Communities Directorate

Warwick District Council
Local Development Framework Core Strategy

Warwickshire County Council
Highways Agency

Strategic Transport Assessment

August 2011

Warwickshire County Council

HIGHWAYS AGENCY

Communities Directorate

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1.1 Background

1.1.1 This document forms the County Council's response on transport matters to a consultation carried out by Warwick District Council in 2011 entitled 'Local Plan – Helping Shape the District'. This response supersedes the submissions on transport which the County Council made as part of the previous Warwick District Local Development Framework Core Strategy.

1.1.2 The County Council has prepared this document to form a key input to the decision making process regarding the levels of future housing and employment growth within the District over the next 15 years. It is recognised however that transport is only one of many important considerations in the planning process.

1.1.3 The approach taken by the County Council in presenting this submission builds on the experience gained from the similar assistance which was provided to Rugby Borough Council as part of the preparation of its Core Strategy. The use of an evidence based approach is also consistent with the expectations of the Planning Inspectorate, who will ultimately determine whether or not the Local Plan is deemed to be sound.

1.2 The Process

1.2.1 An iterative, staged approach is being adopted by the County Council in providing its advice to the District Council on the transport implications of the Local Plan. It is envisaged that further timely input to the process will be made at the option development, preferred option and submission stages.

1.2.2 In parallel with this process, the County Council, Highways Agency and District Council are working closely with promoters of a number of potential development sites within the area. It is likely that this work will help:

(i) Identify the key transport infrastructure and services which will be needed to support the Local Plan proposals, in advance of the Independent Examination; and

(ii) Inform the position of the County Council and the Highways Agency when planning applications and supporting Transport Assessments (TAs) come forward for these sites in due course.

2 Portrait of the District

2.1 The District in its Wider Spatial Context

2.1.1 Warwick District is located broadly in the centre of Warwickshire, south of Coventry. The District is bordered by five local authorities, these being Rugby Borough and Stratford-on-Avon District in Warwickshire, and Solihull Metropolitan Borough and Coventry City within the West Midlands. The principal towns of Warwick, Leamington Spa, Kenilworth and Whitnash are supplemented by a number of smaller settlements and villages which can be found in the rural parts of the District. The proximity of Coventry and Warwick University to the area leads to an intensive interaction which places demands on the local and strategic transport network.

2.1.2 The resident population of Warwick District in 2008 was ??, with ?? of these living in the four main towns (Source: ONS/Warwickshire Observatory). Despite the recent economic slowdown, the resident population has increased by around ?? since 2003, representing a growth of ??%. This is the highest level of growth within the County.

2.1.3 The District has a strong position within the geography of Britain, given its proximity to the A45, A46, M40 and M42, and the busy Birmingham Snow Hill to London Marylebone rail line. Despite their growth in recent decades, the area retains much of its character which is largely based on the history associated with Warwick and Kenilworth Castles and the spa town of Leamington, reinforced by the proximity of Stratford-upon-Avon. This attractiveness does however mean that the area is a popular place to live work, and visit, all of which puts pressure on the local transport system. It is vital that future growth is seen to benefit the area rather than add to existing problems.

2.1.4 As the County town, Warwick is home to the County Council. A number of other major employers are also based in the area who, along with Warwick Castle, play a vital role in supporting the local economy. The regency town of Leamington Spa forms the main commercial centre of the District, and is also home to the District Council. Although a town in its own right, Whitnash forms a large suburb to the south of Leamington Spa. Kenilworth is essentially a dormitory town serving Warwick, Leamington Spa, Coventry and Solihull.

2.1.5 As noted above, Warwick University is located just outside the District within Coventry City. Coventry Airport can be found near Baginton to the south east of Coventry but within the District. The former Peugeot plant at Ryton-on-Dunsmore can be found in nearby Rugby Borough, whilst the Prodrive automotive research and development facility is located on the border with Solihull Metropolitan Borough near Chadwick End.

2.1.6 There are currently four declared AQMAs within Warwick District. Three were declared in December 2004 in Warwick, Leamington Spa and Barford, the last of which has subsequently been revoked. Two further AQMAs were declared in Kenilworth in 2008.

2.1.7 The AQMA in Warwick has been extended from the original declaration, and now includes High Street up to the junction with Bowling Green Street, Theatre Street/Saltisford up to the junction with Vittle Drive, Northgate/The Butts, Smith Street, St Nicholas Church Street and (most recently) Coventry Road near St Johns. This effectively means that the majority of the town centre core is covered by the AQMA.

2.1.8 The AQMA in Leamington Spa is located at the junction of High Street/Bath Street/Old Warwick Road/Clemens Street, and like Warwick it contains a substantial number of receptors including both residential and business properties. On-going monitoring of the Barford AQMA following its declaration showed a substantial reduction in NO2 levels following the opening of the A429 Barford Bypass in 2007. The AQMA was formally revoked in 2009. The two AQMAs in Kenilworth are located on the Warwick Road between Waverley Road and Station Road in the town centre, and on New Street immediately east of the junction of Bridge Street, High Street, New Street and Fieldgate Lane.

2.1.9 An Air Quality Action Plan to cover the AQMAs in Warwick, Leamington Spa and Barford was jointly prepared by the District and County Councils in 2008. A revised AQAP for the District covering the two AQMAs that have been declared in Kenilworth along with the extended AQMA in Warwick is likely to be prepared in 2011/12.

2.2 Transport Context

Transport Policy

2.2.1 At a national level, transport policy is underpinned by five national transport goals which were set by the previous Government for the development of the UK's future transport policy and infrastructure. These national goals and associated challenges were identified in the Department for Transport's publication 'Delivering a Sustainable Transport System' (DaSTS) in 2008. The five goals are outlined below.

- To reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of **tackling climate change**.
- To **support economic competitiveness and growth**, by delivering reliable and efficient transport networks.
- To **promote greater equality of opportunity** for all citizens, with the desired outcome of achieving a fairer society.

- To **contribute to better safety, security and health** and longer life expectancy by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health.
- To **improve quality of life** for transport users and non-transport users, and to **promote a healthy natural environment**.

2.2.2 The Local Transport White Paper, 'Creating Growth, Cutting Carbon: Making Sustainable Local Transport Happen' (January 2011) reiterates the Government's vision for a sustainable local transport system that supports the economy and reduces carbon emissions. It explains how the Government is placing localism at the heart of the transport agenda, taking measures to empower local authorities when it comes to tackling these issues in their areas. The White Paper also underlines the Government's direct support to local authorities, including through the Local Sustainable Transport Fund.

2.2.3 The wide ranging nature of the goals contained in both DaSTS and the Local Transport White Paper reflect the important contribution that transport can make in both supporting and acting as a stimulus to achieving a range of objectives, including supporting future growth proposals.

Warwickshire Local Transport Plan 2011-2026

2.2.4 The recently published Warwickshire Local Transport Plan (LTP3) sets out the County Council's proposals to improve transport and accessibility between 2011 and 2026. The Plan, which was submitted to the Department for Transport in March 2011, provides a 15-year strategy for transport up to the year 2026, with a rolling short term Implementation Plan.

2.2.5 The previous Warwickshire Local Transport Plan (2006-11) identified five overarching objectives for transport in the County. These have been reviewed to ensure that they remain relevant within the current policy context for transport. The revised objectives are as follows:

1. To promote greater equality of opportunity for all citizens in order to promote a fairer, more inclusive society;
2. To seek reliable and efficient transport networks which will help promote full employment and a strong, sustainable local and sub-regional economy;
3. To reduce the impact of transport on people and the [built and natural] environment and improve the journey experience of transport users;
4. To improve the safety, security and health of people by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health;
5. To encourage integration of transport, both in terms of policy planning and the physical interchange of modes; and

6. To reduce transport's emissions of carbon dioxide and other greenhouse gases, and address the need to adapt to climate change.

2.2.6 Objective 6 has been added to support the Government's commitment to tackling climate change as set out in the Climate Change Act 2008, the National Transport Goals and the Local Transport White Paper.

Existing Travel Patterns

The Highway Network

2.2.7 The highway network within or near the District is dominated by a number of important motorway and trunk roads which carry large volumes of local and longer distance traffic, these being:

- M40, which links Birmingham with London;
- M42, which forms part of the motorway box around Birmingham;
- A45/M45, which links the M1, Coventry and Birmingham; and
- A46, which links the M1/M69 with the M5 near Tewkesbury.

2.2.8 There are numerous routes which link the four key towns as well as provide access to the motorway and trunk road network described above, these being:

- A452/A4177 Balsall Common to Warwick;
- A452 Balsall Common to Kenilworth, Leamington Spa and M40;
- A429 Coventry to Kenilworth, Warwick, Wellesbourne and Moreton-in-Marsh;
- A425 Warwick to Southam and Daventry;
- A445 Warwick to Leamington Spa and Rugby (via the A45/A4071); and
- A423 Coventry to Southam and Banbury

2.2.9 Certain routes within Warwick carry a significant amount of local and through traffic (particularly during peak periods of the day), including:

- A425 Birmingham Road/Saltisford/The Butts/Castle Hill/Banbury Road/Myton Road;
- A445 Northgate/Priory Road/Coten End/Emscote Road;
- A429 Coventry Road/St Johns/St Nicholas Church Street/Smith Street/Jury Street/High Street/West Street/Stratford Road;
- A4189 Friars Street/Hampton Street/Hampton Road;
- Theatre Street/Bowling Green Street;
- Cape Road/Wedgnock Lane/Primrose Hill; and
- Spinney Hill/Greville Road.

2.2.10 Within Leamington Spa and Whitnash, the following routes are heavily used by traffic:

- A445 Rugby Road/B4099 Warwick New Road/Warwick Place/Warwick Street;
- A452 Kenilworth Road/A445 Lillington Avenue
- Northumberland Road/A452 Binswood Street/Clarendon Place/Dale Street/Adelaide Road/Avenue Road/Park Drive/Europa Way/Greys Mallory;
- Princes Drive;
- Heathcote Lane/Gallows Hill/Harbury Lane;
- Clarendon Avenue/The Parade/Victoria Terrace/Bath Street/Spencer Street/Lower Avenue/B4087 Tachbrook Road/Clemens Street;
- Warwick Street/Willes Road/Radford Road;
- A425 Myton Road/Old Warwick Road/High Street; and
- Queensway/Tachbrook Park Drive/Heathcote Lane.

2.2.11 Within Kenilworth, the main routes affected by traffic are limited to the following:

- A452 Birmingham Road/Beehive Hill/Upper Spring Lane/Fieldgate Lane/Bridge Street/Rosemary Hill/Priory Road/Waverley Road/Warwick Road/Leamington Road/A46 Thickthorn;
- B4103 Warwick Road/The Square/Abbey End/Abbey Hill/Borrowell Lane/Castle Road/Clinton Lane;
- A429 Coventry Road/New Street/High Street/Castle Hill;
- Birches Lane/Glasshouse Lane/Knowle Hill;
- Common Lane;
- Windy Arbour/Leyes Lane/Park Hill/Park Road/Manor Road/Tainters Hill
- Farmer Ward Road/Whitemoor Road/Spring Lane;
- Rosemary Hill/Albion Street/Stoneleigh Road/Mill End/Dalehouse Lane

2.2.12 Other junctions or routes within or close to the District that experience high traffic flows include:

- A45/A46 Tollbar End (near Coventry);
- M40/A46/A429 Longbridge (recently improved);
- A46/A4177/A425 Stanks;
- A46/C32 Stoneleigh;
- B4113 and B4115 Leamington Spa to Coventry (via Stoneleigh)

2.2.13 Whilst there are proposals to improve certain junctions such as Tollbar End, there are currently no proposals to build any new roads within the District.

2.2.14 Variable Message Signing has recently been introduced on the main radial routes within Warwick and Leamington Spa to inform drivers of car park availability, thus reducing circulating traffic and congestion within the two town centres.

2.2.15 The three main towns in Warwick District (Leamington Spa, Warwick and Kenilworth) have all experienced overall negative traffic growth between 2000 and 2009 with traffic levels in Leamington Spa having reduced by 3.3%. It is believed that the decline in traffic levels in Warwick and Leamington Spa can be attributed to the closure of a number of major employment sites including Pottertons in Warwick, the Peugeot plant at Ryton, the Ford foundry in Leamington Spa and changes to the number of employers based on the Tachbrook business park in Leamington Spa. (Source: Warwickshire LTP3, Warwick/Leamington Spa/Kenilworth/Whitnash Urban Area Strategy).

2.2.16 Within the District, 68.8% of people use the car for their journey to work (Source: Census 2001). The respective figure for the journey to school is 33% (Source: WCC School Travel Survey 2010).

2.2.17 Public Transport

2.2.18 The urban areas of the District have a relatively comprehensive network of bus services, made up of a combination of intra and inter-urban routes. The majority of these services are provided on a commercial basis by Stagecoach and, to a lesser extent, Travel Coventry. A number of services are operated by these companies (along with Johnsons) on behalf of the County Council where there is a need to provide socially necessary journeys for the local community.

2.2.19 Access to the rail network can be found at Warwick, Warwick Parkway, Hatton, Lapworth, Leamington Spa and Claverdon. Coventry also acts as an important railhead for the District by providing access to train services on the West Coast Main Line (Virgin and London Midland).

2.2.20 On the Birmingham Snow Hill to London Marylebone line, Chiltern Railways provide a half-hourly service in each direction. From December 2011, fast and semi-fast trains will operate alternately giving a best journey time from Leamington Spa to London of xx minutes *(check with DC)*. Leamington Spa, Warwick, Hatton and Claverdon are served by Chiltern Railways services between London Marylebone and Stratford-upon-Avon, which generally run every two hours. London Midland also operate some stopping trains between Birmingham and Leamington Spa which call at Hatton, Lapworth and Warwick. Leamington Spa and Coventry are also served by half-hourly Arriva Cross Country services between Manchester Piccadilly and Reading/Southampton/Bournemouth.

2.2.21 11% of journeys to school are made on public transport (Source: WCC School Travel Survey 2010). The journey to work by public transport (bus and rail) accounts for 5.3% of the modal share (Source: 2001 Census).

Walking and Cycling

2.2.22 The cycle network within Warwick District (particularly within Warwick and Leamington Spa) has been expanded and improved over the last 10-15 years through investment by the County Council (using LTP funding), Sustrans (as part of the development of the National Cycle Network) and Warwick District Council. There have also been improvements as a result of new development in the main towns. Key routes include the A429 Coventry Road, Woodloes – Aylesford School, Warwick Technology Park link, A445 Emscote Road, St Nicholas Park/A425 Myton Road/Old Warwick Road, B4087 Tachbrook Road and Radford Road/Sydenham Drive. Although less well developed, the cycle network within Kenilworth is currently being substantially expanded as a result of the construction of the Connect2 scheme between Abbey Fields, the Berkswell Greenway and Warwick University.

2.2.23 Apart from the usual range of controlled and uncontrolled pedestrian crossings, the main facilities for those on foot can be found within the existing pedestrianised areas of Warwick, Leamington Spa and Kenilworth.

2.2.24 The mode share for journeys to work made on foot and by bike in the District is 11.2% and 3.5% respectively (Source: 2001 Census). For the journey to school, 48% of pupils walk whilst 7% cycle (Source: WCC School Travel Survey 2010).

Performance of the Local Transport Network

The Highway Network

2.2.25 There are a number of issues and constraints which tend to be the cause of the majority of congestion problems across the transport network within Warwick District. These include:

- The historical nature and configuration of certain routes within the main town centres, particularly in Warwick;
- The geographical location of large employment sites to the south of Leamington Spa, which results in a heavy demand for movements at peak times of the day through both Warwick and Leamington Spa town centres;
- The proximity of Warwick, Leamington Spa and Kenilworth to parts of the motorway and trunk road network. This has implications both for

traffic passing through the area in order to access this network, and when there is an incident on either the A46 or M40;

- The limited number of routes between Warwick and Leamington Spa (A445 Emscote Road and A425 Myton Road), Warwick and Kenilworth (A46 and A429/Leek Wootton road) and Leamington Spa and Kenilworth (A452); and
- The additional pressure brought about by significant tourist activity within the area.

2.2.26 These issues result in delays and congestion throughout the network (as described earlier), principally (though not exclusively) at peak periods of the day and on Saturdays. The District has some of the slowest journey times within Warwickshire according to data collected by the County Council.

Public Transport

2.2.27 The principal constraint to bus operations within the District relate to issues of congestion and journey time reliability on certain routes. Generally speaking, bus service timings (for example on the G1 service between Warwick and Leamington Spa) during the peak periods are more generous to reflect this issue. New or enhanced bus services to serve future growth within the District will require careful planning in order to integrate them into the existing commercial and subsidised network.

2.2.28 The primary constraint for rail to maximise its role within the area is the availability of car parking at stations, particularly Hatton, Warwick Parkway and Leamington Spa. The County Council is working with Chiltern Railways and Network Rail to bring forward proposals to extend the station car park at Hatton. Chiltern themselves have proposals for decking at Warwick Parkway, and a franchise commitment to provide more parking at Leamington Spa.

2.2.29 Kenilworth currently lacks its own railway station. The County Council has developed proposals for a new station to be provided, the site of which is safeguarded in the existing Warwick District Local Plan. The principal barrier to the delivery of the station relates to funding.

Walking and Cycling

2.2.30 There are limited issues in terms of the performance of the pedestrian and cycle network within Warwick District. The expansion of the cycle network within and around the town over the last 10-15 years has significantly improved conditions for cyclists. There are however a number of gaps in both the intra-urban and inter-urban cycle route network (e.g. Kenilworth to Leamington Spa).

Warwick District Transport Issues

2.2.31 Maps of the district have been produced summarising the key transport issues in the district, highlighting congested routes and areas and with safety concerns. Additionally, key recent, committed and proposed schemes have been plotted.

2.2.32 Key Committed and Completed Schemes

- A46 Stanks grade separated roundabout signalisation due 2011/2012.
- Princes Dr/Park Dr signalisation and Foundry roundabout upgrade due 2012.
- A425 Emscote Rd signals upgrade due 2011/2012.
- M40 J15 improvements completed 2010.
- A429 Gallows Hill junction signalisation completed 2010.
- Kenilworth town centre one-way system completed 2008.

2.2.33 Key Scheme Proposals or Investigations (not committed)

- A452 Europa Way/Heathcote Lane roundabout upgrade, likely delivery in 2012.
- A452 Grey Mallory roundabout upgrade, likely delivery in 2012.
- Warwick town centre street by street proposals.
- A46 Thickthorn grade separated roundabout signalisation.
- A46 Stoneleigh grade separated priority junction upgrade.
- B4113/C32 junction improvement.
- A45 Tollbar upgrade, access improvements to Coventry Airport and employment and improvements to Stivchall roundabout, jaguar link road and A45 link to Tollbar.

2.3 Strengths, Weaknesses, Opportunities and Threats

2.3.1 A summary of the strengths, weaknesses, opportunities and threats of the transport network is set out in Table 2.1 overleaf.

Strengths	**Weaknesses**
• Unique location of Warwick District in relation to the national road and rail network • Committed improvements to rail services and facilities and improved connections on certain routes • Well developed cycle network • Reasonably comprehensive intra and inter-urban bus network • Partially pedestrianised areas within the main town centres	• Existing congestion on key routes within and around the main town centres • Poor location of Warwick and Leamington Spa railway stations in relation to their respective town centre • Pressure on parking at rail stations • Majority of bus and rail services are outside the control of the • County Council • Existing bus network will probably need to be revised to maximise the public transport potential of development sites
Opportunities	**Threats**
• All of the strengths above represent opportunities • Future development could be provided in a way that maximises the benefits of new or enhance transport infrastructure and services, e.g. public transport proposals will become commercially viable in the medium/long term after initial pump-priming • Revisions to the existing bus network may open up new journey opportunities	• Development sites may come forward which are not supported by sustainable transport improvements, leading to a growth in car-based travel. Subsequent impacts on rat-running and increased congestion (particularly in town centres and surrounding residential areas) and on local air quality

Table 2.1: Strengths, Weaknesses, Opportunities and Threats

3 Option Assessment

3.1 The Vision for Transport within Warwick District

Introduction

3.1.1 The proposals for transport in relation to the Local Plan must support the vision for the District. In this respect, transport should:

1. Contribute to the area being a place where people want to live, work and visit;
2. Support the economy of the main towns and surrounding rural areas, thus stimulating growth and prosperity;
3. Mitigate, where possible, the negative impacts of growth;
4. Help achieve connectivity between new and existing neighbourhoods, community facilities and public spaces; and
5. Ensure that communities can access heath and local services by sustainable means.

Local imperatives

3.1.2 As set out earlier, the County Council's objectives for taking forward National Transport Goals at a local level are as follows:

1. To promote greater equality of opportunity for all citizens in order to promote a fairer, more inclusive society;
2. To seek reliable and efficient transport networks which will help promote full employment and a strong, sustainable local and sub-regional economy;
3. To reduce the impact of transport on people and the [built and natural] environment and improve the journey experience of transport users;
4. To improve the safety, security and health of people by reducing the risk of death, injury or illness arising from transport, and by promoting travel modes that are beneficial to health;
5. To encourage integration of transport, both in terms of policy planning and the physical interchange of modes; and
6. To reduce transport's emissions of carbon dioxide and other greenhouse gases, and address the need to adapt to climate change.

3.1.3 When these are combined with the vision for transport in Warwick District as set out above, a number of local imperatives begin to emerge:

1. The need for a sustainable transport system to underpin growth, with a focus on public transport, walking, cycling and targeted highway improvements;
2. The need to ensure that any growth proposals support the economy of the District, and do not adversely impact upon it (particularly in terms of congestion);
3. The need for the impact of any transport improvements on the built and natural environment to be minimised (particularly air quality); and
4. The need to ensure that existing and future residents/visitors to the area can access and use the transport network safely and in an integrated way.

3.2 Future Growth in Warwick District

Introduction

3.2.1 As described below, the District Council has consulted on three levels of housing and employment growth that could take place over the next 15 years. In order for the County Council to inform this process, it has been necessary to make some assumptions regarding what broad geographical areas across the District could come forward to deliver this growth. In conjunction with officers from the District Council, a number of sites which were identified in the Strategic Housing Land Availability Assessment (SHLAA) have been used as the basis of a number of option tests. By inclusion in this piece of work, no implication should be taken that these are the preferred sites for future development within the District. Without making some assumptions about the location of development, it is extremely difficult to come to any meaningful conclusions regarding the likely impact on the transport network of one growth scenario compared to another.

Development Scenarios and Assumptions

Levels of Growth and Location of Sites

3.2.2 WDC requested 3 levels of growth to be assessed in terms of high level highway impact and accessibility to sites. One low growth option, three variations of medium growth options and one high growth option were tested and analysed through strategic modelling and accessibility analysis. WDC provided potential broad locations for residential and commercial development and advised on the capacity of these sites and suitable access points onto the highway network. Further details on the scenarios tested are shown in Table 3.1… below.

Commitment, Windfalls and Unidentified Sites

3.2.3 All scenarios assume that 3750 housing units and 60 Ha of employment are provided through commitments, windfalls and unidentified SHLAA sites. As the same base situation is assumed for all scenarios and the volume of traffic on the modelled network does not inform route choice, it was unnecessary to include this element within the first stage of testing. Inclusion of trips associated with these developments would actually mask the impact relating to the identified broad locations of development sites presented for each scenario. Additionally, the windfalls which provide almost 2,000 houses up to 2026 cannot be associated with any specific area which means further assumptions must be made.

3.2.4 As a second stage, a sensitivity test was modelled for the 3750 housing units and 60 Ha of employment. A number of assumptions were made regarding the distribution of developments. The sensitivity test was run once to understand the impact of the developments not allocated to a scenario. The outputs from this process are shown in Appendix ….. The results from this sensitivity test were then combined with the outputs for each scenario and plotted on a final set of scenario impact plots to show the overall impact of all developments combined.

3.2.5 The following assumptions were made in order to model commitments, windfalls and unidentified SHLAA sites;

- All committed employment was distributed according to the capacity and location of employment described within *Employment and Land Supply in Warwick District April 2011*. Employment trip rates adopted for each land use were the same as the trip rates adopted in the analysis of each scenario. Just over 60 Ha of employment can be identified through this process.
- Of the 1078 housing units committed as of 01/04/2011, 752 units were allocated to large development sites shown in Table 3.2 The remaining housing units were distributed throughout Warwick District urban areas based on census ward populations.
- Estimated windfalls 2011-2026 of 1897 housing units have been distributed proportionately throughout Warwick District urban areas based on census ward populations.
- For the remaining 775 housing units allocated to unidentified SHLAA sites, it was more difficult to define a suitable methodology to represent the associated development traffic impact. Allocating to specific sites was considered to be unfair and may be unrealistic. It was concluded that representing the additional traffic impact by allocating the trips associated with the 775 housing using the same methodology as with Windfalls and remaining commitments was the most suitable approach. At least adopting this approach would allow for a representation of this traffic impact without skewing the results towards a particular unidentified SHLAA site.

3.2.6 The development scenarios modelled in stage one are based only on the proposed growth figures, these are shown in Table 3.1.

3.2.7 The stage two committed windfalls and unidentified housing and employment sites consisting of the 3750 housing units and 60 Ha of employment are described in Table 3.2 and 3.3.

Trip Rates

3.2.8 The trip rates adopted for each housing and employment land use are shown in Appendix…. The trip rates adopted are for strategic modelling use only. Once the actual characteristics of each site are more certain more detailed analysis and identification of suitable trip rates will be required for microsimulation modelling purposes.

	POTENTIALLY SUITABLE SHLAA GREENFIELD SITES	SHLAA REFERENCE	SITE CAPACITY	SCENARIO 1		SCENARIO 2						SCENARIO 3	
						A46 Corridor Option		War/Leam/Whit Option		Four Towns Option			
				HOUSING (Units)	EMP (Has)	HOUSING (Units)	EMP (Has)	HOUSING (Units)	EMP (Has)	HOUSING (Units)	EMP (Has)	HOUSING (Units)	EMP (Has)
WAR/LEAM/WHITNASH	Gogbrook Farm	W19	100	100	0	100	0	100	0	100	0	100	0
	South Sydenham	L10	200	0	0	0	0	150	0	100	0	200	0
	Red House Farm	L23	200	0	0	0	0	0	0	0	0	200	0
	Woodside Farm	L14	250	0	0	0	0	0	0	0	0	250	0
	Warwick Gates Emp Land	W20	250	0	0	0	0	0	0	0	0	250	0
	Heathcote Sewerage Works	W03	250	0	0	0	0	0	0	0	0	0	0
	Grove Farm	L09 W08 &	750	0	0	0	0	0	0	0	0	0	0
	Europa Way	W21	1250	0	0	750	1	1250	2	1250	2	1250	2
	Milverton	L07	1465	0	0	600	0	750	2	0	0	1500	2
	Lower Heathcote Farm	W07	1500	0	0	0	0	1500	2	1500	2	1500	3
KENILWORTH	Southcrest Farm	K17	750	0	0	0	0	0	0	0	0	750	0
	Jersey Farm/ RFC Glasshouse	K09 &K06	350	0	0	350	0	0	0	350	0	350	0
	Land at Thickthorn	K01	300	0	0	300	2	0	0	300	2	300	2
	Ken RFC Rocky Lane	K05	150	0	0	150	0	0	0	150	0	150	0
SOUTH OF COVENTRY	Finham	C06	1500	0	0	1500	3	0	0	0	0	1500	3
	TOTAL		**9265**	**100**	**0**	**3750**	**6**	**3600**	**6**	**3750**	**6**	**8300**	**12**
	APPROXIMATE REQUIREMENT			**0**	**0**	**3750**	**6**	**3750**	**6**	**3750**	**6**	**8250**	**12**

Table 3.1: Development Scenarios and Site

3.3 Strategic Modelling Methodology with CITEware

3.3.1 The test year for all assessments was 2026. AM morning peak (0800-0900) and PM evening peak (1700-1800) have been adopted as the most suitable time periods to test as they represent the worst case in terms of traffic congestion issues on the road network with Warwick District..

3.3.2 The highway impact relating to each scenario was assessed using JMP's CITEware strategic modelling software. This software was developed with input from WCC and has been tailored for our use through the inclusion of surveyed traffic flows across the entire strategic network and observed vehicle speeds derived from DfT NI167 data. The software also utilises census journey to work data, OS mapping and DfTs TEMPRO for the calculation of growth factors. The model has been used by a number of other local authorities and the Highways Agency. WCC are satisfied that this model is the most suitable tool for the kind of high level strategic modelling required at this stage. Further details on how CITEware works can be found in Appendix….

3.3.3 It should be noted that this is a strategic modelling exercise. The CITEware model calculates the routes chosen by vehicles based on a time and distance calculation. The time taken to travel along any given link is informed by DfT NI167 data and is therefore based on the delays/speed of travel experienced during 2008/9. Route choice during the 2026 test year may differ as speed of travel along various links may differ, the model cannot take account of the delay caused by the additional traffic on the network associated with each scenario tested. The CITEware model runs an "All or Nothing" assignment which means that the model will work out the least cost route from the origin of the trip to the development site (or vice versa), there is no rerouting of traffic due to increased levels of congestion for either the baseline traffic flows or the development related traffic flows. Therefore a sense check is required in the interpretation of the CITEware output plots. Where it is known that capacity is restricted (i.e a town centre) and there are few options to improve the capacity it can be expected that a proportion of the development site vehicles would in reality reroute onto more appropriate routes, for example the A46/M40 corridor.

3.3.4 It should also be noted that the outputs from CITEware are considered to be a worst case scenario. The profile of development related trips is based on current mode share and time period choice. By 2026 it is inevitable that there will be a higher degree of modal shift onto more sustainable means of transport and commuters are likely retime their journeys in response to the higher levels of congestion on the network (e.g. commuting between 0700-0800 rather than the current peak period). There is evidence that this behaviour is already happening however it is difficult to protract this evidence to provide reliable 15 year forecasts. Therefore the most suitable approach is to use current patterns of travel and except that the model is providing a robust worst case scenario.

3.3.5 The 3750 housing units and 60 Ha of employment provided in all scenarios which include windfalls, commitments and undetermined SHLAA sites have not been included in stage one analysis and their impact is not measured. A sensitivity test has been undertaken to provide a strategic approximation of the impact of including this element. This issue is raised in Chapter 4.

3.3.6 This type of modelling provides evidence to be used in a strategic sift of scenarios and sites, and highlights where possible highway infrastructure improvements are required. Once this has been achieved a more detailed modelling exercise should be undertaken using microsimulation modelling to ascertain with more confidence the actual impact on the highway network, thoroughly testing mitigation options and attributing cost to developments. This issue is discussed further in Chapter 6.

3.3.7 Three methodologies have been adopted in the analysis of the CITEware outputs and should be used in conjunction when formulating an opinion on the impact of a scenario on the highway network.

3.3.8 The first methodology involved a simple assessment of the overall increase in 2-way traffic flow on all links within the model relating to each development scenario. The outputs for this method are provided in development traffic plots using the following banding;

- 0-50 additional vehicles
- 50-100 additional vehicles
- 100-250 additional vehicles
- 250-500 additional vehicles
- 500+ additional vehicles

3.3.9 This is useful for understanding the overall increase in traffic in an area/on a route but gives no context. For example, an increase of 100 vehicles on the A46 or M40 would be neglible, we already experience such differences on a daily basis, however, the same increase on the Parade in Leamington Spa may be considered significant.

3.3.10 To overcome this issue a second methodology was developed using a common traffic modelling calculation called GEH. Using the GEH Statistic avoids some pitfalls that occur when using simple percentages to compare two sets of volumes. This is because the traffic volumes in reality vary over a wide range. For example, the mainline of a motorway might carry 5000 vehicles per hour, while a side road may only carry 50 vehicles per hour (in that situation it would not be possible to select a single percentage of variation that is acceptable for both volumes). The GEH statistic reduces this problem; because the GEH statistic is non-linear and self-scaling, a single acceptance threshold based on GEH can be used over a fairly wide range of traffic volumes. The use of GEH as an acceptance criterion for travel demand forecasting models is recognised in the *DfT Design Manual for Roads and Bridges (DMRB), Volume 12, Section 2*.

3.3.11 For traffic modelling in the "base" scenario, a GEH of less than 5.0 is considered a good match between the modelled and observed hourly traffic flows. Therefore any link that has a GEH value of less than 5 in a forecast model can be deemed to accommodate only a small increase in traffic relative to the existing flows, between 5.0 and 7.5 GEH shows a more significant impact, 7.5 to 10.0 GEH suggests a high impact and anything above 10.0 GEH experiences a very significant impact in relation to the existing flows on the particular link.

3.3.12 In addition to the analysis described above a third exercise was undertaken to assess;

- the increase in traffic movements along key route between towns;
- the increase in traffic movements along key routes between towns and the HA Strategic Road Network (SRN);
- additional numbers of vehicles using the SRN compared to WCC road network;
- the additional numbers of vehicles travelling through, to or within town centres.

3.3.13 This methodology provides an easily understood output in a tabular form. Additional development traffic in 2026 has been provided in absolute generation of additional vehicle trips on the network and percentage increase. Base traffic flows were factored according to DfTs TEMPRO forecasting software and adjusted by NTEM, standard modelling practice. The growth rates used for this process are in Appendix…..

3.3.14 Finally, each scenario output was combined with the output from the sensitivity test which modelled the impact of the commitments, windfalls and unidentified SHLAA sites. An overview plot was produced showing the overall combined impact on the network, in terms of 2 way additional development traffic.

3.3.15 It should be noted that all analysis has been undertaken using 2-way flow as is typical for a strategic modelling exercise of this nature. Trips originating from the development zones will have tidal flows where in the AM a housing development will be producing many more trips than it will be attracting and vice versa for the PM period. The opposite of this will be true for an employment development site. It should be recognised that any mitigation solutions identified should be able to accommodate the tidal nature of the trips associated with the developments and the baseline traffic conditions.

3.3.16 An analysis of outputs is provided in Chapter 4. CITEware outputs are provided in Appendix ….

3.4 Accessibility Analysis Methodology with Direct Route

3.4.1 Accessibility analysis was undertaken using JMP's Direct Route software. This software is similar to a slimmed down version of Accession accessibility modelling software. The software was developed in house, benefits from fast model run times and is ideally suited to strategic accessibility analysis. DirectRoute has been used in the North West Regional DaSTS study and by the DoH. Further details relating to the development of DirectRoute, how it works and examples of previous studies are included in Appendix…Accessibility outputs are provided on a development site basis rather than an option basis, plots by scenario would prove difficult to understand and to draw conclusions.

3.4.2 Information on the locations of employment, healthcare and shopping has been derived from 2006/7 Accession repositories held by WCC. There may have been some small changes to this information since this date. Locations of these sites are based on postcode centroids. Therefore, the points marked on the maps may not correlate exactly with where the employment etc. is geographically located, but they should be within 200 metres.

3.4.3 An analysis of outputs is provided in Chapter 4. DirectRoute outputs are provided in Appendix …

3.5 Identification and costing of transport interventions

3.5.1 Identification of key transport interventions was based on expert analysis of the modelling outputs through a 8 member project board including senior transport planning and development control officers from WCC and senior planners from the HA and JMP (HA consultants). Transport interventions were identified in terms of provision of sustainable transport to encourage modal shift and key road network schemes to improve capacity.

3.5.2 Broad approximations of costs have been provided based on suitable mitigation schemes discussed with the project board. These can only be considered as indicative costs. The most suitable mitigation measures will be derived though mitigation option testing using microsimulation modelling. This can only be undertaken once a suitable set of sites and growth level have been decided.

4 Results of Option Assessment

4.1 Introduction to Strategic Modelling

4.1.1 As discussed in the methodology in Chapter 3, all assessments are in addition to the 3750 housing units identified through commitments, windfalls and unidentified SHLAA sites. These 3750 units were not considered in Stage 1 of the analysis as their inclusion confuses the interpretation of outputs. This exercise was to determine the impact of traffic relating to the identified broad location of sites, a comparative difference between growth options and a comparative difference between the 3 medium growth options. As discussed, Stage 2 of the assessment included analysis of committed, windfall and unidentified sites.

4.1.2 On the whole AM and PM plots are very similar as the distribution for PM trips is a reversal of the AM journey to work data taken from the National Census. There will be slight difference in trip rates and more significant difference in delays on certain links(informing route choice) and for this reason PM plots are provided in the Appendices. The following comments relate to AM and PM period traffic impacts where there is any significant difference between AM and PM outputs this will be noted.

4.1.3 Analysis of results covers the following;

- Development Traffic Plots – interpretation of the 2 way additional development traffic flow plots over the network.
- GEH Plots – interpretation of the GEH indicators as described in chapter 3.
- Comparative Indicators - interpretation of Table 4.1 and 4.2 which highlight additional development traffic on key routes and within town centres in terms of absolute and percentage increase.
- Impact SRN – interpretation of all outputs relevant to the impact on the Highways Agency Strategic Road Network.

	base		base 2026		scen 1		scen 2a		scen 2b		scen 2c		scen 3	
Route /Area	**am**	**pm**	**am**	**pm**	**am**	**pm**	**am**	**pm**	**am**	**pm**	**am**	**pm**	**am**	**pm**
1. A452 (M40 to Leamington)	3834	3917	4339	4432	8	8	300	299	770	770	774	774	844	843
2. A452 (A46 to Leamington)	3091	3101	3498	3510	1	1	228	228	309	309	144	144	553	553
3. A429 (A46 to Warwick)	1946	1776	2202	2010	10	9	249	249	176	176	242	242	449	449
4. A452 (A46 to Kenilworth Town Centre)	2781	2961	3147	3351	1	1	248	248	31	31	253	253	389	389
5. A429 to Coventry border etc.	1564	1487	1770	1683	1	1	385	385	18	18	55	55	459	459
6. A429 M40 to Warwick	2098	2059	2374	2330	46	43	82	82	110	110	115	115	136	136
7. A425 Greys Mallory to Warwick	2337	2302	2644	2605	1	1	108	108	293	293	292	292	334	334
8. A445 between Warwick and Leamington	3231	2893	3656	3274	0	0	75	75	126	126	82	82	187	187
9. A425 between Warwick and Leamington	2337	2345	2644	2653	1	1	108	108	272	272	271	271	320	320
10. A425 (A46 to Warwick Town Centre)	1893	2000	2142	2263	3	3	30	30	39	39	48	48	77	77
Warwickshire County routes total	25112	24842	28417	28111	72	68	1830	1828	2172	2170	2301	2299	3793	3790
Town centres														
Warwick	5819	5642	6806	6598	3	6	186	186	431	430	433	433	528	527
Leamington Spa	5790	5593	6771	6541	6	11	231	231	412	412	305	305	594	593
Kenilworth	2781	2429	3252	2841	1	1	118	118	62	62	136	135	180	179
HA trunk roads														
M40	10875	11765	11765	17420	11	11	127	127	505	505	515	515	595	594
A46	6981	5781	7972	6602	24	22	316	315	252	252	325	325	558	557
Highways Agency SRN total	17855	17546	19737	24022	34	33	442	442	757	756	840	840	1152	1151

Table 4.1: Absolute increase in 2026 development related traffic on selected routes and areas

	scen 1		scen 2a		scen 2b		scen 2c		scen 3	
Route /Area	am	pm	am	pm	am	pm	am	pm	am	pm
1. A452 (M40 to Leamington)	0%	0%	7%	7%	18%	18%	18%	18%	19%	19%
2. A452 (A46 to Leamington)	0%	0%	7%	7%	9%	9%	4%	4%	16%	16%
3. A429 (A46 to Warwick)	0%	0%	11%	11%	8%	8%	11%	11%	20%	20%
4. A452 (A46 to Kenilworth Town Centre)	0%	0%	8%	8%	1%	1%	8%	8%	12%	12%
5. A429 to Coventry border etc.	0%	0%	22%	22%	1%	1%	3%	3%	26%	26%
6. A429 M40 to Warwick	2%	2%	3%	3%	5%	5%	5%	5%	6%	6%
7. A425 Greys Mallory to Warwick	0%	0%	4%	4%	11%	11%	11%	11%	13%	13%
8. A445 between Warwick and Leamington	0%	0%	2%	2%	3%	3%	2%	2%	5%	5%
9. A425 between Warwick and Leamington	0%	0%	4%	4%	10%	10%	10%	10%	12%	12%
10. A425 (A46 to Warwick Town Centre)	0%	0%	1%	1%	2%	2%	2%	2%	4%	4%
Warwickshire County routes total	0%	0%	6%	6%	8%	8%	8%	8%	13%	13%
Town centres										
Warwick	0%	0%	3%	3%	6%	6%	6%	6%	8%	8%
Leamington Spa	0%	0%	3%	3%	6%	6%	5%	5%	9%	9%
Kenilworth	0%	0%	4%	4%	2%	2%	4%	4%	6%	6%
HA trunk roads										
M40	0%	0%	1%	1%	4%	4%	4%	4%	5%	5%
A46	0%	0%	4%	4%	3%	3%	4%	4%	7%	7%
Highways Agency SRN total	0%	0%	2%	2%	4%	4%	4%	4%	6%	6%

Table 4.2: Percentage increase in 2026 development related traffic on selected routes and areas

4.2 Stage 1 Strategic Modelling – Growth Scenarios

Option 1 Low development option

4.2.1 The low development option allocates 100 housing units on the A429 (W19). A site of this size generates very few trips and therefore shows little impact.

Development Traffic Plots

4.2.2 No determinable impact is measured in either AM or PM peak periods.

GEH Plots

4.2.3 No determinable impact is measured in either AM or PM peak periods.

Comparative Indicators

4.2.4 A very minor increase of 2% is experienced on the A429 route between Warwick and the M40. No other determinable impact is measured in either AM or PM peak periods.

Impact on SRN

4.2.5 No determinable impact is measured in either AM or PM peak periods.

Option 2a Medium development option – A46 Corridor Option

4.2.6 This medium growth option allocates 3750 units dispersed throughout Warwick District along the A46 Corridor. Sites included are;

- W19 Gogbrook Farm - A429 Stratford Rd;
- W21 & W08 - A452 Europa Way;
- L07 Milverton - A452 Leamington Rd;
- K01,K09,K06 & K05 Ken RFC - Glasshouse Lane;
- C06 Finham - C32 Stoneleigh Rd.

Development Traffic Plots

4.2.7 The greatest impacts are experienced in close proximity to the larger sites. The A429 between Kenilworth and Coventry and the C32 Stoneleigh Rd experience a significant increase in traffic volumes. Significant pressure will therefore be put on C32/A46 grade separated junction, Dalehouse Lane roundabout and A429/C32 signalised junction.

4.2.8 Birches Lane/Glasshouse Lane and the A46 between Kenilworth and Warwick also experience a significant increase in traffic volume. Significant increase in vehicle movements through St John gyratory and Thickthorn grade separated junctions will add to existing traffic issues.

4.2.9 A452 Europa Way and Gallows Hill experience high volumes of traffic as sites exit directly onto these important strategic routes. This will add increasing pressure on to an already congested route. The entire A46 route from M40 J15 Longbridge to Coventry experiences an increase in traffic volumes of between 100 and 500 vehicles. Whilst the Europa Way-J14-J15-A46 route around Warwick and Leamington is being used by up to 250 additional vehicles. A similar pressure is put on the A452 route through Leamington and north to Coventry and via Spinney Hill and the A429 to the A46. In reality, as there is little opportunity to increase capacity along this route, a significant proportion would use the M40-A46 route, where additional capacity can be accommodated through mitigation solutions.

GEH Plots

4.2.10 The GEH plots highlight a similar picture. They show that in proportion to the existing traffic flows, the A429 Coventry Rd, Warwick and A429 Kenilworth Rd and C32 are the worst affected areas. There also appears to be a significant pressure on the A46 between Warwick and Kenilworth. The B4113 is also under pressure north and south of Stoneleigh.

Other impacts to note are;

- In Kenilworth, the pressures on Glasshouse Lane, Birches Lane, A452 Leamington Rd, Common Lane and A429 to Coventry;
- Additional pressure on B4113 to Coventry (although in reality some of this may divert to the A46);
- C32 and B4113/B4115 near Stoneleigh.
- PM impacts are very similar to AM

Comparative Indicators

4.2.11 Of the key comparative indicator routes highlighted in Table 4.1 and 4.2, the A429 between Kenilworth and Coventry border experiences 22% increase in flow during the peak hour. This equates to approximately 385 additional vehicles. This volume of traffic has potential to cause significant congestion issues around junctions along this corridor. The second biggest percentage increase in additional development traffic (11%) is experienced along the A429 from the A46 to Warwick, this equates to approximately 250 additional vehicles. The A452 between Kenilworth and Leamington also experiences approximately 300 additional vehicles along the route during the peak hours. Most of the other comparative indicator routes experience a significant increase in traffic flow.

4.2.12 From the medium growth scenarios, this option has the least impact on Warwick and Leamington town centre with approximately 3% increase in traffic during the peak periods. This is a logical finding as a significant proportion of the housing growth is located on the Coventry border. Kenilworth town centre does however experience a 4% increase.

Impact on SRN

4.2.13 As mentioned previously this scenario puts significant pressure on the A46/C32 grade separated junction and the Thickthorn grade separated junction. There is also a significant increase in traffic volume on the A46 between Kenilworth and Warwick.

4.2.14 Although this option has been coined the A46 corridor option due to the location of sites, the total impact on the A46 and the SRN is the least of the 3 medium growth options. This is likely to be a result of the large C06 site distributing journeys to work towards Coventry employment areas rather than the more dispersed journey to work distributions in Leamington, Warwick and Kenilworth. This does not necessarily make this scenario better for the SRN as feasibility of mitigation schemes for the grade separated junctions needs to considered.

Option 2b Medium development option – Warwick, Leamington and Whitnash Option

4.2.15 This medium growth option allocates 3750 units within Warwick, Leamington and Whitnash. The majority of development is located along the A452 Europa Way corridor in Leamington. Sites included are;

- W19 Gogbrook Farm - A429 Stratford Rd;
- W21 & W08 - A452 Europa Way;
- W07 Lower Heathcote Farm – Harbury Lane;

- L07 Milverton - A452 Leamington Rd;
- L10 South Sydenham.

Development Traffic Plots

4.2.16 As with all assessments, the greatest impacts are in close proximity to the sites. As all sites are dispersed within Warwick and Leamington area, significant pressure is experienced throughout the network especially to the south of Leamington along the A452 corridor, Gallows Hill/Harbury Lane and the M40/A46 corridor.

4.2.17 As 3 large sites (W07,W21 and W08) are located south of Leamington, most of the pressure is experienced in this area and is significantly worse than option 2a. However concentrating development may allow for more focussed larger scale mitigation measures to be achieved. In excess of 500 additional vehicles will be using the M40, Banbury Spur, Europa Way, Harbury Lane and Gallows Hill, thus, putting significant pressure on the junctions in the area. Vehicles are also travelling through Warwick and Leamington town centres as an alternative to the M40/A46 corridor. In reality capacity constraints and lack of feasible capacity improvement mitigation measure around the town centres means that additional traffic may switch to the M40/A46 routes.

4.2.18 Due to their relatively small size sites W19 and L10 are having little impact and vehicles disperse quickly throughout the network.

4.2.19 The combination of traffic from site L07 and the accumulation of traffic from other sites results in between 250 and 500 additional vehicles on the A452 immediately north of Leamington. Old Milverton Lane is experiencing significant pressure, capacity constraints will become an issue at Blackdown roundabout. The B4113 also experiences a significant increase in volumes of traffic.

GEH Plots

4.2.20 The GEH plots highlight the Europa Way corridor, Banbury Spur, Harbury Lane and Gallows Hill as being the worst affected areas. High volumes of traffic are experienced. A GEH value exceeding 10 on these routes suggests demands well out of proportion with existing levels of traffic and significant mitigation measures would be necessary to deal with this level of demand on the road links and junctions in the area.

Other impacts to note;

- Use of A452 through Leamington and Princes Dr/Spinney Hill/A429 Coventry Rd to access the A46.
- Pressure on Emscote Rd, St Nicholas Church St and Castle Bridge in Warwick
- PM impacts are very similar to AM

Comparative Indicators

4.2.21 The A452 between the M40 and Leamington experiences the greatest impact with an additional 19% growth in traffic. This equates to approximately 770 additional vehicles on the route during the peak hour. The A425 from Greys Mallory to Warwick also has significant growth of 11% which is approximately 290 additional vehicles and additional 270 vehicles on the A425 route between Warwick and Leamington. This may be a result of vehicles rerouting to avoid the existing congestion along Europa Way. The A452 is also under significant pressure between Leamington and Kenilworth with approximately 310 extra development related trips on the route in the peak hour. This section of the A452 is recognised as being one of the most congested routes in the county and a site located here would require significant infrastructure to mitigate the impacts.

4.2.22 From the medium growth scenarios, this option has the least impact on Kenilworth town centre with approximately 2% increase in traffic during the peak periods. This is a logical finding as a significant proportion of the housing growth is located to the south of the district and the C06 Finham site is not included. Leamington And Warwick town centres experience the same level of growth of traffic flows with a 6% increase. It may not be possible accommodate such increases in traffic and in reality alternative less constrained routes may be adopted.

Impact on SRN

4.2.23 The SRN experiences a 4% increase in 2 way flow during the peaks. As most of the developments are located south of Leamington significant pressure is placed on the A46/M40/Europa Way corridor routes. As mentioned previously, in reality this pressure may increase due to capacity constraints through the town centres (where no feasible mitigation can be provided).

4.2.24 Congestion issues will be experienced along this corridor and further significant mitigation (in addition to current proposals) will certainly be required.

Option 2c Medium development option – Four Towns Option

4.2.25 This medium growth option allocates 3750 units within Warwick, Leamington, Whitnash and Kenilworth. The majority of development is located along the A452 Europa Way corridor in Leamington whilst a significant proportion is located in South Kenilworth. Sites included are;

- W19 Gogbrook Farm - A429 Stratford Rd;
- W21 & W08 - A452 Europa Way;

- W07 Lower Heathcote Farm – Harbury Lane;
- L10 South Sydenham;
- K01,K09,K06 & K05 Ken RFC - Glasshouse Lane.

Development Traffic Plots

4.2.26 The site locations for option 2C are exactly the same in South Leamington as option 2b, hence the impact on the road network in this area is very similar. Again, the greatest impacts are in close proximity to the site access.

4.2.27 The difference between 2b and 2c is that instead of locating housing at Milverton on the A452, the Kenilworth sites along Glasshouse lane make up the numbers of housing units required. Again the impact of this is similar to 2a options for Kenilworth. Birches Lane/Glasshouse Lane and the A46 between Kenilworth and Warwick experience a significant increase in traffic volume. Significant increase in vehicle movements through St John gyratory and Thickthorn grade separated junctions will add to existing capacity constraints.

GEH Plots

4.2.28 As with option 2b, the GEH plots highlight the Europa Way corridor, Banbury Spur, Harbury Lane and Gallows Hill as being the worst affected areas. High volumes of traffic are experienced. A GEH value exceeding 10 on these routes suggests demands well out of proportion with existing levels of traffic and significant mitigation measures would be necessary to deal with this level of demand on the road links and junctions in the area.

4.2.29 Additional pressure is placed upon the A46/A429 route from Kenilworth to Warwick rather than A452. In reality it would be expected that there would be a more even split between these routes.

Other impacts to note;

- The A46 and M40 appear to take higher volumes of traffic than other medium growth options.
- Use Princes Dr/Spinney Hill/A429 Coventry Rd to access the A46.

Comparative Indicators

4.2.30 Option 2c has very similar impacts on the road network in South Leamington and Warwick compared to Option 2b. The main differences are the A452 north of Leamington is not under such significant pressure (4% - 140 vehicles), whilst the A452 north of the A46 comes under more pressure (8% - 240 vehicles).

4.2.31 Marginally less traffic is attracted through Leamington town centre when compared to Option 2c whilst a 2% increase is experienced in Kenillworth town centre.

Impact on SRN

4.2.32 Again, the impact on the SRN is very similar to option 2b. Slightly more pressure is placed on the A46, this is a result of the Kenilworth sites located close to the SRN. As most of the developments are located south of Leamington significant pressure is placed on the A46/M40/Europa Way corridor routes, again significant infrastructure will be required. The Thickthorn grade separated island over the A46 will also be under significant pressure, further improvement over and above the proposal for signalisation may be required.

Option 3 High development option

4.2.33 This high growth option allocates 7500 units dispersed within Warwick, Leamington, Whitnash, Cubbington and Kenilworth and south of Coventry. Sites included are;

- W19 Gogbrook Farm - A429 Stratford Rd;
- W21 & W08 - A452 Europa Way;
- W07 Lower Heathcote Farm – Harbury Lane;
- L10 South Sydenham.
- K01,K09,K06 & K05 Ken RFC - Glasshouse Lane;
- K17 SouthCrest Farm – Glasshouse Lane
- C06 Finham - C32 Stoneleigh Rd.
- L23 Red House Farm - Cubbington
- L14 Woodside Farm – Harbury Lane
- L07 Milverton - A452 Leamington Rd;

Development Traffic Plots

4.2.34 This combination of sites encompasses all the sites included in the medium growth options plus additional sites in Cubbington, off Harbury Lane in Whitnash, off Glasshouse Lane in Kenilworth and a large site in Finham. The roads the Leamington sites impact on are therefore similar to the option 2 analysis. However the level of impact is much more extreme. It can clearly be seen that there is demand for an additional 250+ vehicles during the peak hour on a large proportion of routes in Leamington and Warwick. There are very few strategic routes within Leamington which experience less than 100 additional vehicles.

4.2.35 Kenilworth also experiences high levels of additional traffic movements across the eastern perimeter routes including Glasshouse lane, Common Lane, Crew Lane and Knowle Hill and A429 Kenilworth Rd. St Johns Gyratory and Thickthorn roundabout will experience significant delay issues. C32, A45 and Stoneleigh area also experience high volumes of traffic associated with the C06 Finham site and with the volumes of traffic using the B4113 to access Coventry. Significant delays may be experienced in this area without suitable mitigation.

GEH Plots

4.2.36 Any route with 7.5+ GEH + will experience significant congestion issues without appropriate mitigation solutions especially where existing junctions are already under pressure. It can clearly be seen that a significant number of route have 7.5+ GEH and a number have 10+ GEH in areas already experiencing congestion issues. Routes with 10+ GEH include; A429 Kenilworth Rd

- B4113 Stoneleigh Rd
- C32 Stoneleigh Rd
- A452 north of Leamington
- A46 between Kenilworth and Warwick
- A429 Coventry Rd, Warwick
- Spinney Hill & Portobello Bridge
- Banbury Rd
- Gallows Hill
- Harbury Lane
- Europa Way
- Banbury Spur
- Princes Dr
- Tachbrook Rd

4.2.37 Significant pressures in proportion to the existing traffic volumes are also experienced across a significant proportion of the network in Warwick district.

4.2.38 It should be noted that in all analyses the 3750 windfalls and commitments have not been included and therefore these results may be significantly worse, however on balance the utilisation of more minor roads, time period choice and modal shift will dampen this impact.

4.2.39 Mitigation measures that focus solely on improving road capacity, however significant, may not be sufficient to deal with this level of growth given the existing constraints in Warwick, Leamington and Kenilworth areas (e.g. capacity constraints in built up areas). In order to accommodate this level of growth, significant sustainable transport interventions will also be required in addition to extensive network mitigation options.

Comparative Indicators

4.2.40 All identified key routes come under significant pressure with an average increase in traffic of 13%. The entire A452 from M40 to Kenilworth experience significant increases between 12% and 19% with between 390 and 840 additional vehicles dependent on section. The A429 between the A46 and Warwick experience 20% growth whilst which equates to approximately 450 vehicles. An additional 450 vehicles will also place pressure on the A429 up to the Coventry border. Most routes will require significant infrastructure delivery.

4.2.41 Warwick experiences 8% growth, Leamington 9% and Kenilworth 6%. In reality this level of increase cannot be accommodated on such constrained town centre routes thus putting further pressure on routes key distributor routes out to the SRN. Therefore reinforcing the need for major infrastructure delivery to mitigate the impacts.

Impact on SRN

4.2.42 The SRN experiences significant growth of around 6% with an increase of 7% on the A46. Link capacity may start to become an issue with concern particularly relating to the 2 lane sections of the A46 and the link between J15 and 14 southbound on the M40. It is likely that mitigation will be required at a number of junctions along the SRN corridor.

Stage 1 General Comments

4.2.43 It is apparent the pressure on M40 J13 and the eastern approach to Greys Mallory are not under significant pressure. This may appear unusual as one would conclude that this would be one of the main approaches from the south to the developments. However, the scenarios we have tested a very heavily skewed towards housing provision rather than employment provision. Warwick District already has substantial committed employment development, committed developments were not included in stage 1 of the assessment. The Journey to Work profile of housing developments (taken from census ward distributions) distributes traffic either within the local towns or north towards large employment centres around Coventry and Birmingham.

4.2.44 It is also worth noting that certain routes are not showing significant pressure due to the congestion that already exists on the network. A good example of this is the A452 between Kenilworth and Leamington. As a result, pressure is put on alternative routes as drivers attempt to find the least cost route to their destination. Therefore knowledge of congested routes needs to be used in conjunction to these plots to ascertain the most appropriate location and nature of mitigation. Appendix A shows outputs from the DfT Congestion Indicator data and provides a good guide to the most congested routes in the district – CITEware also utilises this data, hence the congestion avoiding travel behaviour.

4.3 Stage 2 Commitments, Windfalls and Unidentified SHLAAs

Impact Excluding Scenarios

4.3.1 The impact on the road network relating to commitments, windfalls and unidentified SHLAA sites up to 2026 must be fully understood prior to combining this impact with each scenario output. The first pages of Appendix E highlight the impact of these developments in terms of additional development traffic flow on the road network.

4.3.2 It should be noted that only the committed developments have been modelled as site specific. Windfalls and Unidentified SHLAAs were distributed by population centres, as locations are as yet unknown. This was deemed the most appropriate methodology to account for these developments. As such, trips associated with housing developments with no location attributed will be loaded onto links passing high population centres.

4.3.3 It should also be noted that the committed developments to date are very heavily skewed towards the provision of employment land.

4.3.4 The following committed developments and development assumptions were accounted for;

COMMITMENTS AT 01/04/2011	1,078
ESTIMATED WINDFALLS 2011-2026	1,897
OTHER SITES IDENTIFIED IN SHLAA	775
TOTAL	**3,750**

Table 4.3: Commitments, Windfalls and Unidentified SHLAA Growth

Committed Development	Ha
Queensway Business Park, Leamington	1.88
South Heathcote Lane, Warwick	13.41
Spa Park, Leamington	1.15
South West Warwick Severn Trent	15.95
South West Warwick	3.87
Tachbrook Park, Leamington	7.38
Benfords, Cape Road, Warwick	1.84
Former Council Depot, Saltisford, Warwick	0.2
Park Drive, Leamington	0.46
Quarry Farm, Old Milverton	0.35
Opus Land, Warwick	3.7
Police HQ, Greys Mallory, Warwick	0.3
Thwaites, Welsh Rd, Offchurch	0.63
Former Honiley Airfield, Honiley	10
Middlemarch Business Park, Siskin Drive	0.11
Total	**61.23**

Table 4.4: Committed Employment Development

Committed Development	Housing Units
South West Warwick, A429 Stratford Rd, Warwick	297
Former Benfords Site, Cape Rd Warwick,	15
Former Pottertons Site, Emscote Rd, Warwick	195
Former North Leamington School, Park rd, Leam	60
Former RNIB, Warwick New Rd, Leamington	35
Station Approach, Off Lower Avenue, Leamington	150
Remaining Distributed Across Network	326
Total	**1078**

Table 4.5: Committed Housing Development

Development Traffic Plots

4.3.5 The "Traffic from committed developments – 2026" plots show significant impact on the highway network prior to the application of the Growth Scenarios.

4.3.6 Most notable issues on WCC highway network include;

Over 500 additional vehicles -

- on the A452 Europa Way corridor and surrounding links.
- on sections of the B4113.
- on some Leamington town centre routes.
- on the A429 Coventry Rd approach to Warwick

- on the Greville Rd/Spinney Hill/Primrose Hill/Wedgenock Lane route around Warwick.
- on the A429 Stratford Rd.
- on the A425 approach to Wedgenock Lane from the A46.
- on routes around Wroxhall(associated with committed development)

4.3.7 There are other routes with significant traffic impact, some of this may be explained by the following points.

4.3.8 In reality a number of these routes will reach capacity and trips would divert to alternative routes, re-time or change mode of travel.

4.3.9 There may be overloading of links passing high population centres as discussed in 4.3.2. This may in par be the cause of the heavily traffic route though Woodloes and Greville Rd.

4.3.10 There appears to be significant rat running on some of the more minor routes. In reality if capacity improvements are made on certain corridors this will be avoided.

4.3.11 No mitigation schemes associated with committed developments have been taken account of through this strategic modelling exercise.

4.3.12 It should be noted that the impact shown is for 2 way flows and not by direction.

Development Impact on SRN

4.3.13 The entire length of the A46 experiences an additional impact of at least 500 vehicle 2 way flow in the peak hour, as does the section of the M40 between J15 and J14.

4.3.14 In parts this impact is likely to be greater due to town centre capacity issues.

4.3.15 Trip re-timing and modal shift in congested networks is more likely and therefore the impact may be overestimated by as much as 20%.

Combining Stage 1 and Stage 2 Outputs

4.3.16 It should be noted that the outputs contained in Appendix E and their interpretation should be used with caution. The process of combining known locations of sites with developments distributed according to population centres may reveal some unlikely outcomes. Hence, the 2 stage approach to modelling which identifies the impacts related to the proposed locations and growth level separately in Stage 1.

4.3.17 These outputs should also be considered to be an absolute worst case scenario due to trip re-timing and modal shift encouraged by the extensive sustainable transport proposals.

4.3.18 Despite these issues it is important to take account of, and estimate the overall impact of the proposed development scenarios when combined committed development, windfalls and unidentified SHLAAs. However this should only be used as a guide and the more detailed microsimulation modelling that will be undertaken later on in the LDF planning process will take full account of these developments with a much greater degree of accuracy.

4.3.19 Interestingly, trips form the M40 south and the use of M40 J13 appear to be much greater. The cause of this is the substantial growth in committed employment provision. Warwick District appears to have a highly mobile Journey to Work profile and attracts a significant number of trips from the south. In contrast, the attraction of large employers to the north pulls commuter traffic from housing zones onto the SRN, which is apparent in the growth scenario plots.

Option 1 Low Development Scenario + Stage 2

Development Traffic Plots

4.3.20 It should be noted that the scale on the development plots was altered to show the significant impact of including the committed developments, windfalls and unidentified SHLAAs. A top scale of 100+ two way movements was adopted. This highlights that the A46 Warwick Bypass, A429 Coventry Rd, M40 between J14 and 15 and Europa Way up to Heathcote Lane and A429 Stratford Rd all experience over 1000 extra 2 way vehicle trips. However this would be the case without combining Stage 2 with Scenario 1.

4.3.21 No determinable impact in addition to stage 2 is measured in either AM or PM peak periods.

Impact on SRN

4.3.22 No determinable impact in addition to Stage 2 is measured in either AM or PM peak periods.

All Option 2 Medium Development Scenarios + Stage 2

Development Traffic Plots

4.3.23 Due to the significant impact of the Stage 2 elements of growth, it appears as though there is little difference between low growth and medium growth options. However the scale used on the plots may be masking the impact to an extent. The actual difference between the low and medium growth options will be similar to that shown in the Stage 1 modelling.

4.3.24 Easily identified differences include additional impact in the town centres. In reality mitigation packages will aprovide easier access to the SRN via the main A road corridors and capacity issues within the town centres will dissuade commuters from using these routes.

Impact on SRN

4.3.25 The same issues commented on in 4.2.23 are true for the SRN.

4.3.26 The section of the A46 between Gaveston and Thickthorn in option 2a also now triggers the 1000+ vehicle 2 way flow.

4.3.27 The section between M40 J15 and J14 as probably considered the most critical part of the network. Further scrutiny of the modelling outputs for this section is provided in Table 4.6

Option 3 High development option + Stage 2

4.3.28 Again there appears little difference between high and medium growth scenarios. However the scale used on the plots may be masking the impact to an extent. The actual difference between the low and medium growth options will be similar to that shown in the Stage 1 modelling.

4.3.29 Easily identified differences include additional impact in the town centres +1000 vehicles demanding some routes. In reality mitigation packages will provide easier access to the SRN via the main A road corridors and capacity issues within the town centres will dissuade commuters from using these routes. Also the distribution of unallocated development sites may be unrealistically loading too much traffic in high population density areas.

	Scenario 1 am	Scenario 1 pm	Scenario 2a am	Scenario 2a pm	Scenario 2b am	Scenario 2b pm	Scenario 2c am	Scenario 2c pm	Scenario 3 am	Scenario 3 pm
Committed Dev, Windfalls and Unidentified SHLAAs Traffic	1447	1288	1447	1288	1447	1288	1447	1288	1447	1288
Growth Scenario Traffic	11	11	127	127	505	505	516	515	591	591

Table 4.6: 2-Way Flow Impact Between M40 J15 and J14

Stage 2 General Comments

4.3.30 The impact of the committed developments, windfalls and unidentified SHLAAs is very significant. This is not unexpected as the housing element is equal in size to the medium growth scenarios. In addition to this is the 60Ha + of committed development which is a huge attractor of trips.

4.3.31 One consideration is that the method of distributing development sites which currently have no location may be giving some false outcomes. In the absence of any other suitable methodology, the methodology adopted distributes the unidentified SHLAA sites accross the network. This makes defining useful mitigation strategies more difficult. One conclusion that is apparent is that it would be desirable to locate the unidentified SHLAA sites together so that mitigation infrastructure and sustainable transport proposals can be focussed on a critical mass.

4.3.32 Due to this issues raised, the Stage 2 modelling should only be considered as a broad indicator of network issues. The real impacts relating to individual sites for each growth scenario can only really be considered in the context of the Stage 1 modelling. As such all mitigation proposals in Chapter 4 are based on Stage 1 modelling, however consideration has been given to the Stage 2 modelling impacts.

4.3.33 Despite the issues raised, Stage 2 modelling has provided a good insight to the overall impact of all growth levels.

4.3.34 It should be recognised that these outputs are absolute worst case as no account has been given to trip re-timing, and modal shift.

4.3.35 Modal shift when encouraged by comprehensive sustainable infrastructure and supporting policies can achieve a 15%-20% reduction in travel.

4.3.36 Warwick and Leamington automatic traffic monitors shows clear evidence of peak spreading over the last 10 years. This is likely to be a result of existing capacity constraints on the network. There is no reason to believe that this trend will cease, thus further reducing the future impact of development through time period choice.

4.3.37 Another consideration is that these impacts assume that economic conditions are good and costs of motoring do not escalate. In recent years there has been 3-4% negative traffic growth. With uncertainty about the future of economies, the supply of fuel and rising insurance premiums the level of background traffic and demands for use of the highway by car based trips may not be as large as expected.

4.4 Further Work

4.4.1 It should be noted that this is a strategic assessment of the impact on the road network. Detailed operation of junctions has not been considered. Comparisons have been made against existing peak hour traffic flows and no assessment of latent capacity on routes which may be utilised has been made. The effects of modal choice, time period choice and other measure that influence travel behaviour have not been considered. To make a more informed assessment which considers all these issues it will be necessary to carry out additional modelling work using WCC microsimulation S-Paramics models which cover the Warwick, Leamington and Kenilworth areas. This type of detailed modelling can be undertaken when there is more certainty over the level of growth and the options for locations of sites have been limited. These points are covered further in Chapter 6.

4.5 Accessibility Assessment

4.5.1 As discussed in Chapter 3, accessibility to each site has been analysed using JMPs DirectRoute software. The outputs from this process can be viewed in Appendix…. Accessibility from each site was assessed on the basis of existing public transport provision and existing provision for pedestrian use. Access to key services and town centres was considered through the analysis.

4.5.2 Table 4.3 and 4.4 ranks the outputs from the DirectRoute runs, the lower the rank, the better the site is in terms of accessibility. The table also combines sites by Scenario (i.e 1, 2a, 2b, 2c and 3) and gives an average ranking for each combination of sites. Ranking assumes that access to all key services and access to town centres are of equal importance and thus have equal weighting.

4.5.3 In terms of walking accessibility site, W08 has the best access to key services and town centres. In terms of public transport accessibility, W08 also has the best access to key services and town centres by a direct route within 400m of the site. Interestingly site W21 has the poorest access even though it is located just south of W08 and accessed off Gallows Hill. This situation arises as there are no public transport services within 400m that could serve the site, however if a service as available, access ranking in terms of journey time would be similar to site W08.

4.5.4 It should be noted that accessibility assessments can only be carried out on existing PT and walking infrastructure. A site may come forward with a set of sustainable travel proposals that improve walking access and provide dedicated bus routes to serve the site. Therefore, a site with poor accessibility should not be disregarded on the basis of this assessment. The assessment provides a guide as to what the current state of accessibility is and where improvements will be required.

4.5.5 There is no particular scenario that stands out as having particularly poor accessibility. Sites C06 and L07 have the worst score for accessibility based on current PT infrastructure.

Option	Sites	Jobs	Hospitals	GPs	Fruit and Veg	Town Centre	Average Ranking
1	W19	1	2	1	1	3	1.6
	Average Ranking	**1.00**	**2.00**	**1.00**	**1.00**	**3.00**	**1.60**
2a	W19	1	2	1	1	3	1.6
	W08	1	1	1	1	2	1.2
	W21	5	5	5	5	5	5
	L07	1	3	1	1	3	1.8
	K09	1	5	1	1	4	2.4
	K06	1	5	1	1	4	2.4
	K01	1	5	1	1	4	2.4
	K05	1	5	1	1	4	2.4
	C06	2	5	1	1	4	2.6
	Average Ranking	**1.56**	**4.00**	**1.44**	**1.44**	**3.67**	**2.42**
2b	W19	1	2	1	1	3	1.6
	L10	1	5	1	1	3	2.2
	W08	1	1	1	1	2	1.2
	W21	5	5	5	5	5	5
	L07	1	3	1	1	3	1.8
	W07	2	5	1	1	3	2.4
	Average Ranking	**1.83**	**3.50**	**1.67**	**1.67**	**3.17**	**2.37**
2c	W19	1	2	1	1	3	1.6
	L10	1	5	1	1	3	2.2
	W08	1	1	1	1	2	1.2
	W21	5	5	5	5	5	5
	K09	1	5	1	1	4	2.4
	K06	1	5	1	1	4	2.4
	K01	1	5	1	1	4	2.4
	K05	1	5	1	1	4	2.4
	Average Ranking	**1.50**	**4.13**	**1.50**	**1.50**	**3.63**	**2.45**
3	W19	1	2	1	1	3	1.6
	L10	1	5	1	1	3	2.2
	L23	2	5	1	1	1	2
	L14	1	4	1	1	3	2
	W20	2	5	1	1	3	2.4
	W08	1	1	1	1	2	1.2
	W21	5	5	5	5	5	5
	L07	1	3	1	1	3	1.8
	W07	2	5	1	1	3	2.4
	K17	1	5	2	1	3	2.4
	K09	1	5	1	1	4	2.4
	K06	1	5	1	1	4	2.4
	K01	1	5	1	1	4	2.4
	K05	1	5	1	1	4	2.4
	C06	2	5	1	1	4	2.6
	Average Ranking	**1.53**	**4.33**	**1.33**	**1.27**	**3.27**	**2.35**

Key	
1	Less than 10 minute bus time and <400m walk distance
2	Between 10 and 20 minute bus time and <400m walk distance
3	Between 20 and 30 minute bus time and <400m walk distance
4	Greater than 30 minute bus time and <400m walk distance
5	No direct route within 400 m of site

Table 4.7: Public Transport Accessibility Ranking

Option	Sites	Jobs	Hospitals	GPs	Fruit and Veg	Town Centre	Average Ranking
1	W19	1	3	3	1	3	2.2
	Average Ranking	**1.00**	**3.00**	**3.00**	**1.00**	**3.00**	**2.20**
2a	W19	1	3	3	1	3	2.2
	W08	1	3	1	1	2	1.6
	W21	1	3	3	3	3	2.6
	L07	3	4	3	2	3	3
	K09	2	4	2	2	4	2.8
	K06	2	4	2	2	4	2.8
	K01	2	4	2	2	4	2.8
	K05	2	4	2	2	4	2.8
	C06	3	4	3	1	4	3
	Average Ranking	**1.89**	**3.67**	**2.33**	**1.78**	**3.44**	**2.62**
2b	W19	1	3	3	1	3	2.2
	L10	1	4	1	1	3	2
	W08	1	3	1	1	2	1.6
	W21	1	3	3	3	3	2.6
	L07	3	4	3	2	3	3
	W07	1	3	2	2	3	2.2
	Average Ranking	**1.60**	**4.00**	**2.60**	**2.00**	**3.40**	**2.72**
2c	W19	1	3	3	1	3	2.2
	L10	1	4	1	1	3	2
	W08	1	3	1	1	2	1.6
	W21	1	3	3	3	3	2.6
	K09	2	4	2	2	4	2.8
	K06	2	4	2	2	4	2.8
	K01	2	4	2	2	4	2.8
	K05	2	4	2	2	4	2.8
	Average Ranking	**1.50**	**3.63**	**2.00**	**1.75**	**3.38**	**2.45**
3	W19	1	3	3	1	3	2.2
	L10	1	4	1	1	3	2
	L23	1	4	1	1	1	1.6
	L14	2	4	1	1	3	2.2
	W20	1	3	3	2	3	2.4
	W08	1	3	1	1	2	1.6
	W21	1	3	3	3	3	2.6
	L07	3	4	3	2	3	3
	W07	1	3	2	2	3	2.2
	K17	1	4	3	1	3	2.4
	K09	2	4	2	2	4	2.8
	K06	2	4	2	2	4	2.8
	K01	2	4	2	2	4	2.8
	K05	2	4	2	2	4	2.8
	C06	3	4	3	1	4	3
	Average Ranking	**1.71**	**3.93**	**2.29**	**1.71**	**3.36**	**2.60**

Key	
1	Less than 10 minute walk time
2	Between 10 and 20 minute walk time
3	Between 20 and 30 minute walk time
4	Greater than 30 minute walk time

Table 4.8: Walking Accessibility Ranking

5 Transport Interventions

5.1 Introduction

5.1.1 Identification of key transport interventions to mitigate the traffic impact relating to sites/scenarios was based on expert analysis of the modelling outputs. An 8 member project board which included senior transport planning and development control officers from WCC and senior planners from the HA and JMP (HA consultants) was set up to interpret the modelling outputs and identify mitigation solutions. Transport interventions were identified in terms of provision of sustainable transport to encourage modal shift and key road network schemes to improve capacity.

5.1.2 Key transport interventions were identified to mitigate development scenario traffic impact only. Committed, windfall and unidentified SHLAA sites mitigation have not been considered to the same level. Mitigation requirements for committed developments should have already been identified as part of the planning process. Unidentified sites and windfalls are very difficult to deal with as no specific location has been given (hence development distribution by proportional population methodology used in Stage 2 modelling). However this does not mean that mitigation will not be required for such sites. As can be seen in Appendix… the cumulative impact of this quantity of development is significant. A Community Infrastructure Levy (CIL) type charging scheme may be required to ensure that this cumulative impact can be mitigated (i.e. no single development may trigger the requirement for a mitigation scheme, however, combined impact may trigger this need and therefore a charging structure may be required). This issue is covered in more detail in Chapter 6.

5.1.3 The mitigation described in this chapter does not include the requirements for site accesses. Position of site accesses is important and can influence the mitigation required.

5.1.4 It should be noted that mitigation requirements are based on professional opinion based on the strategic modelling exercises. To fully understand the impact of the developments and the mitigation requirements, an in depth microsimulation modelling study would be required which would include all committed developments and schemes, would take account of time period choice and modal shift and would test a series of mitigation options for a development scenario. This kind of study is not possible until there is more certainty over the location and size of sites.

5.1.5 A number of the mitigation schemes identified may be delivered/partly delivered by developments that are currently in the planning process. Therefore some schemes may not be required/costs reduced if they are delivered by such developments.

5.1.6 The costs identified for each scheme are indicative and are based solely on professional opinion and experience of similar types of infrastructure delivery. Once a more detailed mircosimulation modelling exercise has been undertaken, the nature and costs associated with mitigation strategies can be more accurately assessed. Although efforts have been made to provide some contingency within the cost estimates, it should be noted that the location of utilities and acquisition of non-highway or non-developer owned land could significantly alter some of the proposed costs.

5.1.7 The mitigation schemes listed include both site(s) specific interventions and area wide interventions. There will be derived benefits for public transport through the delivery of network interventions that aid the free flow of traffic on the network. In addition to this a number of sustainable transport schemes are listed which should complement the Green Travel Plans for each development. The mitigation schemes described are for major capital schemes and do not include minor schemes such as bus shelter provision, footpaths and pedestrian crossing facilities, nor do they include revenue based schemes secured through S106 such as provision of additional bus services.

5.1.8 Where a new bus service is required to serve a site or cluster of sites approximately £800,000 contribution over 5 years would be required to deliver a 15 minute bus service. At certain sites there may be opportunity to make minor diversions to existing routes subject to the agreement of bus service providers and will also incur costs. Further work would be required to ascertain the actual bus service provision for each individual site. This work can be undertaken once there is more certainty over the exact location of sites and the level of growth adopted.

5.1.9 Where developments are clustered it would be possible to achieve a critical mass of development that enables greater mitigation possibilities. This is especially true in the provision of sustainable travel infrastructure. Although the usual approach is to ensure that the highway network experiences nil detriment, some of the more major mitigation solutions may actually accrue benefits for the wider network. However, it is inevitable that some areas of the network will experience additional congestion issues as a result of all growth levels.

5.2 The Transport Strategy

5.2.1 The following rationale underpins the transport strategy which the County Council believes is necessary to support the objectives of the LDF Core Strategy and the delivery of development through the various scenarios and growth options provided by WDC:

- Maximise the use of public transport to meet new travel demand for both short and medium/longer distance journeys;
- Maximise the overall number of trips which can be made on foot and by bike;

- Ensure that development does not generate significant numbers of car trips through town centres and in surrounding communities; and
- Minimise the need for significant new highway infrastructure, unless it is essential

5.3 Interventions required to deliver the Transport Strategy

Scenario 1

5.3.1 Mitigation schemes for each scenario have been identified and an indicative cost is provided. A full list of all mitigation options is provided in section 5…. which includes further details on the likely requirements.

Scenario1

Scheme Code	Key transport interventions that are very likely to be required	Costs	Sites responsible for majority of impact at location
None	None*	0	None

Table 5.1 Scenario 1 Mitigation

5.3.2 Scenario 1 requires no site specific mitigation other than provision of suitable access to the single site. The impact of any site which provides a small number of housing units is likely to be small. However the cumulative impact of such sites can be significant. Therefore, WCC would recommend that developers should contribute to a funding pool that can be used to mitigate the cumulative impact of developments.

Scenario 2a

Scenario2a

Scheme Code	Key transport interventions that are very likely to be required	Costs	Sites responsible for majority of impact at location
1	A429/C32 Gibbet Hill junction improvements	1,000,000	C06
2	A46/C32 Stoneleigh major junction improvements	5,000,000	C06
3	Coventry network mitigation improvements	2,000,000	C06
4	St Johns Gyratory improvements and capacity improvements at Thickthorn, Kenilworth	500,000	K01,K09,K06,K05
5	A46/A452 Thickthorn junction improvements	1,500,000	L07,K01,K09,K06,K05
6	A452 Blackdown Roundabout Improvements with/without LNRR	750,000	L07

7	A452 Bericote Island Improvements	500,000	L07
8	A429 Coventry Road/Spinney Hill Percy Island roundabout improvements	1,000,000	L07
9	Partial dualling/link capacity improvement A452 Europa Way and junction improvements	5,000,000 -15,000,000	W08, W21
10	Sustainable Travel Infrastructure	2,000,000	All
11	Town Centre Improvements	2,000,000	All
12	Virtual P&Rs	1,500,000	All
16	Kenilworth Station	1,000,000	K01,K09,K06,K05
	Total	**23,750,000 -33,750,000**	
	Schemes that could possibly be required and are subject to further investigation		
13	Leamington Northern Relief Road (LNRR)	20,000,000	L07
	Possible Additional Mitigation Total	**20,00,000**	

Table 5.2 Scenario 2a Mitigation

5.3.3 It is expected that scenario 2a will require between £23m-£33m of mitigation infrastructure provision with the possibility of further mitigation requirements subject to further investigation. Network interventions are mainly required in close proximity to the large clusters of sites in Kenilworth, Coventry and Leamington.

5.3.4 One key piece of infrastructure is the partial dualling/link capacity improvement of the A452 between the M40 J14 and Leamington. This route is already under significant pressure. We are currently investigating schemes in conjunction with the HA to alleviate the congestion on this route. Queuing can currently be observed back to the M40 mainline on a regular basis, thus posing a significant safety concern. it is hoped that mitigation currently being investigated to address this situation will significantly reduce this problem. However, with the additional volume of traffic associated with developments in the vicinity, it is very likely that additional link capacity will be required.

5.3.5 Site L07 north of Leamington puts considerable pressure on the surrounding road network. The A452 between Leamington and Kenilworth is already recognised as one of the most congested routes in the county. The strategic model recognises this and has diverted trips onto alternative routes (e.g. B4113 from Leamington to Coventry through Stoneleigh). However this situation is not desirable from a highway planning perspective as it would be preferred if trips used the A road network to distribute traffic onto the SRN. Therefore schemes along this route have been identified in order to increase capacity on the route out to the A46.

5.3.6 At this stage the outputs from strategic modelling suggest that the impact on the road network related to L07 and the cumulative impact of other developments could possibly be mitigated through improvements to junctions on the A452. However, further analysis and use of more detailed modelling techniques would be required to confirm this. One option discussed in the project board is the possibility of building Leamington Northern Relief Road (LNRR). LNRR is a scheme that WCC has considered in the past and would become more viable with development located in this area. The scheme would link the A452 to the A46 at Stanks Island. Initial testing has indicated that the route would be well utilised by development traffic. However, the scheme would be expensive and would require much further investigation through detailed modelling, cost benefit analysis and feasibility studies. Therefore this scheme has not been included in the total costs of mitigation highlighted in red.

5.3.7 In addition to the wider benefits to public transport derived from improved network operation, £2m worth of sustainable travel infrastructure will be required to encourage modal shift. This allocation could be used to provide a Kenilworth to Leamington cycle route (K2L) and complete the cycle network "missing links". In addition to this WCC would expect significant contribution towards revenue based mitigation such as public transport provision.

5.3.8 Further sustainable transport measures in the form of a Virtual Park and Ride would deliver benefits for commuter vehicle trips approaching Leamington and Warwick from the south. Virtual Park and Rides accrue the benefits of standard park and ride facilities without incurring the costs of providing expensive infrastructure.

5.3.9 £2m has also been identified for network improvements with the town centres. Leamington in particular has significant pressure on town routes. Careful consideration needs to given as to whether additional capacity should provided where possible in order to alleviate these routes or whether further improvements to sustainable infrastructure and the wider highway network would be effective at reducing the demand for through routes.

5.3.10 Further details of broad specifications of these schemes is provided in section 5….

Scenario 2b

Scenario 2b

Scheme Code	Key transport interventions that are very likely to be required	Costs	Sites responsible for majority of impact at location
5	A46/A452 Thickthorn junction improvements	1,500,000	L07

6	A452 Blackdown Roundabout Improvements with/without LNRR	750,000	L07
7	A452 Bericote Island Improvements	500,000	L07
8	A429 Coventry Road/Spinney Hill Percy Island roundabout improvements	1,000,000	L07
9	Dualling A452 Europa Way and Banbury Spur, junction improvements and bus priority	10,000,000 -20,000,000	W08, W21,W07
14	Junction 13 and 14 improvements	3,000,000	W08, W21,W07
10	Sustainable Travel Infrastructure	2,000,000	All
11	Town Centre Improvements	2,000,000	All
12	Virtual Park and Ride	1,500,000	All
	Total	**22,250,000 -32,250,000**	
	Schemes that could possibly be required and are subject to further investigation		
11	Leamington Northern Relief Road	20,000,000	L07
	Possible Additional Mitigation Total	**20,000,000**	

Table 5.3 Scenario 2b Mitigation

5.3.11 The same level of contribution towards mitigation would be expected for Scenario 2b. Similar mitigation to that proposed for Scenario 2a is required for the A452 north of Leamington to the A46 in order to mitigate the impact of site L07. The possibility of providing LNRR is also highlighted as a possible mitigation strategy subject to further investigation (and not included in the total scheme costs).

5.3.12 A higher concentration of development along the A452 Europa Way corridor south of Leamington is proposed in Scenario 2b. Modelling outputs suggest that link and junction capacity may become a critical issue. As referred to in Scenario 2a mitigation, this corridor currently experiences significant congestion issues which have become potential safety issues. Recent investigations in conjunction with the HA are aimed at reducing these issues and future proofing the route to an extent. However, with the proposed level of development, further significant mitigation will be required which is likely to involve dualling or link capacity improvements along the entire Europa Way corridor and improvements to junction 13 and 14 of the M40. This may involve dualling the slip at J14 and signalising the off slip at J13.

5.3.13 The same level of investment as in all medium growth options will be required in sustainable transport infrastructure, town centre improvements and provision of park and ride facilities. The same provision/issues as discussed in Scenario 2a relate to Scenario 2b.

5.3.14 Further details on the broad specifications of these schemes is provided in section 5.4.

Scenario 2c

Scenario 2c

Scheme Code	Key transport interventions that are very likely to be required	Costs	Sites responsible for majority of impact at location
5	A46/A452 Thickthorn junction improvements	1,500,000	K01,K09,K06,K05
4	St Johns Gyratory improvements and capacity improvements at Thickthorn, Kenilworth	500,000	K01,K09,K06,K05
6	A452 Blackdown Roundabout Improvements with/without LNRR	750,000	All
7	A452 Bericote Island Improvements with/without LNRR	500,000	All
9a	Dualling A452 Europa Way and Banbury Spur, junction improvements and bus priority	10,000,000 -20,000,000	W08, W21,W07
14	Junction 13 and 14 improvements	3,000,000	W08, W21,W07
10	Sustainable Travel Infrastructure	2,000,000	All
11	Town Centre Improvements	2,000,000	All
12	Virtual Park and Ride	1,500,000	All
16	Kenilworth Station	1,000,000	K01,K09,K06,K05
	Total	**22,250,000 -32,250,000**	

Table 5.4 Scenario 2c Mitigation

5.3.15 Again, similar mitigation proposals and financial contributions to the other medium growth options may be required. However for this option mitigation should be focussed around the large Kenilworth based sites, the route between Kenilworth and Leamington and around the south Leamington development sites.

5.3.16 For south Leamington, exactly the same mitigation infrastructure proposals as in 2b may be required. Similar improvements along the A452 between Kenilworth and Leamington, however further mitigation may be required at St Johns gyratory in Kenilworth. An access from the site onto the A452 between the Gyratory and Thickthorn island would alleviate this problem, however it is highly likely some form of mitigation would be required.

5.3.17 It is unlikely that the LNRR would be required in the absence of site L07.

5.3.18 The same sustainable transport infrastructure proposals are proposed for all medium growth options, as is the contribution toward town centre improvements.

Scenario 3

Scenario 3

Scheme Code	Key transport interventions that are very likely to be required	Costs	Sites responsible for majority of impact at location
1	A429/C32 junction improvement	1,000,000	C06
2	A46/C32 major junction improvement	5,000,000	C06
3a	Coventry network mitigation improvements	3,500,000	C06
4	St Johns Gyratory improvements and capacity improvements at Thickthorn, Kenilworth	500,000	K01,K09,K06,K05,K17
5	A46/A452 Thickthorn junction improvements	1,500,000	L07,K01,K09,K06,K05,K17
6	A452 Blackdown Roundabout Improvements with/without LNRR	750,000	L07
7	A452 Bericote Island Improvements with/without LNRR	500,000	L07
8	A429 Coventry Road/Spinney Hill Percy Island roundabout improvements	1,000,000	L07
15	Further Capacity/PT Improvements on A452 between Kenilworth and Leamington	5,000,000	L07
13b	Dualling A452 Europa Way and Banbury Spur, junction improvements and bus priority	20,000,000	W08, W21,W07,W20
14a	Junction 13 and 14 improvements (further investigation required)	15,000,000 - 30,000,000	W08, W21,W07,W20
10a	Sustainable Travel Infrastructure	4,000,000	All
11a	Town Centre Improvements	4,000,000	All
12a	Virtual P&Rs	3,000,000	All
16a	Kenilworth Station	1,500,000	K01,K09,K06,K05,K17

	Total	**64,650,000**	
	Schemes that could possibly be required and are subject to further investigation		
13	Leamington Northern Relief Road	20,000,000	L07
	Possible Additional Mitigation Total	**20,000,000**	

Table 5.5 Scenario 3 Mitigation

5.3.19 The impact on the road network of the high growth Scenario 3 is noted to be extensive and will require significant mitigation in the form of highway infrastructure.

5.3.20 Proposals include all the schemes highlighted for the medium growth options with enhancements and greater contributions towards sustainable infrastructure, Coventry network mitigation and town centre improvements.

5.3.21 Most notable differences include;

- further £5m contribution towards improvements on the A452 corridor from Kenilworth to Leamington in addition to the proposals for junction capacity improvements. This could be used to increase link capacity through partial dualling and/or provide bus priority;
- major improvements to J13 and J14 with the option of further investment to consolidate the junction into a single all movements grade separated junction.
- provision for additional virtual P&R facilities, locations yet to be determined.
- doubling sustainable transport provision and town centre improvements.
- £3.5m towards Coventry network mitigation which should provide funding for significant network improvements especially if its is able to complement Coventry Airport expansion proposals.

5.4 Mitigation Scheme Definitions

Scheme Code	Key transport interventions	Approximate Cost	Explanation
1	A429/C32 Gibbet Hill junction improvements	1,000,000	Key junction on the approach to Coventry from Kenilworth and linking the A46 to Warwick University. The junction currently experiences significant congestion issues due to the tidal flow of traffic to the University and Coventry in the AM peak and vice versa in the PM peak. Site C06 and the cumulative impact of other developments in the district put further

Scheme Code	Key transport interventions	Approximate Cost	Explanation
			significant pressure on the junction. Improvements would involve increasing length of 2 lane approaches to the junction on the A429 and if possible on the C32 approaches. Some proposals were put forward as part of the Warwick University expansion plan the status of these is unknown at present and may not be sufficient to mitigate the impact.
2	A46/C32 Stoneleigh major junction improvements	5,000,000	Key junction on the A46 providing access to Warwick University, north Kenilworth and Stoneleigh. This will become the main route onto the SRN for site C06. The area is known to already suffer from congestion and capacity issues. Proposals currently in the planning process for Stoneleigh Park may provide sufficient capacity, however this scheme is not committed, nor has it been tested to ascertain spare capacity. Scheme proposals may include signalisation or provision of a dumbbell roundabout arrangement. It is not expected that additional bridges over the A46 will be required.
3	Coventry network mitigation improvements	2,000,000	Site C06 and the cumulative impact of other developments in the district put pressure on Coventry's network especially along the A45 and at the A45/A429 junction. It is suggested that a contribution is provided to support the mitigation of these issues. Further investigation on the likely nature of the mitigation should be developed in conjunction with Coventry City Council.
3a	Coventry network mitigation improvements	3,500,000	Site C06 and the cumulative impact of other developments in the district put pressure on Coventry's network especially along the A45 and at the A45/A429 junction. It is suggested that a more significant contribution is provided to support the mitigation along the A45 and beyond which will be required for the higher growth option. Further investigation on the likely nature of the mitigation should be developed in conjunction with Coventry City Council.
4	St Johns Gyratory improvements and capacity improvements at Thickthorn, Kenilworth	500,000	Kenilworth based development sites will put significant pressure on this junction. Even though WCC would expect an access onto the A452 between the gyratory and Thickthorn Island, it is still expected that additional capacity will be required. This may involve provision of additional capacity on the Birches Lane approach or lane widening up to Thickthorn. Due to the existing uses within the gyratory and the rail

Scheme Code	Key transport interventions	Approximate Cost	Explanation
			bridge constraints, it is unlikely that signalisation could be provided. This scheme should be considered in conjunction to the proposals for the A46/A452 junction and it may be worth pooling the contribution to enable a more substantial and coherent scheme can be delivered.
5	A46/A452 Thickthorn junction improvements	1,500,000	Kenilworth based developments, L07 at Milverton and the cumulative impact of other proposed developments put significant pressure on this junction. Full signalisation and the possibility of bus priority should be investigated. Lengthening the 2 lane approaches to the junction on the A452 may be required. Provision should also accommodate the requirements of the K2L cycle scheme which would pass through this junction.
6	A452 Blackdown Roundabout Improvements with/without LNRR	750,000	L07 at Milverton and the cumulative impact of other proposed developments put significant pressure on this junction. The A452 is already recognised to be one of the worst congested routes in the county. This is further demonstrated by the strategic model outputs which show development traffic is avoiding the route due to existing congestion issues. Mitigation may include provision of additional lanes on the approaches and circulatory of the roundabout and should still allow for the provision of K2L.
7	A452 Bericote Island Improvements	500,000	L07 at Milverton and the cumulative impact of other proposed developments put significant pressure on this junction. The A452 is already recognised to be one of the worst congested routes in the county. This is further demonstrated by the strategic model outputs which show development traffic is avoiding the route due to existing congestion issues. Mitigation may include provision of additional lanes on the approaches and circulatory, dedicated slip to Bericote Lane and 2 lane exits on the A452 to aid the through put. Any mitigation should still allow for the provision of K2L.
8	A429 Coventry Road/Spinney Hill Percy Island	1,000,000	Cumulative impact of the developments in the district put significant pressure on this . Mitigation may include extending the approach lanes on the A429, widening the circulatory and providing 2 lane exits on the A429 to aid the

Scheme Code	Key transport interventions	Approximate Cost	Explanation
	improvements		through put.
9	Partial dualling/link capacity improvement A452 Europa Way and junction improvements	5,000,000 - 15,000,000	Link and junction capacity along Europa Way. A number of schemes are proposed for the corridor to address existing junction capacity issues, however it is likely that additional works will be required to ensure capacity is available to mitigate the impact of developments in the area. Sections of the route may require dualling or more innovative cheaper alternatives such as centre lane tidal running using ATM gantries could be investigated. It is imperative that queuing onto the M40 mainline is avoided.
9a	Dualling A452 Europa Way and Banbury Spur, junction improvements and bus priority	10,000,000 - 20,000,000	Link and junction capacity along Europa Way. A number of schemes are proposed for the corridor to address existing junction capacity issues, however it is likely that additional works will be required to ensure capacity is available to mitigate the impact of developments in the area. The costs where development is concentrated on this corridor escalate as it is likely that the entire route including Banbury Spur may require dualling or more innovative cheaper alternatives such as centre lane tidal running using ATM gantries could be investigated. It is imperative that queuing onto the M40 mainline is avoided.
10	Sustainable Travel Infrastructure	2,000,000	Extensive sustainable travel infrastructure should be constructed to encourage modal shift and thus alleviate pressure on the road network. It is likely that this contribution would be best spent on provision of K2L cycle route between Kenilworth and Leamington, completion of the existing cycle networks - this has been termed "Missing Links" and provision of new cycle infrastructure linking proposed developments to the existing cycle network. Provision of "Missing Links" may involve working closely with WDC in order to provide the shortest routes to key destinations (e.g. Use of Victoria Park to link the town centre with the proposed cycle infrastructure for Ford Foundry, linking Connect2 to Kenilworth town centre and linking Warwick town centre to the rail station). Provision should include toucan/pedestrian crossings to avoid severance. Provision of minor schemes has not been included in these costs but provision of bus shelters should also be included.

Scheme Code	Key transport interventions	Approximate Cost	Explanation
10a	Sustainable Travel Infrastructure	4,000,000	As above. However, to reflect the additional impact from high growth options, a total of £4m has also been identified for sustainable travel infrastructure.
11	Town Centre Improvements	2,000,000	£2m has also been identified for network improvements with the town centres. Leamington in particular has significant pressure on town routes. Careful consideration needs to be given as to whether additional capacity should provided where possible in order to alleviate these town routes, whether further improvements to sustainable infrastructure such as further cycle route provision, bus priority and crossing facilities with the aim of reducing demand or divert the funds for use on the wider highway network on order to provide realistic alternatives to using town centre through routes. The funding pool could be used for any of these options or combinations and may require involvement of stakeholder groups to decide the most appropriate way to use the fund.
11a	Town Centre Improvements	4,000,000	As above. However, to reflect the additional impact from high growth options, a total of £4m has also been identified for network improvements within or to alleviate the town centres.
12	Virtual P&Rs	1,500,000	Virtual Park and Rides accrue the benefits of standard park and ride facilities without incurring the costs of providing expensive infrastructure. Developers would be encouraged to provide additional parking at edge of town sites which could then be utilised for P&R facilities. Existing developments where parking capacity is available could also be used. Instead of providing a bespoke bus services to the P&R facilities, a two stage bus journey would be made where the first stage would provide a direct service to the town centres or employment sites with perhaps one or two stop on route thus avoiding. The second stage would distribute local trips around housing areas or employment areas This would maximise potential of new bus routes provided by developers which are necessary ensure sustainable access to their developments and to meet model share targets. Such facilities would be easier to deliver where there is a critical mass of development proposed in one area. Suitable sites may include developments along the A452 corridor to the south of Leamington or close to

Scheme Code	Key transport interventions	Approximate Cost	Explanation
			the sites next to the A46 proposed at Kenilworth
12a	Virtual Park and Ride	3,000,000	As above, however with a higher level of growth, more substantial contributions would be required to provide additional facilities.
13	Leamington Northern Relief Road (LNRR)	20,000,000	A scheme that has been investigated in the past and initial testing indicates it would be well utilised, would alleviate congestion on the wider network and would accommodate a significant amount of development traffic. The positioning of site L07 could make this route a viable option. The route would link an upgraded Old Milverton Lane or would utilise L07 development site distributor roads to link to the A429/A46 grade separated junction. Indicative costs are based on similar experiences with Rugby Western Relief Road. At this stage WCC are not suggesting that this option is definitely required, but further investigation is required especially if the higher growth options come forward.
14	Junction 13 and 14 improvements	3,000,000	These schemes may involve dualling the off slip at J14 of the M40 and signalising J13. Further work would be required to ascertain the most effective mitigation schemes.
14a	Junction 13 and 14 improvements (further investigation required)	15,000,000-30,000,000	With the high growth option it is likely substantial infrastructure would be required. This may involve consolidating the existing junction to a single grade separated signalised roundabout. Other more contentious options could include reinstating Old Warwick Bypass linking Greys Mallory to Longbridge without the need to travel on the M40. The M40 between J15 and J14 will be under significant pressure especially considering the short section between junctions (approx 1km) where substantial weaving movements take place. Hard shoulder running could also be considered.
15	Further Capacity/PT Improvements on A452 between Kenilworth and Leamington	5,000,000	These schemes may involve dualling sections or widening to provide additional link capacity, bus lanes and bus priority schemes to encourage modal shift and should complement the K2L proposals and junction capacity improvements. Chesford bridge may require widening works.
16	Kenilworth Station	1,000,000	The delivery of Kenilworth Station has been a long term aspiration. Planning consent has now been secured however lack of available funding has delayed the delivery. This facility has potential to influence travel behaviour to more

Scheme Code	Key transport interventions	Approximate Cost	Explanation
			sustainable means thus reducing pressure on the road network, especially on routes to Leamington and Coventry.
16a	Kenilworth Station	1,500,000	As above, with a more significant contribution to reflect the additional impact of site K17 in the high growth scenario.

Table 5.6: Mitigation Schemes – Definitions

5.5 Other mitigation considerations

5.5.1 When combined with the committed development, windfalls and unidentified SHLAA sites, both medium and high growth options put significant pressure on a number of critical links in the district. Therefore WCC would recommend to undertake further studies to consider the Congestion Reference Flow(CRF) for link capacity. It is recognised that the A452 north and south of Leamington is already nearing capacity, as such, mitigation options including public transport priority lanes(thus reducing demand) and additional lane capacity have been suggested. However, further investigation is required especially on the SRN most notably southbound on the M40 between J15 and J14 in the high growth option to determine if link capacity would become a problem. This could be undertaken once there is more certainty regarding the likely locations and level of growth and in combination with the microsimulation modelling exercises.

5.6 Other Modal Shift Mitigation Strategies – All levels of Growth

5.6.1 Encouraging modal shift is a key strategy aimed at reducing the impact of the developments on the road network. A “sticks and carrots” approach to influencing modal shift should be adopted. Options to complement Green Travel Plans could include;

Sticks

- Preferential business rates for those employers that can evidence significant shifts in employee travel behaviour.
- Parking tariffs for employee parking.
- Road pricing within town centres.

Carrots

- Subsidised employee bus shuttles from all rail stations to build on the success of the National Grid shuttle bus.
- Subsidised commuter bus shuttles to all rail stations.

- Long distance virtual P&Rs and staff bus schemes.
- Area wide car share databases.
- Further investment in Smarter Choices.

5.6.2 Smarter Choices are ‘soft’ measures in influencing people’s travel behaviour away from car use towards more sustainable modes of transport. They are aimed at helping people to choose to reduce their car use while enhancing the attractiveness of more sustainable alternatives, such as walking, cycling and public transport. These include:

- Workplace and School Travel Plans
- Personalised travel planning
- Travel awareness campaigns
- Public transport information and marketing
- Car clubs
- Car sharing schemes
- Teleworking, teleconferencing and home shopping

5.6.3 ‘Smarter Choices’ measures have an integral role in complementing ‘hard’ policies and infrastructure improvements, which alone are unlikely to generate significant behaviour change. Information, promotion, marketing and other supporting measures are key to successful schemes aimed at increasing use of sustainable transport and reducing single-occupancy car journeys through improving knowledge, perceptions and choice of alternative modes of transport. Research by Sustrans shows that lack of information about alternative modes such as cycling and public transport, and motivation to try them, are key barriers to change.

5.6.4 The DfT commissioned a major study in 2004 to examine whether large-scale programmes could potentially deliver substantial cuts in car use. In summary the results suggested that, within approximately 10 years, smarter choices measures have the potential to reduce national traffic levels by about 11% with reductions of up to 21% of peak period urban traffic.

5.6.5 Each measure should work on the three principles of (i) 'inform'; (ii) 'enable'; and (iii) 'promote' with resources and interventions tailored to the individual needs of the target audience and proximity to the development (s).

5.6.6 Example activities for each of the three principles include, but are not limited to:

(i) Inform - provide route maps, timetable information, travel advice;
(ii) Enable - 'taster' public transport tickets, travel training services, marketing offers
(iii) Promote - destination advertising, discount (e.g. 2 for 1 via rail) promotions, public transport launch events.

5.7 Initial Assessment of Deliverability

5.7.1 WCC believe that the impact of all growth options can be mitigated and that there are no fundamental barriers to delivering schemes that achieve mitigation. A number schemes presented have potential to accrue benefits for the wider network. However there will be implications resulting from any level of growth. Overall the network should be able to accommodate the different levels of growth proposed, however there will be areas of the network that will suffer from increased congestion issues with no potential mitigation options. Implications of growth (i.e congestion issues) will be closely related to the level of growth adopted.

5.8 Managing Risk

5.8.1 Throughout the work undertaken to date on the LDF Core Strategy, the County Council has attempted to identify and manage risk and will continue to do so as the Core Strategy evolves. Examples of this include the following:

- Early discussions with the District Council regarding its LDF, and timely submissions on transport throughout the development of the strategy;
- Joint working with the Highways Agency to ensure that a complete assessment of the impact of development on the local and strategic highway network is undertaken with agreements on the most suitable way forward in terms assessing these impacts once there is more certainty on the levels of growth and locations of sites ;
- Establishment of joint working arrangements with the developers of the preferred sites;
- To seek agreement with the respective developers and the Highways Agency regarding the combined use of the Warwick and Leamington Area Wide S-Paramics model and the Kenilworth and Stoneleigh Area Wide S-Paramics Model to include agreement trip rates/distribution and public transport assumptions;
- Carrying out timely discussions with other organisations regarding potential transport interventions and measures;
- Working in partnership with WDC to deliver a comprehensive cycle network which may involve linking through district land;
- Commenting and advising on the technical work in support of the
- proposals for major infrastructure delivery;
- Possibility of undertaking work on key measures to help support the transport network of the towns and the LDF housing and employment growth. This may include the assessment of public transport improvements, town centre proposals and the design of key mitigation infrastructure.
- Advising developers on measures to encourage modal shift.

5.8.2 It is envisaged that further detailed work will be undertaken in conjunction with developers, public transport providers and authorities to develop a comprehensive Transport Infrastructure Delivery Plan prior to the LDF Core Strategy Examination in Public to further reduce any remaining elements of risk.

5.9 Funding

5.9.1 WCC indicative costings suggest that for medium growth options contributions towards mitigation schemes would be approximately £33m and approximately £64.5m for the high growth options.

5.9.2 These mitigation schemes do not include revenue based contributions towards bus services which could be significant. Further studies would be required to understand the requirements.

5.9.3 Further work modelling work would be required to identify the definitive requirements and the is the possibility that costs escalate as if major schemes such as the LNRR are discovered to be necessary.

5.9.4 Based on 3750 houses in the medium growth option a contribution of approximately £8800 per housing unit would be required. A similar level of contribution would be required for the high growth option at 7500 housing units. This figure does not account for contributions from employment developments nor does it include contributions from the unidentified SHLAA sites and windfalls. Once unidentified SHLAA sites are indentified, further mitigation proposals may be required. It is therefore difficult to ascertain whether there will actually be a reduction in contributions. If for example a site triggers the need for LNRR, costs could escalate.

5.9.5 It should be noted that costs are based on current prices. They are derived from the professional opinion of the project board. No detailed cost estimates have been undertaken. Although contingency has been provided in the costs estimates the existence of utility services and purchasing of land can substantially increase costs.

5.9.6 Funding could be secured through the traditional S106 agreement approach or a Community Infrastructure Levy(CIL)/Supplementary Planning Document(SPD) type approach.

5.9.7 The benefits of using the CIL type approach would be that an average cost per household/cost per trip could be collected and placed in a funding pool which could be used for mitigation purposes. Under the S106 approach it may be that an uneven distribution of costs and responsibility is placed on the different development sites. For instance, it may be considered the LNRR is required for site L07 at Milverton and the developers would be expected to pay for it. In reality development traffic from all sites may use the LNRR route and diverted background traffic may alleviate routes surrounding alternative developments, thus reducing the need for mitigation in these areas. Therefore all developments accrue benefits from the mitigation packages as a whole and should provide contributions in relation to the numbers of housing unit/size of employment development/numbers of vehicle trips.

6 Conclusions and Further Work

6.1 Conclusions

6.1.1 This document has outlined the existing transport issues within Warwick District, highlighted the impact of proposed growth scenarios and their existing accessibility, taken consideration of committed development and unidentified development site impacts. A series of effective mitigation infrastructure schemes have been proposed to be complemented by sustainable transport provision, soft measures in the form of “Smarter Choices” and policy changes to influence travel behaviour.

6.1.2 Strategic modelling and accessibility assessments was undertaken using industry recognised tools and the interpretation and identification of mitigation schemes was carried out by senior transport professional working for WCC and the HA.

6.1.3 WCC believe that a combination of innovative engineering solutions combined with significant, effective, sustainable transport provision will mean that all growth levels that the District put forward can be accommodated.

6.1.4 It has been demonstrated that no scenario has particularly poor accessibility based on existing provision of infrastructure and services. However all scenarios/sites should improve accessibility through comprehensive sustainable travel packages. It should also be noted the capacity of existing services will not be sufficient to accommodate any of the levels of growth proposed.

6.1.5 All levels of growth will have implications. There may be some areas of the network that accrue significant benefits from well targeted mitigation measures especially where a critical mass of development exists. However, with any proposed growth level there will be areas of the network that suffer. The extent to which gains and losses are experienced on the network can only really be assessed once there is more certainty over the level of growth and locations of sites, and when appropriate mitigation is more accurately defined through Microsimulation modelling option testing.

6.1.6 The impact on the modelling outputs may appear severe in places however a number of points must be considered in their interpretation;

- The strategic modelling does not account of the propensity for modal shift through infrastructure, public transport provision, policy changes, congestion avoidance, escalating costs of motoring and targeted soft measures such as “Smarter Choices”. Approximately 15-20% modal shift was in fact the recommended targets for use in Rugby Borough Council’s LDF Core Strategy which has been approved at the Examination in Public.

- Time period choice becomes a reality. Evidence already exists of peak spreading across the Warwick and Leamington cordon monitors. This is likely to continue as more pressure is applied to the network.

- This is a strategic modelling exercise some of the numerous more minor routes will not have been utilised, and as such, impact is over estimated.

- The assumption is that economic conditions are good. Recently we have experienced negative traffic growth thus creating capacity on the network.

- Mitigation proposals to improve a number of corridors to improve access to the SRN will alleviate routes around the town centres.

- Significant committed employment land development has been modelled in Stage 2 modelling. Mitigation assumptions for these sites have not been included in the strategic modelling exercises

6.1.7 Further recommended work through detailed microsimulation modelling will take account of all the issues raised above. See 6.2.4 – 6.2.11.

6.1.8 A comprehensive and viable set of mitigation infrastructure proposals has been identified for each scenario. For medium growth scenarios, the approximate cost of required infrastructure would be £33m and for high growth options around £64.5m. On the assumption that only the identified sites pay for this mitigation (it is difficult to identify mitigation solutions for unidentified sites and therefore costs cannot be attributed) a contribution of up to £9,000 per housing unit would be required. Very little employment land was identified in the scenarios and therefore no contribution has been allocated.

6.1.9 Consideration has been given to managing risk throughout the LDF Core Strategy planning process.

6.1.10 WCC has expressed a Community Infrastructure Levy type scheme as our preferred route to manage developer contributions for mitigation proposals.

6.1.11 A series of further studies is recommended on the following section.

6.2 Further Work

Congestion Reference Flow (CRF) analysis to determine link capacity constraints

6.2.1 It is apparent that when the impact of the high growth level and to some extent the medium growth level scenarios are combined with the trips associated with the committed developments, windfalls and unidentified SHLAAs link capacity may become an issue.

6.2.2 The analysis of CRF to determine with link capacity will become an issue is recommended along with S-Paramics microsimulation modelling to determine the requirement for elements of the proposed mitigation.

6.2.3 It should be recognised however that the result of the modelling exercise demonstrate a worst case scenario as no account has been taken for modal shift influenced by sustainable travel infrastructure and provision and use of smarter choices for influencing travel behaviour. As mentioned previously, it is estimated that up to 15%-20% reduction in demand on the road network could be achieved through such measures. In addition to this no account has been taken of time period choice as commuters choose to re-time their journeys in order to avoid congestion.

Detailed modelling of Preferred Option using S-Paramics

6.2.4 To fully understand the real impact of proposed developments an in depth study using microsimulation modelling tools will be required.

6.2.5 This type of modelling should be undertaken once there is more certainty over the levels of growth and location of development sites.

6.2.6 Microsimulation modelling should be used to determine the effectiveness of the proposed mitigation options.

6.2.7 WCC has a preferred microsimulation modelling package called S-Paramics.

6.2.8 WCC has two up to date models covering the Warwick District;

- Warwick and Leamington 2011,2016 and 2026 Area Wide Models
- Kenilworth and Stoneleigh 2009,2016 and 2026 Area Wide Models (this model is being updated (to base year 2011)and extended to investigate proposal for Coventry & Warwickshire Gateway developments around Coventry Airport.

6.2.9 WCC has setup a licence agreement and modelling protocol for use of the models by developers. WCC will work with promoters of the preferred sites to test mitigation proposals. This will also cover phasing of development and mitigation.

6.2.10 Microsimulation modelling will take account of the modal shift and time period choice elements missing from this strategic assessment thus giving a true picture of the impact on the local road network.

6.2.11 An explanation of S-Paramics is provided below:

> *"S-Paramics is the latest version of the widely applicable Paramics microsimulation traffic flow modelling system, software for the analysis and design of urban and highway networks. Only S-Paramics offers wide area vehicle routeing with dynamic feedback for accurate traffic flow modelling within a context of active ITS and UTC.*
>
> *S-Paramics simulates the individual components of traffic flow and congestion, and presents its output as a real-time visual display for traffic management and road network design. S-Paramics represents the actions and inter-actions of individual vehicles as they travel through a road network. It models the detailed physical road layout, and includes features such as bus operations, traffic signal settings, driver behavioural characteristics and vehicle kinematics. As a consequence, S-Paramics can accurately portray the variable circumstances which lead to congestion in all types and sizes of road network……*
>
> *…..S-Paramics enables non traffic experts, such as the public and their elected representatives, to interactively test " What If " scenarios and immediately see the results in terms of real-time traffic flows and congestion. The most widely used microsimulation system in the UK for applications at all scales, S-Paramics brings new standards of integrity and veracity to traffic flow modelling.*
>
> *S-Paramics is being applied to trunk, urban, suburban and rural schemes for a very wide range of purposes and situations. It is being used routinely to examine signalised roundabouts, bus priority, emissions control, ramp metering, toll plaza design, urban traffic control, traffic calming, wide area traffic management, road works design, car park location and control, multi-level inter-changes, pedestrian and cyclist interaction, traffic impact, unusual/non-standard layouts and complex junctions, incident management, slow moving traffic on rural roads ... indeed every conceivable combination of circumstances which other modelling systems have difficulty simulating and analysing."*
>
> Source: SIAS S-Paramics Website
> http://www.sias.com/ng/spoverview/spintroduction.htm

Public Transport Studies

6.2.12 Further work on the requirements and viability of public transport provision will be required and will involve close working relationships with site promoters, bus and rail service providers and WCC.

Costing and Feasibility Assessment of Transport Interventions

6.2.13 Initial estimates covering the mitigation requirements at various growth levels and alternative site locations have been provided within this document.

6.2.14 Once there is more certainty over the locations of sites and levels of growth more detailed testing of mitigation requirements can be undertaken. This will inform the actual mitigation requirements.

6.2.15 When the actual mitigation requirements are defined, further work on the costing and feasibility of the transport interventions can be undertaken.

6.2.16 Where substantial mitigation requirements are proposed with significant construction of infrastructure, it may be appropriate to undertake preliminary feasibility studies on individual schemes.

Preparation of Draft IDP/Input to Wider Viability Assessment

6.2.17 It is recognised that the LDF Core Strategy needs to be supported by a comprehensive Transport Infrastructure Delivery Plan, which covers the measures which are required to mitigate the impact of the proposed development sites.

6.2.18 An Infrastructure Delivery Plan will be prepared to support the development proposals set out in the LDF. WCC has identified a number of the transport mitigation measures as described in Chapter 5. These proposals will form the basis for mitigation testing through more detailed modelling exercises. Once the broad specification of the mitigation requirements is defined, the preparation of the Infrastructure Delivery Plan can be undertaken. It is suggested that officers from both the District and County Council meet at an appropriate point in the near future to discuss the current mitigation proposals. It is also suggested to convene again, once the mitigation proposals have further defined through the modelling process in order to discuss which measures need to be included in the Plan, who the lead delivery organisation will be, the likely timescale for the improvements to come forward, and their anticipated cost.

6.2.19 It is envisaged that further detailed work will be undertaken prior to the LDF Core Strategy Examination in Public to further reduce any remaining elements of risk within the Transport Infrastructure Delivery Plan.

Preparation of Developer Contributions SPD/draft CIL Charging Schedule

6.2.20 It is anticipated that contributions from developers will be secured through either the conventional S106 route, or via an approach based on the principles of a Community Infrastructure Levy (CIL). This document highlights, the County Council view that the latter, a CIL type developer contribution model, as its preferred approach. It is understood that this would need to be produced as a separate Supplementary Planning Document (DPD) to the LDF Core Strategy.

6.2.21 WCC is currently working with Rugby Borough Council to produce a similar document based on this approach. Stratford District Council has already adopted an SPD for developer contributions which is considered to be working well.

Appendices