New Husbands Bosworth 'distributor road'	60mph distributor road, upgrade of Station Road to 60mph to facilitate part of the distributor road rather than new link.				Y
G4a	A5199 Bypasses	Bypass of Welford along the A5199, coded to the same standard as the A5199 before speed limit changes.				Y
H1	B676 Upgrades	Bypass of Burton on the Wolds along the B676, coded to the same standard as the B676 before speed limit changes for those villages.				Y
H2	A4304 Upgrades	Bypass of villages along the A4304 (North Kilworth, Theddingworth and Lubenham), coded to the same standard as the A4304 before speed limit changes for those villages.				Y

10.5. Annex E – PM "Do Minimum" Results



	2021	2036	2051			
	Core	Core	Option 1	Option 2	Option 3	Option 4
			Do Minimum			
Average Speed (kph)	54	50	46.6	46.7	46.5	46.7
Over Capacity Queues (PCU Hours)	14,565	19,386	24,282	24,275	24,445	24,378
Indexed Travel Time (Hours)	100	124	149	148	149	149
Indexed Travel Distance (KM)	100	116	128	128	128	129

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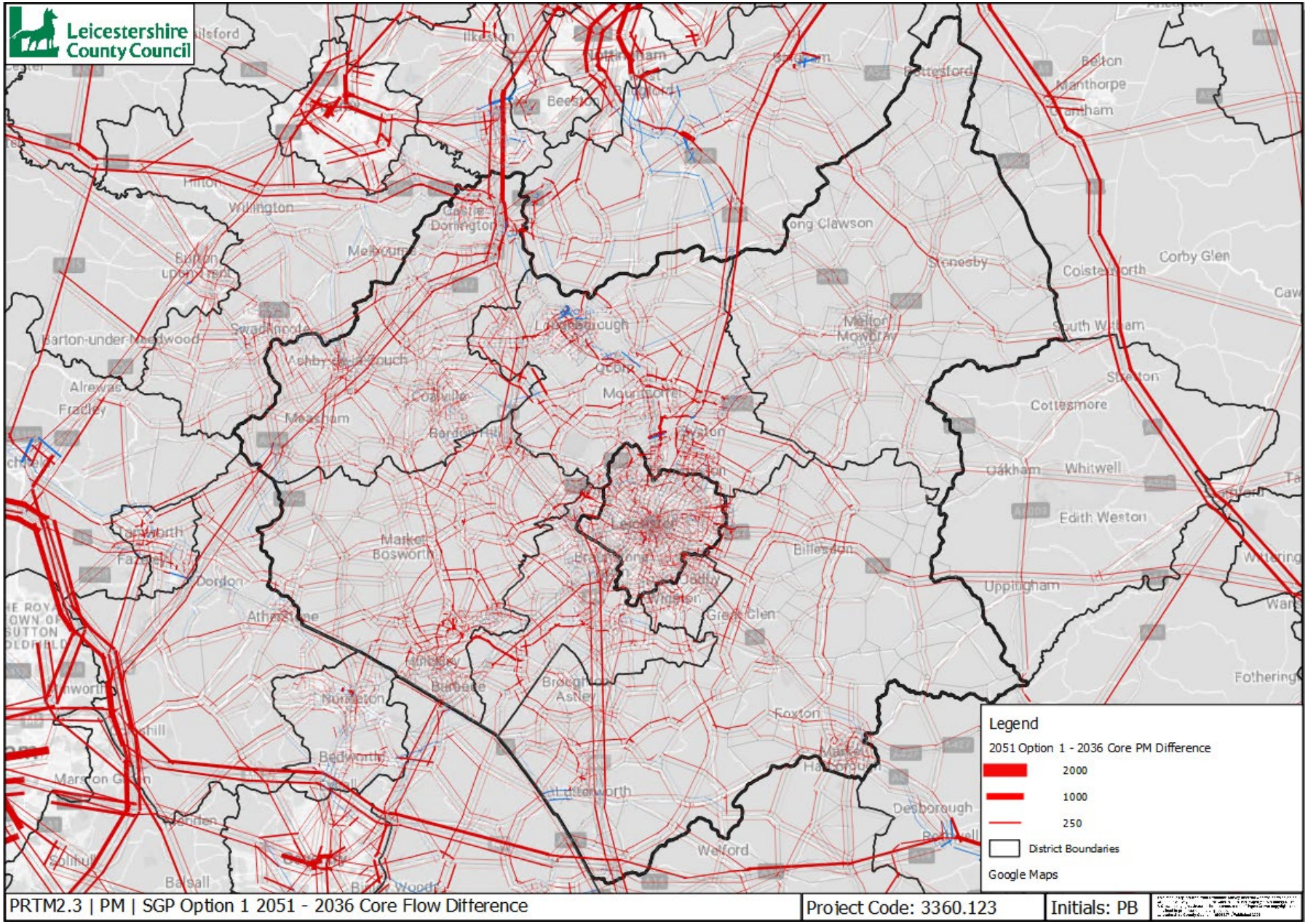

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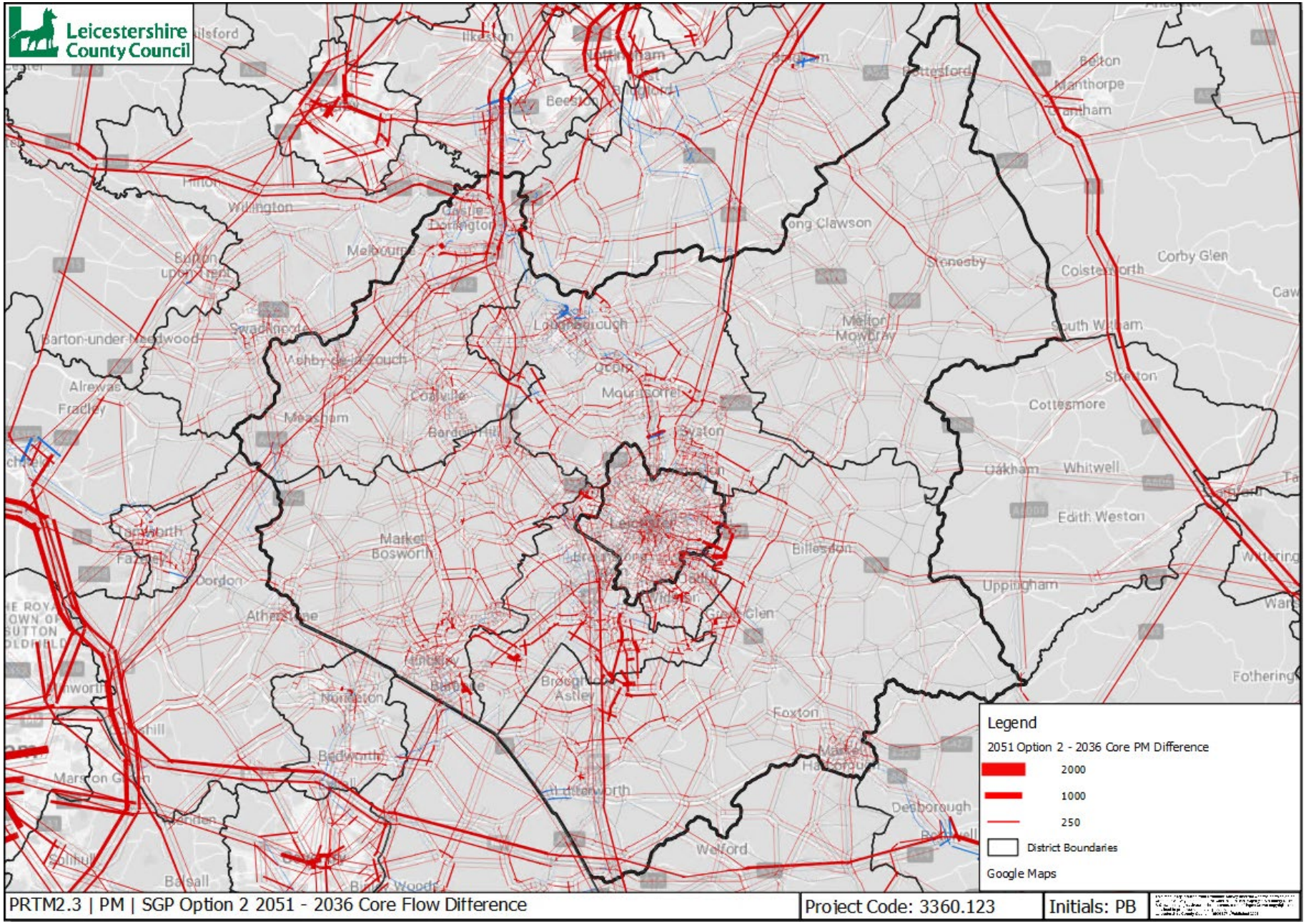

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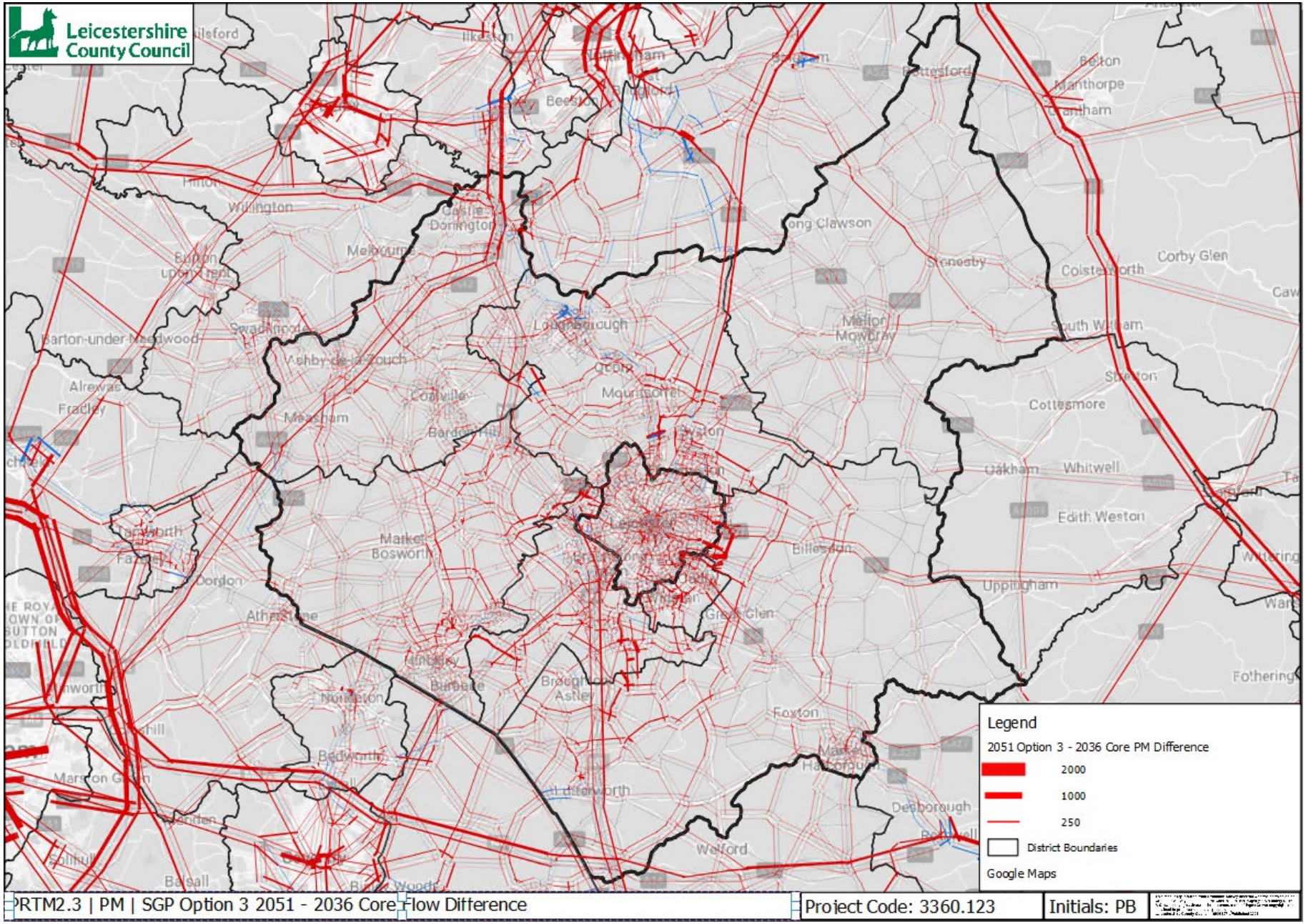
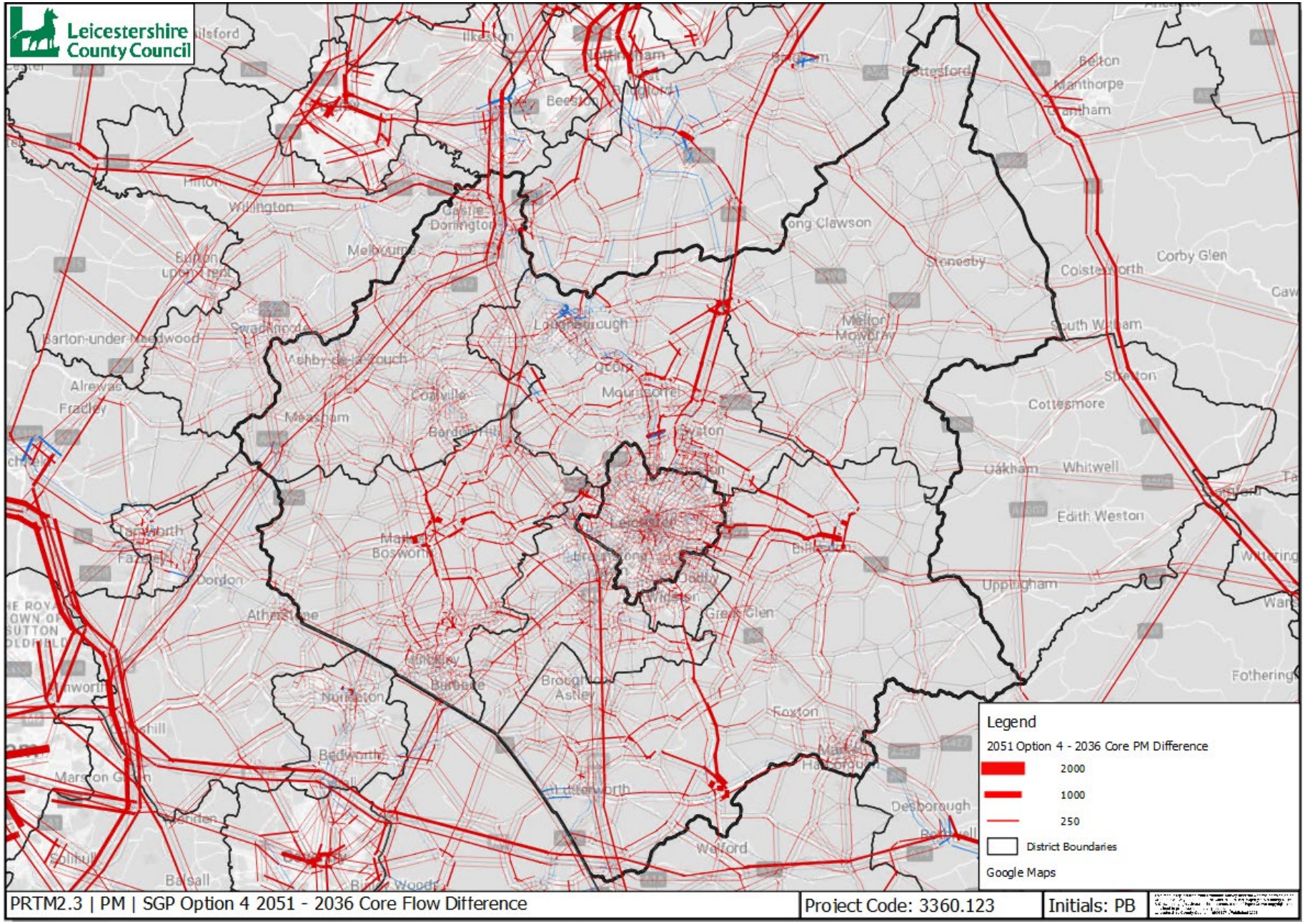


Leicestershire County Council



Leicestershire County Council

Leicestershire County Council

Legend

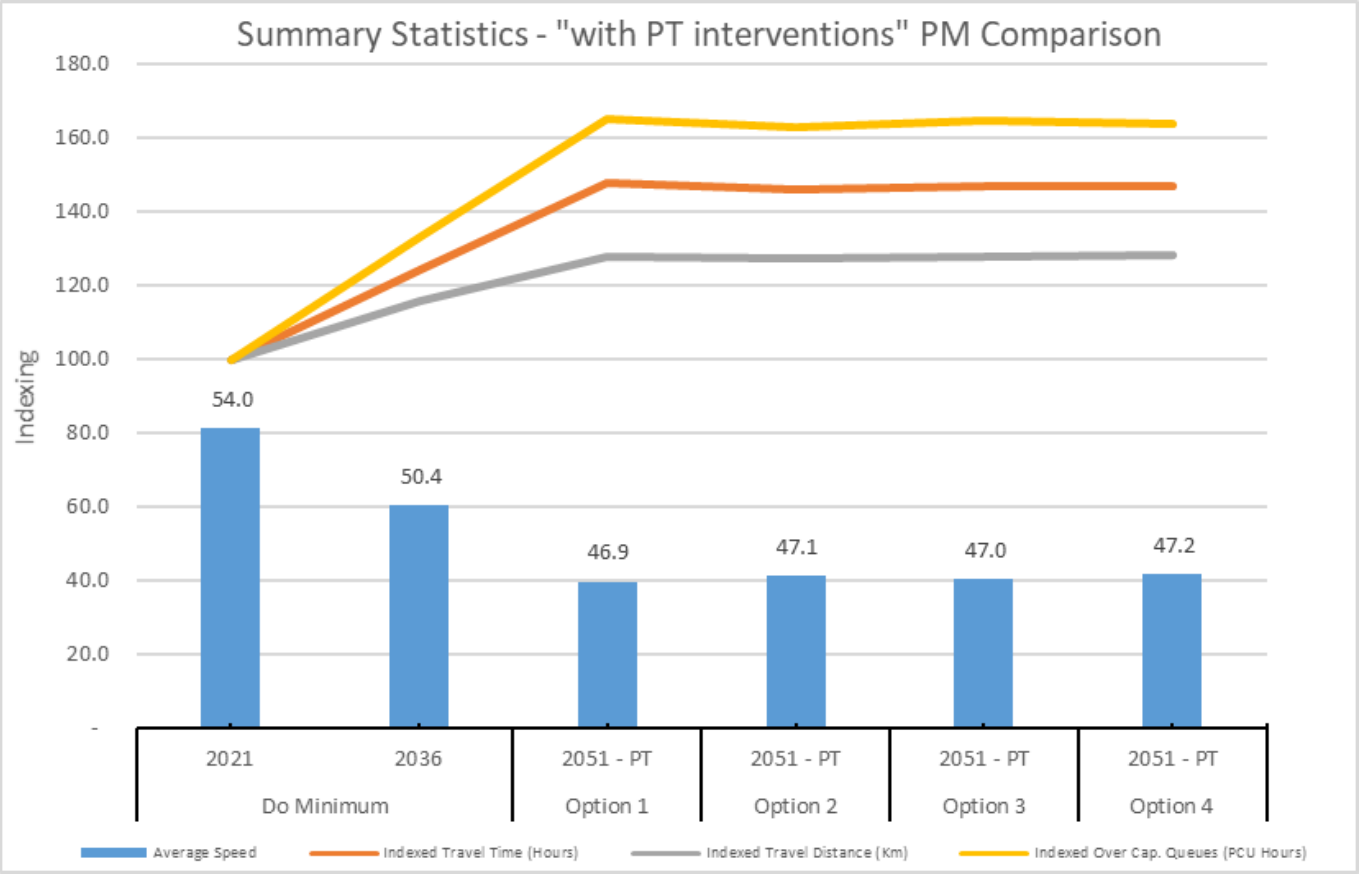
"Do Minimum" Max V/C

- Black Diamonds (All Scenarios 100%+)
- Option 1 Marker (Option 1 100%+)
- Option 2 Marker (Option 2 100%+)
- Option 3 Marker (Option 3 100%+)
- Option 4 Marker (Option 4 100%+)
- District Boundaries

Google Maps

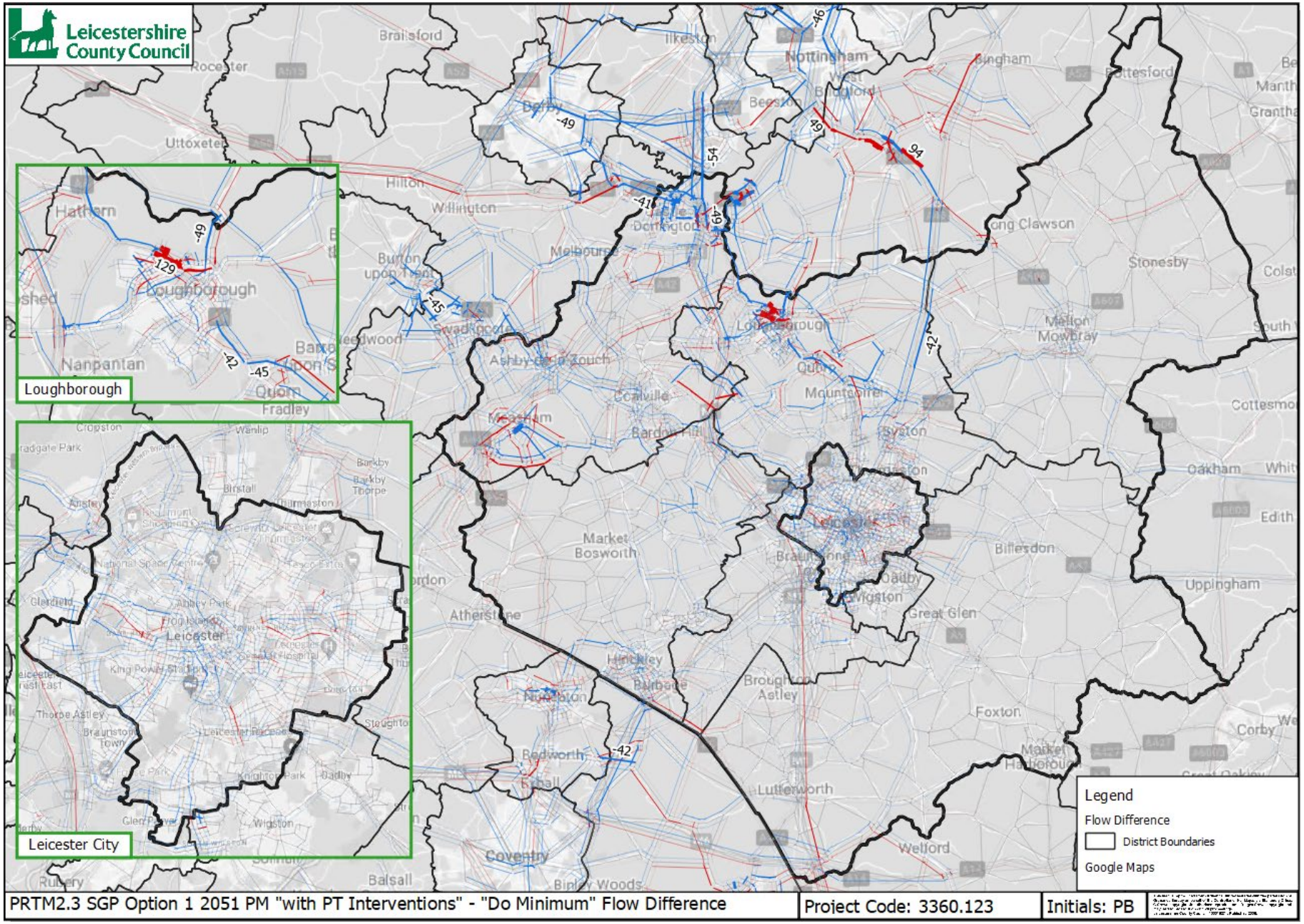
PRTM2.3 SGP PM "Do Minimum" Max V/C Option Comparison | Project Code: 3360.123 | Initials: PB

10.6. Annex F – PM "with PT" Results

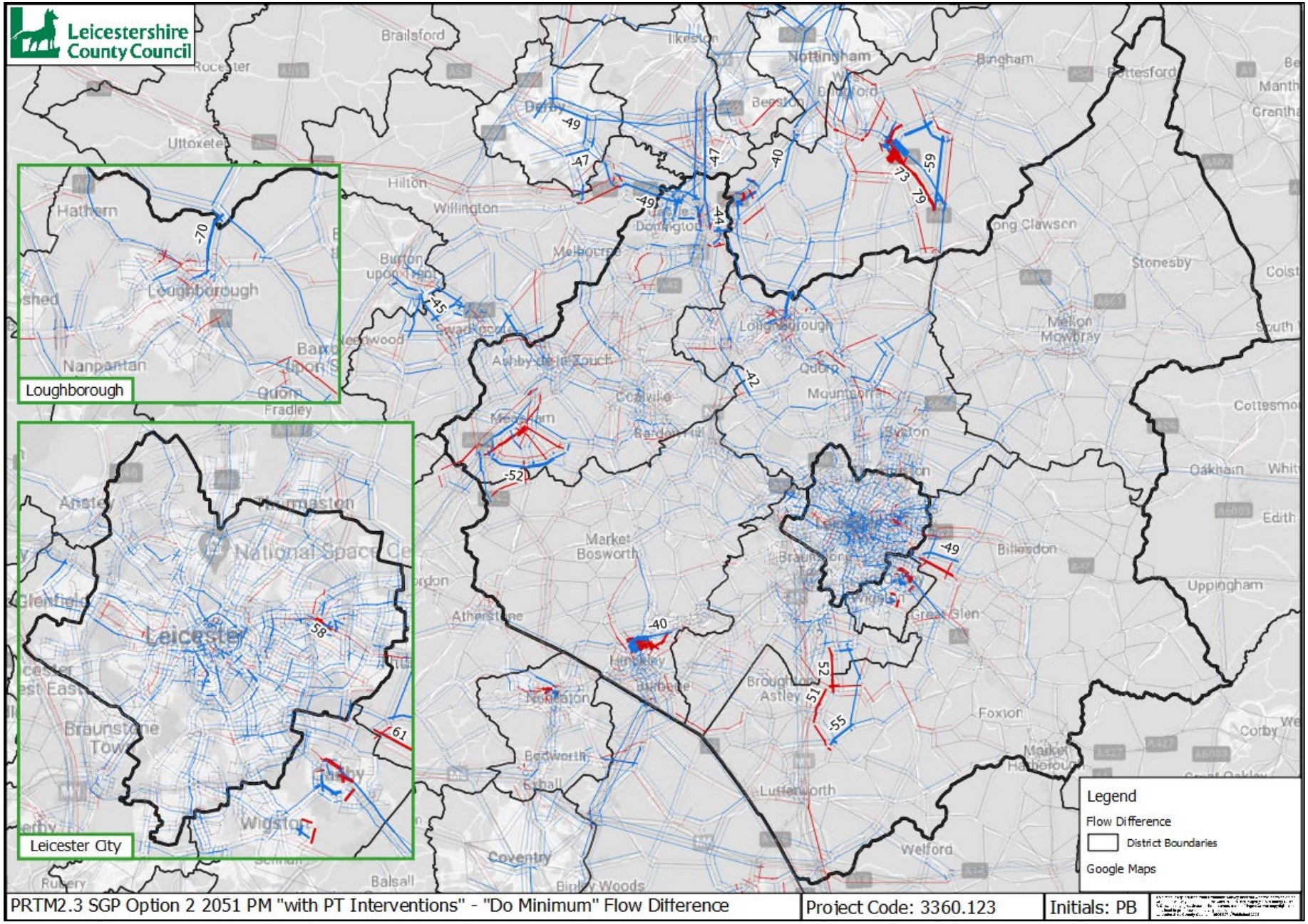


	2021	2036	2051			
	Core	Core	Option 1	Option 2	Option 3	Option 4
			"with PT"			
Average Speed (kph)	54	50	46.9	47.1	47.0	47.2
Over Capacity Queues (PCU Hours)	14,565	19,386	24,049	23,708	24,009	23,854
Indexed Travel Time (Hours)	100	124	148	146	147	147
Indexed Travel Distance (KM)	100	116	128	128	128	128

Leicestershire County Council



Leicestershire County Council



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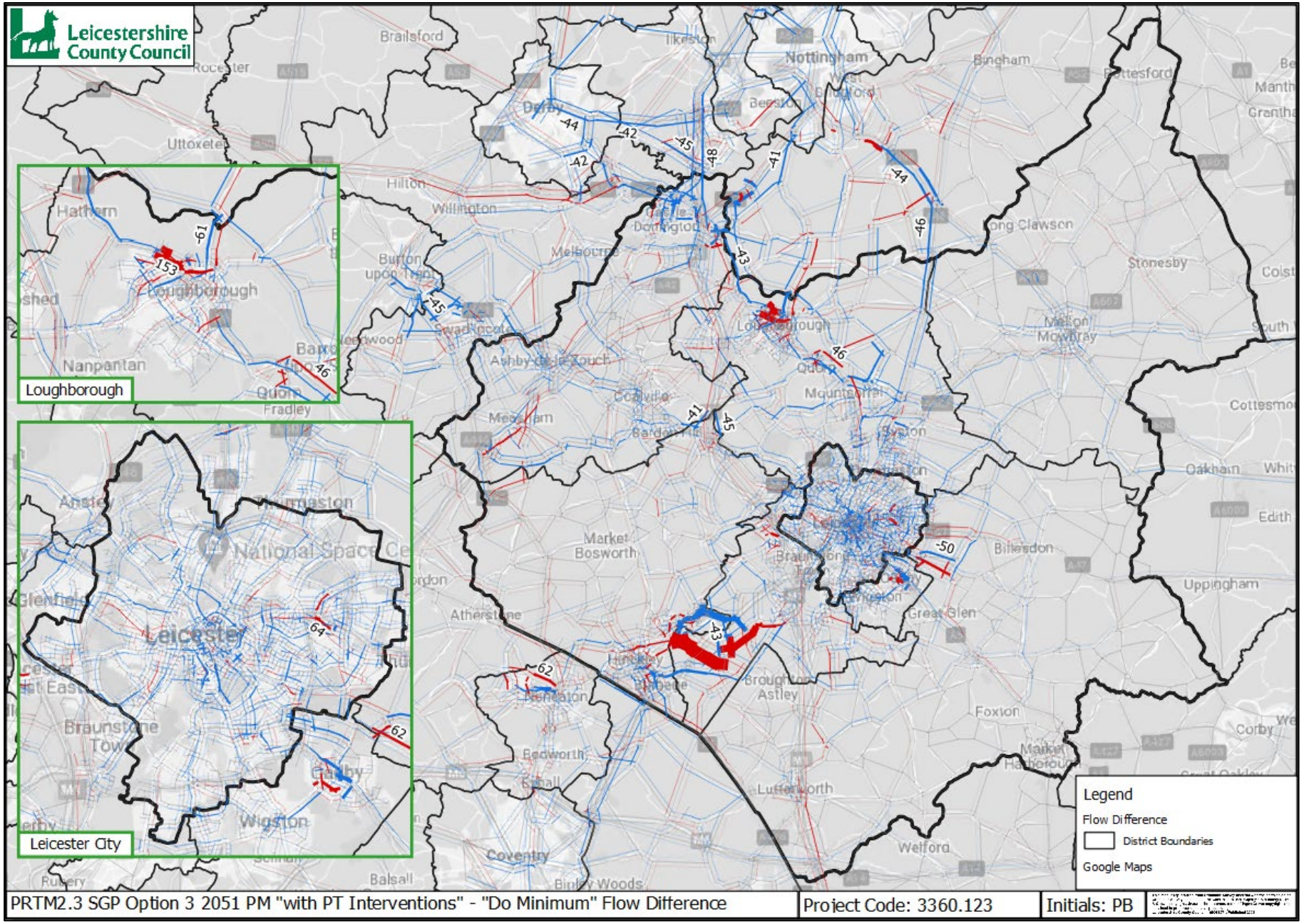
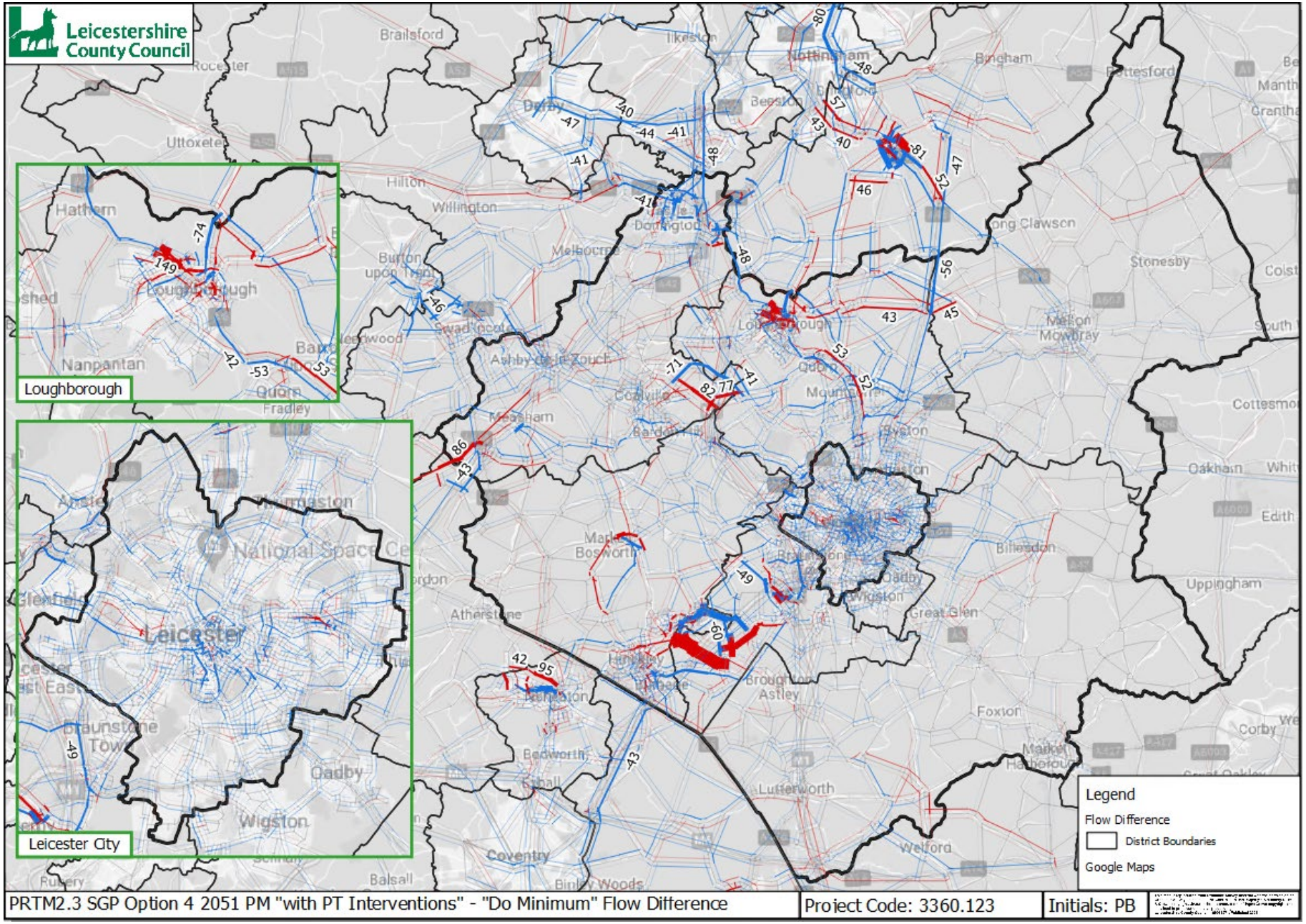


Leicestershire County Council



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Leicestershire County Council

Map 1

Legend

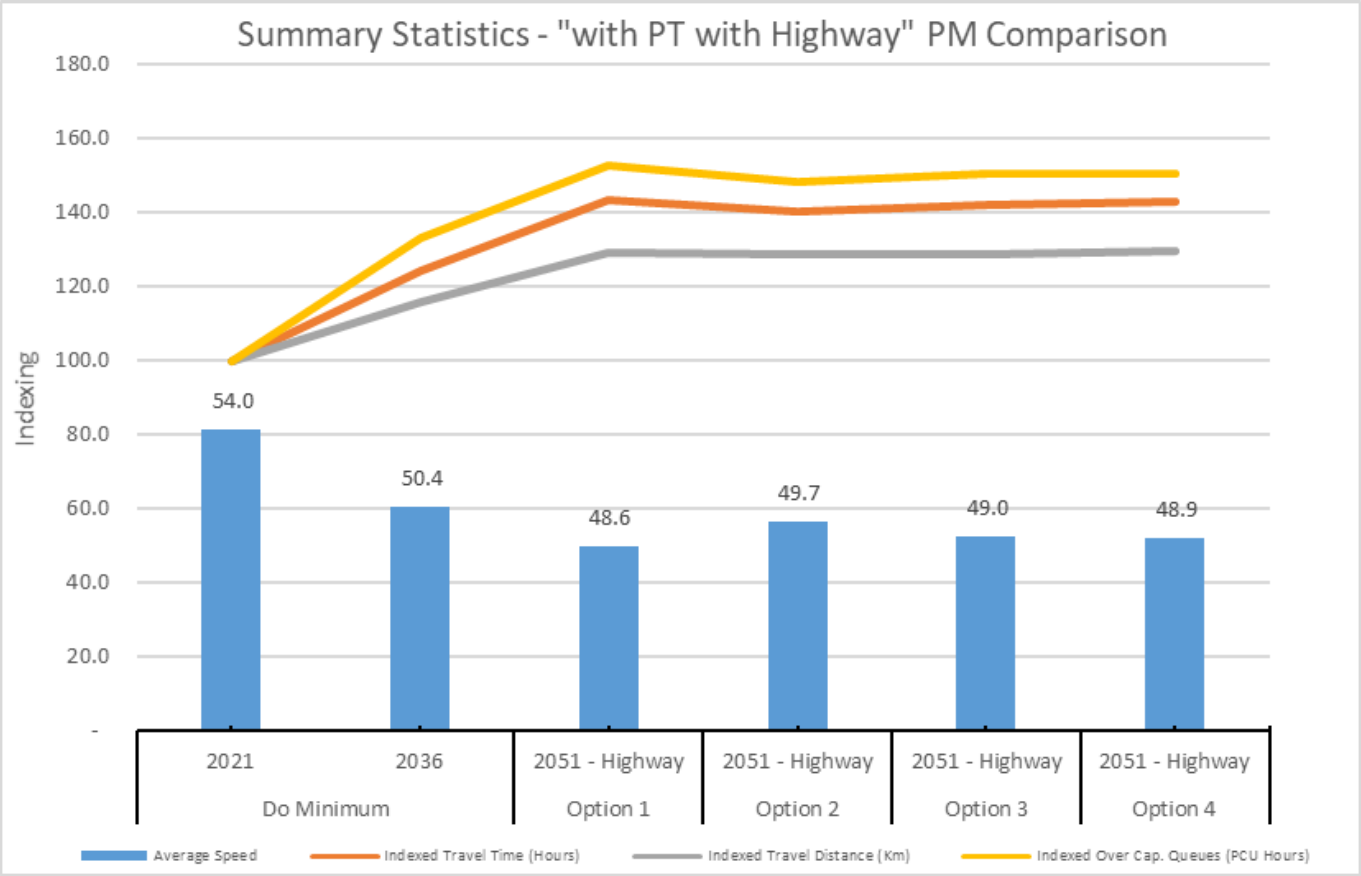
"with PT" Max V/C

- Black Diamonds (All Scenarios 100%+)
- Option 1 Marker (Option 1 100%+)
- Option 2 Marker (Option 2 100%+)
- Option 3 Marker (Option 3 100%+)
- Option 4 Marker (Option 4 100%+)
- District Boundaries

Google Maps

PRTM2.3 SGP PM "with PT" Max V/C Option Comparison | Project Code: 3360.123 | Initials: PB

10.7. Annex G – PM "with PT with Highway" Results



	2021	2036	2051			
	Core	Core	Option 1	Option 2	Option 3	Option 4
			Highway			
Average Speed (kph)	54	50	48.6	49.7	49.0	48.9
Over Capacity Queues (PCU Hours)	14,565	19,386	22,229	21,619	21,899	21,928
Indexed Travel Time (Hours)	100	124	143	140	142	143
Indexed Travel Distance (KM)	100	116	129	129	129	129

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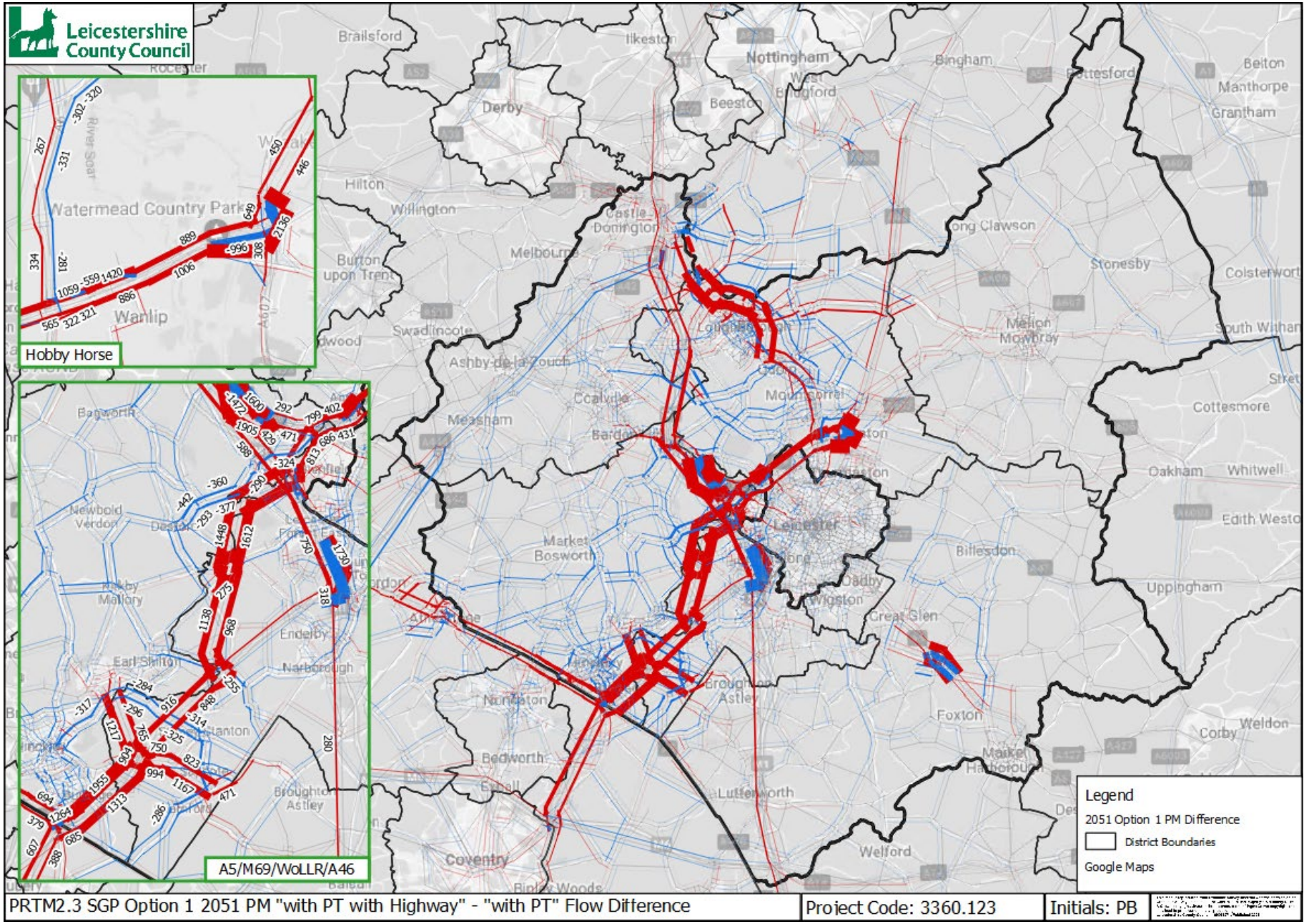
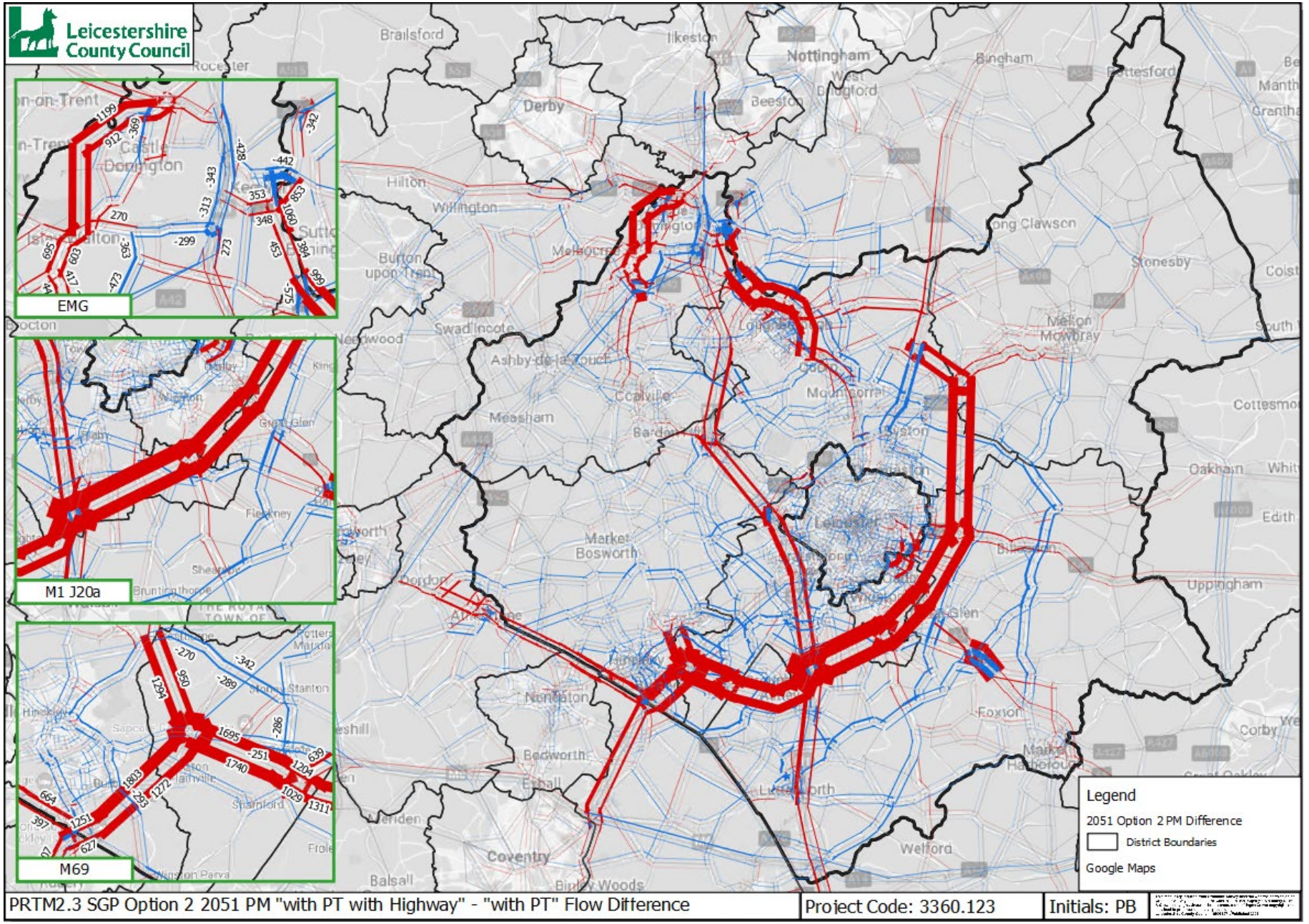
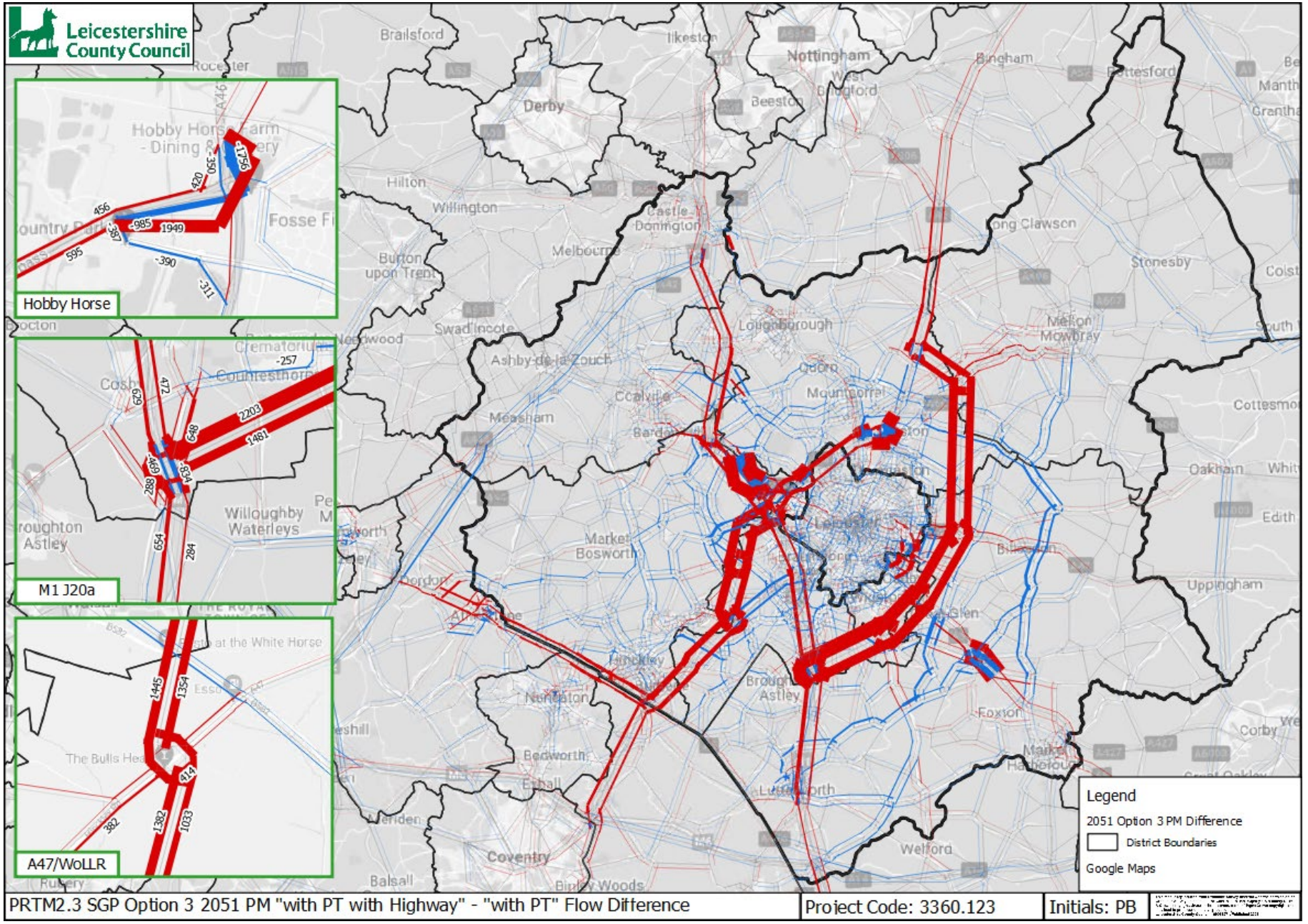


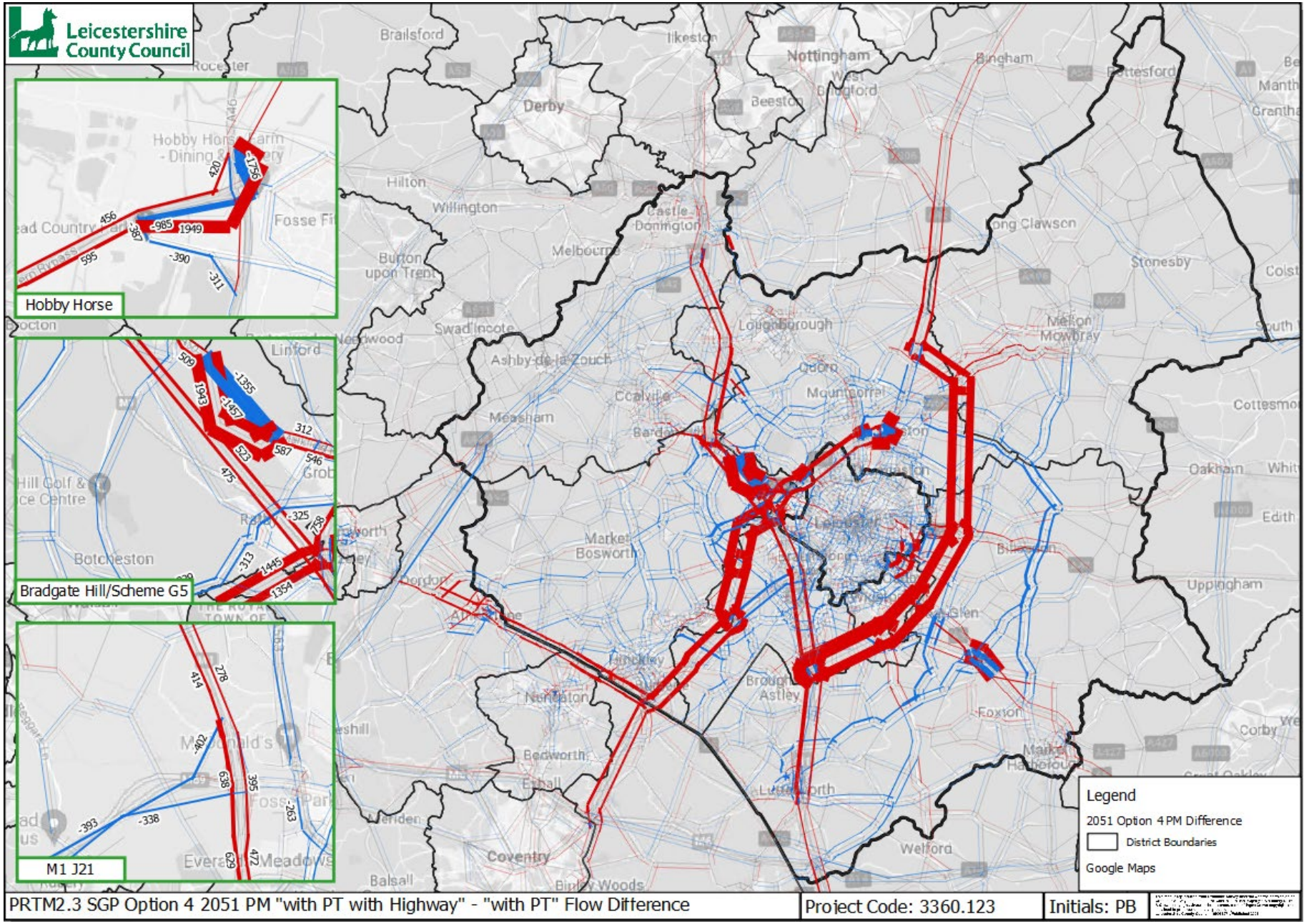
Leicestershire County Council



Leicestershire County Council



Leicestershire County Council



Project Reference: 3360.123

Leicestershire County Council

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Legend

Highway Mitigation Max V/C

- Black Diamonds (All Scenarios 100%+)
- Option 1 Marker (Option 1 100%+)
- Option 2 Marker (Option 2 100%+)
- Option 3 Marker (Option 3 100%+)
- Option 4 Marker (Option 4 100%+)
- District Boundaries

Google Maps

PRTM2.3 SGP PM "with PT with Highway" Max V/C Option Comparison | Project Code: 3360.123 | Initials: PB

10.8. Annex H – Full List of Potential Strategic Interventions

Scheme Code	Description
A1	M1 from J21 to J21a
A2	M1 J21
A3	Leicester Forest East Motorway Services
A4	A46 from M1 to Hobby Horse
A5	A46 from Groby Rd to Anstey Lane Interchanges
A6	A46 Hobby Horse Roundabout
A7	New "West of Leicester" link road
A8	Leicester Outer Circle Bus Route
B1	New M1 Junction 20a
B2	New South and East Leicester Orbital Link Road
B2a	New East Leicester Orbital Link Road
B3	A563 Leicester Outer Ring Road
B4	Leicester Outer Circle Bus Route
C1	LUA Mass Transit System
C2	Additional P&R hubs on edge of LUA
C3	LUA Heavy rail enhancements
C4	New/enhanced PT links between Leicester city centre and strategic site locations.
C5	LUA-wide integrated PT ticketing/fares
C6	LUA-wide demand management package
D1	M1 J21a to J23a
D2	A42 J14
D3	New A42 to A50 link road to west of Castle Donington and East Midlands Airport
D4	New Kegworth Eastern Bypass
D5	M1 J24
D6	New A6 Hathern Bypass
D7	East Midlands Airport Heavy/Light Rail Connection
D8	Fixed Link 'people mover' between East Midlands Parkway (HS2 Station) and East Midlands Airport
D9	New/enhanced PT links from strategic site locations to EMA/ EMG, L'boro, Derby and Notts.
E1	M1 J21
E2	M69 J2
E3	New A47 to M69 link
E3a	New A47 to M69 to B4114 Link
E4	New M69 to M1 link
E5	A5 from M69 J1 to M42 J10
E6	New/enhanced PT links from strategic site locations to Hinckley town centre.
E7	New rail station on B'ham to Leics line between Hinckley and Narborough
E8	New 'Hinckley and Nuneaton Parkway' rail station on B'ham to Leics Line
E9	Hinckley to Leicester 'Express'/ High Frequency Bus Service
F1	M1 from J20 to J21

F2	New M1 Junction 20a
F3	M1 J21a to J23a
F4	New A6 Kibworth Bypass
F5	New A6 Loughborough Eastern Bypass
F6	A6004 Epinal Way Upgrade
F7	New A6 Hathern Bypass
F8	New A50 Bradgate Hill Bypass
F9	Market Harborough to Leicester Passenger Rail Links
F10	New Kibworth Railway Station
F11	County Radials 'Express' / High Frequency Bus Network
G1	Major upgrade of B582
G1a	B582/B585 Bypasses
G2	A46 North of Syston
G3	New A47 Houghton on the Hill Bypass
G4	New Husbands Bosworth 'distributor road'
G5	New/enhanced PT links between new market towns and Leicester city centre.
G6	County Radials 'Express' / High Frequency Bus Network
H1	B676 Upgrades
H2	A4304 Upgrades

10.9. Annex I – Strategic Intervention Scores

10.9.1. Note: Some schemes were combined/reimagined post-NDI intervention scoring. Hence some schemes modelled do not have an associated score.

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		Option 1
9	A1	M1 from J21 to J21a
9	A7	New "West of Leicester" link road
9	C4	New/enhanced PT links between Leicester city centre and strategic site locations.
9	D7	East Midlands Airport Heavy/Light Rail Connection
9	D8	Fixed Link 'people mover' between East Midlands Parkway (HS2 Station) and East Midlands Airport
9	F11	County Radials 'Express' / High Frequency Bus Network
9	G5	New/enhanced PT links between new market towns and Leicester city centre.
9	G6	County Radials 'Express' / High Frequency Bus Network
8	A2	M1 J21
8	B2	New South and East Leicester orbital link road
8	C2	Additional P&R hubs on edge of LUA
8	D5	M1 J24
8	D9	New/enhanced PT links from strategic site locations to EMA/ EMG, L'boro, Derby and Notts.
8	E1	M1 J21
8	E4	New M69 to M1 link
8	E9	Hinckley to Leicester 'Express'/ High Frequency Bus Service
8	F5	New A6 Loughborough Eastern Bypass
7	A3	Leicester Forest East Motorway Services
7	A4	A46 from M1 to Hobby Horse
7	A6	A46 Hobby Horse Roundabout
7	A8	Leicester Outer Circle Bus Route
7	B3	A563 Leicester Outer Ring Road
7	B4	Leicester Outer Circle Bus Route
7	D3	New A42 to A50 link road to west of Castle Donington and East Midlands Airport
7	D4	New Kegworth Eastern Bypass
7	F9	Market Harborough to Leicester Passenger Rail Links
6	D1	M1 J21a to J23a
6	D6	New A6 Hathern Bypass
6	E7	New rail station on B'ham to Leics line between Hinckley and Narborough
6	F3	M1 J21a to J23a
6	F6	A6004 Epinal Way Upgrade
6	F7	New A6 Hathern Bypass
6	G1	Major upgrade of B582
5	A5	A46 from Groby Rd to Anstey Lane interchanges
5	B1	New M1 Junction 20a
5	E3	New A47 to M69 link
5	E6	New/enhanced PT links from strategic site locations to Hinckley town centre.
5	E8	New 'Hinckley and Nuneaton Parkway' rail station on B'ham to Leics Line
5	F1	M1 from J20 to J21
5	F2	New M1 Junction 20a
4	F8	New A50 Bradgate Hill Bypass
4	F10	New Kibworth Railway Station
3	D2	A42 J14
3	E2	M69 J2
3	E5	A5 from M69 J1 to M42 J10
3	F4	New A6 Kibworth Bypass
2	G2	A46 North of Syston
1	G3	New A47 Houghton on the Hill Bypass
1	G4	New Husbands Bosworth 'distributor road'
	C1	LUA Mass Transit System
	C3	LUA Heavy rail enhancements
	C5	LUA-wide integrated PT ticketing/fares
	C6	LUA-wide demand management package

		Option2
10	C4	New/enhanced PT links between Leicester city centre and strategic site locations.
10	D7	East Midlands Airport Heavy/Light Rail Connection
10	D8	Fixed Link 'people mover' between East Midlands Parkway (HS2 Station) and East Midlands Airport
10	F11	County Radials 'Express' / High Frequency Bus Network
10	G5	New/enhanced PT links between new market towns and Leicester city centre.
10	G6	County Radials 'Express' / High Frequency Bus Network
9	A7	New "West of Leicester" link road
9	B2	New South and East Leicester orbital link road
9	C2	Additional P&R hubs on edge of LUA
9	D9	New/enhanced PT links from strategic site locations to EMA/ EMG, L'boro, Derby and Notts.
9	E4	New M69 to M1 link
9	F5	New A6 Loughborough Eastern Bypass
8	A1	M1 from J21 to J21a
8	A2	M1 J21
8	D3	New A42 to A50 link road to west of Castle Donington and East Midlands Airport
8	E1	M1 J21
8	E3	New A47 to M69 link
8	E7	New rail station on B'ham to Leics line between Hinckley and Narborough
8	E9	Hinckley to Leicester 'Express'/ High Frequency Bus Service
8	F9	Market Harborough to Leicester Passenger Rail Links
8	G1	Major upgrade of B582
7	A3	Leicester Forest East Motorway Services
7	A4	A46 from M1 to Hobby Horse
7	A6	A46 Hobby Horse Roundabout
7	B3	A563 Leicester Outer Ring Road
7	B4	Leicester Outer Circle Bus Route
7	D4	New Kegworth Eastern Bypass
7	D5	M1 J24
6	A8	Leicester Outer Circle Bus Route
6	B1	New M1 Junction 20a
6	D6	New A6 Hathern Bypass
6	F1	M1 from J20 to J21
6	F2	New M1 Junction 20a
6	F6	A6004 Epinal Way Upgrade
6	F7	New A6 Hathern Bypass
5	A5	A46 from Groby Rd to Anstey Lane interchanges
5	D1	M1 J21a to J23a
5	E6	New/enhanced PT links from strategic site locations to Hinckley town centre.
5	E8	New 'Hinckley and Nuneaton Parkway' rail station on B'ham to Leics Line
5	F3	M1 J21a to J23a
4	D2	A42 J14
4	E2	M69 J2
4	E5	A5 from M69 J1 to M42 J10
4	F8	New A50 Bradgate Hill Bypass
3	F4	New A6 Kibworth Bypass
3	F10	New Kibworth Railway Station
2	G2	A46 North of Syston
1	G3	New A47 Houghton on the Hill Bypass
1	G4	New Husbands Bosworth 'distributor road'
	C1	LUA Mass Transit System
	C3	LUA Heavy rail enhancements
	C5	LUA-wide integrated PT ticketing/fares
	C6	LUA-wide demand management package

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Option 3		
10	C4	New/enhanced PT links between Leicester city centre and strategic site locations.
10	F11	County Radials 'Express' / High Frequency Bus Network
10	G5	New/enhanced PT links between new market towns and Leicester city centre.
10	G6	County Radials 'Express' / High Frequency Bus Network
9	A1	M1 from J21 to J21a
9	A2	M1 J21
9	A7	New "West of Leicester" link road
9	B2	New South and East Leicester orbital link road
9	C2	Additional P&R hubs on edge of LUA
9	D7	East Midlands Airport Heavy/Light Rail Connection
9	D8	Fixed Link 'people mover' between East Midlands Parkway (HS2 Station) and East Midlands Airport
9	E1	M1 J21
9	E9	Hinckley to Leicester 'Express'/ High Frequency Bus Service
8	A3	Leicester Forest East Motorway Services
8	D9	New/enhanced PT links from strategic site locations to EMA/ EMG, L'boro, Derby and Notts.
8	E4	New M69 to M1 link
8	F5	New A6 Loughborough Eastern Bypass
8	F9	Market Harborough to Leicester Passenger Rail Links
8	G1	Major upgrade of B582
7	A4	A46 from M1 to Hobby Horse
7	A6	A46 Hobby Horse Roundabout
7	A8	Leicester Outer Circle Bus Route
7	B3	A563 Leicester Outer Ring Road
7	B4	Leicester Outer Circle Bus Route
6	D3	New A42 to A50 link road to west of Castle Donington and East Midlands Airport
6	D4	New Kegworth Eastern Bypass
6	D5	M1 J24
6	E3	New A47 to M69 link
6	E7	New rail station on B'ham to Leics line between Hinckley and Narborough
6	F6	A6004 Epinal Way Upgrade
5	A5	A46 from Groby Rd to Anstey Lane interchanges
5	B1	New M1 Junction 20a
5	D1	M1 J21a to J23a
5	D6	New A6 Hathern Bypass
5	E6	New/enhanced PT links from strategic site locations to Hinckley town centre.
5	E8	New 'Hinckley and Nuneaton Parkway' rail station on B'ham to Leics Line
5	F1	M1 from J20 to J21
5	F2	New M1 Junction 20a
5	F3	M1 J21a to J23a
5	F7	New A6 Hathern Bypass
4	F8	New A50 Bradgate Hill Bypass
4	F10	New Kibworth Railway Station
3	D2	A42 J14
3	E2	M69 J2
3	E5	A5 from M69 J1 to M42 J10
3	F4	New A6 Kibworth Bypass
2	G2	A46 North of Syston
1	G3	New A47 Houghton on the Hill Bypass
1	G4	New Husbands Bosworth 'distributor road'
	C1	LUA Mass Transit System
	C3	LUA Heavy rail enhancements
	C5	LUA-wide integrated PT ticketing/fares
	C6	LUA-wide demand management package

Option 4		
10	G1	Major upgrade of B582
10	G5	New/enhanced PT links between new market towns and Leicester city centre.
10	G6	County Radials 'Express' / High Frequency Bus Network
9	C4	New/enhanced PT links between Leicester city centre and strategic site locations.
9	D7	East Midlands Airport Heavy/Light Rail Connection
9	D8	Fixed Link 'people mover' between East Midlands Parkway (HS2 Station) and East Midlands Airport
9	F11	County Radials 'Express' / High Frequency Bus Network
8	A1	M1 from J21 to J21a
8	A2	M1 J21
8	A6	A46 Hobby Horse Roundabout
8	A7	New "West of Leicester" link road
8	B2	New South and East Leicester orbital link road
8	C2	Additional P&R hubs on edge of LUA
8	D9	New/enhanced PT links from strategic site locations to EMA/ EMG, L'boro, Derby and Notts.
8	E1	M1 J21
8	E4	New M69 to M1 link
8	E9	Hinckley to Leicester 'Express'/ High Frequency Bus Service
8	F5	New A6 Loughborough Eastern Bypass
8	F9	Market Harborough to Leicester Passenger Rail Links
7	A3	Leicester Forest East Motorway Services
7	A4	A46 from M1 to Hobby Horse
7	A8	Leicester Outer Circle Bus Route
7	B3	A563 Leicester Outer Ring Road
7	B4	Leicester Outer Circle Bus Route
7	E7	New rail station on B'ham to Leics line between Hinckley and Narborough
6	D3	New A42 to A50 link road to west of Castle Donington and East Midlands Airport
6	D4	New Kegworth Eastern Bypass
6	D5	M1 J24
6	D6	New A6 Hathern Bypass
6	E3	New A47 to M69 link
6	F6	A6004 Epinal Way Upgrade
6	F7	New A6 Hathern Bypass
5	A5	A46 from Groby Rd to Anstey Lane interchanges
5	B1	New M1 Junction 20a
5	D1	M1 J21a to J23a
5	E6	New/enhanced PT links from strategic site locations to Hinckley town centre.
5	E8	New 'Hinckley and Nuneaton Parkway' rail station on B'ham to Leics Line
5	F1	M1 from J20 to J21
5	F2	New M1 Junction 20a
5	F3	M1 J21a to J23a
5	G4	New Husbands Bosworth 'distributor road'
4	F8	New A50 Bradgate Hill Bypass
4	F10	New Kibworth Railway Station
4	G2	A46 North of Syston
3	E2	M69 J2
3	E5	A5 from M69 J1 to M42 J10
3	F4	New A6 Kibworth Bypass
3	G3	New A47 Houghton on the Hill Bypass
2	D2	A42 J14
	C1	LUA Mass Transit System
	C3	LUA Heavy rail enhancements
	C5	LUA-wide integrated PT ticketing/fares
	C6	LUA-wide demand management package

11. Contact Details

We trust that our report meets your expectations and look forward to working with you again soon.

If you have any questions, please do not hesitate to contact:

Tom Baker
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Environment & Transport Department
Leicestershire County Council

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Email: etcf@leics.gov.uk