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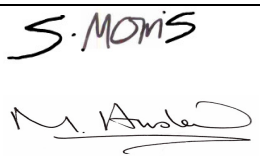
Prepared by	Stephen Morris/ Mark Anslow		3rd Nov 09	Senior Project Transport Planner Technical Director
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EXECUTIVE SUMMARY

Background

URS was appointed by the Hertfordshire Infrastructure Investment Strategy (HIIS) Partners to identify transport infrastructure and associated costs required as a result of targeted Regional Spatial Strategy (RSS) growth in Hertfordshire to 2031. The objective of the work was to provide a means by which the partners could prioritise and bid for infrastructure 'interventions' (schemes, 'soft' measures or initiatives). The report describes the method adopted to undertake the study before presenting the various stages of assessment and finally the issues, recommendations and conclusions.

The transport work covered in this study was part of a broader study commissioned by the HIIS Partners into the general infrastructure requirements resulting from RSS growth, such as education, utilities, and healthcare, and how these elements might be funded. The broader study represented 'Lot 1' of the project brief, and was undertaken by Atkins and Roger Tym and partners (RTP). The Lot 1 consultants were also responsible for producing the funding model for the study. The transport elements constituted 'Lot 2' of the project, and were dealt with separately due to the importance and likely scale of transport infrastrucre needed and because it is different in nature from the Lot 1 infrastructure requirements, which are more directly related to population size and geographical distribution. The cost and associated funding outcomes from this transport report provide a direct input into the funding model.

Summary of Outcomes

The Strategy identified a total of 95 transport infrastructure schemes necessary to enable development within Hertfordshire, and which were considered suitable for funding through a Community Infrastructure Levy (CIL). Some of these represented 'Smarter Choices' in the periods to both 2021 and 2031[1]. In addition there were capacity schemes including four substantial national schemes that already had funding from central government and which were also considered essential to enabling growth within the county. There were a number of schemes that were not included in the funding model because they were considered to relate solely to existing infrastructure 'deficit'; that is, to existing issues and not specifically to those triggered by future growth.

An estimate was been made of the cost of each of the 95 schemes. The total estimated cost of these was £1.1 billion. Potential funding sources from the Regional Funding Allocation (RFA), and from the Local Transport Plan (LTP), were assumed to be available to contribute to this cost. However even when this was taken into account, there was still a substantial funding shortfall, and it was agreed with Hertfordshire County Council that this balance should be fed into the funding model.

[1] Smarter Choices are techniques for influencing people's travel behaviour towards more sustainable options such as encouraging school, workplace and individualised travel planning. They also seek to improve public transport and marketing services such as travel awareness campaigns, setting up websites for car share schemes, supporting car clubs and encouraging teleworking. Some of the evidence for the work on Smarter Choices in this study can be found at www.dft.gov.uk/pgr/sustainable/smarterchoices/, for more detail refer to the main text of the Transport Technical Report.

A broad assessment was been made of the phasing and priorities of the schemes, based on the transport model runs carried out.

Methodological Approach & Key Tasks

Throughout this study the following modes and measures have been considered:

- Cycling;
- Walking;
- Public Transport;
- Demand Management (including Smarter Choices);
- Road; and
- Freight (both road and rail).

The principal data sources used throughout the study were the East of England Regional Model (EERM), a review of the strategic evidence base (e.g. the LTP and regional documents), and a review of the local evidence base (e.g. district level documents). A number of workshops were also held at key stages in the process to involve and consult stakeholders.

The transport network was considered to be 'deficient' where it fell short of providing the necessary capacity for the prevailing travel demand. Our Stage One review of baseline conditions identified existing deficit.

The Study identified, valued and prioritised programmed interventions to tackle deficit, and identified new schemes considered necessary for this purpose. This exercise incorporated the outcome of masterplanning work undertaken by the Lot 1 consultants, whereby the travel implications of the spatial distribution of RSS growth were estimated by the EERM.

National, regional, and local policies were taken into consideration when identifying suitable interventions. Infrastructure requirements in addition to those already programmed were assessed based on EERM runs, which also informed locations on the key bus networks that would come under increasing pressure in terms of maintaining reliability on a congested road network. The project programme dictated that all interventions be tested in single model runs: one for 2021 and one for 2031. (The original aim was to test an additional sensitivity scenario involving maximising the use of PT).

The key tasks completed were as follows:

- Identification of infrastructure deficit and programmed schemes to a base year of 2011, including baseline assessment of transport network conditions at a strategic level;
- Revised allocation of RSS growth to the EERM and assessment of reference case model runs for 2021 and 2031 including only programmed schemes in the transport network;

- Identification of infrastructure (from the existing scheme inventory) and generation of new interventions (infrastructure and Smarter Choices) for testing in EERM, with assessment of the impact of these schemes in 2021 and 2031;
- Costing of schemes and identification of potential funding for inclusion in the Lot 1 funding model; and
- Identification of key issues arising during the course of the study.

Key Elements of Funding Model

The inputs from this study to the Lot 1 funding model were the schemes and their cost estimates, alongside the potential funding that was identified. The schemes, their costs, and the funding, were phased over the period 2011 (the transport baseline) to 2031.

Viability Considerations

The study identified the strategic interventions that were considered necessary to enable growth in Hertfordshire. This was not limited by considerations of what might be most feasible given existing funding assumptions, as the HIIS sought to ensure a level of provision sufficient to meet travel demand (i.e. no deficit across a multimodal solution). The requirements were passed to the Lot 1 consultants who, as well as producing the funding model, undertook a review of viability for the CIL that took into consideration 'need' across all disciplines.

Detailed Conclusions

The baseline review identified that the walking and cycling and bus and coach networks were generally adequate to cater for existing demand. However hours of bus operation can be restrictive and there is a lack of a focused centre for services in the county. Accessibility was a key consideration both now and into the future. There was a 'severe' deficit in rail services both for passengers and freight. The assessment of the road network was primarily focused on principal roads, due to the strategic nature of the study and necessary reliance on the EERM. Much of the motorway network was already at or over capacity in the peak periods, and on other routes congestion occurred at key junctions both within and between principal urban areas and on key east-west corridors.

The key challenge for this study was identifying effective interventions for the transport network that were consistent with current policy to cater for lack of capacity where this existed. This meant promoting sustainable transport above use of the private car, and to recognise that a 'predict and provide' approach was no longer appropriate. At the national level this includes the Smarter Choices initiative and research such as the Eddington Transport Study.

The interventions initially identified for the transport network therefore attempted to provide sustainable alternatives for personal travel (including commuting) such as improved cycling facilities and bus routes. Smarter Choices were also recognised as being an important tool for tackling the increased travel demand from RSS growth. However, it was necessary to acknowledge that improvements to the road network would still be required at some locations. Where possible these would be in the form of minor improvements or enhanced traffic management, and in a small number of cases limited road building. Some regional and nationally strategic road schemes exist.

In 2021, including masterplanned RSS growth, it is expected that the implementation of the HCC cycling strategy would support Smarter Choices and help improve the attractiveness of walking and cycling across Hertfordshire, with new travel patterns 'habitualised' by 2021. Infrastructure investment in the bus and coach network would help to improve its efficiency and attractiveness for new and existing residents alike by these modes. Without further intervention however conditions on the road network would continue to deteriorate. The interventions identified, supplemented by Smarter Choices, would substantially resolve the deficit on the motorway network and help improve conditions at a number of key locations on the county road network.

Due to the strategic nature of the study it was not feasible to identify clearly walking and cycling measures between 2021 and 2031, although the habitualised behaviour should ensure that these modes have an important role to play. The bus network would have most of its infrastructure in place by 2021 but would continue to be able to react to passenger demand within short timescales, although there are likely to be challenges for the operators and HCC, especially on busy routes. The predictions for rail capacity indicated that without further substantial investment at a national scale the effectiveness of the rail network would be severely restricted post-2021 which would suppress the attractiveness of this mode. By 2031 both the motorway and county road networks would remain reasonably effective with the interventions in place and were significantly better than without the interventions, although not all issues were resolved.

All interventions identified by the study were costed. When large nationally strategic schemes were included, the estimated total infrastructure cost was £9.6 billion. These larger schemes, totalling £8.5b, were fully funded but were included in the study in recognition of the important role that they will play in ensuring that transport in Hertfordshire operates efficiently.

Table ES 1 presents a summary of schemes and costs against each district for the period 2011 to 2031. It excludes the nationally strategic schemes costing £8.5b as they did not feature in the funding model. It shows that the greatest number of schemes, and highest scheme costs, were principally within districts that contain Key Centres for Development Change (KCDCs). Road schemes accounted for just over half of the total cost, with the remainder broadly classed as those that promote sustainable transport. A number of the road schemes would however benefit sustainable travel, for example those that reduce congestion enabling quicker and more reliable bus journeys.

Table ES 1: Summary of Schemes by District 2011-2031

	NMU		Bus & Coach		Rail inc. Freight		Road		Other		Total	
District	No.	£m	No.	£m	No.	£m	No.	£m	No.	£m	No.	£m
Broxbourne	0	0.0	1	1.5	0	0.0	2	6.5	0	0.0	**3**	**8.0**
Dacorum	0	0.0	2	42.5	2	4.0	8	108.3	0	0.0	**12**	**154.8**
East Herts	0	0.0	5	47.1	0	0.0	9	131.9	0	0.0	**14**	**179.0**
Hertsmere	0	0.0	1	1.5	0	0.0	1	0.1	0	0.0	**2**	**1.6**
North Herts	0	0.0	4	6.5	1	1.0	3	91.9	0	0.0	**8**	**99.4**
St Albans	0	0.0	5	45.4	0	3.0	6	91.6	0	0.0	**11**	**140.0**
Stevenage	0	0.0	12	5.6	0	0.0	4	32.2	0	0.0	**16**	**37.7**
Three Rivers	0	0.0	0	0.0	0	0.0	0	17.3	0	0.0	**0**	**17.3**
Watford	0	0.0	2	39.5	1	180.0	2	42.2	1	1.0	**6**	**262.7**
Welwyn/Hat	0	0.0	5	6.9	1	1.2	1	41.5	0	0.0	**7**	**49.6**
Other	1	36.0	1	0.0	3	5.1	9	0.0	2	114.7	**16**	**155.8**
Herts total	**1**	**36.0**	**38**	**196.5**	**8**	**194.3**	**45**	**563.6**	**3**	**115.7**	**95**	**1106.0**

Note: 'Other' refers to countywide and multidistrict schemes. Costs are attributed to districts by % of schemes that fall into them but scheme numbers are either by district or countywide/ other. Where there is a cost but no scheme this indicates that a proportion of the scheme numbered in 'Other' falls into this district.
NMU = Non-Motorised User (e.g. walking and cycling)

Based on an assessment of areas of substantial planned RSS growth coinciding with existing deficit and future corridor limitations that could restrict this growth, a number of interventions have been identified from the Transport Technical Report as potential priorities (see Table ES 2). The process of identifying these is explained in the main report. However it is important to recognise that final priorities cannot be set until plans for growth have been completed as part of the ongoing LDF process. Resulting phasing of growth across the county from detailed masterplans will allow for the refinement of the interventions recommended in this study. In addition to the schemes shown in Table ES 2, Appendix F of the report assigns a priority rating to all 95 schemes considered necessary for growth in Hertfordshire, which was based on those schemes used in the funding model produced by the Lot 1 consultants.

Table ES 2: Potential Priority Interventions

ID	Scheme	Reason for Prioritisation
N1	Implementation of HCC cycling strategy	Facilitating reduction in car trips and therefore congestion, particularly for shorter journeys
N6	A1000/ B6426 bus priority	Enhancing bus services around Hatfield railway station and between Hatfield and Welwyn Garden City
N13	A1(M) ATM J6-8	Improving north-south movement through the centre of the county and between Stevenage and Welwyn Hatfield
N18	A4147 corridor junction improvements	Improving access between Hemel Hempstead and St Albans
N19	St Albans Relief Road improvements	Improving access around northern St Albans, facilitating east-west movement for existing and RSS traffic
N25	A1(M) J8 capacity enhancement	Improving access to the A1(M) for growth around Stevenage and A1(M) and reduce existing congestion
N27	Smarter Choices	Promotion of sustainable travel across the county, which will have county and local benefits
R11	Abbey Line passing loop	Improving rail connections between St Albans and Watford
S252	Watford Junction Rail Interchange	Improving intermodal connectivity and road network efficiency within Watford, including benefits for the bus network
S31	Breakspear Way junction improvements	Improving access to the M1 from Hemel Hempstead and between Hemel Hempstead and St Albans

Note 'ID' refers to the identification of individual schemes used in the main report

A comparison of cost and potential funding is shown in Table ES 3, which again excludes large centrally funded schemes. It gives an indication of the phasing of schemes, with the majority being required by 2021. This phasing was identified on the basis of the modelling undertaken for this project and on the critical assumption that all interventions should be in place in time for the opening of a development, to support growth and to enable the delivery of sustainable travel patterns.

Table ES 3 indicates the profile of costs and funding over the period 2011 to 2031. Of the balance, funding potentially available from RFA and LTP is estimated at approximately £360m, which leaves a shortfall of almost £750m.

Table ES 3: Summary of Scheme Costs and Funding by Period

	2021	2031	Total
Costs (£m)	936	170	1,106
Potential Funding (£m)	284	75	359
Shortfall (£m)	**-652**	**-95**	**-747**

Overall Recommendations

The principal recommendations from this study are:

- To refine over time the interventions presented in Section 10 of the Transport Technical Report (including their timing and their prioritisation) as more detailed plans come forward through the planning process, building on the foundations provided by this study. This would involve reviewing and monitoring the suitability of schemes identified for growth in this study as the growth agenda develops in more detail, through the LDF process and specific proposals. This may require the use of more detailed modelling, taking into consideration the issues raised in Section 13 of the Transport Technical Report;

- To implement schemes relating to those items of deficit that are solely existing or 'historic', which cannot technically be addressed through CIL funding. This will help to ensure that the transport network operates effectively across the county, without those areas with negligible impact becoming 'poor relations' in transport terms and subsequently adversely affecting the efficiency of the transport network in areas of growth. These schemes are likely to be underfunded, based on the evidence presented in Section 1 of the Transport Technical Report, and it is further recommended that representations are made to regional and central government for funding to remedy previous under-investment in the county transport network;
- Lobbying of central government and its agencies (the Highways Agency and DfT Rail/ Network Rail) to ensure that the schemes for which they are responsible are implemented in a timely manner to facilitate growth in the county; in particular that there be substantial rail investment to cater for the lack of capacity post-2021;
- Application to regional and central government funding sources to fund any additional costs above those included here, including those resulting from more detailed scheme development

1. INTRODUCTION

1.1. Background

URS was appointed in April 2008 by Hertfordshire County Council (HCC) and the districts within Hertfordshire (collectively, The Partners) to provide consultancy services for the preparation of the Lot 2 transport elements of the Hertfordshire Infrastructure and Investment Strategy (HIIS). URS was assisted by MTRU on specific sustainable transport issues. Atkins and Roger Tym and Partners (RTP) were appointed as the Lot 1 consultants to lead the overall strategy, to deal with the non-transport infrastructure elements and to establish the investment Funding Model.

In the absence of a formal Implementation Strategy the study was commissioned to examine the implications for Hertfordshire associated with the published Regional Spatial Strategy (RSS – also called the East of England Plan), which has established district housing growth targets for the county to 2021 and 2031.

Towards recommending a series of transport improvements that considers The Partners' transport policy objectives, the impacts of growth, and basic feasibility, the key tasks identified for transport consideration from the original project brief were to:

- Establish the impact of RSS growth on the existing transport network and to identify the strategic infrastructure required to ameliorate these impacts;
- Consider the transport infrastructure implications of masterplanning and other work on spatial assignment of RSS growth within Hertfordshire's districts;
- Establish the transport infrastructure that will be required to deliver housing and employment development at the growth area (Key Centre for Development and Change or 'KCDC') level; and
- Produce a costed schedule of transport infrastructure that will input to the Funding Model developed through Lot 1.

The objective was to enable the partners to plan, prioritise and bid for required infrastructure improvements to accommodate anticipated RSS housing and employment growth and thereby satisfy Hertfordshire's longer-term transport needs.

The first and crucial stage of the process involved the need to establish a baseline situation of known transport issues (referred to as 'network stress' to include road congestion, rail overcrowding etc) and imminently scheduled or actually delivered new infrastructure improvements, before subsequently considering future conditions. From this baseline position the process was moved forward through a pragmatic review that identified:

- The degree of remaining 'stress' on the transport network in the absence of future RSS growth – referred to as 'historic' or 'legacy' deficit; and

- The requirement for, or likelihood of, further infrastructure to accommodate future RSS growth.

Early work relating to reviewing documents and proposed schemes established that for assessment purposes a reasonable baseline position of transport conditions should be founded on predicted RSS growth delivered by the year 2011. URS concluded that 2011 would be a reasonable year to represent baseline conditions as it corresponded to the time horizon of published Local Plans and Local Transport Plans. It also corresponded to a year for which strategic EERM (East of England Regional Model) runs existed.

While there was an element of prediction given the actual study year of 2008/09, it was considered that 2011 was a rational baseline year from which to determine historic deficit, given the reasonably high degree of certainty concerning commitments to deliver published infrastructure improvements in tandem with predictive transport modelling founded on planned growth assumptions and commitments for the period 2001-2011.

Beyond this time horizon planning decisions on land-use and infrastructure need or delivery were less certain. This emphasises the main focus of the HIIS: namely, to determine the likely impact of further RSS (i.e. post-2011) growth across Hertfordshire and its associated transport impacts to guide the framework for future infrastructure and investment decisions.

1.2. Scope of the Report

This report represents Stages One and Two of the HIIS assessment process and its focus is on taking forward the elements of historic or legacy transport deficit (Stage One) that were likely to remain post-2011, to be considered in the mix with an assessment of the transport implications associated with further RSS growth for the period 2011-2021 and subsequently 2021-2031 (Stage Two). One of the difficulties associated with transport is that of attempting to associate the demand for travel with particular geographic areas and points in time and this is why it was considered helpful to combine the historic and future deficit results into a single report.

Stage One was concerned with identifying historic deficit. The Stage Two assessment process was undertaken in parallel with a masterplanning and location assignment exercise that was undertaken by the Lot 1 consultants. The focus of this process was on refining the spatial assignment of RSS growth to 2021 and subsequently to 2031 for all Hertfordshire districts, to develop growth options in accordance with the original project brief. Transport is widely acknowledged as an induced demand, which is influenced by actual land-use distribution and development densities. This report therefore also provides an assessment of the transport implications associated with the development assignment options to emerge from the Lot 1 consultants, togehter with assessment of the additional transport infrastructure requirements associated with these more refined planning assumptions.

1.3. Report Framework

The report is presented in the following format:

- Section 2 explains the method adopted;
- Section 3 identifies the data sources used in this study;
- Section 4 presents the baseline conditions at 2011 – the 'historic deficit';
- Section 5 lists the programmed infrastructure schemes post-2011;
- Section 6 assesses the effect the programmed infrastructure schemes would have on reducing historic deficit in the absence of additional RSS growth using a 2021 reference case known as **2021^{RC}**;
- Section 7 identifies the impact of RSS growth post-2011;
- Section 8 summarises the cost of schemes that will solely cater for historic deficit;
- Section 9 presents the approach for identifying new infrastructure;
- Section 10 presents the interventions that have been identified and the impact that they will have;
- Section 11 reports on the estimated costs for these interventions;
- Section 12 compares these costs with the potential existing funding;
- Section 13 discusses the overarching issues identified throughout the report; and
- Section 14 presents the conclusions from the study, with a summary of the associcated recommendations.

1.4. Key Terms

- Strategic – Hertfordshire County Council designate particular routes as 'Strategic' according to their own classification. However, throughout this document 'strategic' is used in a broader sense to indicate transport infrastructure that is serving a strategic function, as opposed to local. This definition is taken from the adopted Regional Spatial Strategy published in May 2008 (page 38):

  > *The heirarchy distinguishes between the elements that serve a major national or strategic regional purpose (Strategic); those that are regionally important in terms of inter-urban movements (Regional); and other links which complete the network (Local).*

- Masterplanning – this term is generally used for specific plans for a development site. However, the nature of this study means that such plans were outside its remit (although outline plans were produced by the Lot 1 consultants). Throughout this document 'masterplanning' refers to the process of identifying growth location and incorporates the large sites (including KCDCs) along with the broader planning for growth away from the KCDC areas. These were the subject of the Lot 1 discussions with stakeholders.

- NMUs – this refers to Non-Motorised Users such as pedestrians and cyclists.

Note that Figure and Table references starting with a letter (eg Table A 11) indicate that they are located in the Appendix denoted by the letter in question.

2. METHOD

2.1. Definition of deficit

Deficit is defined as the amount by which something falls short. For the purposes of this study any part of the transport network can therefore be considered to be deficient where it falls short of providing the necessary capacity for the prevailing travel demand.

However in reality it is not as straightforward as this because the concept of transport deficit is rarely absolute. People will tolerate different levels of travel hardship resulting from increasing congestion, as delays increase and journey reliability decreases. Deficit may also be identified in terms of lack of choice if, for example, only one mode is available. Thus it is convenient to identify lack of capacity initially on a mode-by-mode basis, although these individual modes also have to be considered collectively for the overall assessment.

This should not necessarily be taken to mean that a deficit exists where people cannot travel by their mode of choice. If this were the case the outcome may be one of unrestrained road building to cater for both existing and forecast growth in car trips. Rather, a deficit exists where travel of people and goods is inconvenient and not within a reasonable journey time, where excessive delay is experienced, or where travel between the required or desired destination is not possible at all. For the purposes of this report, deficit is always related to demand and thus can be addressed by expanding mode choice, by demand management and by the disposition of land-uses (sustainable masterplanning) as well as by creating new capacity on private or public networks.

This is where the influence of policy needs to be taken into account. The national, regional and local policies that affect Hertfordshire are outlined in Section 9.1.2. As far as possible the responses to transport deficit should be sustainable, both in terms of the transport solutions and in terms of the planning and land-use approach, as the two are closely related.

Bus passengers should be able to expect that their buses are not operating above capacity. Similarly rail passengers should be able to expect that their trains do not have a passenger loading greater than 100% of capacity at their terminating station.

On the highways and for private vehicle travel, a ratio of Volume to Capacity (V/C) of 85% is considered to be acceptable; it was considered that anything lower would mean that demand management measures and public transport would not necessarily be attractive. In essence this means that an element of deficit may be essential to ‘oil the wheels’ of policy aspiraion.

2.2. Aims

This section explains the approach taken and data sources used to undertake the two key elements of the HIIS study:

- Stage 1: Review baseline conditions and historic infrastructure deficit;

- Stage 2: Identify planned infrastructure to 2021 and 2031, and estimate future deficit associated with RSS growth. Measures to tackle this deficit are then identified and costed.

Stage 2 findings complement parallel work on masterplanning for the location of new development.

Information for both stages was based on three sources:

- The East of England Regional Model (EERM). The HA's strategic multi-modal model that has been used to identify current and future congestion and constraints in the transport network;

- A strategic review of evidence from the county level and higher. This included a review of the Regional Transport Strategy, Local Transport Plan, bus and coach networks, Rail Route Plans, and rail Route Utilisation Strategies;

- A local review of existing evidence. This included the Area and Urban Transport Plans and documents produced by the districts that were relevant to this work. This strand also involved consultation with all districts, initially through the Hertfordshire Highways Strategy Development Managers who each have responsibility for achieving a co-ordinated approach to the development of transport both within and across districts.

Information from these sources was drawn together during Stage 1 to produce a robust and credible evidence base to inform the HIIS with regard to the current infrastructure deficit. The data sources are described in more detail in Section 3.

2.3. Outputs

The outputs from the above processes can be summarised as follows:

Locations: A list of locations by mode that were deemed deficient due to e.g. congestion or overcrowding, together with a brief description and the source of the information (a detailed breakdown is provided in Appendix A);

Schemes: A list of proposed schemes, measures and initiatives collectively known as 'interventions' were identified together with a brief description, the source of the information and other available information including the the proposed year, funding source and status (a detailed breakdown is provided in Appendix B). Potential schemes were also identified (a breakdown of these is provided in Appendix F).

For ease of reference, the aim of this work was to collate all information into a single set of maps and tables, to maintain as a database and to provide the transport inputs required for the wider study.

2.4. Analytical approach

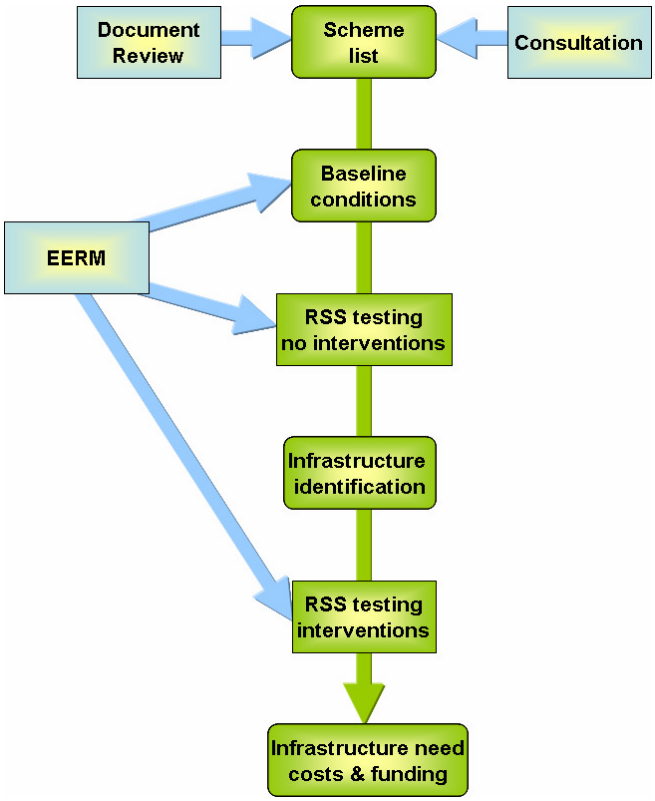
The approach adopted was incremental as shown below and depicted as a simple flowchart in Figure 2-1.

- 2011 Baseline conditions (Section 4). Once the committed development and programmed schemes up to 2011 are in place, remaining deficit is 'historic' and cannot be due to RSS growth post-2011;
- Post-2011 schemes (Section 5). There were a series of schemes in the planning pipeline that were due to be implemented during the period 2011 to 2021. These are listed in Section 5.
- Post-2011 conditions (Section 6). The object of this exercise was to assess the extent to which the schemes listed in Section 5 would address the 2011 baseline problems (the historic deficit) in the absence of any further RSS growth in Hertfordshire, to see what deficit remains even before RSS growth is introduced;
- 2021 RSS conditions (Section 7). Using the same infrastructure as for the Post-2011 scenario, this looked at the incremental effect of adding the full balance of 2011-2021 RSS growth in accordance with Lot 1 masterplanning. The differences in deficit between this and the previous scenario were then assumed to be due to the medium term RSS growth to 2021. From this, the requirement for additional interventions was investigated;
- 2031 RSS conditions (Section 9). Incorporating any longer-term schemes planned for 2021-2031 delivery, this looked at the incremental effect of adding the full balance of 2021-2031 RSS growth in accordance with Lot 1 masterplanning. The differences in deficit between this and the previous scenario could then be largely attributed to the longer-term RSS growth to 2031.

This process helped to distinguish between historic and RSS-dependent causes and effects, but it could not be definitive. It was reasonably well suited to the EERM model runs that operate in 5-year intervals, but there was much less certainty about the timing and status of delivery of major rail schemes, and other local schemes. Therefore a degree of consultation and judgement was required to assess the extent to which such schemes addressed deficit.

In terms of interventions to address infrastructure deficit, it would be neither easy nor necessarily advisable to increase capacity by building more roads. This was one reason why the Lot 2 consultants were originally given the task of identifying two intervention scenario packages: (i) reflecting the current levels of mode split, and (ii) reflecting a maximum realistic shift to PT. However as the study progressed, the reduced programme time for this work dictated the use of a single 'combined' scenario including a balance of both sustainable and increased capacity measures.

Figure 2-1: Simplified Study Method



Note: Green arrow defines steps between key phases, blue arrow indicate inputs.

2.5. Addressing infrastructure deficit

There is a shortfall of capacity that would be worsened by the effects of RSS. Policy would dictate that this shortfall should not be solved solely by building more roads. This section briefly outlines some of the key considerations relating to the approach needed to address infrastructure deficit by sustainable means in the context of Hertfordshire. Section 9.1.2 outlines the transport policy context for Hertfordshire.

2.5.1. Demand Management Including Travel Planning

Infrastructure measures that can complement, and be complemented by, 'Smarter Choices', locking in the combined benefits, include:

- Re-allocating road capacity;
- Re-phasing traffic signals to give priority to pedestrians and buses;
- Using signals to control demand to agreed development targets;
- Replacing subways with at-grade crossings;
- Parking control;

- Effective anti-congestion measures; and
- Traffic calming, pedestrianisation, and speed regulation/ enforcement.

The Local Transport Plan is supported by a cycling strategy that aims to encourage more cycling more often. Travel plans are part of the HCC policy and guidance is available for both green and school travel plans.

In addition to the 'Smarter Choices' demand management there is a role for hardware. For example, Intelligent Transport Systems allow the existing transport infrastructure to be better managed, making it more efficient. Urban Traffic Management and Control (UTMC) systems allow signals to be optimised in 'real time' to maximise the throughput of signalised junctions on a network-wide basis. Real Time Passenger Information improves the information available to passengers on public transport (particularly bus), increasing their confidence that a bus is on the way and helping to monitor the reliability of the bus network.

Demand Management incorporates a broad range of 'hard' and 'soft' measures to reduce the desire and need to travel by private vehicles on the road network and is already a feature of HCC's transport planning policy and management of the transport network. Part of this is through the provision of information about alternative modes. HCC has also recently published its Intalink Strategy, which is the information strategy for public transport in Hertfordshire supported by the county, districts and public transport operators including bus and rail.

Part of the demand management process is through various travel plans, or personalised travel planning. Government guidance on travel plans is available at the DfT website[2]. Research, also available on the website, indicates that peak hour traffic could be reduced by 21% and 14% (urban and non-urban respectively) with a sustained 10-year 'Smarter Choices' programme[3]. This would include elements such as:

- Workplace/ residential/ school travel plans;
- A rolling programme of personalised travel planning;
- A partnership with local bus and rail operators to market improvements made to public transport (the vehicle for this already exists in the form of Intalink);
- A broader travel awareness campaign underpinning more targeted initiatives; and
- A series of projects, such as an authority-wide car share scheme/ local car club.

[2] http://www.dft.gov.uk/pgr/sustainable/travelplans/. Department for Transport, July 2008.
[3] 'Making Smarter Choices Work', Department for Transport (http://www.dft.gov.uk/pgr/sustainable/smarterchoices/makingwork/makingsmarterchoicesworkpdfs5771), July 2008.

2.5.2. Land-use Planning

The location and form of development is important, to ensure that it encourages the use of sustainable modes over less sustainable modes. This means locating services and facilities in easily accessible places, for example at the centre rather than the edge of development. The form of development can encourage the use of sustainable modes by providing easy routes between key origins and destinations, whilst maintaining a road pattern that discourages short journeys by car. This may require bus priority to ensure that buses are not disadvantaged through having to use circuitous routes. Permeability of new development for sustainable modes should not be provided through a road network designed around private vehicles, but via purpose built infrastructure.

2.5.3. Accessibility

Accessibility can mean ease of access for all into places and ease of access between places. For the purposes of this work the latter definition is appropriate. Transport networks must provide links between places that are desirable origins and destinations (this includes ensuring that transport infrastructure and services are DDA/ DiPTAC-compliant). Accessibility is in part related to Land-use Planning, as this has a significant impact on the ability to make development accessible. The layout of development and the mix of uses influence the degree to which people can walk within and through development to access services. It also promotes social inclusion.

2.5.4. Efficient use of existing resources (ref. Eddington Study)

This approach is likely to be less expensive and to be potentially less environmentally damaging than implementing large new infrastructure. It includes the use of systems such as UTMC, as mentioned above. It can also include revising the layout of existing inefficient junctions, or other infrastructure such as bus interchanges to improve their operation, capacity, and attractiveness to passengers.

Maximising the effectiveness and capacity of rail infrastructure is a subject that features strongly in terms of increasing platform and train length, to make the best use of existing track paths. However, the increasing pressure on rail from passenger and freight services is likely to mean that additional capacity is required and this may mean finding ways of increasing the number of train paths, in favour of new rail alignments being constructed.

2.5.5. Provision of large infrastructure where there is a genuine need

Large infrastructure such as new roads, rail alignments, or multi-modal transport interchanges, is expensive and time-consuming to implement. It is therefore important that such schemes have robust evidence to justify their promotion, and to be used in defence of any challenge by funding agencies and developers.

It is reasonable to anticipate that not all of the predicted infrastructure requirements will secure the necessary funding over the plan periods. It is therefore essential for partners to prioritise schemes, aiming to deliver those that satisfy key objectives and derive maximum benefit at the county and strategic level.

3. DATA SOURCES

3.1. EERM Assessment

Stage 1 of the HIIS brief required existing EERM runs to be used to help quantify the road infrastructure deficit in Hertfordshire and on relevant regional corridors outside the county. EERM output in the form of Volume over Capacity (V/C) ratio values were used to identify where the road network was under stress, thus indicating an infrastructure deficit. Maps presented in the text were colour-coded to identify two bands of network stress corresponding to the following V/C ratio bands:

- Between 80% and 100% (amber): nearing capacity, this level is indicative of increasing instability and unreliability, which may require consideration for future treatment;
- Above 100% (red): over capacity, indicative of longer delays associated with queuing.

For roads, this metric allowed consistent comparisons through time to be made.

Although these results were based only on the highway assignment, the model takes account of mode split with a demand module that divides the total travel demand by mode prior to assigning the vehicle component to the highway network. The effects of rail and bus schemes were therefore reflected in the highway assignment, and vice versa.

The EERM is a strategic model validated principally at the inter-urban level, so the V/C ratios are more accurate on inter-urban links compared to links within urban areas, which may be subject to a degree of flow under-representation (short local and all intra-zonal trips will be absent), and 'lumpiness' due to zone loading points artificially concentrating traffic on links adjacent to origin and destination connectors. Nevertheless, obtaining information on the deficit in urban areas was complicated and the EERM was able at least to provide an indication of urban stress levels and of relative changes through time, so was therefore used to inform the process.

3.2. Document Review

The document review consisted of both strategic and local sources depending on the reports available and the level of detail therein. For example, at the strategic level documents such as the Regional Transport Strategy, Regional Funding Allocation, and Local Transport Plan and supporting documents were reviewed. At the local level relevant district documents and Urban Transport Plans were reviewed.

The review of all documents was approached in the same way. Infrastructure that catered for existing and future deficit was identified for consideration and potential inclusion in the HIIS. A summary was made of the scheme objectives, data available, problems and issues including the scheme status and priority. This information was used to develop the scheme listings identified earlier in Appendix B. Relevant plans and figures were incorporated into the summary where they provided a useful means of assimilating issues

and solutions. A tabulated bibliography of the documents used in this study is provided in Appendix D.

3.3. Consultation

Various stakeholders were consulted for the first stage of the HIIS transport elements work. In each case where URS held meetings or discussions records were made and circulated for comment by the attendees and contributors.

3.3.1. General Approach to Consultation

Throughout the study the approach taken by URS was to work closely with the client. To this end the principal transport planning professionals and the client project manager were contacted at regular intervals to discuss the way forward as matters for discussion arose. This meant that the client was aware of the study progress throughout and helped to mitigate the impact of any issues beyond the control of URS.

3.3.2. Hertfordshire Highways

Contact was made with Hertfordshire Highways early in the study. As they are involved in the day-to-day operation and strategy implementation across the county this helped to identify key deficit issues and provide a solid platform from which other issues could be investigated. Hertfordshire Highways were also involved in a number of transport-specific meetings throughout the study to ensure that there was an opportunity for input to the outcomes.

3.3.3. HCC Passenger Transport

The HCC Passenger Transport Unit was contacted on a number of occasions, first to discuss the existing situation in Hertfordshire on buses, principally in terms of infrastructure and HCC's involvement in co-ordinating bus operations in the county. Later discussion concentrated on passenger capacity restrictions.

As well as identifying existing and potential future deficit this consultation assisted URS in formulating future interventions to cater for growth. In particular the information provided regarding principal bus corridors and routes already identified for improvements were incorporated into the interventions presented in Section 10.

3.3.4. The Highways Agency

It was recognised by both the client and URS that the role of the Highways Agency (HA) within the study area was pivotal for the strategic road network and adjoining roads. Initially contact was made with the HA to discuss the broad scope of the study. Afterwards, agreement was sought as to the major schemes to be included in the modelling work from the Targeted Programme of Improvements and other potential schemes to ensure that any modelling work undertaken was in accordance with the HA understanding of the future strategic network.

3.3.5. Workshops

A series of workshops was held in summer 2008. The first of these was a joint workshop with the Lot 1 consultants. During this the work to date was outlined and a number of the outputs presented. In particular URS took the opportunity to present the identified deficit and existing schemes (included in Appendix A and Appendix B respectively). This gave the district representatives and transport practitioners the opportunity to observe the transport work within the wider study objectives and to comment on the work to date.

The second workshop was a natural progression from the first and was chaired by URS as a transport-only event. It sought to refine the work on the deficit and existing schemes, following an opportunity by the attendees to review the work prior to the workshop. Those invited included representatives from all districts, Hertfordshire Highways, HCC Transport Planning and HCC Passenger Transport Unit. This workshop gave URS an opportunity to seek answers to some of their queries regarding particular schemes and for the client attendees to comment on the accuracy of the collated information, allowing URS to benefit from their detailed local knowledge.

3.3.6. Reference Group Meetings

The Reference Group Meetings were held at regular intervals and were attended by the broad client group and a number of observer organisations. These events were multidisciplinary, intended as a forum to discuss the whole project. This helped to give the study as a whole a 'steer' from the client and for any technical issues to be discussed openly, allowing rounded decisions to be made. These meetings enabled client feedback by URS on the ongoing work, and allowed feedback to the broader client group as to the implications that some non-transport issues may have had on transport within the county.

3.3.7. Project Meetings

The consultant team (Roger Tym & Partners, Atkins, and URS) held regular meetings to discuss the progress of the study, technical issues, and matters arising. This ensured that all on the consultant team were aware of the work of the others and could receive and provide input into the various work streams.

4. INFRASTRUCTURE DEFICIT 2011

4.1. Introduction

This section of the report identifies the various elements of 'unmet' demand for infrastructure (indicated by network stress) for transport infrastructure at 2011 before moving forward to determine the impacts once RSS growth is factored into the review for the period 2011-2021 and beyond.

For clarity the various travel modes have been separated, although it is recognised that they all form part of an integrated transport system.

4.2. Non-Motorised Users (NMUs) & Accessibility

There is a requirement to improve the general facilities for pedestrians and cyclists in the county, including the wider introduction of safer routes to schools. Safety is also an issue and with the requirement for growth across Hertfordshire to be sustainable there is a need for personal security as well as accident safety to be addressed for the existing population, to provide a foundation on which to build future RSS growth and promote walking and cycling as safe and convenient modes of choice.

In line with the Department for Transport's policies and targets, accessibility to key services and facilities for new housing within Hertfordshire was also a key consideration. The accessibility evidence for Hertfordshire is described in Appendix C. Accessibility in Hertfordshire is generally good though the urban extensions generated by population growth are likely to increase average access times to some services and facilities such as to transport interchanges and hospitals. As such accessibility will need to be addressed in detail in development Transport Assessments to ensure that national and county targets can be met.

4.3. Buses and Coaches

Hertfordshire has an extensive bus network, providing for all but the smaller villages. Many of the routes serving East Hertfordshire are however limited in terms of the days of the week that they operate.

Despite this most Hertfordshire residents are reasonably well catered for. The towns have, on the whole, bus routes that provide for almost all areas and good inter-urban routes across most of the county. Hours of operation are similar to many non-metropolitan areas in that services are largely timetabled around the working day, with reduced or no evening and Sunday services. Approximately one third of all bus services in Hertfordshire are supported school services, with a further 20% being public services tendered by the county council and districts.

The main problems identified in relation to bus network improvements are[4]:

- Competition from high car ownership and use;
- No dominant centre on which demand for services is focused;
- The impact of London attracting operators and workers in the industry;
- Decline in bus use of 2% per annum since the mid 1990s;
- Bus costs rising by 7-8%, fares rising by 5% per annum;
- An ageing fleet of vehicles; and
- Accessibility for disabled users placing financial costs on operators and HCC.

The principal areas where access to bus services would benefit from improvement have been identified as the southern half of Broxbourne District, and the Chorleywood - Rickmansworth - Watford corridor, although Watford itself has a reasonable level of accessibility to services (generally 20-30 minutes). Hatfield residents can also be considered to have a relatively poor level of access to bus services.

Hertfordshire is well served by long-distance coach services, which concentrate on the main towns in the county and tend to focus on the main urban and inter-urban road network. This means that they experience the same network problems as private vehicles. Notably there is no natural hub for long distance services in Hertfordshire. Although a number of routes pass through Hemel Hempstead this is relatively remote from much of the county. The nearest opportunities for interchange between long distance services are at Luton and Stansted airports, or in London where many services start and end.

The challenge for the bus network at present is to achieve improvements in the quality and accessibility of services (e.g. low floor vehicles), while ensuring that the network is sustainable and affordable. Both the bus strategy and discussions with HCC Passenger Transport Unit identified that the infrastructure bottlenecks for buses on the highway network reflect those that are experienced by general traffic. Operational problems were experienced in two particular areas:

- Hemel Hempstead – St Albans – Hatfield corridor; and
- Hemel Hempstead – St Albans – Watford triangle.

In the second case the motorway network is considered to play a particular part in the congestion that is experienced by bus services, as queuing traffic that is on and accessing the motorway network queues back onto local roads and hence disrupts the reliability of the bus network.

[4] 'Hertfordshire Local Transport Plan 2006/07 – 2010/11: Bus Strategy', Hertfordshire County Council, March 2006. Page 2-3. (URS Document Reference 165).

Away from these areas, deficit issues tend to be at localised junctions. The recently published Bus Network Review (a daughter document to HCC's Bus Strategy) provides strategies for 100 bus corridors in Hertfordshire. The 20 bus corridors considered the best candidates for improvements are listed below. The improvements outlined in the strategies are not limited to hard infrastructure but include better vehicles and marketing. Of note is that many of these corridors are inter-urban, reflecting the reality that existing passenger capacity deficits are mainly experienced on inter-urban routes (it is of course important to recognise that, to a greater or lesser extent, interurban services will also cater for intra-urban travel).

1.	**500/550** Hemel Hempst'd – Watford section	11.	**724** Harlow – Heathrow Airport
2.	**300/301** Hemel Hempst'd – St.Albans – Stevenage	12.	**84** St Albans – Potters Bar – Barnet
3.	**H2/3** Hemel Hempst'd – Woodhall Farm & Gadebridge	13.	**S1-5** St Albans City
4.	**H4/5** Hemel Hempstead – Bennetts End/Grove Hill	14.	**100/101/102** Stevenage – Hitchin – Luton
5.	**W5/6** Maple Cross – Watford – Hemel Hempstead	15.	**SB1** Stevenage – Chells & Poplars
6.	**W8/10** North Watford – Watford – Northwood	16.	**SB2/3/4/5** Stevenage – Shephall & St Nicholas
7.	**W7/9** Watford – Bushey – Borehamwood	17.	**92/94/97** Hitchin – Letchworth – Baldock/ Stotfold
8.	**321** Watford – St Albans – Luton	18.	**510** Harlow – Bishops Stortford – Stansted Airport
9.	**320** Watford – St Albans – Harpenden	19.	**308** Bishops Stortford – Stansted Airport
10.	**602** Hatfield – St Albans – Watford	20.	**310/311** Hertford – Waltham Cross

LTP2 recognised that there was a need to improve bus facilities and this would continue post-2011. HCC own all bus stops, and have working agreements for bus shelters, but bus stations are owned by a variety of stakeholders. This means that there is inconsistency and passengers cannot be certain about which organisation they are dealing with. HCC recently started the process of reviewing bus stop and bus station infrastructure across the county with a view to identifying whether existing facilities are suitably located and whether new bus stations are required to cater for demand in different towns. This also gives an opportunity to provide a clear bus route hub within central Hertfordshire for inter-urban and long-distance services.

The HIIS can play a role in identifying the requirements for future passenger waiting facilities that should influence the solutions being sought to existing issues, where those solutions are likely to have a medium to long-term implementation and cost implication. Figure A 1 shows specific problem areas for bus and cross-references more detailed descriptions in Table A 1 to Table A 12, together with the source references to Appendix D.

No passenger load data for buses was available and indeed if more capacity was required then operators could respond with increased frequency of services or by the use of larger vehicles.

4.4. Rail

Despite having an extensive north-south rail network traversing the County, rail use in Hertfordshire is constrained by a lack of capacity. The constraints come in a number of forms:

- Lack of trains to satisfy the passenger demand, especially for commuter trips into and out of London;
- Platform capacity including that at London Stations (i.e. the number of trains that can use the available platforms within any one hour);
- Insufficient car parking space at some station car parks; and
- Limited train paths.

Rail congestion is evident surrounding Cambridge (including to/ from Hertfordshire) and to the south of the East of England Region in Hertfordshire. Passengers boarding trains in Hertfordshire generally experience overcrowding during peak commuter periods, which is severe on services into London at times. The deficit in terms of train paths and carriage capacity is accompanied by the need identified from LPT2 to improve rail facilities.

Failings within London on the rail network also have an impact on travel to and from Hertfordshire such as acute passenger overcrowding on the North London Line, West London Line and parts of Gospel Oak. Forecast growth in rail travel, which includes substantial background growth, indicates that conditions will be unacceptable without extra capacity.

A summary of the main issues identified in relation to unmet rail demand for Hertfordshire is presented in Table 4-1. A number of the passenger and freight issues are transferable from one to the other.

Table 4-1: Post-2011 – Summary of Rail Issues

EAST COAST MAINLINE (ECML)
Long Distance High Speed (LDHS) Services ~ Significant overcrowding at certain times. Not uncommon for passengers to stand on busiest trains, especially London-Peterborough with average current peak loadings between 70 to 80%. ~ Some limited opportunities for passengers at **Stevenage** to use LDHS services from London, although not towards London during AM peak hours. Providing capacity for these commuters a significant issue during the AM and PM peaks.
Suburban Services ~ First Capital Connect (FCC) operates commuter service at southern end of ECML, linking Kings Cross and Moorgate with Hertfordshire. Commuting to and from London predominant usage. ~ Severe overcrowding in AM and PM peaks on many services. Highest inner suburban crowding levels with significant standing (typically south of Gordon Hill) occurs on AM peak Hertford Loop services. Generally quieter periods for remainder of day.
Infrastructure Constraints ~ Welwyn North where four-track main line becomes two for short distance due to local topography. Although not practical in next decade to widen railway at this point, improvements to timetable and capability of parallel route via **Hertford** will make maximum use of the main line capacity and contribute to flexibility and resilience of railway on its approach to London. ~ Insufficient parking spaces at a number of stations within Hertfordshire. First Capital Connect committed to increasing parking capacity across its network[5]. 90% car parking occupancy or higher at **Potters Bar**, **Hatfield**, **Hertford North** and **Royston** (2007). ~ Limited number of trains that can be accommodated on **Hertford Loop**. ~ Sidings at **Welwyn Garden City** provide six-car capability for Moorgate services and currently have no spare capacity available. ~ **Hertford North** sidings require improved security and other enhancements for overnight stabling. ~ Constraints limit the ability to accommodate the growth forecast.
Freight ~ Two-track section between **Welwyn** and **Woolmer Green**, aggravated by some trains needing to stop at **Welwyn North Station**. ~ Requirement to share fast lines by trains of different speeds and calling patterns, particularly between Finsbury Park and **Potters Bar**. ~ Limited power supply capability. ~ The flat junction where the Cambridge line diverges from the main line at **Hitchin**. ~ Limited train paths allocated to freight.
MIDLAND MAINLINE

[5] http://www.firstcapitalconnect.co.uk/Main.php?iCmsPageId=93. 26th June 2008

Suburban Services

~ Route at or near capacity at peak times from London to Bedford. Most heavily loaded trains on London peak commuter services south of Bedford. Performance issues particularly pronounced at locations where route heavily congested. Track capacity limited south of Bedford. Plan is largely to make better use of existing train paths by running longer trains. For First Capital Connect this will require a move to 12-car, which is a key output of Thameslink Programme from December 2011. As well as the platform extension works on this route, major works are required on core Thameslink section.

~ Commuter growth will continue to be key issue, especially into London. Very difficult to create further peak paths to/ from London due to the constraint of four platforms at St Pancras International and number of paths available through the Thameslink core from Kentish Town to Blackfriars once Key Output 2 of the Thameslink Programme connects with ECML route.

Infrastructure Constraints

~ St Pancras International has only four platforms for all East Midlands Trains services in main train shed. Remainder of this part of station used by Eurostar and Kent services. Number of platforms constrains capacity significantly.

~ Severe capacity constraints of East Midlands Train's platforms at St Pancras International limit options for dealing with growth in longer distance commuting journeys, particularly from East Northamptonshire. However, Kettering to London services included in East Midlands Trains franchise likely to use less capacity as probably need less turnaround time at St Pancras International than services from further north.

~ Current signalling control arrangements on approach to junctions at Radlett, Harpenden and Leagrave, when trains need to cross between the fast and slow lines. Where these not planned can incur up to two minutes delay.

GREATER ANGLIA

Suburban Services

~ During AM Peak some passengers have to stand when boarding at Bishops Stortford and passengers cannot board the train due to overcrowding on some trains at Broxbourne.

~ Capacity exceeded on some trains on all routes with over-crowding especially severe on Cambridge – Liverpool Street and GE Inner services. Future growth will be severely constrained on these without additional passenger capacity because best-timed trains so full some passengers unable to board.

~ Passenger numbers typically greatest at key interchanges (i.e. Stratford, Seven Sisters, Tottenham Hale, West Ham and Limehouse) rather than at London Termini.

~ Scope to carry out improvements to stations, including: improving interchange; reducing crowding at key stations; development of car parks; and improving access to busier stations, particularly in the rural areas.

CROSS LONDON

Passenger Services

~ Acute passenger crowding on the North London Line, West London Line, and parts of Gospel Oak.

~ Forecast growth will make conditions unacceptable without extra capacity.

Freight

~ Freight will be constrained by capacity on the Great Eastern Main Line, which could only accommodate an additional 10 freight trains per day. Restricts rail freight movements through London; particularly important as Cross London Network is only freight route by rail for large containers from Felixstowe and Tilbury to the rest of UK. Anticipated that both ports will expand over the coming years.

Figure A 2 shows specific problem areas for rail and cross-references more detailed descriptions in Table A 1 to Table A 11, together with the source references to Appendix

D. Table 4-2 shows load factors, for 2002/03 and the study baseline (2011),on passenger services that pass through Hertfordshire and terminate in London. These load factors are discussed in more detail in Section 5.3.

Table 4-2: Passenger Load Factor (%), AM Peak Period Arrivals at London Termini

ROUTE	2002/03 baseline	2011
West Anglia	74	**97**
East Coast Main Line (ECML)	**86**	**96**
Midland Main Line (MML)	**95**	**94**
West Coast Main Line (WCML)	79	72
Metropolitan Line	-	-

Source: Table 7.3 ERP Assessment for the Railway (2006). DfT

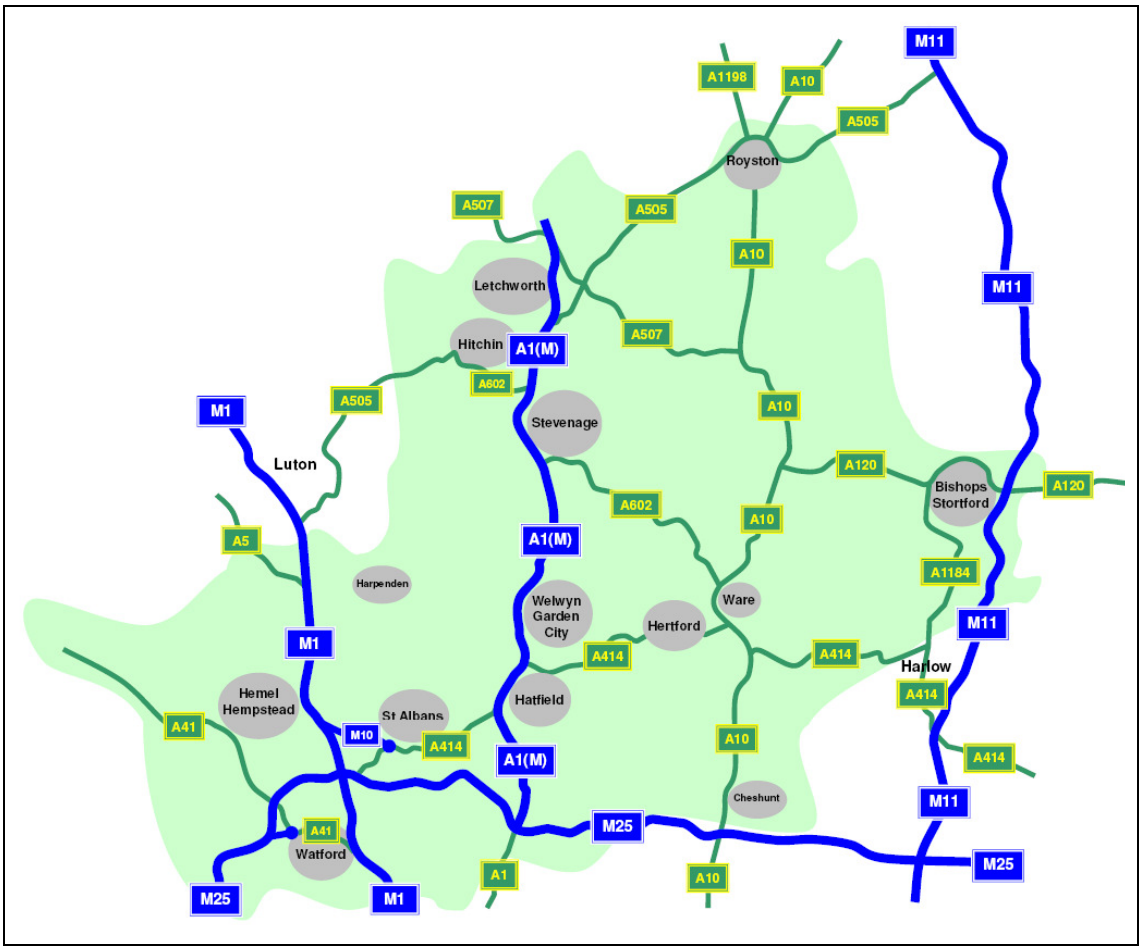
4.5. Road Network 2011

The initial presentation of infrastructure deficit relating to roads in Hertfordshire was based upon the main strategic and inter-urban corridor routes. These primary routes are shown in Figure 4-1. It can seen that the M1, A1(M), A1, A10 and M11 provide the main framework for strategic north to south movements. Journeys across the county are less well catered for, with the M25 offering the main east to west corridor to the south, supplemented by a variety of route combinations to cater for journeys further north including the A414-A1169 and A505-A602.

The infrastructure deficit along key corridors for the baseline 2011 AM peak is presented in Table 4-3, as obtained from the EERM. For ease of reference a simple colour coding was applied to denote links or junctions that are recognised as either approaching capacity at 80-100% (Amber) or exceeding capacity at 100%+ (Red) in 2011 based on the Volume to Capacity (V/C) ratio.

To add further clarity and to aid comparison with future year scenarios the coding system was also applied to a network map, which is included as Figure E 1.

Figure 4-1: Hertfordshire Roads – Main Routes



In the case of Motorways and other grade-separated junctions a distinction was made in Figure E 1 and Table 4-3 between issues related to the mainline and those involving the junction interface with adjoining roads. Additional notes are provided to identify where capacity on the slip road is a particular issue.

Table 4-3: 2011 – Summary of Strategic and Intra-urban Road Deficit

M1		**(Junction 4 – 9)**	
Mainline – Northbound		**Mainline – Southbound**	
J6A – J7		**J9 – J6A**	
		J6 – J4	
Junctions			
J5 (M1 NB & SB Off Slips)			
J6 (M1 SB On Slip), **J6A** (M1 NB On Slip) and **J9** (A5 NW Approach)			
M25		**(Junction 17 – 26)**	
Mainline – Clockwise		**Mainline – Anti-Clockwise**	
J17 – J21		**J26 – J24**	
J21 – J21A (Approach M1 Merge Only)		**J24 – J23**	
J22 – J26		**J23 – J21A**	
		J21 – J20	
		J19 – J18	
		J18 – J17	
Junctions			
J20 (A41 N App.), **J21** (M25 EB Off Slip to M1), **J23** (WB Off Slip) and **J25** (WB Off Slip)			
A1 (M)		**(Junction 1 – 10)**	
Mainline – Northbound		**Mainline – Southbound**	
J1 – J3		**J7 – J6**	
J6 – J7		**J3 – J1**	
Junctions			
J1 (M25 J23: A1(M) SB Off Slip), **J7** (circulating), and **J9** (SB On Slip)			
J3 (NB On Slip, SB and NB Off Slips, circulating), and **J8** (SB Off Slip)			
A1			
BOREHAMWOOD: A1/A5135 Junction (SB Off Slip and SE Rowley Lane Approach)			
BOREHAMWOOD: A1/A411 Stirling Corner Junction (A1 N and A411 E & W Approaches)			
A5			
MARKYATE: A5/B4540 Junction (A5 N and B4540 NE Luton Road Approaches)			
FLAMSTEAD: A5/M1 J9 (A5 NW Approach)			
A10			
WALTHAM CROSS: A10/M25 J25 (A10 N and S Approaches)			
CHESHUNT: A10/Church Lane Junction (Church Lane E Approach)			
ROYSTON: A10/Melbourn St Junction (Melbourn St W Approach)			
A41			
BERKHAMSTED: A41/A416 Junction (A416 N Approach)			
BERKHAMSTED: A41/A4251 Junction (A41 W Approach to A4251 On Slip)			
KINGS LANGLEY: A41/M25 J20 (A41 NW Approach)			
WATFORD: A41/A412 Junction (All Approaches)			
WATFORD: A41/A4008/M1 J5 (A4008 SW Approach)			
BUSHEY: A41/A5183/A5 Junction (A41 NW Approach)			
A120			
LITTLE HADHAM: A120 Standon Road/Stortford Road/Albury Road Junction (All Apps.)			
A405			

BRICKET WOOD: A405/M1 J6 (A405 NE Approach)	
ST ALBANS: A405/A5183/A414/M10 J1 (A405 SW and A5183 N Approaches)	
A411	
WATFORD: A411/A412 Junction (A411 E Approach)	
WATFORD: A411/A4178/Beechen Grove Interchange (Note: limited modelling detail)	
BUSHEY: A411/A409 Junction (A411 E and A409 S Approaches)	
ELSTREE: A411/A5183 Junction (A5183 N Approach)	
ELSTREE: A411/Furzehill Road Junction (Furzehill Road NW Approach)	
BOREHAMWOOD: A411/A1 Stirling Corner Junction (A411 E & W and A1 N Approaches)	
A414	
HEMEL HEMPSTEAD: A414/A4251 Junction (A414 N Approach)	
HEMEL HEMPSTEAD: A414/A4146 Junction	
HEMEL HEMPSTEAD: A414/A4147 Junction (All Approaches)	
HEMEL HEMPSTEAD: A414/Green Lane Junction (A414 E Approach)	
ST ALBANS: A414/A1081 Junction (A1081 NW Approach)	
HATFIELD: A414/A1(M) J4 (A414 E Approach)	
WELWYN GARDEN CITY: A414/B1455 Junction (B1455 SE Approach)	
HERTFORD: A414/A119(W) Junction (A414 E & W and A119 N Approaches)	
HERTFORD: A414/B158 Junction (A414 E & W Approaches)	
HERTFORD: A414/A119(E) Junction (A414 SE Approach)	
A505	
LETCHWORTH: A505/A6141(W) Junction (A505 W Approach)	
LETCHWORTH: A505/Norton Way S/Willian Way Junction (A505 E & W Approaches)	
HITCHIN: A505/St Michael's Road Junction (A505 W Approach)	
HITCHIN: A505/B656 Junction (A505 E & W Approaches)	
HITCHIN: A505/A602 Junction (A505 E & W Approaches)	
HITCHIN: A505/B655 Junction (A505 W and B655 W Approaches)	
A507	
No major problems highlighted for this road within Hertfordshire.	
A602	
HITCHIN: A602/B656 Junction (A602 NW and B656 N Approaches)	
STEVENAGE: A602/A1(M) J8 (A602 W & SE Approaches)	
STEVENAGE: A602/A1072 Junction (A602 N and A1072 E Approaches)	
WATTON: A602/A119 Junction (A602 N Approach)	
WARE: A602/B158 Junction (A602 N Approach)	
A1184	
SAWBRIDGEWORTH: A1184/Station Road/West Road Junction (A1184 S Approach)	
SAWBRIDGEWORTH: A1184/High Wych Road Junction (A1184 N Approach)	
A1198	
No major problems highlighted for this road within Hertfordshire.	

Figure A 3 shows specific problem areas for road and cross-references more detailed descriptions in Table A 1 to Table A 11, together with the source references to Appendix D.

4.5.1. Motorway Network

By 2011 the majority of motorway corridor links within Hertfordshire were operating at between 80% and 100% of their capacity in the AM peak, with some sections above 100% leading to instability and the likelihood of poor journey time reliability. The high volumes of traffic in question make flow conditions susceptible to shock wave effects caused, for example, by traffic joining at merges and minor incidents. Therefore the conditions suggested by the model may in reality be worse due to these side-effects of high link volumes. These characteristics affect significant sections of the M1, M25 and A1(M) in both directions. Problems on the grade-separated motorway junctions themselves that are listed in the table occur either due to slip road or circulating capacity shortfall, at access points from the non-motorway network, or both.

4.5.2. Other Road Corridors

Consideration of the main non-motorway routes shows that congestion is, as expected, principally due to insufficient capacity at junctions. Key locations coincide with town centres, in particular Watford, St Albans and Hemel and Stevenage. However the broader picture is one of a series of corridors. Apart from the motorways, those experiencing the most problems, with the highest density of overloaded junctions, tend to be those running broadly east-west, including:

- Berkhamsted / Hemel / St Albans / Hatfield;
- Watford / Bushey / Borehamwood;
- Welwyn / Hertford;
- Hitchin / Letchworth / Baldock; and
- Hadham / Bishop's Stortford.

The north-south corridors tend to be less problematic, although there are sections such as the A1(M) J6-J7 that are under pressure (see Table 4-3).

4.6. Freight

Road

The trunk road network in Hertfordshire is a major distributor of road freight for the UK, linking the ports in the south and east of England with origins and destinations across the UK. The ECML and East Midlands routes are both heavy transporters of rail freight, both for goods that have been off-loaded at ports and for internal carriage. The airports on the outskirts of the county also provide opportunities for air freight, including daily services for time-sensitive industries such as DHL, who operate out of London Luton Airport.

Rail

The limitation on train paths through Hertfordshire has an impact on rail freight. Coupled with rail freight generated within the county, particularly aggregates, there are substantial

through-movements from and through London, and port-related. The limited train paths and gauge restrictions through Hertfordshire and along neighbouring rail corridors increase the pressure on freight transfer associated with, and passing through, the county. Such limitations impede existing movement and suppress potential expansion to the detriment of Hertfordshire's Rail Strategy, which aims to increase the rail freight mode share including through rail freight partnerships. Increased rail freight may also increase land-use pressures along rail corridors, as additional rail freight facilities may be required.

The Freight Route Utilisation Strategy identifies the West Coast Mainline as a capacity gap. In addition it highlights the capacity restrictions within London, referred to in the Cross London Route Utilisation Strategy (RUS), as impeding rail freight[6]. The West Coast Mainline passes through western Hertfordshire, suggesting that rail freight initiatives along this rail corridor to cater for existing freight demands would not be practicable without route enhancements. The ability of freight to travel through London to and from as well as through Hertfordshire is discussed above.

[6] 'Freight Route Utilisation Strategy' Network Rail, March 2007. Page 51.

5. PROGRAMMED INFRASTRUCTURE SCHEMES

5.1. Introduction

Section 4 outlines the baseline position for infrastructure deficit anticipated at 2011, which establishes the foundation from which subsequent impact testing of RSS growth can be determined. It is important to note at this stage in the assessment process that in response to both existing and future infrastructure capacity issues, some agencies have already programmed specific network improvements for the post-2011 period.

5.2. Bus and Coach Network

5.2.1. Infrastructure

A number of interchange improvements are planned by Hertfordshire County Council and it is expected that the majority of these will take place after 2011 due to lead times for construction. They include:

- Hemel Hempstead Bus Station;
- Stevenage Bus Station; and
- Bishops Stortford Bus Station.

There are also a number of bus priority schemes and it is likely that these will be implemented over the short to medium term, i.e. both before and after 2011.

5.2.2. The Network

The HCC Bus Strategy runs from 2006/07 to 2010/11 and its 'daughter' document the Bus Network Review Action Plan identifies 20 routes where corridor treatments will be applied (see Section 4.3). As such it is anticipated that the improvements listed therein will be completed by 2011. This reflects the consultation response from the HCC Passenger Transport Unit, that it is difficult to plan for the medium to long-term for routes due to the role of the private bus operators and the reactive demands of the public to changes in land-use.

5.3. Rail Network

5.3.1. Future Network Stress

The assessment of future rail capacity is informed by DfT projections[7]. Table 5-1 confirms passenger numbers within Hertfordshire for 2002/03, in hand with an indication of journey destinations within and external to the Regional Planning Assessment area covering North & East London and the East of England.

[7] Eastern Regional Planning Assessment for the Railway (Covering North & East London and the East of England) - February 2006. DfT

Table 5-1: Rail Trips per Day from the Regional Planning Assessment Area (2002/03)

ORIGIN	Trips and Proportion of Total to Destination				Total Trips
	Within Area	Central London	Rest of RPA area	External	
Hertfordshire (W)	4,188	23,034	4,188	3,490	34,900
	12%	66%	12%	10%	100%
Hertfordshire (E)	6,258	18,178	3,874	1,490	29,800
	21%	61%	13%	5%	100%
TOTAL TRIPS	10,446	41,212	8,062	4,980	64,700
% TOTAL TRIPS	16%	64%	12%	8%	100%

Source: LENNON ticket sales data 2002/03. Reproduced from Table 4.1- Eastern Regional Planning Assessment for the railway (covering North & East London and the East of England). (Feb 2006). DfT

The 2002/03 baseline figures have informed DfT forecasts of the potential growth in daily rail trips generated in Hertfordshire for the period 2002/ 03 to 2016, shown in Table 5-2 to confirm a predicted increase for the period of 14 per cent.

Table 5-2: Forecast of Potential Growth in Rail Trips from RPA Area (Originating Trips per Day to All Destinations)

ORIGIN	2002/03 Baseline	Change 2002/03 - 2016	2016
Hertfordshire	64,700	8,910	14%

Source: Table 7.1 ERP Assessment for the Railway (2006). DfT

At a finer grain this predicted overall 14 per cent rise in passenger numbers to 2016 is informed by forecasts published by Network Rail in the ECML RUS. This provides 'constrained' and 'unconstrained' 2016 forecasts for L&SE commuter services shown in Table 5-3 for the inner Welwyn/ Hertford service group, with a marked variation between the two.

Table 5-3: Forecast Growth in L&SE Peak Passenger Journeys 2004 - 2016

SERVICE GROUP	AM peak Boarders 2004	Growth to 2016	
		Constrained	Unconstrained
Inner (Welwyn/ Hertford)	20,200	5%	14%

Source: Atkins PLANET South AM 2016 – Extracted from Fig.39 - Typical Growth at L&SE Stations – East Coast Main Line Route Utilisation Strategy (Feb 2008) – Network Rail

The values for Unconstrained Growth provide an indication of demand if crowding levels were to remain much as they are now (i.e. become no worse); it does however exclude any existing suppressed demand. Constrained Growth predicts events where additional capacity, to maintain crowding at current levels, is not provided. Constrained passenger

demand is suppressed by the available peak capacity, which increases crowding levels and would act as a deterrent to the travelling public.

Further variations can be noted from Table 5-4, where predicted Constrained and Unconstrained Growth at selected Hertfordshire Stations can be compared.

Table 5-4: Typical Growth at Hertford Stations 2004 - 2016

STATIONS	Forecast Growth 2004 - 2016	
	Constrained	Unconstrained
Outer Suburban Services		
Hitchin	9%	18%
Stevenage	7%	14%
Inner Suburban (Welwyn Route)		
Potters Bar	7%	11%
Inner Suburban (Hertford Route)		
Hertford North	13%	18%

Source: Atkins PLANET South AM 2016 – Extracted from Fig.40 - Typical Growth at L&SE Stations – East Coast Main Line Route Utilisation Strategy (Feb 2008) – Network Rail

One of the key rail features highlighted in the earlier chapter on the 2011 baseline situation and emphasised by Table 5-1 above is the attraction for journeys to London. The identification of need for future rail capacity is therefore also informed by DfT projections that focus on AM peak period arrivals at London Termini reproduced in Table 5-5.

Table 5-5: Forecast of Potential Passenger Load Factor (%), AM Peak Period Arrivals at London Termini

ROUTE	2002/03 baseline	2011	2016	2021
West Anglia	74	97	103	111
East Coast Main Line (ECML)	86	96	101	107
Midland Main Line (MML)	95	94	103	110
West Coast Main Line (WCML)	79	72	77	83
Metropolitan Line	-	-	-	-

Source: Table 7.3 ERP Assessment for the Railway (2006). DfT

It should be noted that these values are based on load factor forecasts for the whole three-hour morning peak period. The forecasts however predict Unconstrained Growth for a demand that is not evenly spread across the three-hours as there is a tendency for concentration on the peak hour (normally about 55 percent of the three-hour total). A

three-hour load factor exceeding 80 per cent therefore indicates a likely crowding problem in the busiest hour of each peak period.

The DfT suggests that much of this additional demand can be accommodated on the existing railway: through better timetabling solutions, or by managing demand into the shoulder peak period. On certain routes, substantial improvements can be delivered by relatively small-scale projects. However, major increases in peak capacity on the Midland and East Coast Main Lines require new infrastructure, which is planned to be provided by the implementation of two very large schemes: Thameslink and Crossrail.

5.3.2. Thameslink Programme and Crossrail

Thameslink Programme (Formerly Thameslink 2000)

The Thameslink Programme is a £5.5 billion investment in improved rail infrastructure and new rolling stock. It will deliver more capacity, and more journey options for passengers travelling through or to London from the North and South. In all, work will be required at 50 stations with some 4km of additional platform length being constructed before the 2012 Olympics.

The route is one of the busiest and fastest growing in the UK, with 50 per cent of regular users sometimes not able to board the train due to overcrowding[8]. 8 trains per hour (each up to 8 carriages in length) currently run through the central core section between St Pancras and Blackfriars with other services terminating at Blackfriars from the South and Moorgate from the North. The line is one of very few in the UK that requires a changeover from overhead electrical power supply (North) to third rail (South).

In all the Thameslink Programme will deliver:

- 50 per cent longer trains across the current Thameslink route (by 2012);
- New direct services, to new destinations on the Thameslink route (e.g. Cambridge to Gatwick);
- A reduction in overcrowding on the Underground, with three times as many trains travelling between St Pancras International and Blackfriars every hour (an increase from 8 to up to 24 by 2015);
- New stations and an end to bottlenecks at Blackfriars (by 2012) and London Bridge (by 2015);
- New trains across the Thameslink route – an entirely new fleet by 2015; and

[8] Source: http://www.networkrail.co.uk/aspx/1326.aspx

- Platform extensions and other improvements at around 50 stations outside central London (by 2012).

Preliminary works have started too in central London at Blackfriars and Farringdon with major works due to get underway in early 2009. The full benefits of the Thameslink Programme are anticipated by the end of 2015 with up to 24 trains per hour through central London. Scheme planning hopes to deliver better services before the Olympic Games. For example, by 2012, longer 12 car trains (50 per cent extra capacity) will run on the route between Bedford, Central London and Brighton for the first time.

Crossrail

Construction of Crossrail is due to commence in 2010 and the first trains are expected to run in 2017.

The Crossrail project will provide a new link between the Great Western Main Line and the Great Eastern Main Line with a link to Docklands and South East London. It is primarily designed to provide improved access across the capital to relieve the Central and Hammersmith & City lines, as well as improving access between Heathrow Airport, Central London and Docklands, and South East London.

The Crossrail project is designed to serve journeys running across the centre of the capital rather than those running around the suburbs. Forecasts from work associated with the Cross London RUS 2006 suggest a small reduction in passengers is probable on the North London Line as a result of Crossrail, which is largely due to the connectivity provided by the East London Line linking the North London Line to Crossrail at Whitechapel. The Cross London RUS 2006 suggest that in general terms however, the orbital routes around London serve a different market from Crossrail, and forecast a negligible change in passenger demand elsewhere on the Cross London RUS network.

5.3.3. Croxley Rail Link

Both the Thameslink Programme and Crossrail are significant strategic proposals that are likely to satisfy rail demand involving journeys to and from Hertfordshire. At a more local level Hertfordshire County Council has also identified a new Croxley Rail Link (CRL) and has received active support for the proposals from Transport for London (TfL), which owns the current Watford branch.

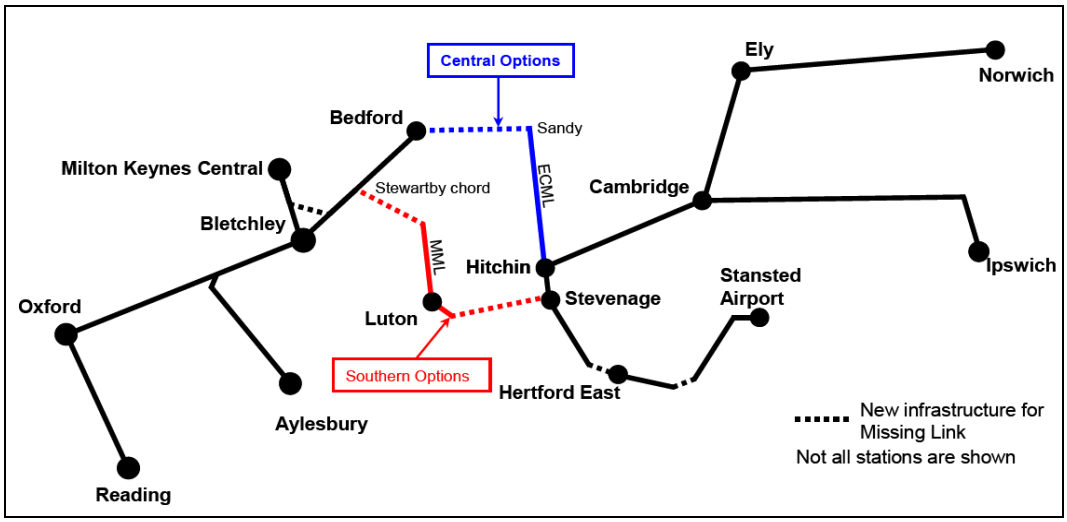
The Rail Link proposal seeks to divert Metropolitan Line Watford branch services east of Croxley station away from Watford station to Watford Junction via intermediate stations using a reopened section of presently disused track. If implemented, direct services into Watford Junction from Aylesbury would also be possible, linking Watford to the new developments in Aylesbury as well as the Chilterns to the commercial centre at Watford while also providing transport connections at the Junction to the North and other destinations.

5.3.4. East-West Rail (EWR)

At the time of writing a consultation is underway on east-west rail. 'The overarching objective of the EWR projects is to re-open the railway between the East of England and Central Southern England'.[9] The western section of the route between Bedford and Oxford is already well progressed.

The consultation is seeking views on two options, a Central and a relatively recently emerged Southern option, to identify a preferred route. At this early stage it would appear that the Southern option would be more appropriate to Hertfordshire as it would have a greater population catchment and would help to achieve a number of key objectives such as improving east-west links across the county and travel between Luton and Stansted Airports.

Figure 5-1: East-West Rail Consultation Options[10]



5.3.5. Post-2011 Summary of Rail Infrastructure Prospects

A summary of the main issues identified in relation to future rail prospects for Hertfordshire is presented in Table 5-6.

[9] 'East West Rail Central Section – Operating Case: Discussion Paper', Steer Davies Gleave for the East West Rail Consortium, February 2009. Page 1.
[10] 'East West Rail Central Section – Operating Case: Discussion Paper', Steer Davies Gleave for the East West Rail Consortium, February 2009. Page 3.

Table 5-6: Post-2011 – Summary of Future Rail Infrastructure Prospects

EAST COAST MAINLINE (ECML)	Source: RUS 2008
Challenges ~ Expected to be substantial in almost all the markets served by route as a result of growth over the next 10 years, principally associated with volume of traffic and reliability of services. ~ In 2016 predicted there will be high levels of crowding on approaches to London, notably on inner suburban services via Hertford Loop and outer suburban services from Stevenage and beyond. ~ Most pressure will be experienced where route already busiest, on its southern half. Anticipated that some growth can be accommodated within existing train services (lengthening of some trains contained in strategy) but additional passenger and freight trains will be required.	
Strategy ~ Short-term: Timetable solutions to optimise use of existing infrastructure. ~ Medium term (2009-2014): Investment in longer passenger trains at peak times where practical (for example, many London commuter services),. ~ Increase and improve long-distance passenger services throughout day and provide capacity for freight growth. ~ Expand infrastructure capacity around main bottlenecks on route.	
Solutions ~ Strategy takes account of wide variety of changes underway on this long and complex route. Most significant among these are: ~ Improvements to timetable and capability of parallel route via Hertford – will maximise use of main line capacity and contribute to flexibility and resilience of railway on its approach to London. ~ The Thameslink Programme (due to becompleted in 2015): Will link outer suburban services from ECML directly via St Pancras International to City of London, as well as wide range of destinations further south. ~ New Intercity Express trains to be introduced to the route. Should be in use on majority of long-distance services by 2020.	
London Inner Suburban Services ~ Current three-car services to be run at full six-car length – requires work to upgrade power supply. ~ Additional six-car AM and PM peak inner suburban services operated to/ from Moorgate with priority to Hertford North route. Will require significant range of infrastructure enhancements. ~ Additional inner suburban services running between peaks, at evenings and weekends to move towards all-day frequency of 4 trains per hour on Hertford and Welwyn routes. ~ Inner suburban services on the Hertford Loop less disrupted by diversions when there is engineering work or other disruption on route via Welwyn, because of improvements to capability of route via Hertford North. **London Outer Suburban Services** ~ Peak services that are currently eight cars long will increasingly be run at full 12-car length – requires works to upgrade power supply, provide additional stabling and maintenance facilities, and lengthen platforms at a number of stations. ~ Much of this work within scope of Thameslink Programme, but likely to be needed before the Programme currently plans to deliver it. Network Rail will work with the Department for Transport to prioritise those items that are within the scope of the Programme and develop schemes to deliver other enhancements required to deliver HLOS outputs for 2014. ~ Services will be less disrupted by engineering work or other disruption on the route via Welwyn, through improvements to the capability of diversionary route for this section via	

Hertford North.

Long Distance Passenger Services To/From London

~ Additional long distance high-speed passenger services running to and from Kings Cross in peak (up to 8 trains per hour) and off-peak (6 trains per hour) in a standard hour or two-hour repeating timetable.

~ Best delivered as combined approach that also caters for medium-term freight growth through investment in infrastructure capacity between Peterborough and Doncaster.

~ Infrastructure enhancements required south of Peterborough to enable peak level of service to operate reliably. This approach will meet expected growth, while creating potential to improve connectivity, make best use of capacity and reduce long-distance journey times.

~ Long-distance passenger services will be less disrupted by engineering work or other disruption on the route via Welwyn, through improvements to the capability of the diversionary route for this section via Hertford North. Pre-series Intercity Express trains are expected to be introduced on some services.

Freight

~ See above.

Critical Elements

~ Thameslink Key Output 2, which connects the ECML to the Cross London tunnels, will not be complete until 2015 – enabling works will be carried out during the preceding years.

~ RUS identifies elements of the Thameslink Programme, particularly improvements to the power supply, platform extensions at outer suburban stations, and additional stabling and maintenance facilities, as being critical to delivery of required outputs during the years 2009 – 2014.

EAST MIDLANDS MAINLINE **Source: RUS 2004**

Challenges

~ Current RUS 2004 covers period to 2009, with no reliable forward projections.

~ RUS for East Midlands not due for publication until Summer 2009.

Strategy

~ In terms of Hertfordshire the impact of the Thameslink Programme (see main text above) is significant and is likely to form a substantial part of the rail strategy to accommodate commuter trips to London along this corridor.

~ Further detail should emerge with the publication of the new RUS.

GREATER ANGLIA **Source: RUS 2007**

Challenges

~ Serves a region forecast to experience very high levels of growth over next 15 years, particularly on West Anglia/ M11 corridor. Driven by a number factors, including housing allocation in RSS, increases in central London employment, importance of regional economic centres (especially Cambridge and Norwich), expansion plans for Stansted Airport and development of region's main ports.

~ Many peak trains severely overcrowded: problem worst on West Anglia services from Cambridge and particularly acute on Great Eastern (GE) inner suburban services.

~ Most routes already operating at or close to capacity – makes reliable operation on many routes challenging. Also limits options for dealing with growth without sizeable interventions.

Strategy

~ Recommended strategy for handling predicted number of passengers on route during peak is:

~ Train lengthening on inner-suburban services to 9-car length in peak with new high capacity rolling stock with Selective Door Opening (SDO) to avoid high cost of remodelling at Stoke Newington.

~ Re-introduction of shuttle service between Cheshunt and Seven Sisters to increase service frequency to a minimum of four trains an hour at all stations on Southbury Loop with power operated turnback at Seven Sisters to maintain performance.

- ~ Train lengthening on outer-suburban services from Cambridge and Stansted Airport to 12-car length.
- ~ Increasing service frequency on main line route by six trains an hour – two to Liverpool St via Hackney Downs; four to Stratford.

Solutions

Infrastructure Required

- ~ Some work on inner stations to meet modern standards for 9-car working.
- ~ Work extending a number of platforms at outer-suburban stations to handle 12-car trains.
- ~ New island platform at Cambridge to facilitate 12-car running on this and GN route. Power supply upgrades and additional berthing needed.
- ~ Four-tracking of main line route between Coppermill Junction and Broxbourne Junction necessary in CP5.

2009-2014

- ~ Increased service frequency on GE route and train lengthening on all three routes into London during morning peak. Requires modest changes to infrastructure. Works to improve performance on West Anglia and Great Eastern routes planned. Initial work on development of major capacity scheme on West Anglia route also planned.
- ~ 12-car trains to be introduced on West Anglia outer-suburban services between Cambridge and Stansted Airport and London Liverpool Street.
- ~ All remaining platforms on route extended for 12-car trains (a number already have 12-car platforms) and new island platform at Cambridge (allowing 12-car services to operate on both West Anglia and Great Northern routes). Additional berthing capacity and upgrades to power supply recommended facilitating this. Some track circuit works also necessary.
- ~ Proposals to run trains of up to 9-car length on all West Anglia inner-suburban services (i.e. Chingford, Enfield Town, Cheshunt via Southbury and Hertford East services) to accommodate peak demand is re-introduced.

2014-2019

- ~ On each route into London continuation of train lengthening to accommodate increasing passenger demand. Most train lengthening anticipated in CP5 will be during shoulder peak hours (as most or all high-peak trains will be running at full length by then) and so less effective at providing for passenger needs than train lengthening proposed for CP4.
- ~ On West Anglia running of up to an additional six trains an hour at peak times.
- ~ A second rail tunnel needs to be built and additional platform edge provided to increase capacity into and out of Stansted Airport. Will allow some extra trains to run between airport and Liverpool St – provides long-term solution to address predicted increasing passenger demand on route anticipated as M11 corridor and Stansted Airport develop.

West Coast Mainline **Source: RUS Scoping Study 2008**

Strategy
~ Details of future infrastructure are anticipated to emerge from a study to deliver a new RUS. The RUS will cover lines on Strategic Route 18, which includes the West Coast Main Line from London Euston to Carstairs via Trent Valley and Crewe for approximately 600km. ~ The study for the RUS was scheduled to commence in December 2008 to allow the new December 2008 timetable to be used as the 'baseline'. The work is anticipated to take approximately 22 months. ~ The output will be the rail industry's preferred strategy for railway regulatory Control Periods 4 (2009-2014) and 5 (2014-2019) in the context of strategic priorities and considering likely requirements over 30-year period from 2009. ~ Of particular interest in the context of Hertfordshire will be any proposals for improvements focused on: ▪ London to Hemel Hempstead, Berkhamsted, Milton Keynes and destinations North; ▪ Watford Junction to St Albans Abbey (Designated as a 'Community Rail' line); and ▪ Camden Junction to Watford Junction DC electric lines.
CROSS LONDON **Source: RUS 2006**
Challenges
~ For the passenger market, overcrowding will be particularly acute on the North London Line between Hackney Wick and Camden Road; on the Gospel Oak - Barking line between Leytonstone High Road and Blackhorse Road; and on the West London Line between Clapham Junction and West Brompton. ~ For freight, the need to grow on existing routes, and the need for more intensive use of the Gospel Oak - Barking and Felixstowe - Nuneaton routes identified – but gauge and capacity improvement works required. ~ Beyond 2014 not possible to identify infrastructure deliverable within the scope and timeframe of this RUS that would accommodate TfL aspiration of four trains per hour on each of a number of overlapping routes as well as existing freight traffic. However, recognised that if TfL's proposals could be delivered they would generate significant socio-economic benefits.
Strategy
~ Substantial element of overall strategy is use and development of existing capacity to deliver an increasingly intensive mixed traffic timetable with the levels of performance and sustainability required. ~ The RUS proposes increasing the frequency of passenger train services on these lines between 2009-2014. ~ In looking to the future, strategy seeks to take forward development of acceptable alternative opportunities for freight traffic, proposing what may eventually become a rail freight bypass for London. ~ Transport for London has highlighted its aspirations in this regard and is taking forward this proposal through the franchising process for the new London Rail Concession, which is due to commence in 2007. The medium term service enhancements are due to commence in 2011.

5.3.6. The Future for Rail Beyond 2021

While the East of England Plan is based on the assumption that out-commuting is reduced through sustainable policy objectives, the scale of development, even if it fully materialises, is unlikely to prevent continued commuting between Hertfordshire and London.

Overall the predictions for rail capacity suggest that in the absence of adequate network improvements to cater for unconstrained passenger demand up to 2016 and beyond,

there is likely to be a limit to the attractiveness of rail as a travel mode for Hertfordshire residents; this could encourage more journeys by private car and as a consequence reduce available on the capacity of the road network and check sustainable travel aspirations supporting growth.

Options for longer-term solutions to growth in the RPA area beyond 2021 will need further consideration. The DfT suggests the need to investigate:

- Scope for improved signalling technology to allow more trains to be run on existing lines; and
- The potential for double-deck trains.

Alternatively, the construction of new strategic railway lines, such as a north to south high speed line, which would serve growth in the RPA area by putting fast inter-city services onto a new line and free capacity on the existing lines for the expansion of freight capacity and passenger services serving regional demand. The DfT will consider this option amongst others in due course.

5.4. Road Network

5.4.1. Highways Agency

Published information confirmed that there are several HA schemes that will affect the area. To confirm our understanding URS consulted the Highways Agency (HA) to determine its programme of schemes in the pipeline that will help shape Hertfordshire. The HA confirmed that these are:

- M1 Dual 4 Junctions 6A to 10; and
- M25 Dual 4 Junctions 16 to 23 and 23 to 27.

5.4.2. Hertfordshire County Council

HCC has a number of highways schemes identified for implementation after 2011. The little Hadham bypass has a preferred alignment and is the subject of a Regional Funding Allocation bid. The A120 strategy would see the widening of the existing Bishops Stortford bypass if traffic levels require it, although this would be the last stage of a traffic management plan for the corridor between the A10 and M11. Proposals for a bypass at Water End, north of Hemel Hempstead, also exist but these are at a very early stage. It is also understood that consideration has been given to a Royston southeast bypass although again this is at a very early stage.

5.5. EERM Model Structure Post-2011

A number of programmed schemes have been included in future year testing of the EERM model and as a consequence it is important to confirm the list of schemes to 2011, 2021 and 2031, which have been assumed within the modelling work. These are as far as practicable representative of the current intentions of, for example, the Highways

Agency. It is important to record the inclusion of these schemes in the model as they effectively provide a new 'baseline' position for 2021 and 2031.

It should be noted however that there are many other schemes that have been identified during the course of this project and Appendix B provides the list of all schemes and measures (collectively, the 'interventions') credited with some programme status that have emerged from the document review, dialogue with local authority officers and at various workshops. Together these form an inventory of potential network improvement schemes that have improved understanding of 'historic deficit' and future demands. They highlight the prospect for other schemes to address growth and historic deficit and have informed the subsequent evaluation and selection process that has delivered the final infrastructure scheme listing.

5.6. EERM Programmed Infrastructure listing

Table 5-7 lists the road schemes that have been assumed and incorporated into the EERM modelling work to date as part of the baseline for this study (subject to scheme implementation dates). Table 5-8, Table 5-9, and Table 5-10 go on to list EERM 'Buffer' schemes (road schemes coded in the more peripheral areas of less modelling detail), bus, and rail schemes respectively. Highway schemes in Hertfordshire are highlighted in red.

Table 5-7: Core Modelled EERM Highway Schemes

SCHEME NAME	Included in:			
	2005	2011	2021	2031
A14 J7 (Kettering) Imp.	Y	Y	Y	Y
A47 Thorney Bypass	Y	Y	Y	Y
M25 J12-15 Widening	Y	Y	Y	Y
A10 Wadesmill to Collier's End Bypass	**Y**	**Y**	**Y**	**Y**
A11 Attleborough to Roudham Dualling	Y	Y	Y	Y
A120 Stansted to Braintree	Y	Y	Y	Y
A142 Fordham Bypass	Y	Y	Y	Y
A4146 Stoke Hammond Northern Link	Y	Y	Y	Y
M11 J8 Slip Road Improvements	Y	Y	Y	Y
West Thurrock Regeneration Route	Y	Y	Y	Y
A421 Great Barford Bypass	N	Y	Y	Y
A505 Baldock Bypass	**N**	**Y**	**Y**	**Y**
M11 J8 / A120 Slip Road Imp.	N	Y	Y	Y
South Lowestoft Relief Road and Related Measures	N	Y	Y	Y
A11 Attleborough Bypass Dualling	N	Y	Y	Y
A1198 Papworth Everard Bypass	N	Y	Y	Y
A4146 Linslade and Stoke Hammond Bypass	N	Y	Y	Y
A428 Caxton Common to Hardwick	N	Y	Y	Y
A131 Dualling between A120 - A131 near Braintree (Great Notley)	N	Y	Y	Y
A1 Peterborough to Blyth Grade Separated Junctions	N	Y	Y	Y
A1081 Luton South Circular Imp' ts (East Luton Corridor)	N	Y	Y	Y
A12/M25 Brook Street Interchange	N	Y	Y	Y
A14 Haughley New St, Stowmarket	N	Y	Y	Y
A507 Ridgmont Bypass and Woburn Link	N	Y	Y	Y
M1 Dual 4 Junctions 6A-10	N	Y	Y	Y

SCHEME NAME	Included in:			
	2005	2011	2021	2031
A1073 Spalding to Eye	N	Y	Y	Y
A421 Dualling M1 to Bedford	N	Y	Y	Y
M1 J19 Improvements	N	Y	Y	Y
A12/A134 New Junction	N	Y	Y	Y
A43 Corby Link Road	N	Y	Y	Y
A509 Isham Bypass	N	Y	Y	Y
M1 J10-13 Widening	N	Y	Y	Y
M25 Widening to Dual 4 Junctions 27-30	N	N	Y	Y
A13 Sadler's Farm Junction Improvements	N	N	Y	Y
Dunstable Northern Bypass (A5-M1 Link)	N	N	Y	Y
A11 Fiveways to Thetford	N	N	Y	Y
A14 Cambridge to Huntingdon	N	N	Y	Y
A47 Blofield to North Burlingham Dualling	N	N	Y	Y
M1 Junction 14 improvement	N	N	Y	Y
Norwich Northern Distributor Road	N	N	Y	Y
M25 Widening to Dual 4 Junctions 16-23	**N**	**N**	**Y**	**Y**
M25 Widening to Dual 4 Junctions 23-27	**N**	**N**	**Y**	**Y**
A421 Milton Keynes - M1 Widening	N	N	Y	Y
A120 Dual 2 Braintree to A12	N	N	Y	Y
M11 J9-14 Widening	N	N	Y	Y
M11 Dual 3 Lane Junctions 8-9	N	N	N	Y
A12 Hatfield Peverel to Witham Link Road	N	Y	Y	Y

Source: Faber Maunsell

Table 5-8: EERM Buffer Network Schemes

SCHEME NAME	Included in:			
	2005	2011	2021	2031
M42 J3-7 ATM	N	Y	Y	Y
M25 J1B-3 Widening	N	Y	Y	Y
M1 J25-28 Widening	N	Y	Y	Y
M25 J5-7 Widening	N	N	Y	Y
M54 to M6 Birmingham Northern Relief Road Link	N	N	Y	Y
M1 J21-25 Widening	N	N	Y	Y
M1 J28-30 Widening	N	N	Y	Y
M1 to M69 Link Roads and Widening to M1 J21A	N	N	Y	Y
M6 Toll Road (Birmingham Northern Relief Road)	Y	Y	Y	Y
M25 J12-15 Widening	Y	Y	Y	Y
A1073 Spalding to Eye	N	Y	Y	Y

Source: Faber Maunsell

Table 5-9: EERM Core Bus Schemes

SCHEME NAMES	Opening Year
A13 Passenger Transport Corridor (Phases 1-3)	2005
Stansted - London (Snowdrop) - Increased frequency to hourly	2006
Stansted - London (EasyBus) - Increased frequency to half hourly	2006
Stansted - London (A51) - Increased frequency to half hourly	2006
Cambridge/St Ives/Huntingdon Guided Bus	2009
Luton/ Dunstable Translink	2010
Witham to Maldon Quality Bus and Coach Corridor	2010
Colchester to Stansted Quality Bus and Coach Corridor	2010
Chelmsford to Harlow Quality Bus and Coach Corridor	2011
Colchester Northern Approaches Busway	2011
Southend to Stansted Quality Bus and Coach Corridor	2011
Canvey Island, Basildon and Chelmsford Quality Bus and Coach Corridor	2011
Colchester Northern Approaches Park and Ride	2011
Service 717/ 797 (Norwich-Stansted) - Increased frequency to hourly	2014
Service 727/ 797 (Cambridge-Stansted) - Increased frequency to half hourly	2014
Service 757 (Oxford) - Increased frequency to hourly	2014
Service X22 (Colchester/Ipswich) - Increased freq to half hourly & extended to Ipswich	2014
Service 777 (Birmingham) - Increased frequency to hourly	2014
New service - Stansted - Nottingham (2 hourly)	2014
New service - Stansted - Peterborough (2 hourly)	2014
New service - Stansted - Southend (Hourly)	2014
New service - Stansted - North Kent (2 hourly)	2014
New service - Stansted - Watford - (Hourly)	2014
South Essex Rapid Transit	2015

Source: Faber Maunsell
Note: Schemes agreed with Go-East in e-mail correspondence of 15th February 2007

Table 5-10: Core Rail Schemes

SCHEME NAME	Included in:		
	2015	2021	2030
ONE services update	Y	Y	Y
Background network update	Y	Y	Y
London Underground (LUL) services update	Y	Y	Y
Dockland Light Rail Extension network and services update	Y	Y	Y
East London Line Extension network and services update	Y	Y	Y
Thameslink 2000 (T2000) service update	Y	Y	Y
CTRL Domestic service update	Y	Y	Y
Integrated Kent Franchise (IKF) service update	Y	Y	Y
ICEC (GNER) service update	Y	Y	Y
Southern service update	Y	Y	Y
WAGN services update	Y	Y	Y
Heathrow Connect services update	Y	Y	Y
West Coast Mainline services update 2005 Dec Timetable	Y	Y	Y
South Western re-franchising services update	Y	Y	Y
Thames Train re-franchising services update	Y	Y	Y
Chiltern Trains re-franchising services update	Y	Y	Y
Silverlink re-franchising services update	Y	Y	Y
Global bus frequency update	Y	Y	Y

Source: Faber Maunsell

6. NO RSS GROWTH IN HERTS: 2021^{RC} REFERENCE CASE

6.1. Introduction

The object of the exercise described in this chapter was to help address some of the issues that had been raised in the course of this study about attributing costs to schemes to inform the process of calculating a viable Community Infrastructure Levy (CIL) charge[11]. Transport is more of a 'grey area' in this respect, for the following reasons.

- The adverse effects of increased transport demand are not necessarily focused on areas of high population growth: it depends on the demand distribution, and what is in the area already in terms of population and infrastructure;
- Cross-boundary effects are arguably not necessarily a consequence of growth in Hertfordshire. The LTP notes that it is a county subject to high levels of both longer-distance commuting, and genuine through traffic, which will both be affected by growth surrounding the county;
- There is the issue of the large schemes that will not realistically be funded by CIL, such as motorway widening, major rail improvements, and also the extent to which other sources, such as RFA, TIF etc might fund county/ regional initiatives; and
- Related to the last point, transport corridors that extend across Districts make it more difficult to be District-specific when considering the agencies that may bear the costs.

To help disentangle some of these issues, especially those related to cross-boundary impacts, an intermediate 2021 EERM run was commissioned that included 2021 RSS growth (as currently represented in the model) in all areas except the county itself. Within the county zero growth beyond the 2011 background level was assumed. It also assumed that all infrastructure that is significant enough to be modelled in EERM, and planned for 2021, was in place, both in Hertfordshire and elsewhere.

To avoid confusion the intermediate 2021 EERM model that excluded proposed RSS Growth for Hertfordshire was referenced as the '2021 Reference Case' (**2021^{RC}**).

6.2. Effect of Programmed Schemes to 2021^{RC}

Section 4.5 incorporated Table 4-3 to provide a summary performance of the strategic and intra-urban road deficit acknowledged by EERM for 2011. Table 6-1 built on this to offer a direct comparison with the 2021^{RC} AM Peak model output. It used the same colour coding system to inform the extent to which the various programmed schemes for 2011-2021 addressed network shortcomings and more significantly whether external

[11] For a detailed explanation and discussion of CIL charging refer to the Lot 1 report of the HIIS.

background growth alone had eroded any new capacity that could be anticipated from this scheduled new infrastructure. A comparable network map is included as Figure E 2.

6.2.1. Motorway Network

On the motorway network there is generally little change between the 2011 and the 2021^{RC} case, which suggests that in relation to Hertfordshire planned capacity improvements could be absorbed by general background traffic growth. Generally the links identified in 2011 as exceeding a V/C threshold of 80% or more either remain in the same category or deteriorate further. There are notable exceptions on the M25 (clockwise) J21-21A and (anti-clockwise) J24-23, and J22-18, where improvements are predicted. It is reasonable to attribute this to the proposed widening schemes for J16-23 and J23-27.

At motorway junctions there are again many similarities between the two cases with a notable worsening of conditions at M25 J21, 22, 23 and 25.

In terms of the A1(M) both the northbound (J6 -7) and southbound (J7-6) are predicted to experience a V/C in excess of 100% during the AM peak. Of the other links identified with a V/C of 80-100% in 2011, nearly all remain in the same category, although southbound J4-3 moves into the 80-100% banding by 2021. A comparison of the various junctions highlighted with capacity issues in 2011 shows no change or improvement by 2021.

6.2.2. Other Road Corridors

In common with the Motorway network there is generally little change evident from a comparison of the various link and junction performances across the respective years. Improvements are registered at the A5 Flamstead, but otherwise the picture remains unchanged with the category identified in 2011 remaining in 2021. Conditions are predicted to deteriorate at the A10/ M25 junction at Waltham Cross and the A405/ M1 J6 junction at Bricket Wood, both of which join other locations in the list that present a V/C in excess of 100%.

While it is acknowledged that the 2021^{RC} is not a realistic scenario, it does show that if no RSS growth happened to 2021 within the county, the programmed infrastructure to 2021 would not be effective at solving problems, and therefore once RSS growth is added (Section 1), these problems are likely to worsen. The increase in highway network stress between these two scenarios can therefore be largely attributable to a legacy of historic deficit and the added pressure of external RSS and background growth having an impact on Hertfordshire.

Table 6-1: Comparative Summary of Strategic and Intra-urban Road Deficit 2011 with 2021[RC] 'Reference Case'

ROAD CORRIDOR	2011	2021[RC]
M1		**(Junction 4 – 9)**
Mainline – Northbound		
J6A – J7		
J8 – J10		
Mainline – Southbound		
J10 – J9		
J9 – J6A		
J6 – J4		
Junctions	2011	2021[RC]
J5 (M1 NB & SB Off Slips)		
J6 (M1 SB On Slip), **J6A** (M1 NB On Slip) and **J9** (A5 NW Approach)		
M25		**(Junction 17 – 26)**
Mainline – Clockwise		
J17 – J19		
J19 – J20		
J20 – J21		
J21 – J21A	▲	
J22 – J24		
J24 – J26		
▲ Approach M1 Merge Only		
Mainline – Anti-Clockwise		
J26 – J24		
J24 – J23		
J23 – J22		
J22 – J21A		
J21 – J20		
J19 – J18		
J18 – J17		
Junctions	2011	2021[RC]
J20 (A41 Approach)		
J21 (M25 EB Off Slip to M1), **J23** and **J25** (WB Off Slips)		
J22 (Circulating)		
A1 (M)		**(Junction 1 – 10)**
Mainline – Northbound		
J1 – J3		
J6 – J7		
Mainline – Southbound		
J7 – J6		
J4 – J3		
J3 – J1		
Junctions	2011	2021[RC]
J1 (M25 J23 – A1(M) SB Off Slip), **J7** (Circulating), and **J9** (SB On Slip)		
J3 (NB On Slip, SB and NB Off Slips, Circulating), and **J8** (SB Off Slip)		
A1		
BOREHAMWOOD: A1/A5135 Junction (SB Off Slip and SE Rowley Lane App.)		
BOREHAMWOOD: A1/A411 Stirling Corner Junc (A1 N and A411 E & W Apps.)		
A5		
MARKYATE: A5/B4540 Junction (A5 N and B4540 NE Luton Road Approaches)		
FLAMSTEAD: A5/M1 J9 (A5 NW Approach)		
A10		
WALTHAM CROSS: A10/M25 J25 (A10 N & S Approaches)		
CHESHUNT: A10/Church Lane Junction (Church Lane E Approach)		
ROYSTON: A10/Melbourn St Junction (Melbourn St W Approach)		

ROAD CORRIDOR	2011	2021[RC]
A41		
BERKHAMSTED: A41/A416 Junction (A416 N Approach)		
BERKHAMSTED: A41/A4251 Junction (A41 W Approach to A4251 On Slip)		
KINGS LANGLEY: A41/M25 J20 (A41 NW Approach)		
WATFORD: A41/A412 Junction (All Approaches)		
WATFORD: A41/A4008/M1 J5 (A4008 SW Approach)		
BUSHEY: A41/A5183/A5 Junction (A41 NW Approach)		
A120		
LITTLE HADHAM: A120 Standon Rd/ Stortford Rd/ Albury Rd Junc (All Apps.)		
A405		
BRICKET WOOD: A405/M1 J6 (A405 NE Approach)		
ST ALBANS: A405/A5183/A1081/M1 J10 (A5183 N Approach)		
A411		
WATFORD: A411/A412 Junction (A411 E Approach)		
WATFORD: A411/A4178/Beechen Grove I/C (Note: limited modelling detail)		
BUSHEY: A411/A409 Junction (A411 E and A409 S Approaches)		
ELSTREE: A411/A5183 Junction (A5183 N Approach)		
ELSTREE: A411/Furzehill Road Junction (Furzehill Road NW Approach)		
BOREHAMWOOD: A411/A1 Stirling Corner (A411 E & W and A1 N Approach)		
A414		
HEMEL HEMPSTEAD: A414/A4251 Junction (A414 N Approach)		
HEMEL HEMPSTEAD: A414/A4146 Junction		
HEMEL HEMPSTEAD: A414/A4147 Junction (All Approaches)		
HEMEL HEMPSTEAD: A414/Green Lane Junction (A414 E Approach)		
ST ALBANS: A414/A1081 Junction (A1081 NW Approach)		
HATFIELD: A414/A1(M) J4 (A414 E Approach)		
WELWYN GARDEN CITY: A414/B1455 Junction (B1455 SE Approach)		
HERTFORD: A414/A119(W) Junction (A414 E & W and A119 N Approaches)		
HERTFORD: A414/B158 Junction (A414 E & W Approaches)		
HERTFORD: A414/A119(E) Junction (A414 SE Approach)		
A505		
LETCHWORTH: A505/A6141(W) Junction (A505 W Approach)		
LETCHWORTH: A505/Norton Way S/Willian Way Junction (A505 E & W Apps.)		
HITCHIN: A505/St Michael's Road Junction (A505 W Approach)		
HITCHIN: A505/B656 Junction (A505 E & W Approaches)		
HITCHIN: A505/A602 Junction (A505 E & W Approaches)		
HITCHIN: A505/B655 Junction (A505 W and B655 W Approaches)		
A507		
No major problems highlighted for this road within Hertfordshire.		
A602		
HITCHIN: A602/B656 Junction (A602 NW and B656 N Approaches)		
STEVENAGE: A602/A1(M) J8 (A602 W & SE Approaches)		
STEVENAGE: A602/A1072 Junction (A602 N and A1072 E Approaches)		
WATTON: A602/A119 Junction (A602 N Approach)		
WARE: A602/B158 Junction (A602 N Approach)		

ROAD CORRIDOR	2011	2021[RC]
A1184		
SAWBRIDGEWORTH: A1184/Station Road/West Road Junc. (A1184 S App.)		
SAWBRIDGEWORTH: A1184/High Wych Road Junction (A1184 N Approach)		
A1198		
No major problems highlighted for this road within Hertfordshire.		

7. IMPACT OF RSS GROWTH POST-2011

This section gives a brief summary of the likely state of the transport network in the periods up to 2021 and 2031 assuming no new infrastructure beyond that programmed. In some respects this is an academic benchmark because it is highly unlikely that there would be no further investment in the transport network above that identified in Section 5 given the substantial growth in housing that is anticipated for Hertfordshire. Interventions that have been identified to cater for growth have been tested and are reported later in Section 10.4.

7.1. Growth Locations

7.1.1. Masterplanning 2021^{MP} 2031^{MP}

In 2004 the EERM model was used to assess the strategic impact of RSS growth to both 2021 and 2031. To estimate the zonal distribution of RSS growth at that time, URS understand that each district was provided with an EERM zone plan with a request to supply a best estimate of the new RSS development distribution to 2021 and 2031. Following the subsequent review of RSS targets, this growth was increased accordingly on a pro-rata basis, without recourse to the districts to repeat the previous exercise in respect of the new targets. The existing modelled EERM representations of 2021 and 2031 are therefore based on the district planners' best estimate of growth distribution at 2004.

To refine and update the process a more detailed Masterplanning exercise was undertaken by the Lot 1 consultants. This provided indicative masterplans and detailed demographics for each district to the required timeframes of 2021 and 2031. URS undertook an exercise to distribute these revised demographics across the zones of the EERM, allowing an assessment of the new travel patterns generated by population growth across the county.[12]

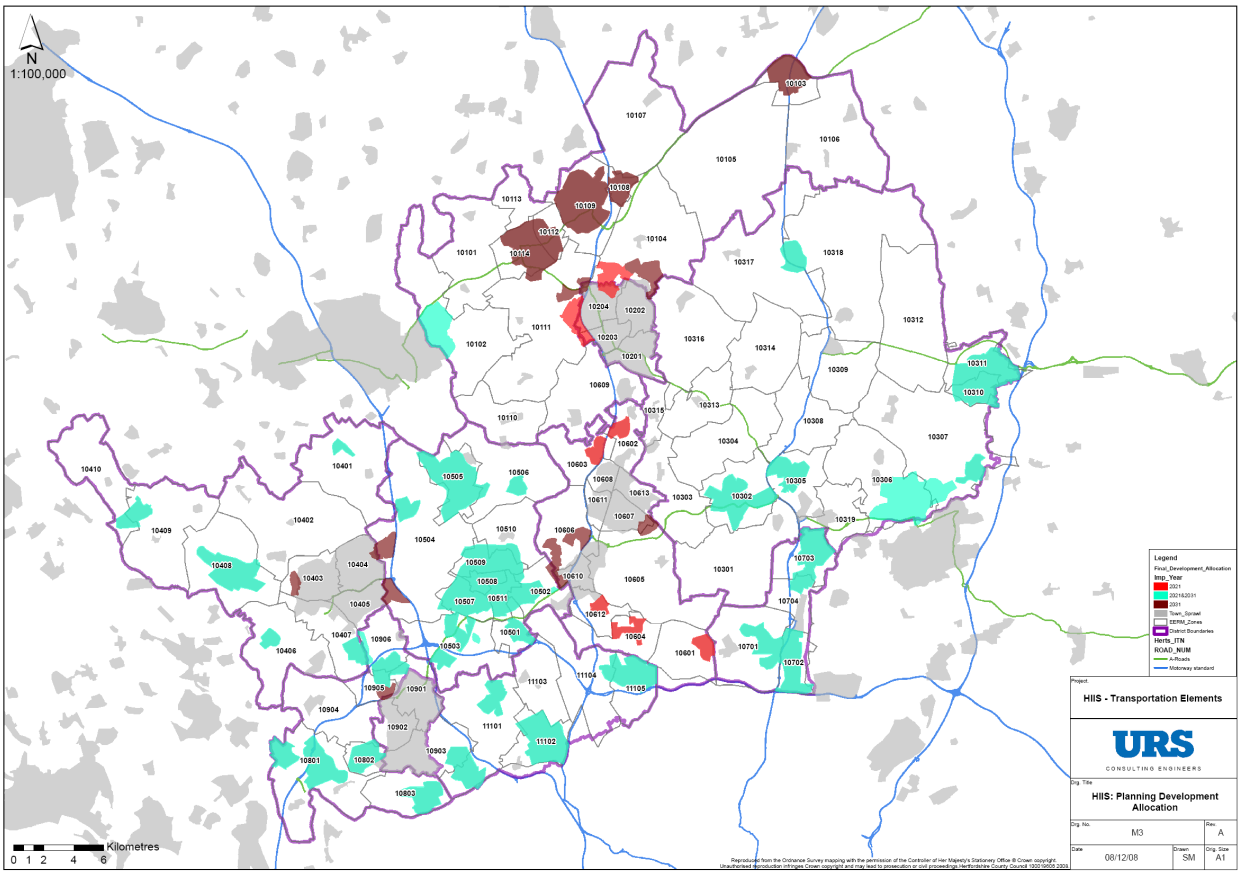
The subsequent output from the updated EERM models with masterplanning data was used to define a new 'Base Case' for the predicted highway network in 2021 and 2031. While these included revised land allocations they specifically excluded any new transport network improvements to supplement those already identified in Section 5.6.

For clarity and future reference these versions of the EERM model output with masterplanning revisions for 2021 and 2031 were referenced as **2021^{MP}** and **2031^{MP}**, as appropriate. It is important to note that these versions of the model excluded the impacts of further network improvements, but formed the benchmark against which to test the impact of proposed scheme interventions.

[12] A draft note indicating the process for this was issued to the client in December 2008, 'PN009_HIIS Zone allocation'.

Figure 7-1 shows the location of RSS growth provided to URS in a series of masterplanning options and spreadsheets. Red areas indicate growth before 2021, brown areas relate to growth between 2021 and 2031, and green areas illustrate growth occuring across the whole period. The numbers in the Figure are the zone numbers in the EERM to which growth was allocated for modelling purposes.

Figure 7-1: Growth Locations



7.2. Transport Network 2021

7.2.1. Walking and Cycling

At existing levels there would be approximately £7m investment in the cycling network between 2011 and 2021. This is likely to be insufficient to cater for the present requirements laid out in the HCC cycling strategy and the cycling network will therefore fall short of the standard required of it once RSS growth is in place. The requirement that all cycling infrastructure would benefit from being in place by 2021 (to facilitate a change in travel behaviour amongst both new and existing residents) compounds the issue.

Walking is the most flexible of modes in terms of routeing and as such there is unlikely to be any substantial lack of walking facilities away from development sites. However a change in travel behaviour, encouraging more people to walk either for part or all of their

journey, is unlikely to be forthcoming without investment in infrastructure that will provide for them directly and indirectly (such as cycle routes) by improving the walking environment.

7.2.2. Bus & Coach Network

Modelling shows that congestion on the road network will continue to worsen without interventions. This would result in an adverse impact on bus services, with increased journey times and unreliability. Furthermore, existing infrastructure and routeing is not capable of providing for the demands of RSS growth and this will lead to a disinclination to use the bus and coach network where travellers have a choice.

7.2.3. Rail

The rail network is currently over capacity in some locations and approaching capacity in others (see Section 5.3). Existing planned investment will go some way to alleviating this but by 2021 it is anticipated that capacity will have been reached and will act as a cap on further travellers switching modes to the train, expecially during peak periods.

7.2.4. Highway Network

The highway network is severely over capacity in some locations with congestion prevalent on many routes, the principal cause being junctions of strategic and regional importance (see Table 4-3). This is exacerbated by RSS growth with existing congestion worsening and a number of new locations on the road network nearing or exceeding capacity (presented later in Table 10-2 in Section 10 which discusses interventions required to meet travel demand). Despite substantial investment from central government the EERM suggests that congestion will remain on the M1 and M25 as well as on inter-urban county routes, in part at least as a result of RSS growth.

7.3. Transport Network 2031

7.3.1. Walking and Cycling

The deficit experienced by the walking and cycle network prior to 2021 would be maintained post-2021 without interventions. The impact of the lack of investment would be greater as RSS growth is completed.

7.3.2. Bus & Coach Network

Without investment in infrastructure and improvements to bus routes the bus and coach network would increasingly be unable to cope with the demands imposed by RSS growth post-2021.

7.3.3. Rail

Because peak-time capacity will have been reached on the rail network by 2021, in the absence of further strategic investment, it is unlikely that the population from RSS growth beyond 2021 will seek to use this mode of transport unless they consider that they have no alternative. This is likely to mean increased road traffic.

7.3.4. Highway Network

Deficit on the highway network in 2031 is presented in Table 10-3 later in the report. It indicates that without further investment the impact of RSS growth post-2021 is to further exacerbate congestion on key corridors and around the KCDCs (see Figure 9-1 for a graphical overview).

8. INFRASTRUCTURE DEFICIT COSTS

Previous sections have identified the baseline conditions on the transport network and assessed the impact of RSS growth assuming that there are no transport interventions except for those already committed. This section discusses the costs of infrastructure where these interventions (excluding those suggested by URS) will solely address historic deficit. Sections 9 to 12 identify interventions required for RSS growth, their costs, funding, and prioritisation post-2011.

Table F 1 lists 141 schemes identified in the study but excluded from the funding model as they are solely 'deficit schemes', intended to resolve existing and historic deficit issues. They do not necessarily directly address RSS growth to a point that justifies CIL funding.

These schemes should be implemented alongside the specific interventions required for growth (see sections 9 to 12). This will help to ensure that the wider transport network operates as efficiently as possible. It will also avoid those areas of the county with minimal or no direct impact from RSS growth from becoming 'poor relations' in terms of transport provision compared to the areas experiencing growth.

A total cost was not available for these deficit-only schemes as, although it is expected that broad costs have been identified by the partners, they were not generally available for this study and were not necessary for its completion. However, a limited number of costs were available and provided some insight into the funding of deficit schemes. Of the 141 schemes catering solely for historic deficit some 20 have associated cost estimates, totalling £70.5m. It has been assumed that one third of total LTP or equivalent funding for the period 2011-2031 will be used for schemes required as the result of RSS growth (see Section 12.1). This would leave a total of £159m for historic deficit schemes. Since the 20 costed schemes, which represent only 14% of the 141 identified in total, would require almost half this budget it would appear that there is likely to be a significant funding shortfall for schemes related to historic deficit.

It is likely that the majority of these schemes will call on LTP funding (or its future equivalent) as they cost less than £5m. However, there are a number of interchange improvements, rail, and road schemes that may cost more than £5m that would consequently require funding through the Regional Funding Allocation process or other regional and/ or national funding sources. The partners will therefore need to follow up opportunities for such funding with the relevant organisations.

9. FUTURE SCHEME SELECTION AND IMPACT ON THE NETWORK

9.1. Scheme Selection

9.1.1. Introduction

Earlier sections of this report examined the transport network for Hertfordshire in terms of establishing a baseline position for 2011, followed by an indication of the scale and cost of historic deficit. The assessment process was then taken forward to highlight the schedule of programmed schemes already identified for the network between 2011 and 2021, with a subsequent evaluation of network performance to help disentangle some of the issues related to cross-boundary impacts.

Before moving the process forward to determine the impact of proposed RSS growth within Hertfordshire itself, it is necessary to confirm the terms of reference and additional workstreams that influenced subsequent decisions on scheme selection, as they underpin the final infrastructure listing.

In summary these focus on considerations related to sustainable transport policy, strategic masterplanning work that refines previous assumptions on new areas for Hertfordshire growth, and the subsequent selection process that has been deployed to draw out the list of schemes that inform the final transport infrastructure list for the county. This chapter therefore concentrates on the rationale supporting these various elements.

9.1.2. Policy

The publication of Planning Policy Guidance 13 (PPG13)[13] in 1994 (revised in 2001), followed by 'A New Deal for Transport' in 1998 and the White Paper Transport 10-Year Plan 2000 set the context and direction for transport policy in the UK. The policies enshrined within these documents demonstrated an acceptance that unrestrained growth in road traffic was neither desirable nor feasible based on concerns related to rising congestion levels, the effect of road traffic on the environment (both natural and built) and worries that an emphasis on road transport discriminated against vulnerable groups in society such as the poor, the elderly and the disabled.

The latest major statement of government transport policy is the White Paper entitled "The Future of Transport: a network for 2030", which was published in July 2004, and sets out how the Government aims to maximise the benefits of transport while minimising the negative impact on people and the environment. The Government is seeking a coherent transport network that can meet the challenges of a growing economy and the increasing demand for travel with:

- Walking and cycling offering a more serious alternative for local trips;
- Bus services that are reliable, flexible, convenient and tailored to local needs;

- The rail network providing a fast, reliable and efficient service, particularly for inter-urban journeys and commuting into large urban areas;
- The road network providing a more reliable and free-flowing service for both personal travel and freight, with people able to make informed choices about how and when they travel; and
- Ports and airports providing improved international and domestic links.

It is also clear from the recent Climate Change Act 2008[14] that there is an enhanced commitment and legal responsibility to improve carbon management to help the transition towards a low carbon economy in the UK.

Transport policies and objectives in the Government framework have been cascaded and refined through the regional and sub-regional planning process to direct transport decisions across Hertfordshire. The Regional Transport Strategy (RTS)[15] seeks to manage travel behaviour and transport demand effectively for all, and reduce the rate of road traffic growth to ensure the transport sector makes an appropriate contribution to reducing greenhouse gas emissions.

Complimentary transport policies are confirmed at county level by the Local Transport Plan and its supporting documents, such as the bus and rail strategies. Objectives in the HCC Local Transport Plan 2006/ 07 - 2010/ 11 (LTP2)[16] focus on:

- Improving safety;
- Obtaining the best use of the existing network through effective design, maintenance and management;
- Managing transport growth and travel volumes across the county to secure improvements in the predictability of travel time;
- Developing an efficient, safe, affordable and enhanced transport system which is attractive, reliable, integrated and makes best use of resources;
- Developing a transport system that provides access to employment, shopping, education, leisure and health facilities for all, including those without a car and those with impaired mobility;

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[13] 'Planning Policy Guidance 13: Transport' Office of the Deputy Prime Minister, March 2001. Section 1.
[14] The Climate Change Bill was introduced into Parliament on 14 November 2007 and became law on 26th November 2008. Copies of the Climate Change Act 2008 can be obtained via the OPSI website:

[15] 'East of England Plan', East of England Regional Assembly, May 2008. Page 39.
[16] 'Hertfordshire Local Transport Plan 2006/07-2010/11', Hertfordshire County Council, March 2006. Page 42-43.

- A transport system that contributes towards improving the efficiency of commerce and industry and the provision of sustainable economic development in appropriate locations;
- Mitigating the effect of the transport system on the built and natural environment and on personal health;
- Raising awareness and encouraging use of more sustainable modes of transport through effective promotion, publicity, information and education; and
- Reducing the need for the movement of people and goods through integrated land-use planning, the promotion of sustainable distribution and the use of telecommunications.

Hertfordshire's LTP Accessibility Strategy 2006/07-2010/11 is another important component that guides decisions on transport planning and land-use/ master planning with objectives aimed at:

- Supporting those who are disadvantaged to achieve their potential and to access sustainable employment;
- Working in partnership with transport providers to achieve an efficient, affordable and enhanced transport system; and
- Developing a transport system that provides access to employment, shopping, education, leisure, and health facilities for all, including those without a car and those with disabilities.

These policy considerations have consequently motivated and channelled the selection process and helped to define key objectives and selection parameters. Transport planning and infrastructure cannot deliver the outputs to achieve these objectives on their own. Policy and good practice dictate that land-use and transport planning must work together to deliver the most appropriate pattern of sustainable development to improve accessibility across Hertfordshire.

9.1.3. Modelling Sustainable Choices in the EERM 2021[MPI] 2031[MPI]

In developing a view on what infrastructure is necessary, it is essential to consider how far new infrastructure can or should cater for projected demand. Policy dictates that the "predict and provide" method of infrastructure planning is no longer tenable and simply building more and more roads is not the answer to traffic growth.

In response to policy URS used a hierarchy and priority for improvements where:

- The key objective is to promote sustainable travel habits and behaviours, and as a consequence sustainable transport options will lie at the forefront of consideration for infrastructure delivery;
- Improvements to public transport facilities, especially local bus services serving urban areas, will supply the main mechanism to tackle congestion;

- Quality Bus Corridors will be implemented along main radial routes, especially into the main urban areas, with only a minimal negative impact on other traffic;
- Improvements for all traffic including cars, lorries, cycles and pedestrians will focus on key problem areas;
- Major road infrastructure such as village or town bypasses will only be promoted where they fulfil an essential strategic function and complement or facilitate rather than compete against sustainable transport objectives (e.g. within bypassed communities); and
- The sustainable transport strategy will require implementation of softer measures to influence behavioural change to underpin 'harder' interventions.

In response to the need to develop a view of the transport network that considers the impact of sustainable transport a version of the EERM model run for 2021 and 2031 that included the revised spatial strategy developed by the masterplanning and supplemented by a number of interventions. To distinguish the model output this was referenced as the 'Intervention' model output and was designated as 2021^{MPI} and 2031^{MPI}.

One component of the intervention assessment considers the impact of 'Smarter Choices' on promoting sustainable travel behaviour and as a consequence reducing the impact of peak hour trips on the network.

9.1.3.1. What Are Smarter Choices?

Smarter Choices are aimed at encouraging more sustainable travel. The greatest benefit is to the road network, reducing the amount of traffic and therefore congestion. However, there can also be associated health and community benefits, as well as reducing environmental impact of travel. Smarter Choices measures include:

- Car sharing;
- Working from home;
- Tele-working; and
- Encouraging the use of sustainable modes such as walking, cycling, and public transport.

The method for allowing for Smarter Chices in modelling is described in subsequent sections, and was based on initiatives to encourage Smarter Choices. The costing is described later in this report, and largely excludes the infrastructure costs of sustainable modes. These would be required regardless through policy and strategy commitments.

Smarter Choices therefore represent a sustainable approach to tackling congestion and addressing demand management, working alongside other sustainable transport measures. It should not be considered that one can replace the other, but that they complement each other to provide a more holistic and effective toolkit. It is not possible to identify mode shift and the replacement of travel with alternative forms of communication at this stage. This would be

determined by undertaking site-specific assessments based on the particular Smarter Choices initiatives implemented at different locations to suit different circumstances.

9.1.3.2. General approach to modelling Smarter Choices

To determine a reasonable level of intervention the usual approach uses a single set of factors applied at the matrix level to estimate the impact of demand management and sustainable modes. It is sufficient to predict changes in road traffic, and to some extent costs, at an area-wide level. It is however considered less reliable when re-allocating previous car trips to specific alternative modes, which would include public transport, but also car sharing, cycling and walking. The latter two can be combined with public transport use in ways that are not easy to predict in conventional traffic models.

It is also the case that full representation of shorter journey lengths, through the redistribution of trip ends in the model, creates new opportunities for transfer to cycling and walking. This reflects policies designed to reduce the need to travel. Again this effect is poorly represented in most models.

In broad terms, the position on modelling 'Smarter Choices' is that there is a consensus that such effects exist and are powerful, especially when backed by planning, parking or fiscal policies that are anticipated to support transport management in Hertfordshire. In relation to models, there is considerable evidence on the scale of effect by journey purpose and area type, but less on how far policies can be 'rolled out'. There is also data on cost, although this varies considerably. As with all modelling, applying the programme over a large number of trips makes the use of average levels of costs and benefits more appropriate.

The effects are usually expressed in terms of car use reduction rather than mode transfer, reflecting the diverse ways in which people make their travel choices. Conventional mode transfer models do not capture this effect because they are calibrated to existing attitudes and perceptions of alternatives, and therefore cannot deal with items such as non-traditional marketing incentives that are outside simple generalised costs.

A report prepared for DfT in 2008 recommended the following approach:[17]

- **Stage 1**: Identify any "hard" measures that are part of a package (for example PT improvements);
- **Stage 2**: Run the model and cross-check the impact, with benchmarks from existing sources; and
- **Stage 3**: Adjust model parameters to reproduce the benchmark level.

It makes the point that the crucial third stage involves judgement in terms of producing mode-by-mode outputs.

17 Modelling and Appraisal of Smarter Choices - Technical Note 2d(1), WSP, DfT October 2008 unpublished

For this project, the key output is the scheme programme and cost, rather than individual mode results. These could however be estimated by forcing trips off the highway network and using a redistribution and mode choice model. However, the latter would have to include walking, cycling and car share as modes.

9.1.3.3. Basic approach to Smarter Choices for HIIS

A simple matrix factoring method by journey purpose and urban/rural area type was used, consistent with the approach recommended to DfT. The factors were applied to all trips terminating in Hertfordshire zones. Following an assessment, each Hertfordshire zone was allocated an urban or rural designation based principally on existing and future population and land-use.

It should be noted that the effect of applying the factors to trips terminating in Hertfordshire does not guarantee that the capacity released will not be absorbed by traffic re-routing through the county to avoid congestion at other locations within the model.

Three sources were used:

- DfT reference 2004 "Smarter Choices" report[18];
- Modelling and Appraisal of Smarter Choices - Technical Note 2d(1), WSP, DfT October 2008; and
- MTRU material on modelling options, some of which was used as one of the sources for the October report.

The October Report also used data from a 2008 analysis by Moser and Bamburg and data from the DfT Sustainable Towns initiative.

In the DfT 2004 report, factors are given for a "low intensity" and "high intensity" scenario by journey purpose and urban /rural split. These used 2001 NTS data and for HIIS it was practicable to update this by using 2006 NTS data. At the same time, some effects that were included in the DfT 2004 report were omitted because they may be included in other policies. This illustrates the point that it is the additional costs that need to be calculated for CIL purposes.

The final step deducted the effect of the low intensity scenario from the high intensity scenario. This allowed for existing Smarter Choice policies in the local and regional transport plans being implemented, although it was not completely clear whether a full funding allowance for these had already been made. It may be that the cost of existing programmes should be included and this may mean the calculation both of costs and effects was a little too conservative.

18 Smarter Choices – Changing the Way We Travel, Goodwin et al, DfT 2004

Overall this process produced a slightly lower level of achievement than that set out in the DfT 2004 report and was thus relatively cautious. The exception was non-home based non-work related journeys, but these are likely to be relatively small in number.

The factors produced are set out in Table 9-1 below, with the DfT 2004 report factors shown for comparison.

Table 9-1: Smarter Choices – Assumed Car Trip Reduction Factors by Journey Purpose and Area Type

	HIIS proposal		DfT 2004 Report	
Trip purpose	Urban	Rural	Urban	Rural
HB to work	0.81	0.82	0.76	0.80
HB employer	0.84	0.85	0.79	0.84
HB other	0.93	0.96	0.94	0.98
Non-HB emp	0.84	0.85	0.79	0.84
Non-HB other	0.93	0.96	0.94	0.98

Note: HB = Home Based

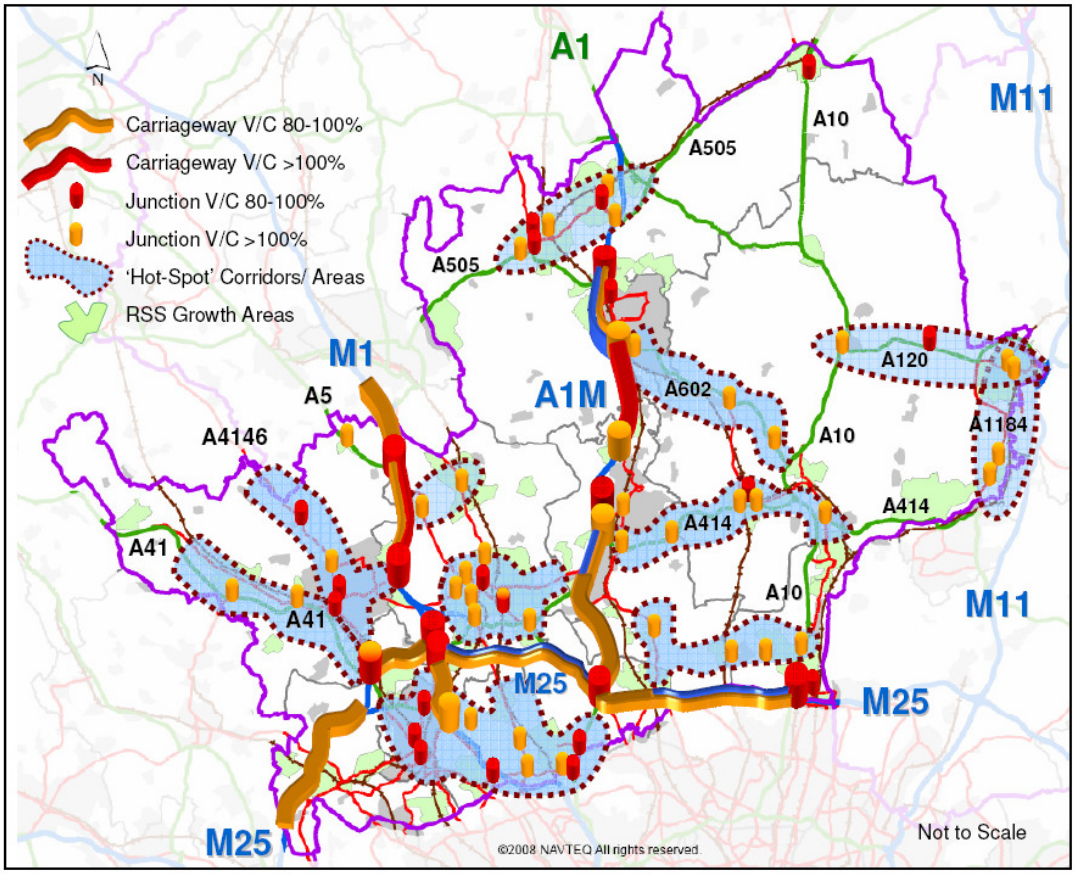
Costs were produced by extracting the number of car trips removed in each category from EERM, and applying an average cost per trip from the existing studies. This was cross-checked using the modelled change in car kilometres. The use of these factors is described in Section 11.2

9.1.4. Priorities for Treatment

One indicator of the potential impact of future growth on the transport network for Hertfordshire was provided by the 2031 AM EERM model output that only includes programmed schemes known to date. This is shown diagramtically in Figure 9-1.

It is clear from this output that in the absence of further infrastructure investment a number of key corridors and junctions will experience a degree of stress that will impact on journey reliability for residents and visitors alike.

Figure 9-1: 2031 RSS Growth and No Interventions – Main Areas and Corridors of Network Stress



While the road network is only one part of the overall transport system, these predictions for 2031 do expose some wider considerations related to future movement patterns within and across the County. These have relevance when considering the need for more interventions to support the impact of predicted growth.

Significantly the road network stress confirms distinct movement corridors. To the west of and including the A1(M), movement is channelled through the main radial routes focussed towards London (A1(M), M1, A5, A4146, A41). To the east of the A1(M) the pattern is more closely aligned along corridors supporting west to east movements (A414, A602, A120). The M25 intercepts and supplements this demand by supporting journeys around the outer London fringes.

The pattern is disrupted within the M25 and between the M1 and A1(M) north of the M25 focussed on the St Albans and Watford/ Borehamwood conurbations respectively. Here the routeing patterns are more complex and reflect the varied nature of journeys responding to the proximity of major route corridors, relative density of the local road network and settlement patterns.

It is clear that these corridors and areas of road network stress generally coincide or impact on areas that are highlighted for RSS growth. As a consequence it is reasonable to concentrate on delivery of new infrastructure that will respond in a sustainable way to the desire for movements between key destinations using these main corridors.

Priority areas for infrastructure for all modes will therefore need to focus on areas of greatest growth and where existing deficit is of such magnitude that it will otherwise restrict this growth. The prioritisation reported in Section 10.5 adopted this approach.

9.1.5. Scheme Identification Method

The schemes included in this study reflect a balanced approach between existing behaviours, policy, and a desire to seek a radical approach towards addressing transport demand in the county. It is expected that in future there will be a stronger emphasis on passenger transport investment, and this is reflected in the new interventions that have been recommended. Many of the road schemes included in these new interventions would enhance public transport reliability on the existing constrained network and there are a number of road space re-allocation and other public transport schemes.

At the same time it has been important to recognise that there is an existing population with habitualised travel habits and that this represents the base from which to begin. The schemes contained within this study therefore seek to find a realistic scenario between business-as-usual and a more radical approach.

9.1.5.1. Considerations

There are two 'categories' of scheme: Infrastructure Deficit schemes and schemes associated with additional growth (RSS) post-2011. The selection of both categories of scheme to a costed shortlist, to be used in the funding model produced by RTP, was affected by the criteria in Table 9-2.

Table 9-2: Scheme Identification Considerations

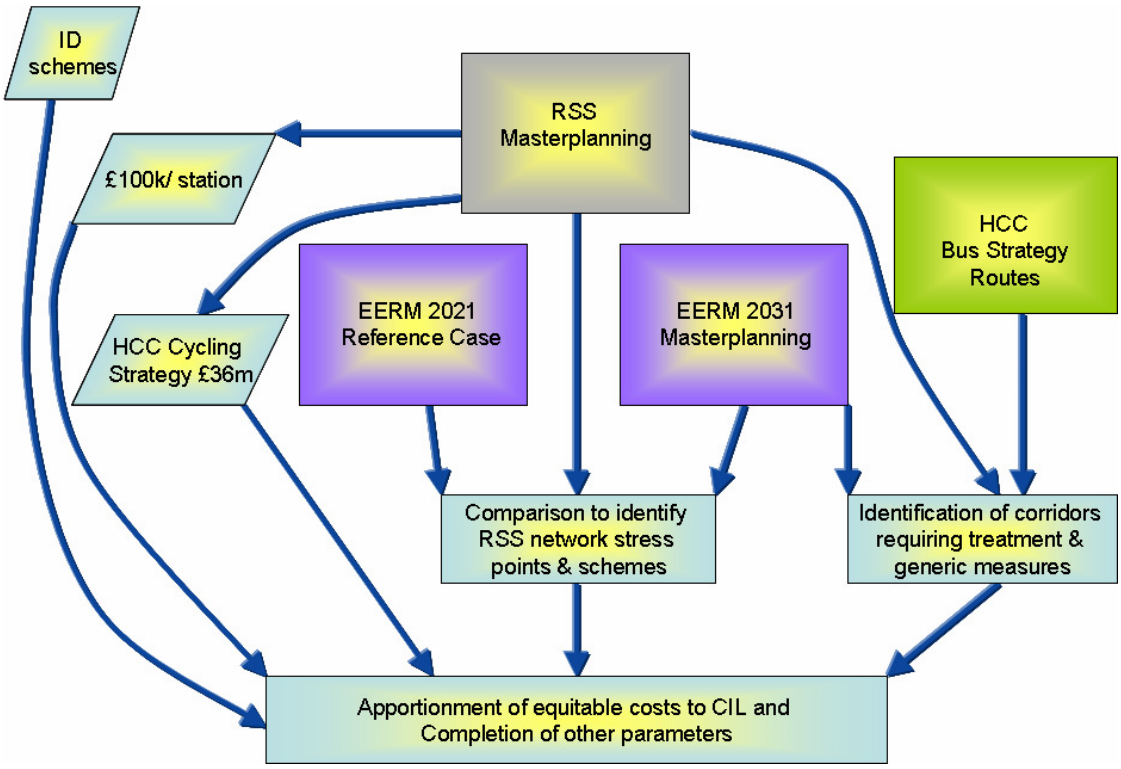
Item	Criteria and Considerations
Policy	Policy would dictate that Demand Management (DM) schemes and initiatives (Interventions) should be given a higher priority than major road building schemes. However, these cannot simply be separated out. For example, improved bus services can only function efficiently on uncongested roads, so a bypass may free town centre roads and help deliver good bus services. Conversely, congested roads may act as the catalyst to trigger greater rail usage, which may not happen if the road were improved.
RSS growth	The masterplanning work has led to a distribution across the county of new development. The location of this development needs to be taken into account in identifying the RSS schemes, as by definition these are not schemes to address 'historic' infrastructure deficit.
Enabling Schemes	There may be infrastructure required without which certain elements of RSS growth cannot take place. Similarly there may be major schemes without which the effectiveness of smaller schemes in the vicinity is reduced or negated.
Capital/ Revenue Schemes	It is recognised that the implementation of schemes involving capital expenditure require revenue funding either in the short-term as 'pump-priming' or in the long-term for maintenance. At this stage no revenue schemes have been identified (these are likely to be DM schemes) but it is anticipated that these can be capitalised.
Infrastructure Deficit Schemes	How do schemes relate to deficit? ~ Select those from the Appendix B inventory that appear to address existing problems; ~ Give priority to bus and rail corridor improvements; ~ Include strategic/ corridor schemes; and ~ Check dependencies – do any smaller schemes rely on larger ones?
RSS Schemes	How do residual problems relate to location of RSS growth? ~ What scope is there to address problems with Public Transport? ~ What is left that requires additional road capacity?

9.1.5.2. Identification Process

Scheme identification involved specifying those schemes relating to historic deficit that were deemed relevant for the funding model (see Section 9.1.5.3) plus new schemes required as a result of post-2011 RSS growth. The deficit schemes were taken from the list in Appendix B (Section 9.1.5.3) whilst new schemes were identified by URS where they were judged to be required (Section 9.1.5.4). A process map of this is shown as Figure 9-2.

The complete list of interventions is included as Table F 2. It includes both large schemes that will cater for travel at the strategic level and smaller schemes for local travel. The year of implementation is also included. Both 'deficit' and newly identified highway schemes not previously included in the programmed list of EERM modelled schemes (see Section 5) are described in Table F 3.

Figure 9-2: New Scheme Identification Process Map



9.1.5.3. Infrastructure Deficit Schemes

It was considered that a number of these 'deficit' schemes were appropriate for inclusion in the CIL funding model because the RSS growth from 2011 would increase stress on the parts of the transport network that these schemes are already seeking to improve.The deficit schemes to be considered for future delivery were taken from those listed in Appendix B. These were agreed with HCC and associated client partners through workshops and other consultation. A review was completed to identify schemes that were inappropriate for HIIS funding, such as very small schemes and safety schemes. This left a shortlist of approximately 80 schemes, which are presented in Table F 4.

9.1.5.4. New Schemes Identified by URS

For all modes the spatial allocation of post-2011 RSS growth, produced by Atkins and RTP, was a key consideration. Bus, cycling, rail, and road were analysed separately. Demand Management schemes were also identified following completion of the EERM runs that incorporated matrix factoring, as described earlier in Section 9.1.3.

In addition to the rail schemes identified earlier in this report it was assumed that each of the 51 stations in Hertfordshire should be allotted £100,000 for general improvements. It is however recognised such an allocation would be on an 'as justified' basis rather than a strict £100,000 per station.

Hertfordshire Highways was contacted with regard to cycling. 18 towns were identified as principal areas where the Hertfordshire County Council (HCC) Cycling Strategy could be implemented with Hertfordshire Highways asked to identify an average cost for doing so. The total cost was identified as £36m, excluding structures and other major engineering. Again it is expected that the allocation of the funds would be as required and not strictly limited to each town.

Bus corridor treatments were identified by comparing the HCC Bus Strategy Routes with the existing 2031 EERM output. This revealed principal bus corridors and locations where they aligned with forecast congestion. At these corridors it was recommended that bus priority measures be put in place.

The highway network was assessed using the EERM runs for 2021^{MP} and 2031^{MP}, i.e. that include the HIIS masterplanning but use the road network that incorporates only programmed schemes, and not 'deficit' or new schemes. A ratio of volume to capacity (V/C) of 80% was used to identify stress points. However, for any further assessment it may be desirable to increase this to 85% and to place a greater emphasis on Demand Management schemes to provide for overall transport demand. This is an issue of policy that will need to be considered by HCC and other partners.

The list of new schemes identified is included in Table F 5, with the scheme ID beginning with 'N' (for New). It is important to note that this was a first attempt at modelling schemes, and while it was expected that it would represent a reasonable initial assessment of requirements, nevertheless it was recognised that more detailed assessment and modelling would be required to refine and add to the list.

9.1.6. Completion of All Scheme Parameters

In addition to scheme identification a number of parameters were also completed where possible:

a) Cost;

b) Existing funding, where available;

c) The likely or known source of the funding;

d) The year by which the scheme should be implemented;

e) A lead partner; and

f) A priority based on the classification provided by Roger Tym & Partners (RTP).

Items a) to e) and the various assumptions made are discussed in Sections 10 to 12.

9.1.6.1. Timing of Scheme Delivery

It was assumed that all selected schemes from the 'historic' infrastructure deficit work should be implemented by 2021, and indeed it is probably desirable and necessary that many of these schemes are implemented before this. It was also considered that the improvements to

the cycling network should be completed by 2021 to ensure that this infrastructure is in place in good time to encourage sustainable travel behaviour.

The implementation of new schemes was necessarily based upon the existing 2021 and 2031 EERM outputs (each with Hertfordshire RSS growth to 2021/31 included from the 2004 exercise), as the new 2021^{MP} and 2031^{MP} runs were not available in time to be used. Comparison of these shows that most of the newly identified infrastructure items would be required by 2021. Of the few that are not it was considered that they should be in place by 2025 to ensure that the issues caused by growth between 2021 and 2031 are provided for sooner rather than later in that period (in the same way that a bus route would be expected to be in place from the day a development opened for occupation, rather than from the day it was completed, as this could follow occupation).

9.1.6.2. Lead Partner

The lead partner identified for infrastructure deficit schemes is based on the lead identified in the deficit report; these were consulted upon with the HIIS client partners. The newly identified schemes have lead partners allocated using the infrastructure deficit schemes as a guide. In the majority of cases it is the local highway authority.

9.1.6.3. Scheme Priorities

The following priority system was provided by RTP and has been applied by URS (numbers are RTP's):

1) **Desirable** schemes that would enhance network operation;

2) **Required** (description by URS as a guide for the parameter) schemes that would ensure the network runs smoothly but may not be essential;

3) **Essential** schemes are those that HCC is likely to consider fundamental to development; and

4) **Statutory** schemes without which consent for development from agencies such as the HA may not be forthcoming.

Sections 9.1.3 and 10.5 for further discuss prioritisation.

10. INTERVENTIONS: NEED

10.1. Introduction

The schemes identified in this section are those considered necessary to cater for growth. They should be taken as a complete package rather than a 'picklist' if the results presented in Sections 10.5 and 10.6 are to be achievable.

In this study, we assumed that the overall level of transport investment is likely to be based on the total package of integrated transport measures defined by published documents such as the Local Transport Plan. We subsequently required a reasonable estimate of total transport demand in the county and the proportion of transport demand created by new development due to the RSS Growth Agenda.

Some allowance was necessary to reflect the likely intensity of development and its location relative to existing services and network capacities.

Historic deficit was not ignored as it affects timing and prioritisation. At this stage however it was and is difficult to predict how new transport infrastructure might be used by residents of new houses, or might instead simply absorb trend growth. As a result this was not analysed. Once identified, schemes that catered solely for historic deficit were not considered in detail. They are, however, addressed in Section 8.

The objective was therefore to understand the implications of growth in housing and jobs and how this affects future infrastructure requirements. While our general approach was to concentrate on the transport implications associated with growth only, historic deficits were included as they can have a significant bearing on scheme deliverability, timing and prioritisation. Even if it were desirable to isolate trend growth, it is extremely difficult at this stage in the planning process to do so to any level of accuracy. In many instances, it is impossible to attribute a particular item of transport infrastructure to a particular housing growth area. This infrastructure investment may however be necessary to create sufficient capacity to enable a number of developments to be delivered. Better evidence will be required to separate historic deficit from development and thereby attribute cost and programme to the various agencies responsible for delivery and funding in more detail.

This evidence will tend to emerge from transport assessments accompanying masterplans and the like when moving forward to Development Plan Documents (DPDs), which have a bearing on the transport aspects of this report. The specific transport infrastructure requirement for any given development will be influenced by its trip generation potential, which is linked to both land-use mix and location relative to the existing network and services.

It should be noted that the scope of this report does not allow for detailed assessment of every transport requirement across the county. This is partly because such an approach would draw the report into a more detailed assessment of deficit than is required or indeed possible at the modelling level available, and partly because there are other processes that go into the details – for example S106 analyses, which will still be required for site-specific transport items irrespective of this strategic work.

10.2. Distinguishing Between Primary and Secondary Infrastructure

This strategic study concentrated on primary rather than secondary infrastructure. Primary infrastructure comprises public transport and the road network outside the development sites. Secondary infrastructure is everything that developers need or can be expected to provide within development sites to achieve serviced development, except the primary strategic infrastructure. It includes local access to development sites and all on-site roads.

At times, it can be difficult to distinguish between the two precisely. It is useful to provide some additional information to assist in the categorisation.

Primary infrastructure is defined as:

- The provision or funding for off-site measures that are essential to ensure that on-site facilities will be effective;
- Contributions to off-site public transport, cycling and walking measures, in the general area or corridor within which the development lies, including road-based improvements such as bus lanes.

Infrastructure that can be classed as either primary or secondary (depending on individual circumstance) is as follows:

- The provision or funding for necessary local highway infrastructure improvements designed to cater for additional private road-based traffic, where this is based on a target for reduced traffic levels.

While **Secondary Infrastructure** is defined as:

- The provision of on-site highway, walking, cycling and public transport measures such as the internal road network, footways and bus shelters.

10.3. Compilation of the Scheme List

In simple terms, this is a list of schemes required to ensure that each growth site is adequately connected to the multi-modal transport network. Looked at on a district-by-district basis, it may be the case that some districts need relatively little additional infrastructure investment, since enough spare capacity exists in the system. Others may need significant investment, as they require substantial new connections, or generate an impact where there is insufficient capacity available to cater for predicted demand, or both.

The list of schemes is based in the first instance on the County's Infrastructure Plans, and those of other providers such as the HA and DfT, and was supplemented and confirmed by consultation with the various planning authorities following a series of workshops. The final list was subsequently developed to also take account of strategic masterplanning, sustainable transport policy and practice and due considerations related to delivery of an appropriate and functional network.

10.4. Interventions Required for Growth

The full list of schemes that was identified as necessary for growth is presented in Table 10-1. A full version of this can be found as Table F 2. It lists interventions by corridor, as presented in previous sections, and for those that cannot be clearly placed in a corridor, into the district that they fall. The corridors that have no interventions listed beneath them are shown for completeness.

Table 10-1: Interventions Required for Growth

ID	District	Location	Type	Description	Year
M1					
R2	Other	Brighton-Bedford	Rail	Thameslink Programme	2021
N15	Other	M1	Road	J6-10 ATM	2021
M25					
H9	Other	M25 J16-J31	Road	Widening	2021
N16	Other	M25 J20	Road	M25/ A41 Jct improvements	2021
N21	Other	M25 J17-19	Road	J17-19 ATM	2031
A1(M)/ A1					
R1	Other	East Coast Mainline	Rail	ECML improvements	2021
N13	Other	A1(M) J6-8	Road	ATM J6-8	2021
N25	Other	A1(M) J8	Road	Capacity enhancement	2021
A5					
A10					
R4	Other	WAGN Line	Rail	WAGN improvements	2021
H22	North Herts	Royston	Road	Southeast bypass A10-A505	2021
N22	Other	A10/ A1170	Road	Capacity enhancements	2021
A41					
S8	Hertsmere	A41/B462 Hartspring Lane	Road	Hartspring Rbt improvements	2021
A120					
H2	East Herts	A120 (A1-M11)	Road	A120 improvements	2021
H23	East Herts	Little hadham	Road	Bypass	2021
S296	East Herts	A120 Jct	Road	Jct capacity increase	2021
S349	East Herts	A120 Bishop's Stortford	Road	Bypass Dualling	2021
A405					
A411					
N8	Watford	Watford	Bus	East Watford bus corridor	2021
H10	Watford	Watford town centre	Road	Ring road 2-way operation	2021
S411	Watford	Bushey Arches	Road	Bushey Arches Jct improv.	2021
A414					
N28	Other	Central Herts	Bus	East-West PT corridor	2021
N14	East Herts	Hertford	Road	A414 mitigation	2021
N17	Dacorum	Hemel Hempstead	Road	A4146/ A414 jct (+ N2)	2021
S360	Dacorum	London Road/ Stn Road	Road	Rbt improvements	2021
S393	St Albans	St Albans	Road	SCOOT	2021
A505					

ID	District	Location	Type	Description	Year
N3	North Herts	Hitchin-Letchworth	Bus	A505 corridor bus priority	2021
N4	North Herts	Hitchin	Bus	A505/ A602 bus priority	2021
H3	North Herts	A505 Hitchin-Letchworth	Road	Improvements	2021
A507					
A602					
S123	Stevenage	Superstore access on Hitchin Rd	Bus	Bus Priority	2021
S124	Stevenage	Monkswood Way, Stevenage	Bus	Bus Priority	2021
S125	Stevenage	Six Hills Way/ Lytton Way Rbt	Bus	Bus Priority	2021
S126	Stevenage	Six Hills Way/St George's Way Rbt	Bus	Bus Priority	2021
S127	Stevenage	Fairlands Way westbound	Bus	Bus Priority	2021
S128	Stevenage	Gunnels Wood Road/ A602	Bus	Bus Priority	2021
H4	East Herts	A602 Ware-Stevenage	Road	Improvements	2021
N29	Stevenage	A602/ A1072	Road	Improvements	2021
S336	Stevenage	A602 Gunnels Wood Road Rdbt	Road	Improvement	2021
S364	Stevenage	Stevenage	Road	A602/Coreys Mill Lane	2021
A1184					
N10	East Herts	Sawbridgeworth	Bus	Town centre bus priority	2021
N23	East Herts	Sawbridgeworth	Road	A1184 Jcts capacity (+ N11)	2021
A1189					
Broxbourne					
BI11	Broxbourne	Cheshunt Town Centre	Bus	Interchange improvement	2021
S340	Broxbourne	Broxbourne Essex Road	Road	Improvement	2021
S359	Broxbourne	Waltham Cross	Road	Waltham Cross Stn Links	2021
Dacorum					
BI1	Dacorum	Hemel Hempstead Bus Stn	Bus	Interchange improvement	2021
N2	Dacorum	Hemel Hempstead	Bus	Central corridor bus priority	2021
S12	Dacorum	Tring Rail Stn	Rail	Stn Improv. (new building)	2021
S14	Dacorum	Hemel Hempstead Stn	Rail	Stn improvements	2021
H20	Dacorum	Hemel Hempstead	Road	Swallowdale Ln widening & jct	2021
H24	Dacorum	Water End	Road	Bypass	2021
N12	Dacorum	Hemel Hempstead	Road	Hemel Hempstead N. Bypass	2031
S16	Dacorum	Durrents Hill / London Road Jct	Road	Signalisation	2021
S17	Dacorum	Featherbed Lane/ London Road	Road	Jct improvements	2021
S31	Dacorum	Breakspear Way	Road	Jct improvements	2021
East Herts					
BI12	East Herts	Bishops Stortford Bus Stn	Bus	Interchange improvement	2021
N9	East Herts	Hertford-Ware	Bus	Corridor bus priority	2021
S292	East herts	Dunmow Road Crridor	Bus	P&R	2021
N24	East Herts	Bishops Stortford	Road	Town centre Jcts (+ N12)	2021
S228	East herts	Sacombe Pound	Road	Jct improvements	2021
Hertsmere					
BI4	Hertsmere	Borehamwood Town Centre	Bus	Interchange improvement	2021
N11	East Herts	Bishops Stortford	Bus	Town centre bus priority	2021
North Herts					
BI14	North Herts	Letchworth Stn	Bus	Interchange improvement	2021

ID	District	Location	Type	Description	Year
BI6	North Herts	Hitchin	Bus	Interchange improvement	2021
S353	North Herts	HItchin Stn	Rail	Hitchin Stn Forecourt improvements	2021
S243	North Herts	Cadwell Lane, Hitchin	Road	Signalisation	2021
St Albans					
BI2	St Albans	St Albans Town Centre	Bus	Interchange improvements	2021
S235	St Albans	Harpenden	Bus	Interchange improvements	2021
S383	St Albans	St Albans	Bus	P&R serving St Albans	2021
S384	St Albans	St Albans	Bus	Hatfield Rd bus corridor improv.	2021
S48	St Albans	Hemel Hempstead M1 Jct	Bus	Maylands Masterplan P+R	2021
N18	St Albans	Hemel-St Albans	Road	A4147 corridor Jct improv.	2021
N19	St Albans	St Albans	Road	Relief road improvements	2021
N20	St Albans	Harpenden	Road	Harpenden south Jct improv.	2021
S391	St Albans	St Albans	Road	Hatf'd/ Clarence/ Camp Rds Jct	2021
S392	St Albans	St Albans	Road	SCOOT on w. orbital route	2021
Stevenage					
BI5	Stevenage	Stevenage Bus Stn	Bus	Interchange improvement	2021
S122	Stevenage	Bessemer Drive, Stevenage	Bus	Widening of road	2021
S129	Stevenage	Gresley Way, Stevenage	Bus	Signalisation of the Juctions	2021
S130	Stevenage	The White Way, Stevenage	Bus	Signalisation of the Juctions	2021
S131	Stevenage	Fairlands Way, Stevenage	Bus	Signalisation of the Juctions	2021
S132	Stevenage	Mobbsbury Way, Stevenage	Bus	Signalisation of the Juctions	2021
S134	Stevenage	A1 (M) Stevenage	Road	Passage under or over A1(M)	2021
Three Rivers					
Watford					
N7	Watford	Watford	Bus	North Watford bus corridor	2021
S107	Watford	St Albans Road	Other	Watford Jct redevelopment	2021
S252	Watford	Watford Jct	Rail	Creation of Rail Interchange	2021
Welwyn Hatfield					
BI7	WelHat	WGC Bus Stn	Bus	Interchange improvement	2021
BI8	WelHat	Hatfield Rail Stn	Bus	Interchange improvement	2021
N5	WelHat	WGC spine	Bus	A1000 bus priority	2021
N6	WelHat	Hatfield	Bus	A1000/ B6426 bus priority	2021
S87	WelHat	College Lane onto A1001	Bus	Introduce bus priority measures	2021
S91	WelHat	Hatfield Rail Stn	Rail	Hatfield Stn interchange	2021
S99	WelHat	Hatfield Rail Stn	Road	Additional Parking	2021
Other					
N1	Other	Countywide	Cycle	HCC cycling strategy	2021
N27	Other	Countywide	DM	Smarter Choices	All
N26	Other	Countywide	Rail	General improvements to Stns	2021
R11	Other	Abbey Line	Rail	Abbey Line passing loop	2021
R12	Other	Croxley Rail	Rail	Croxley Rail Link	2021
S321	Other	M11 J7 & J8	Road	Jct Improvements	2021
S36	Other	M1 Luton	Road	Improve East - West Routes	2021
S47	Other	M11 Stansted	Road	Improve East - West Routes	2021

10.5. Transport Network Impact 2021

10.5.1. Introduction

This section considers the effects in 2021 of implementing the interventions described in Section 10.4. It uses the same criteria as previous sections (in broad terms, where there have been improvements or otherwise on the highway network) and offers qualitative comments on the other modes.

10.5.2. Walking and Cycling

To ensure that sustainable travel behaviour becomes habitual implementation of the HCC cycling strategy, and notably its related infrastructure, will need to be complete by 2021. The routes that are constructed will serve both cyclists and pedestrians. Detailed schemes that would perform this function will be identified by HCC and the districts through the Urban Transport Plan process as this rolls forward from 2011 to 2021.

Cycling infrastructure will also support Smarter Choices, which will reduce the impact of travel on the road network. In addition to cycle routes, good quality cycle parking and related facilities, as well as information on cycling provision in Hertfordshire, will help to make use of this mode attractive to both existing and potential users.

10.5.3. Bus and Coach Network

There are a number of large infrastructure items identified for bus and coach up to 2021, mainly improved or new bus stations. The aim of these is to facilitate the efficient movement of the increased number of buses required for Smarter Choices and also to improve conditions for bus passengers, attracting a greater number of potential users. Bus priority will also be a significant feature of the bus network from 2011 to 2021, enhancing its efficiency and, as a consequence, its attractiveness to passengers.

The number of bus services and the frequency of buses on them is a matter for short term route planning. There is likely to be a challenge for bus operators and HCC to improve the service offered to attract passengers from the existing population and the new population generated by RSS growth. It is not expected that the bus network would become over-subscribed as the services themselves should be able to respond to increasing demand in a relatively short space of time.

10.5.4. Rail

Table 5-5 indicated that by 2021 all rail corridors through the county will be approaching or over capacity. This highlights the need for investment above that identified in this study if rail is to play a part in ensuring efficient travel throughout the county.

10.5.5. Highway Network Comparison 2021^{MP} and 2021^{MPI}

Continuing the incremental approach to the assessment of transport infrastructure, this section considers the effects of full RSS growth with masterplanning in 2021, and

interventions that might be needed to help address the problems. It therefore considers two scenarios, represented by EERM runs:

- **2021^{MP}**: This EERM run included full RSS growth up to 2021, in conjunction with the 2021 Reference Case network that included only the programmed schemes as set out in Chapter 4;
- **2021^{MPI}**: This EERM run included full RSS growth up to 2021, as did the above run, but the network incorporated additional interventions to help mitigate adverse effects of the growth on transport.

It should be borne in mind too that the 2021^{MPI} scenario incorporated fewer trips than that of the 2021^{MP} scenario as it allowed for the assumed effects of Smarter Choices.

10.5.5.1.Motorway Network

The motorway network shows that, in conjunction with the trip reductions through the Smarter Choices assumptions, the ATM schemes are effective at achieving considerable reductions in V/C ratios on links, in most cases to levels below the 80% threshold value. However there are very few corresponding junction improvements. This is not unexpected, since in general ATM has no effect on, for example, non-motorway approaches to motorway junctions (which have been considered in the criteria governing the junction V/C rating). In particular, the preliminary improvements to A1(M) J8 do not appear to have been effective according to the modelling and larger-scale measures may be needed to accommodate the traffic here, with more detailed operational modelling. This may be due to the additional traffic throughput between Junctions 6 and 8 more than offsetting the effect of the junction improvements; in other words transferring the problem to another point in the network, which is always a danger in congested networks.

10.5.5.2.Other Road Corridors

According to the model, there are small reductions in the degree of network loading, particularly where a specific scheme has been implemented to solve a specific problem, such as the Little Hadham bypass. There are also minor improvements to some of the primary road corridors, such as the A41, A411, and A602 but the overall picture is one of largely maintaining the status quo without dramatic improvements. The A602 corridor shows, for example, that congestion is moved around rather than removed or dissipated by the interventions and a more 'holistic' approach to corridor improvement may be required if the intention is to aim to remove congestion or at least to allow buses freer movement within them.

Table 10-2: Comparative Summary of Strategic and Intra-urban Road Deficit 2021MP (RSS Masterplanning) with 2021MPI (RSS Masterplanning plus new infrastructure)

ROAD CORRIDOR	2021 MP	2021 MPI
M1		**(Junction 4 – 9)**
Mainline – Northbound		
J6A – J7		
J8 – J10		
Mainline – Southbound		
J10 – J9		
J9 – J8		
J8 – J6A		
J6 – J4		
Junctions	2021 MP	2021 MPI
J5 (M1 NB & SB Off Slips)		
J6 (M1 SB On Slip), **J6A** (M1 NB On Slip and SB Off Slip)		
J8 (M1 NB Off Slip, **J9** (A5 NW Approach)		
M25		**(Junction 17 – 26)**
Mainline – Clockwise		
J17 – J19		
J20 – J21A		
J22 – J23		
J23 – J24		
Mainline – Anti-Clockwise		
J26 – J25		
J25 – J23		
J23 – J21A		
J19 – J18		
J18 – J17		
Junctions	2021 MP	2021 MPI
J20 (A41 Approach), **J22** (Circulating)		
J21 (M25 EB Off Slip to M1), **J23** and **J25** (WB Off Slips)		
A1 (M)		**(Junction 1 – 10)**
Mainline – Northbound		
J1 – J3		
J6 – J7		
Mainline – Southbound		
J8 – J7		
J7 – J6		
J4 – J1		
Junctions	2021 MP	2021 MPI
J1 (M25 J23 – A1(M) SB Off Slip), **J7** (Circulating), and **J9** (SB On Slip)		
J3 (NB On Slip, SB and NB Off Slips, Circulating), and **J8** (SB Off Slip)		
J7 (Circulating)		
A1		
BOREHAMWOOD: A1/A5135 Junction (SB Off Slip and SE Rowley Lane App.)		
BOREHAMWOOD: A1/A411 Stirling Corner Junc (A1 N and A411 E & W Apps.)		
A5		
MARKYATE: A5/B4540 Junction (A5 N and B4540 NE Luton Road Approaches)		
FLAMSTEAD: A5/M1 J9 (A5 NW Approach)		
A10		
WALTHAM CROSS: A10/M25 J25 (A10 N & S Approaches)		
CHESHUNT: A10/Church Lane Junction (Church Lane E Approach)		
ROYSTON: A10/Melbourn St Junction (Melbourn St W Approach)		

ROAD CORRIDOR	2021 MP	2021 MPI
A41		
BERKHAMSTED: A41/A416 Junction (A416 N Approach)		
BERKHAMSTED: A41/A4251 Junction (A41 W Approach to A4251 On Slip)		
KINGS LANGLEY: A41/M25 J20 (A41 NW Approach)		
WATFORD: A41/A412 Junction (All Approaches)		
WATFORD: A41/A4008/M1 J5 (A4008 SW Approach)		
BUSHEY: A41/A5183/A5 Junction (A41 NW Approach)		
A120		
LITTLE HADHAM: A120 Standon Rd/ Stortford Rd/ Albury Rd Junc (N App.)		
LITTLE HADHAM: A120 Standon Rd/ Stortford Rd/ Albury Rd Junc (E App.)		
LITTLE HADHAM: A120 Standon Rd/ Stortford Rd/ Albury Rd Junc (W App.)		
A405		
BRICKET WOOD: A405/M1 J6 (A405 NE Approach)		
ST ALBANS: A405/A5183/A1081/M1 J10 (A5183 N Approach)		
A411		
WATFORD: A411/A412 Junction (A411 E Approach)		
WATFORD: A411/A4178/Beechen Grove I/C (Note: limited modelling detail)		
BUSHEY: A411/A409 Junction (A411 E and A409 S Approaches)		
ELSTREE: A411/A5183 Junction (A5183 N Approach)		
ELSTREE: A411/Furzehill Road Junction (Furzehill Road NW Approach)		
BOREHAMWOOD: A411/A1 Stirling Corner (A411 E & W and A1 N Approach)		
A414		
HEMEL HEMPSTEAD: A414/A4251 Junction (A414 N Approach)		
HEMEL HEMPSTEAD: A414/A4146 Junction		
HEMEL HEMPSTEAD: A414/A4147 Junction (All Approaches)		
HEMEL HEMPSTEAD: A414/Green Lane Junction (A414 E Approach)		
ST ALBANS: A414/A1081 Junction (A1081 NW Approach)		
HATFIELD: A414/A1(M) J4 (A414 E Approach)		
WELWYN GARDEN CITY: A414/B1455 Junction (B1455 SE Approach)		
HERTFORD: A414/A119(W) Junction (A414 E & W and A119 N Approaches)		
HERTFORD: A414/B158 Junction (A414 E Approach)		
HERTFORD: A414/B158 Junction (A414 W Approach)		
HERTFORD: A414/A119(E) Junction (A414 SE Approach)		
A505		
LETCHWORTH: A505/A6141(W) Junction (A505 W Approach)		
LETCHWORTH: A505/Norton Way S/Willian Way Junction (A505 E & W Apps.)		
HITCHIN: A505/St Michael's Road Junction (A505 W Approach)		
HITCHIN: A505/B656 Junction (A505 E & W Approaches)		
HITCHIN: A505/A602 Junction (A505 E & W Approaches)		
HITCHIN: A505/B655 Junction (A505 W and B655 W Approaches)		
A507		
No major problems highlighted for this road within Hertfordshire.		
A602		
HITCHIN: A602/B656 Junction (A602 NW Approach)		
HITCHIN: A602/B656 Junction (B656 N Approach)		
STEVENAGE: A602/A1(M) J8 (A602 W & SE Approaches)		
STEVENAGE: A602/A1072 Junction (A602 N and A1072 E Approaches)		
WATTON: A602/A119 Junction (A602 E Approach)		

ROAD CORRIDOR	2021MP	2021MPI
WARE: A602/B158 Junction (A602 N Approach)		
A1184		
SAWBRIDGEWORTH: A1184/Station Road/West Road Junc. (A1184 S App.)		
SAWBRIDGEWORTH: A1184/High Wych Road Junction (A1184 N Approach)		
A1198		
No major problems highlighted for this road within Hertfordshire.		

10.6. Transport Network Impact 2031

10.6.1. Introduction

This section considers the effects in 2031 of implementing the interventions described in Section 10.4. It uses the same criteria as previous sections (in broad terms, where there have been improvements or otherwise on the highway network) and offers qualitative comments on the other modes.

10.6.2. Walking and Cycling

Because the planning of cycling and walking schemes is relatively short term it is not feasible to speculate as to the exact nature of even the larger schemes. However, it is certain that these modes will play an important part in continuing to ensure that Hertfordshire remains a sustainable community and that, by retaining short trips off the road network, highways can operate effectively for longer distance journeys (where other modes are unsuitable) and the movement of goods.

10.6.3. Bus and Coach Network

It is probable that smaller-scale bus infrastructure will continue to be required after 2021 to ensure effective operation of the network. However, it is judged that most schemes already identified, including all larger ones, should be in place by 2021. This means that from 2021 to 2031 the bus network should build on successes achieved in the previous ten years. It is not expected that the bus network would become over capacity as the services themselves should be able to respond to increasing demand relatively quickly.

10.6.4. Rail

Post-2021 it is unlikely that the rail network will have capacity to absorb additional trips unless there is substantial investment in the network. If Smarter Choices are to remain attractive throughout the study period and the road network alleviated of a proportion of its car trips then serious consideration of these implications is required at a national level.

10.6.5. Highway Network Comparison 2031MP and 2031MPI

As for the 2021 case, this section compares the corresponding 2031 model runs, that is, the effects of full RSS growth with masterplanning in 2031, and interventions that might be needed to help address the problems. It therefore considers two scenarios, represented by EERM runs:

- **2031^{MP}**: This EERM run included full RSS growth up to 2031, in conjunction with the 2031 Reference Case network that included only the programmed schemes as set out in Chapter 4;
- **2031^{MPI}**: This EERM run included full RSS growth up to 2031, as does the above run, but the network incorporated additional interventions to help mitigate adverse effects of the growth on transport.

10.6.5.1.Motorway Network

Growth to 2031 has increased traffic levels on the network but the M1, M25 and A1(M) ATM schemes are still reasonably effective at providing relief to the most overloaded sections by 2031. However, the junctions fare less well and these comparisons show further deterioration, as was the case in 2021, particularly M25 J22 and J24. Much of the additional M25 capacity through programmed widening is invoked by 2031, again maintaining a level of service that is similar to current conditions.

10.6.5.2.Other Road Corridors

The overall reaction of the model to the 2031 interventions is similar to that of the 2021^{MP} and 2021^{MPI} comparison, as the majority of the new interventions are the same in each case. Accordingly, it is useful to look at the areas where there are new interventions in 2031 such as the Hemel northern bypass. The northern section is relatively free flowing, but the eastern link down to Breakspear Way is congested. It appears that it attracts some of the north-south through traffic that otherwise uses the A5183 via St Albans, as this latter location, including the A4147 Hemel-St Albans link, is considerably less congested. In general however, the picture is one of increasing growth that tends to outpace the improvements gained from this initial set of interventions.

Elsewhere on the network, there are corridor improvements, such as the A602 Stevenage to Hertford, and these tend to be through the more rural areas of the county. Within the urban areas, traffic problems tend to be moved around as travellers switch routes to attempt to avoid congestion.

Table 10-3: Comparative Summary of Strategic and Intra-urban Road Deficit 2031MP (RSS masterplanning) with 2031MPI (RSS masterplanning plus new infrastructure)

ROAD CORRIDOR	2031 MP	2031 MPI
M1		**(Junction 4 – 9)**
Mainline – Northbound		
J6A – J7		
J8 – J10		
Mainline – Southbound		
J10 – J9		
J9 – J8		
J8 – J7		
J7 – J6A		
J6 – J5		
J5 – J4		
Junctions	2031 MP	2031 MPI
J5 (M1 NB & SB Off Slips)		
J6 (M1 SB On Slip), **J6A** (M1 NB On Slip and SB Off Slip)		
J8 (M1 NB Off Slip), **J9** (A5 NW Approach)		
M25		**(Junction 17 – 26)**
Mainline – Clockwise		
J17 – J19		
J20 – J21A		
J22 – J23		
J23 – J24		
Mainline – Anti-Clockwise		
J26 – J22		
J22 – J21A		
J21A – J20		
J19 – J18		
J18 – J17		
Junctions	2031 MP	2031 MPI
J20 (A41 Approach)		
J22 (Circulating)		
J24 (Circulating)		
J21 (M25 EB Off Slip to M1), **J23** and **J25** (WB Off Slips)		
A1 (M)		**(Junction 1 – 10)**
Mainline – Northbound		
J1 – J3		
J6 – J7		
Mainline – Southbound		
J8 – J7		
J7 – J6		
J4 – J1		
Junctions	2031 MP	2031 MPI
J1 (M25 J23 – A1(M) SB Off Slip)		
J7 (Circulating), and **J9** (SB On Slip)		
J3 (NB On Slip, SB and NB Off Slips, Circulating), and **J8** (SB Off Slip)		
A1		
BOREHAMWOOD: A1/A5135 Junction (SB Off Slip and SE Rowley Lane App.)		
BOREHAMWOOD: A1/A411 Stirling Corner Junc (A1 N and A411 E & W Apps.)		
A5		
MARKYATE: A5/B4540 Junction (A5 N and B4540 NE Luton Road Approaches)		
FLAMSTEAD: A5/M1 J9 (A5 NW Approach)		
A10		
WALTHAM CROSS: A10/M25 J25 (A10 N & S Approaches, Circulating)		

ROAD CORRIDOR	2031 MP	2031 MPI
CHESHUNT: A10/Church Lane Junction (Church Lane E Approach)		
ROYSTON: A10/Melbourn St Junction (Melbourn St W Approach)		
A41		
BERKHAMSTED: A41/A416 Junction (A416 N Approach)		
BERKHAMSTED: A41/A4251 Junction (A41 W Approach to A4251 On Slip)		
KINGS LANGLEY: A41/M25 J20 (A41 NW Approach)		
WATFORD: A41/A412 Junction (All Approaches)		
WATFORD: A41/A4008/M1 J5 (A4008 SW Approach)		
A120		
LITTLE HADHAM: A120 Standon Rd/ Stortford Rd/ Albury Rd Junc (N App.)		
LITTLE HADHAM: A120 Standon Rd/ Stortford Rd/ Albury Rd Junc (E App.)		
LITTLE HADHAM: A120 Standon Rd/ Stortford Rd/ Albury Rd Junc (W App.)		
A405		
BRICKET WOOD: A405/M1 J6 (A405 NE Approach)		
ST ALBANS: A405/A5183/A1081/M1 J10 (A5183 N Approach)		
A411		
WATFORD: A411/A412 Junction (A411 E Approach)		
WATFORD: A411/A4178/Beechen Grove I/C (Note: limited modelling detail)		
BUSHEY: A411/A409 Junction (A411 E and A409 S Approaches)		
ELSTREE: A411/A5183 Junction (A5183 N Approach)		
ELSTREE: A411/Furzehill Road Junction (Furzehill Road NW Approach)		
BOREHAMWOOD: A411/A1 Stirling Corner (A411 E & W and A1 N Approach)		
A414		
HEMEL HEMPSTEAD: A414/A4251 Junction (A414 N Approach)		
HEMEL HEMPSTEAD: A414/A4146 Junction		
HEMEL HEMPSTEAD: A414/A4147 Junction (All Approaches)		
HEMEL HEMPSTEAD: A414/Green Lane Junction (A414 E Approach)		
ST ALBANS: A414/A1081 Junction (A1081 NW Approach)		
HATFIELD: A414/A1(M) J4 (A414 E Approach)		
WELWYN GARDEN CITY: A414/B1455 Junction (B1455 SE Approach)		
HERTFORD: A414/A119(W) Junction (A414 E & W and A119 N Approaches)		
HERTFORD: A414/B158 Junction (A414 E & W Approaches)		
HERTFORD: A414/A119(E) Junction (A414 SE Approach)		
A505		
LETCHWORTH: A505/A6141(W) Junction (A505 W Approach)		
LETCHWORTH: A505/Norton Way S/Willian Way Junction (A505 E & W Apps.)		
HITCHIN: A505/St Michael's Road Junction (A505 W Approach)		
HITCHIN: A505/B656 Junction (A505 E & W Approaches)		
HITCHIN: A505/A602 Junction (A505 E & W Approaches)		
HITCHIN: A505/B655 Junction (A505 W and B655 W Approaches)		
A507		
No major problems highlighted for this road within Hertfordshire.		
A602		
HITCHIN: A602/B656 Junction (A602 NW and B656 N Approaches)		
STEVENAGE: A602/A1(M) J8 (A602 W & SE Approaches)		
STEVENAGE: A602/A1072 Junction (A602 N and A1072 E Approaches)		
WATTON: A602/A119 Junction (A602 N Approach)		

ROAD CORRIDOR	2031 MP	2031 MPI
WARE: A602/B158 Junction (A602 N Approach)		
A1184		
SAWBRIDGEWORTH: A1184/Station Road/West Road Junc. (A1184 S App.)		
SAWBRIDGEWORTH: A1184/High Wych Road Junction (A1184 N Approach)		
A1198		
No major problems highlighted for this road within Hertfordshire.		

10.7. Prioritising Interventions

The assessment presented in Section 9.1.3 predicted areas expecting substantial RSS growth and where existing deficit and future corridor limitations could restrict this growth. These were therefore considered as priority areas for new sustainable transport interventions. The areas identified included (in alphabetical order):

- Hemel Hempstead;
- St Albans;
- Stevenage;
- Watford; and
- Welwyn Hatfield.

Table 10-4 presents examples of the interventions that should be considered for prioritisation. They are not given in order of priority and should not be considered as the only schemes suitable for prioritisation. Priorities have not been given yet as the actual process will require finalising once plans for growth have been completed as part of the LDF process, and phasing of growth across the county is identified and confirmed in greater detail. Further detail on these schemes can be found in Table 10-1 and in Appendix F. Schemes that will be funded at the national level, such as the Thameslink Programme, have not been included in Table 10-1 as the HIIS partners can have little control over their implementation; however such schemes should be considered essential for growth and lobbying to ensure that they progress is a priority.

Table 10-4: Potential Priority Interventions

ID	Scheme	Reason for Prioritisation
N1	Implementation of HCC cycling strategy	Facilitate reduction in car trips and therefore congestion, particularly for shorter journeys
N6	A1000/ B6426 bus priority	Enhancing bus services around Hatfield rail station and between Hatfield and Welwyn Garden City
N13	ATM J6-8	Improving north-south movement through the centre of the county and between Stevenage and Welwyn Hatfield
N18	A4147 corridor Jct improvements	Improved access between Hemel Hempstead and St Albans
N19	St Albans relief road improvements	Improved access around northern St Albans, facilitating east-west movement for existing and growth traffic
N25	A1(M) J8 Capacity enhancement	Improve access to the A1(M) for growth around Stevenage and A1(M) and reduce existing congestion
N27	Smarter Choices	Promotion of sustainable travel across the county will have county and local benefits
R11	Abbey Line passing loop	Improving rail connections between St Albans and Watford
S252	Watford Junction Rail Interchange	Improvement in intermodal connectivity and improvement in road network efficiency within Watford including benefits for the bus network
S31	Breakspear Way jcy improvements	Improved access to the M1 from Hemel Hempstead and between Hemel Hempstead and St Albans

While delivery of projected housing and employment growth is subject to the normal planning processes and constraints, there are in some locations additional or key constraints that impinge directly on whether particular schemes can be delivered. Therefore, in addition to the prioritisation discussed above, all schemes considered necessary for growth were prioritised using the qualitative scale from the funding model, described in 9.1.6.3. As an indication of the way this scale was applied a number of examples are shown in Table 10-5. The prioritisation of all schemes is shown in Table F 4 and Table F 5. It should be noted that there are considerably more higher priority items than there are at the lower end of the scale; in particular there are only three interventions classed as 'Desirable'. Table 10-5 highlights that cost is no indicator of priority. The most expensive item shown is classed as 'Essential', whilst all of the 'Desirable' interventions are more expensive than the widening of Bessemer Drive, which has a priority rating of 3 (Essential) highlighting that cost is not necessarily an indication of a higher priority.

Table 10-5: Examples of Scheme Prioritisation Using the Funding Model Scale

ID	Description	Cost (£m)
4: Statutory		
H23	Little Hadham Bypass	32.0
N25	Capacity Enhancement at A1(M) J8	7.0
N27	Smarter Choices	114.7
3: Essential		
N13	A1(M) J6-8 ATM	164.0
S122	Widening of Bessemer Drive to facilitate bus movement	0.3
S252	Watford Junction Interchange Improvements	32.5
2: Required		
BI1	Hemel Hempstead Bus Interchange Improvement	4.0
N14	Hertford A414 mitigation	10.0
S336	A602 Gunnells Wood Road Rdbt improvement	5.0
1: Desirable		
BI14	Letchworth station potential interchange improvement	1.5
N16	M25/ A41 junction improvements	5
N26	General improvements to rail stations	5.1

Note: Inclusion in this table does not imply that a scheme is considered more important than others of the same priority scale

The interventions included in Table 10-4 and Table 10-5 are illustrative with respect to their importance compared to other schemes identified in the study (i.e. inclusion in these tables should not be taken to mean that the interventions shown are necessarily more important than others identified in this study). Whilst they reflect the outcome of the broad prioritites identified as part of this study final decisions regarding scheme prioritisation are likely to be influenced by political priorities and stakeholder (including public) consultation. This is particularly the case for large and controversial schemes. To assist the partners with this process a Prioritisation Framework is proposed in Appendix G.

The framework was designed to be used for all scheme types of all sizes. It includes consideration of criteria such as policy, need, and wider benefits. To some extent it seeks to simplify the WebTAG scheme assessment process and make it more relevant to all sizes of scheme, whilst at the same time retaining a robust and consistent appraisal to aid prioritisation.

11. INTERVENTIONS: COST

The cost of infrastructure required to support anticipated future growth and demand is just that – the capital costs of the transport infrastructure necessary to allow additional growth to take place.

The cost quoted throughout the report is the "total cost" of, say, a new bus interchange or road improvement, which is considered likely to be necessary to sustain future network functions at an appropriate level of service.

11.1. Infrastructure Capital Cost

Where possible costs already identified for schemes from published sources were used, such as those available from the inventory of deficit schemes in Appendix B. Other cost estimates were based on similar types of schemes; for example the cost of a generic Park and Ride installation. For a number of the schemes it was necessary to make reasonable estimates.

11.2. Smarter Choices Capital Cost

The HIIS project has always recognised the need to include 'soft infrastructure' as part of the transport programme to facilitate new development. This includes what is generally known as Smarter Choices schemes that have been costed for inclusion in the funding model. The method of modelling Smarter Choices is outlined in Section 9.1.3, and is essentially a destination-based set of factors applied to the EERM.

The costing of Smarter Choices was based on the premise that the measures remove car trips from the road network. This represents a measurable saving, but is offset by the cost of Smarter Choice initiatives. An average cost per trip (or per vehicle-kilometre) can therefore be derived empirically, and has been achieved through independent research and case studies in which the impact of Smarter Choices has been proven. These values can then be applied elsewhere to estimate overall costs. The process lends itself to modelling, since it is relatively easy to obtain changes in trips and vehicle kilometres from the modelling process once the Smarter Choice matrix assumptions have been applied. This leads to car and other trip reductions, which are costed, and hence places less pressure on the transport network.

The overall outputs from the model needed to be interpreted carefully with regard to representing and costing Smarter Choices for two reasons.

First it was important to distinguish the impact of Hertfordshire schemes on the County within the context of a model covering the whole region. Clearly the impact on regional flows will be far lower than effects within the County boundary as it was assumed for the purposes of this study that there are no Smarter Choices interventions outside the county. This should not however be the case as other authorities are likely to apply similar measures to promote sustainable travel behaviour. Furthermore, some short journeys within the county will be excluded from the analysis due to the size of the EERM zones (a function of its geographic scale) and the impact of Smarter Choices within may therefore be slightly underestimated.

Secondly it was important to distinguish Smarter Choices impacts, which are "bottom up" in terms of changing patterns of travel, from "top down" plans such as new roads or public transport services. This is for two reasons:

- To estimate the effectiveness of travel planning in terms of improving transport efficiency and reducing carbon emissions; and
- To identify areas where additional hard infrastructure might be needed to provide extra capacity, for example bus or cycle priority, or used to "lock in" benefits, for example creating additional priority to avoid generating extra car traffic.

To give an indication of where demand would be reduced and the possible changes in demand, comparisons of trips to individual and groups of zones representing settlements in the traffic model were made, with and without the Smarter Choice (and other) measures.

As well as indicating the scale of reductions in key locations, it also allowed estimates of the extent of support for public transport. This often takes the form of enhancing existing services, for example through new vehicles, higher frequencies, and priority measures. Increased service frequencies will in turn improve the justification for priority. Such improvements also tend to attract a second round of passenger increases. Major changes in flow in urban settlements indicate the need for enhanced public transport.

Thus the combination of demand which is supplied through travel plans, and that which is generated in urban and suburban areas from service improvement, can make services self-sufficient in the longer-term. At the least it reduces the level of financial support required. Without a more detailed study the precise service designs cannot be tested, so the figures given in the next section should be considered as initial estimates.

Costs were calculated by allowing for hard infrastructure and service improvements associated with the settlements with the highest levels of car trip reduction. For example, additional bus services can be provided, plus some additional on street priority. These are supplied at an average cost. The destination-based planning is then costed on the basis of how many trips are affected and the average annual cost of doing so. This is assumed over the period to 2021 only, as travel behaviour is expected to become habitual by this time.

The estimates include an additional £6.6m for bus priority and other hard measures over and above that already planned in relation to settlements with over 500 car trips switching (see Table 11-1) up to 2021.

Table 11-1: Settlements with Over 500 Car Trips Switching to Other Modes

Settlement	Reduction in car trips (AM peak)
Watford	1563
Hemel Hempstead	1447
Stevenage	1251
St Albans	968
Welwyn Garden City	771
Hatfield	606

Source: EERM HIIS run 2021

Given that the additional Smarter Choices programme is estimated at the strategic level, it is difficult to estimate precise costs of specific elements such as bus service levels or priority that might be required. There is, however, evidence for the cost of destination-based schemes which can be applied. To allow for additional expenditure, it was assumed that around 30% of the reduction in car driver trips in all settlements with a change of 100 trips or more would transfer to bus (based on previous experience and published evidence). The cost of extra services can be calculated using industry average figures from Transport Statistics Great Britain. In addition, some allowance can be made for infrastructure related to areas where the impact was greatest. These also serve to act as a "locking in" device, by reallocating road space. The fares income was also taken to be 40% of costs, towards the low end of the range for additional subsidised services. The additional settlements are shown in Table 11-2 (see page 90).

With allowance for capital expenditure and bus service improvements, the implementation and maintenance costs of the travel planning package can be added. An average cost of £47 per trip saved has been calculated in the DfT study, which used a range of real case studies, particularly for travel to work. This figure was used in the estimation process and applied to all car trips removed in all areas. It should be noted that this revenue cost is assumed for each year between 2011 and 2031.

The total cost using the approach outlined above (i.e. trips saved plus infrastructure allowance) was £114.7m over the 20 year period.

Table 11-2: Settlements with Between 100 and 500 Car Trips Switching to Other Modes

Settlement	Reduction in car trips (AM peak)
Bishops Stortford	446
Hitchin	389
Cheshunt	378
Letchworth	360
Hertford	319
Borehamwood	267
Ware	253
Rickmansworth	235
Hoddesdon	204
Berkhampstead	204
Harpenden	192
Radlett	184
Royston	136
Harlow	125
South Oxney	113

Source: EERM HIIS run 2021

11.3. Potential Underestimation of Total Costs

There are three schemes for which costs could not be estimated. This is solely because the level of detail for each scheme could not be sufficiently identified based on information available at the time. The schemes are listed below; note from Table F 3 that they have not been modelled as changes to the EERM.

- S36 – Improvements to east-west routes as part of strategic connections on the Stevenage and Stansted corridor;
- S47 - Improvements to east-west routes as part of strategic connections on the Luton and Stansted corridor; and
- S321 – M11 J7 and J8 improvements.

In addition the scheme costs do not include any potential land costs as it was not possible to make a robust estimate of these. This is likely to lead to a relatively small underestimation of the total cost of schemes that may need to be funded from alternative sources, such as applications to regional and central government sources.

Identifying the extent of the underestimation will require schemes to be 'worked up' in greater detail. At present details of some schemes (in particular smaller schemes) are somewhat vague and as a result it is impossible to identify costs accurately. Not only would this exercise help to identify the quantum of additional cost, it would also provide useful inputs for the Prioritisation Framework presented in Appendix G.

11.4. The Predicted Transport Costs Associated with Growth

The costs of the schemes presented in Table F 4 (deficit schemes) and Table F 5 (new schemes) in Appendix F are summarised in Table 11-3 by district, type and period (2011-2021 and 2021-2031).

The district with the highest costs in the period to 2021 is East Herts, principally as a result of road schemes such as the Little Hadham bypass and A602 improvements. No costs are identified for Three Rivers as this study has shown that, at the level of detail at which it has been possible to assess locations across the county, there are no infrastructure requirements. However, the 'Other' NMU cost refers to the implementation of the HCC cycling strategy and would involve some spending within Three Rivers. It is also known that there are local issues that would require addressing within the LDF and LTP funding framework.

There is a significant difference in costs between some districts, ranging from £1.6m in Hertsmere to £262.7m in Watford. This is predominantly due the presence or otherwise of large-scale development in each district, and in particular the presence of a KCDC. It is important to note that Table 11-3 reflects the cost of growth, and that there will be additional costs associated with existing deficit. The cost of deficit is discussed in Section 8.

The costs associated with growth are particularly high for Watford because of the attribution of the full or partial cost of the Abbey Passing Loop and Croxley Rail link. Rail schemes are notoriously expensive and so will have a disproportionately high impact on the total cost for a district compared.

Costs in the period 2021-2031 are lower than those of 2011-2021, since the analysis has indicated that the majority of existing and new schemes identified for inclusion in the funding model will be required by 2021. The lower costs are not necessarily an indication that costs in the period 2021 to 2031 are harder to define, although it is likely that new schemes will come forward for this period in particular at a local level. Such schemes are outside the remit of this study.

Table 11-3: Estimated Cost of Primary Infrastructure by Period (£m)

	NMU		Bus & Coach		Rail inc. Freight		Road		Other		Total	
District	No.	£m	No.	£m	No.	£m	No.	£m	No.	£m	No.	£m
2021												
Broxbourne	0	0.00	1	1.50	0	0.00	2	6.47	0	0.00	**3**	**7.97**
Dacorum	0	0.00	2	42.50	2	4.00	7	47.99	0	0.00	**11**	**94.49**
East Herts	0	0.00	5	47.10	0	0.00	9	131.91	0	0.00	**14**	**179.01**
Hertsmere	0	0.00	1	1.50	0	0.00	1	0.10	0	0.00	**2**	**1.60**
North Herts	0	0.00	4	6.50	1	1.00	3	91.90	0	0.00	**8**	**99.40**
St Albans	0	0.00	5	45.40	0	3.00	6	69.13	0	0.00	**11**	**117.53**
Stevenage	0	0.00	12	5.55	0	0.00	4	32.17	0	0.00	**16**	**37.72**
Three Riv.	0	0.00	0	0.00	0	0.00	0	1.67	0	0.00	**0**	**1.67**
Watford	0	0.00	2	39.50	1	179.95	2	26.57	1	1.00	**6**	**247.02**
Wel/Hat	0	0.00	5	6.90	1	1.20	1	41.50	0	0.00	**7**	**49.60**
Other	1	36.00	1	0.00	3	5.10	8	0.00	1	59.12	**14**	**100.22**
2021 Total	**1**	**36.00**	**38**	**196.45**	**8**	**194.25**	**44**	**449.41**	**2**	**60.12**	**92**	**936.23**
2031												
Broxbourne	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	**0**	**0.00**
Dacorum	0	0.00	0	0.00	0	0.00	1	60.34	0	0.00	**1**	**60.34**
East Herts	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	**0**	**0.00**
Hertsmere	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	**0**	**0.00**
North Herts	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	**0**	**0.00**
St Albans	0	0.00	0	0.00	0	0.00	0	22.50	0	0.00	**0**	**22.50**
Stevenage	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	**0**	**0.00**
Three Riv.	0	0.00	0	0.00	0	0.00	0	15.68	0	0.00	**0**	**15.68**
Watford	0	0.00	0	0.00	0	0.00	0	15.68	0	0.00	**0**	**15.68**
Wel/Hat	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	**0**	**0.00**
Other	0	0.00	0	0.00	0	0.00	1	0.00	1	55.58	**2**	**55.58**
2031 Total	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**2**	**114.20**	**1**	**55.58**	**3**	**169.78**
Total 2011-2031	**1**	**36.00**	**38**	**196.45**	**8**	**194.25**	**45**	**563.61**	**3**	**115.70**	**95**	**1,106.01**

Note: Other refers to countywide and multidistrict schemes. Costs are attributed to districts by % of schemes that fall into them but scheme numbers are either by district or countywide/ other. Where there is a cost but no scheme this indicates that a proportion of the scheme numbered in other falls into this district.

From a total of 95 schemes (including Smarter Choices in the periods to both 2021 and 2031) the largest numbers of schemes shown in Table 11-3 are associated with Dacorum, East Herts, St Albans, and Stevenage. Three of these are KCDC areas and so it is to be expected that they attract higher infrastructure requirements. The fact that other districts that also include KCDCs have fewer interventions does not reflect a less rigorous analysis, rather that the need for infrastructure has not been considered so great based upon the evidence gathered and evaluation criteria used. Indeed, the number of interventions associated with each district is only a crude measure of the requirements compared to say cost, as the nature of the interventions may be very different. Furthermore, schemes such as the A1(M) ATM would benefit a number of districts (including East Herts, Stevenage, St Albans and Welwyn Hatfield in this example).

As an additional guide to the distribution of costs throughout the county Table 11-4 shows costs for the whole period (2011-2031) by KCDC. It is important to note that these figures are indicative and should be treated as orders of magnitude. The KCDC total does not match the total cost of transport infrastructure presented in Table 11-3, as it excludes interventions in non-KCDC areas.

Table 11-4: Estimated Cost of Primary Infrastructure by KCDC, 2011-2031 (£m)

District	NMU	Bus & Coach	Rail inc. Freight	Road	Other	Total
Dacorum/ St Albans/ Welwyn Hatfield	0.00	132.20	6.20	95.75	0.00	**234.15**
East Luton	0.00	0.00	0.00	1.79	0.00	**1.79**
Harlow	0.00	0.00	0.00	0.00	0.00	**0.00**
Stevenage	0.00	5.55	0.00	41.37	0.00	**46.92**
Watford	0.00	39.50	179.95	20.22	1.00	**240.67**
KCDC Total	**0.00**	**177.25**	**186.15**	**159.14**	**1.00**	**523.54**

A number of schemes included in the list in Table 10-1 are however excluded from the costs relating to growth (and are not reflected in Table 11-3 and Table 11-4, nor the funding model developed by the Lot 1 consultants) since whilst they are considered essential for growth in Hertfordshire, their strategic nature means that they are beyond the remit of the funding model and CIL. They are flagged separately here as an indication of their importance to growth. At a total cost of £8.5billion the schemes are:

- East Cost Mainline Improvements (£1.6b);
- The Thameslink Programme (£5.5b);
- WAGN Improvements (£50m); and
- Widening and Demand Management on the M25 (£1.3b).

It is also the case that all these schemes have existing full funding from central government sources.

12. INTERVENTIONS: FUNDING

12.1. Funding Opportunities

The costs and likely deliverability of new infrastructure provision need to be matched with the likely availability of suitable funding. This section examines the mainstream funding available for the transport infrastructure in question, with a summary of potential funds provided in Table 12-1.

Four sources of existing funding have been identified:

a) DfT and HA schemes, some of which are considered to be fully funded;

b) Regional Funding Allocation

c) Projection of existing funding such as LTP or equivalent; and

d) Developer funding.

Growth Area Funding and Supplementary Business Rates were also identified but were not suitable for inclusion.

- **Department for Transport and HA**

  A number of schemes are known to be fully funded, such as large rail projects and M25 widening. Although the schemes feature in the list of interventions, due to their significance to the county, they were not included in the funding model or costs because of their national status.

- **Regional Funding Allocation (RFA)**

  RFA funding was only assumed for current RFA bids, which are:

  – Croxley Rail Link;

  – Watford Junction Rail Interchange; and

  – Little Hadham Bypass.

  This gives total funding of £195.5m to 2021 (in approximately 2008 prices). Assuming this is accurate it is feasible that the same amount would be available for similar schemes between 2021 and 2031. However this has not been allocated over the second ten year period as it is not clear which schemes would be most appropriate.

  RFA represents a funding 'last resort', and is usually highly oversubscribed with individual schemes competing not only with others in the same authority, but with other regional schemes as well. The proportion of schemes awarded RFA funding in Hertfordshire in recent years is of the order of a few per cent, and there is therefore a major shortfall in the funding of the larger LTP schemes.

- **Local Transport Plan (LTP) funding**

  LTP funding for the current LTP period was averaged to provide an annual figure that was assumed to remain constant from 2011 to 2031. It is considered that one third of this will be available over this timescale, the remainder going towards deficit only schemes, smaller schemes, those not appropriate for CIL funding, and those coming forward over the next 20 or so years that will exclusively require LTP funding. This gives a total LTP budget of £79.5m from 2011 to 2031. However, the schemes that will need LTP funding are all anticipated to be required by 2021, meaning that only half of the total funding from this source will be available (i.e. LTP funding between 2011 and 2021) resulting in only £39.8m being available for the schemes to which LTP funding will contribute. This is spread according to scheme cost across eligible schemes on a pro rata basis (excluding for example HA schemes). This funding should be considered to be in approximately 2006/7 prices, as this is when the planning guidelines were available.

  A potential £39.8m of LTP funding has been identified for the period 2021 to 2031 but there are no appropriate schemes to which it can be allocated. For this reason it is not shown in subsequent tables.

- **Developer Funding**

  A small number of schemes have been identified that would be wholly funded by developers (as distinct from developer contributions, discussed below).

- **Growth Area Fund (GAF)**

  Although a number of areas in Hertfordshire currently benefit from GAF funding it has been indicated that transport schemes would be unlikely to have the first call on this source, and it was therefore assumed that GAF would not contribute towards the cost of transport growth impacts.

- **Supplementary Business Rates**

  Supplementary Business Rates (SBR) were made possible under the Business Rates Supplement Bill 2009. It allows local authorities to charge a supplement on business rates to contribute towards funding transport and other investments supporting economic growth. This study has not considered contributions from SBR as it is not a tested source of funding and there has been no indication that it might be adopted by the partners.

Table 12-1: Summary of Potential Funding Sources (£m)

Potential Source	Existing Schemes		New Schemes		Period Totals		
	2011-21	2021-31	2011-21	2021-31	2011-21	2021-31	Total
RFA	209.0	0.0	0.0	0.0	209.0	0.0	209.0
LTP	27.4	0.0	21.5	0.0	48.9	0.0	48.9
Other	23.7	0.0	3.0	0.0	26.7	75.0	101.7
Total	**260.0**	**0.0**	**24.5**	**0.0**	**284.5**	**75.0**	**359.5**

'Other' principally includes developer funding

Importantly, Table 12-1 excludes possible developer contributions. In addition to schemes appropriate for CIL funding it is anticipated that monies will be secured through negotiation for off-site public transport, cycling and walking measures. It will be essential to ensure that developers will be able to relate the results of their individual contributions to proposed schemes. Anticipated Section 106 funding will therefore need to be related to the specific package of measures for which contributions will be sought. Packages will become more definitive as plans progress and as it becomes clear what level of new development will be accommodated in each strategic sector or sub-area.

It is not the role of this assessment to decide how to allocate individual developer contributions between service providers (say, between health, transport, and education) and as a consequence there are no recommendations regarding how much developer contributions should be allocated to transport infrastructure investment.

12.2. Costs Versus Funding

A comparison of the cost of interventions and the available funding shows that there is a funding shortfall. The funding model shows a total shortfall of £652m from 2011-2021 and £95m from 2021 to 2031, a total shortfall of £747m. Table 12-2 illustrates the funding shortfall, showing costs against available funding.

Table 12-2: Hertfordshire Funding Shortfall 2021-2031

	2021	2031	Total
Costs (£m)	936	170	1,106
Funding (£m)	284	75	359
Shortfall (£m)	**-652**	**-95**	**-747**

The outputs from the URS work on costs and funding are inputs to the Lot 1 funding model, an excerpt of which is shown as Table 12-3. It shows the cost and funding profile of investment in Hertfordshire (i.e. excluding the strategic schemes listed in Section 11.4) over the period 2011 to 2031. From 2011 to 2015 the annual shortfall is £20m, in the period 2016 to 2020 it is approximately £94m, from 2021 to 2025 it is £20m and between 2026 and 2031 it

is £13m. This highlights that in each year there will be a funding shortfall, and that there are cashflow issues. These are addressed in more detail in the Lot 1 report.

Table 12-3: Profile of Hertfordshire Only Investment (£m)

	2011	2012	2013	2014	2015	2016-2020	2021-2025	2026-2031	TOTAL
Total Costs	£31.774	£30.189	£130.654	£97.239	£29.089	£542.264	£179.500	£65.300	£1.106.008
Total Funding	£11.115	£9.530	£109.995	£76.580	£8.430	£68.826	£75.000	£0	£359.474
TOTAL	-£20.659	-£20.659	-£20.659	-£20.659	-£20.659	-£473.438	-£104.500	-£65.300	-£746.534

Source: Excerpt from RTP Funding Model

13. OVERARCHING ISSUES

13.1. Introduction

In the course of this study, various issues came to light and are briefly set out in this chapter. They relate to considerations of acceptable levels of service, to modelling limitations, and hence to further work that would be appropriate to address some of them.

13.2. Level of Service

As outlined in Section 5, the considerations involved in determining the preliminary highway infrastructure improvements cannot and should not be based on a 'predict and provide' basis, for the following reasons:

- Policy – this does not dictate such an approach, not least as there is no guarantee that a radically improved network would not simply promote a further mode shift to car. Maintaining a certain level of impedance in the highway network is likely to be the necessary deterrent to effect a shift to improved sustainable modes (the 'carrot and stick' approach). This has been reinforced by the recent DaSTS initiative from DfT;
- Cost – extensive highway improvements would simply not be affordable and would quickly render any CIL contribution unviable; and
- Practicalities – space, environmental factors, public opinion etc would make such an approach very difficult to implement.

A decision that may need to be taken by HCC is: what is an acceptable level of service on the various modes? This type of target-driven approach is being considered by the HA as part of their Integrated Demand Management (IDM) strategy for the M25, whereby packages of bespoke interventions (Smarter Choices, ramp metering etc) are looking to provide a more 'holistic' solution to travel management.

The interventions proposed here, based on a preliminary assessment, represent a level of expenditure that is partly attributable to CIL but above which its viability may be compromised; however they do not collectively demonstrate wholesale improvements in travel conditions across the network. Subject to limitations of the modelling discussed below, the overall picture is one of maintaining similar conditions through time as are experienced now – of maintaining the status quo. Thus the study has avoided simply suggesting large-scale capacity improvements, in particular to the road network. A further consideration is that of the proportion of time during the day when the network is congested – this is normally the peaks only (with the possible exception of the M25) and may dilute the justification to provide such improvements. More could be done, but it would need much more money to fund it.

13.3. Modelling issues and limitations

The EERM is a strategic model into which it is has not always been possible to code the new highway interventions identified to address particular issues, due for example to the coarseness of the network. This is no criticism: it is simply a characteristic of strategic models.

Some highway interventions that were costed were not included in the model for this reason, so their effectiveness or otherwise is not reflected in the model outputs. The requirement for these measures has necessarily been based on judgement.

Where specific highway interventions are represented, the effect in some cases was to re-distribute traffic locally, causing demand and in some cases congestion to shift from one location to another. Thus to obtain a more informed picture and maximise the effectiveness of the interventions, some iterative testing, and more detailed analysis of the EERM results, will be needed. Issues such as the optimisation of new signals certainly require iterative testing, similar to the way in which they might be set 'on the ground'.

Related to this is the consideration of how accurately the existing zones and zone connectors represent the new development density and location from the masterplanning. Within the scope of this study and within the way that the EERM process calculates travel demand, it was not appropriate to sub-divide zones and modify connectors for the masterplanning runs; however it is likely that a more detailed review of this would lead to more accurate modelling of the effects, given time to adjust the model accordingly.

There are a number of local, more detailed models being developed in the districts, and further testing of local interventions will inevitably be more informative using such models – particularly those interventions that are intended to 'lock in' the benefits of Smarter Choices, such as bus priority measures. This will be needed for the LDF process irrespective of this work.

The 2021^{MP} results were obtained from a full run of the EERM model incorporating the masterplanning results of this study. Therefore the full set of EERM stages was invoked: demand, distribution, mode split and assignment, allowing for trip suppression and induction. However, testing of the interventions in 2021^{MPI} was carried out using only an assignment of the highway trip matrix obtained from 2021^{MP}, but factored down to represent the effects of Smarter Choices. This was a deliberate decision, since Smarter Choices include responses that are not explicitly modelled (for example car sharing and working at home). In this respect the process for 2021^{MPI} assumes a specified degree of success of Smarter Choices from the outset, and it is the re-assignment effects of this, taking into account further highway schemes, that are modelled. This assumed degree of success has the merit of being empirically-based, but clearly it is still an assumption. In the time available, this was considered a more robust approach than attempting to model Smarter Choices by proxy, invoking the full EERM processes, which would have introduced greater uncertainty. The same approach was used for 2031^{MP} and 2031^{MPI}. A key omission from the MPI work done to date is therefore explicit consideration of, for example, rail initiatives such as ECML improvements and Croxley Rail Link, other than partially through the effect of the Smarter Choice factors. In this respect specific rail interventions are relatively unknown post 2021, and are difficult to predict now.

However, further work would benefit from invoking the full EERM stages, with more consideration given to how Smarter Choices and the public transport interventions could be incorporated realistically within the full process (see Section 9.1.3, which describes how this has been approached in the HIIS study). It would also be informative to test the effects of

Smarter Choices independently from the highway interventions so as to attribute effects to causes more easily, and to appreciate better the likely impact of each.

This is a unique and ground-breaking study – as such, the initial programme for the study evolved and this restricted the number and nature of model runs that it was possible to undertake, compared to those envisaged in the original brief. Therefore, the opportunity has not existed to look carefully at the underlying reasons for the 2021^{MPI} and 2031^{MPI} modelling results, nor to determine whether successes of failures in terms of the effectiveness of interventions are due to realistic and explainable traffic responses, or to limitations of the model coding to represent exactly what is intended. Ideally, there would be some iteration in this process.

The V/C bands used here to indicate impending congestion or over-capacity sections of the network (80%-100% and over 100% respectively) are based on generally accepted criteria rather than on any thresholds or targets set by HCC that are deemed to represent 'unacceptable' levels of traffic. Two consequences of this fairly coarse banding that should be borne in mind are:

- It can mask degrees of worsening or improvement (for example an increase from 85% to 95% in different scenarios would be coded as 'amber' in both cases);
- Similarly, a change from amber to red or vice versa may be triggered by a very small change, if the section of network in question is bordering on capacity.

Therefore the results presented are indicative, and give a feel for future network conditions. The alternative, that of providing numerical V/C ratios, has not been adopted here because it would imbue the figures with a level of accuracy that cannot exist in the EERM, or any other, traffic model – they are a useful guide only. In both cases above it is difficult to determine what will be acceptable in the absence of prescribed targets. We are conscious of the need to maintain an effective network, however this must be viewed on balance with policy demands for sustainable transport; some congestion is likely to be inevitable.

The AM peak period was used throughout to provide a representation of the most congested period of the weekday, since the PM peak is usually less severe with fewer school-related trips and a greater spread of home-commuting traffic over a longer period than that of the AM. However, it is recognised that the PM peak would identify some different congested areas, and that there is an element of tidality in the traffic patterns.

Modelling intermediate years may help to shed more light on the issue of priority infrastructure and the way it is tied in to the phasing of new development. This interaction highlights the need to monitor and measure the effectiveness of interventions against targets. A longer-term strategy based on clear targets may be derailed should these not be met, so it would be essential to have an adaptable process to correct or re-plan based on monitoring. This is linked to enabling development, where certain schemes are reliant on development to trigger them, or vice versa, and the need to prioritise.

13.4. Further Work – Addressing the Issues

Distilled from the above considerations is a list of recommendations for further work that would build on what has been done, and improve the modelling representation of it. These steps would go some way to providing a more robust analysis of the wider issues.

- Modelling intermediate years to enable the priorities and dependencies of developments and infrastructure to be understood better;
- Investigating the extent to which Smarter Choices might be reasonably and realistically be integrated into the modelling process;
- Reviewing and refining the way in which masterplanned developments are represented in the network and zone system;
- Using the local models that are being developed to look in more detail at measures that could improve bus corridors;
- Undertaking similar work including the PM peak to inform measures with higher priorities;
- Further iteration is needed in the testing process to establish the effectiveness of potential measures. Those provided here represent a preliminary view, but the results indicate that they could be refined, improved and if necessary extended in scope.

Other additional work might focus on assesing the impact of decisions that could change investment decisions. The most significant variable may be the location of growth. Whilst it is anticipated that the masterplanning produced by Atkins with input from the partners represents the 'best guess' as to where development will eventually proceed it is a snapshot and circumstances may change.

Further 'optioneering' may centre on local policy decisions to pursue sustainable transport policies more aggressively. This could most easily be reflected through the assessment of schemes using the Prioritisation Framework in Appendix G. It may also be possible to assess simple changes in trip making using a spreadsheet model, although it is likely that further use of the EERM would ultimately be required for the assessment of schemes. The result of such a strategy would be greater investment emphasis on public transport and other sustainable modes. In addition land-use policies might need to reflect the desire to reduce the need to travel by private transport with a higher level of mixed use development and increasingly higher densities.

14. CONCLUSIONS

14.1. Introduction

URS was appointed in April 2008 by the Partners to provide consultancy services for the preparation of the Lot 2 transport elements of the Hertfordshire Infrastructure and Investment Strategy (HIIS). Atkins and Roger Tym and Partners (RTP) were appointed as the Lot 1 consultants to lead the overall strategy, to deal with the non-transport infrastructure elements and to establish the investment-funding model.

In the absence of a formal Implementation Strategy the study was commissioned to examine the implications for Hertfordshire associated with the published Regional Spatial Strategy (RSS – also called the East of England Plan), which has established district housing growth targets for the county to 2021 and 2031.

This report represents Stages One and Two of the HIIS assessment process and its focus is on taking forward the elements of historic or legacy transport deficit (Stage One) that are likely to remain post-2011, to be considered in the mix with an assessment of the transport implications associated with further RSS growth for the period 2011-2021 and subsequently 2021-2031 (Stage Two). One of the difficulties associated with transport is that of attempting to associate the demand for travel with particular geographic areas and points in time and this is why it was considered helpful to combine the historic and future deficit results into a single report.

A two-stage approach was taken to this study. The first stage identified baseline conditions, including historic defict. Stage two studied the required transport interventions to cater for the RSS growth anticipated within Hertfordshire, based on masterplanning completed by the Lot 1 consultants.

Deficit is defined as the amount by which something falls short. For the purposes of this study a part of the transport network can therefore be considered to be deficient where it falls short of providing the necessary capacity for the prevailing travel demand.

This study represents an independent assessment of infrastructure requirements and costs. It was based on the available evidence base but has highlighted where further information is required. As such the schemes presented in it should not be considered definitive but instead as a list for more detailed consideration. Addressing the issues and progressing the outcomes of this study is discussed in Sections 13 and 14.3 respectively.

14.2. Study Outcomes

The study identified the impact of RSS growth and interventions required to cater for this between 2011 and 2031. The outcomes for the base case and future years with RSS growth and interventions are presented below.

14.2.1. 2011 Base Case

There is an existing requirement to improve the general facilities for pedestrians and cyclists in the county, including the wider introduction of safer routes to schools. Safety is also an issue. Accessibility to key services and facilities is currently a key consideration, in line with the Department for Transport's policies and targets.

Hertfordshire has an extensive bus network, providing for all but the smaller villages. Many of the routes serving East Hertfordshire are however limited in terms of the days of the week that they operate. Despite this most Hertfordshire residents are reasonably well catered for, with hours of operation similar to many non-metropolitan areas. However, the county lacks a centralised bus interchange to facilitate longer distance bus and coach travel.

Rail in Hertfordshire is currently constrained by a lack of capacity, with a shortage of trains to satisfy the passenger demand, especially for commuter trips into and out of London, inadequate platform capacity including at London Stations, limited train paths and a suggested shortfall in car parking capacity at some stations. Passengers boarding trains within the County generally experience overcrowding during peak commuter periods, which is severe on services into London at times. The deficit in terms of train paths and carriage capacity is accompanied by the need to improve rail facilities. Forecast growth in rail travel, which includes substantial background growth, indicates that conditions will be unacceptable without extra capacity.

By 2011 the majority of motorway corridor links within Hertfordshire are operating between 80% and 100% of their capacity in the AM peak, with some sections above 100%. This will lead to instability and the likelihood of poor journey time reliability that will impact on the M1, M25 and A1(M) in both directions. Problems on many grade-separated motorway junctions are also anticipated and at access points with the non-motorway network, or both.

The main non-motorway routes are also congested by 2011, principally due to insufficient capacity at junctions. Key locations coincide with town centres, in particular Watford, St Albans, Heme Hempsteadl and Stevenage. At a broader scale the picture is one of congestion along a series of corridors between the main centres, especially at junctions. Those running broadly east to west tend to be most problematic and include:

- Berkhamsted / Hemel Hempstead / St Albans / Hatfield;
- Watford / Bushey / Borehamwood;
- Welwyn / Hertford;
- Hitchin / Letchworth / Baldock;
- Hadham / Bishop's Stortford.

North to South corridors tend to be less challenging, although there are sections such as the A1(M) J6-J7 that are under pressure.

14.2.2. 2021 & 2031 RSS Growth with Interventions

14.2.2.1.Transport Network in 2021

To ensure that sustainable travel behaviour becomes habitual implementation of the HCC cycling strategy, and notably its related infrastructure, will need to be complete by 2021. Detailed schemes will be identified through the Urban Transport Plan process. Cycling infrastructure will also support Smarter Choices, which will reduce the impact of travel on the road network.

There are a number of big infrastructure items identified for bus and coach up to 2021, namely improved or new bus stations. If designed correctly these will facilitate the efficient movement of the increased number of buses required for Smarter Choices Bus priority will also be a significant feature of the bus network from 2011 to 2021. The number of bus services and the frequency of buses on them is a matter for short term route planning. There is likely to be a challenge for bus operators and HCC to improve the service offer but it is not expected that the bus network should become over capacity.

Post-2011 there is a strong need for future rail capacity. While the East of England Plan is based on the assumption that out-commuting is reduced through sustainable policy objectives, the scale of development, even if it fully materialises, is unlikely to prevent continued commuting between Hertfordshire and London. The DfT suggests that much of the predicted demand up to 2021 can be accommodated on the existing railway with relatively small scale improvements. Delivery of infrastructure associated with both the Thameslink Programme and Crossrail is essential to cope with predicted increases in peak capacity on the Midland and East Coast Main Lines.

It has been necessary to comply with cascading national, regional and local transport policies when dealing with the network stress that has been identified. These clearly dictate that simply providing new or significantly improved roads is not a sustainable option for the future. Such considerations have rightly motivated and channelled the selection process for road improvements and helped to define key objectives and selection parameters.

Masterplanning and associated modelling of potential highway demand has shown that there is a need for some key road improvements otherwise Hertfordshire will face an unmanageable and undesirable future in terms of road transport. It was necessary however to balance this potential demand with the need to promote sustainable travel choices. As a consequence, while a number of road schemes were included in the list of proposed infrastructure requirements for 2021, they do not lead to a ‘step-change’ improvement to conditions. They help to free local bottlenecks but represent a balanced approach that aims to tackle the severest problems first in conjunction with the other initiatives. The overall result, not forgetting the larger scale programmed improvements, is very much one of maintaining the status quo.

14.2.2.2.Transport Network in 2031

Because the planning of cycling and walking schemes is relatively short-term it is not feasible to speculate as to the exact nature of even larger schemes beyond 2021. However, it is

certain that these modes will play an important part in continuing to ensure that Hertfordshire remains a sustainable community.

It is probable that smaller-scale bus infrastructure will continue to be required after 2021 to ensure effective operation of the network but that most schemes should be in place by this time. Between 2021 and 2031 the bus network should build on successes achieved in the previous ten years.

Beyond 2021 the predictions for rail capacity suggest that there would be a limit to the attractiveness of rail as a travel mode for Hertfordshire residents unless further substantial network improvements are delivered. This could impact on sustainable travel aspirations supporting growth and impose a 'cap' on rail use. Options for longer-term solutions up to 2031 need further consideration, but unfortunately rail planning does not appear to be that far advanced at present. The current thinking by the DfT suggests a further need to investigate improved signalling technology to allow more trains to run on existing lines, the potential for double-deck trains or alternatively, construction of new strategic railway lines, such as a north to south high speed line to serve growth by putting fast inter-city services onto a new line and freeing capacity on existing lines to accommodate both freight expansion and regional passenger services.

In 2031 the pattern of highway congestion, and the effectiveness of the measures, is similar to that of 2021. There are fewer new schemes and the Smarter Choices are assumed to reduce a larger number of trips. It would however be unwise to attach too much weight to these results simply because they look so far ahead, given the scope for policy, planning and other related circumstances to change in the interim.

14.2.3. Interventions Need, Cost & Funding

The interventions identified in this report come from a sound evidence base, either evidenced the EERM or from proven need backed by research. There are 95 in total, a mixture of those that already existed due to historic deficit (and which will be required to cater for growth as well) and new interventions identified by URS.

A summary of schemes is set out in Table 14-1 by scheme type and district, also showing cost. It indicates that, in general, the districts with the highest costs are those which contain KCDCs. Table 14-1 excludes those schemes not included in the funding model (and costing £8.5bn) such as M25 widening as they will not be funded through a CIL but it is important that such schemes are not forgotten as they will play an essential role in providing for the increased travel demand generated by RSS growth.

Table 14-1: Summary of Schemes by District

	NMU		Bus & Coach		Rail inc. Freight		Road		Other		Total	
District	No.	£m	No.	£m	No.	£m	No.	£m	No.	£m	No.	£m
Broxbourne	0	0.0	1	1.5	0	0.0	2	6.5	0	0.0	**3**	**8.0**
Dacorum	0	0.0	2	42.5	2	4.0	8	108.3	0	0.0	**12**	**154.8**
East Herts	0	0.0	5	47.1	0	0.0	9	131.9	0	0.0	**14**	**179.0**
Hertsmere	0	0.0	1	1.5	0	0.0	1	0.1	0	0.0	**2**	**1.6**
North Herts	0	0.0	4	6.5	1	1.0	3	91.9	0	0.0	**8**	**99.4**
St Albans	0	0.0	5	45.4	0	3.0	6	91.6	0	0.0	**11**	**140.0**
Stevenage	0	0.0	12	5.6	0	0.0	4	32.2	0	0.0	**16**	**37.7**
Three Rivers	0	0.0	0	0.0	0	0.0	0	17.3	0	0.0	**0**	**17.3**
Watford	0	0.0	2	39.5	1	180.0	2	42.2	1	1.0	**6**	**262.7**
Welwyn/Hat	0	0.0	5	6.9	1	1.2	1	41.5	0	0.0	**7**	**49.6**
Other	1	36.0	1	0.0	3	5.1	9	0.0	2	114.7	**16**	**155.8**
Herts total	**1**	**36.0**	**38**	**196.5**	**8**	**194.3**	**45**	**563.6**	**3**	**115.7**	**95**	**1106.0**

Note: 'Other' refers to countywide and multidistrict schemes. Costs are attributed to districts by % of schemes that fall into them but scheme numbers are either by district or countywide/ other. Where there is a cost but no scheme this indicates that a proportion of the scheme numbered in 'Other' falls into this district.

Table 14-2 presents the balance of the costs of interventions, set alongside the funding that has been identified from LTP and RFA sources. It also shows the profile of spending over the period 2011 to 2031, highlighting that the majority of costs are incurred during the first 10 years. This has been assessed based on evidence provided by the EERM and because it is important that infrastructure is in place in time for the opening of new development sites, rather than after they have been completed.

Table 14-2: Summary of Scheme Costs and Funding by Period

	2021	2031	Total
Costs (£m)	936	170	1,106
Potential Funding (£m)	284	75	359
Shortfall (£m)	**-652**	**-95**	**-747**

14.2.4. Scheme Prioritisation

At this stage in the strategic planning process exact priorities cannot be determined. Increased detail through the LDF process and masterplanning will reveal the precise location and phasing of developments that play such an important role in transport prioritisation.

Nevertheless, potential schemes for prioritisation were identified based on the evidence presented in this report. It shows the key areas and corridors of stress, and from these locations schemes can be drawn that will make a significant contribution to catering for increased travel demand. Alongside the need for targeted road improvements, such as the

A1(M) between junctions 6 and 8, are sustainable measures such as Smarter Choices and improvements to the cycling network through the HCC cycling strategy. Furthermore, the prioritisation of each intervention from essential to desirable identifies those that must be implemented to facilitate growth (for example improvements to A1(M) junction 8) through to those that, whilst still considered appropriate to enable growth, should not be considered 'show stoppers' (such as Letchworth Station Interchange improvements).

14.2.5. Overarching Issues

During the study a number of overarching issues arose, which should be taken into consideration as the HIIS is progressed and implemented over the next 20 or so years. These principally relate to providing a more detailed evidence base as the HIIS progresses. Ways to address these issues are preseted in Section **Error! Reference source not found.**

14.3. Progressing The Study Outcomes

The recommendations that are made throughout this report are reiterated here. They focus on taking forward the outcomes of the study with particular reference to ensuring that there is sufficient funding and implementation to meet the intervention requirements of RSS growth outlined in Sections 10. In addition the need to address historic deficit is highlighted

- As more detailed plans come forward through the LDF and masterplanning process the interventions presented in Section 10 of this report (including their timing, and their prioritisation) will need to be refined, building on the foundations provided by this study. A review of the transport infrastructure as the growth agenda develops through more detailed proposals and the LDF process, taking note of the schemes identified for growth in this study. This may require the use of more detailed modelling, taking into consideration the issues raised in Section 13;

- To implement schemes relating to those items that are solely historic deficit and so cannot be addressed through CIL funding. This will help to ensure that the transport network operates effectively across the county, without those areas with negligible impact becoming 'poor relations' in transport terms and subsequently impacting the efficiency of the transport network in areas of growth. These schemes are likely to be underfunded, based on the evidence presented in Section 8, and it is further recommended that representations are made to regional and central government for funding to remedy previous under-investment in the county transport network;

- Lobbying of central government and its agencies (the Highways Agency and DfT Rail/ Network Rail) to ensure that the schemes they are responsible for are implemented in a timely manner to facilitate growth in the county. In particular that there be substantial rail investment to cater for the lack of capacity post-2021;

- Application to regional and central government funding sources to fund any additional costs above those included here, including those resulting from more detailed scheme development;

- Further work between transport service providers and highway authorities to define and refine infrastructure need;
- A further programme of work on scheme prioritisation; and
- A programme of action to potentially shift investment priorities towards and potentially beyond Smarter Choices and other sustainable transport measures identified in this report.