Herefordshire Council

Hereford Transport Strategy Phasing Study

Strategic prioritisation

Report

Hereford Transport Strategy Phasing Study

Strategic prioritisation

Report

JMP Consultants Limited
100 Wellington Street
Leeds
LS1 1BA

E leeds@jmp.co.uk

www.jmp.co.uk

Job No. NEA6100

Report No. 1

Prepared by AS/JJ/PG

Verified LW

Approved by LW

Status Final

Issue No. 5

Date 29 May 2014

Hereford Transport Strategy Phasing Study

Strategic prioritisation

Report

Contents Amendments Record

This document has been issued and amended as follows:

Status/Revision	Revision description	Issue Number	Approved By	Date
Draft	For JMP comments	1	LW	21/11/2013
Draft	For Hereford comments	2	LW	20/12/2013
Final	Updated outputs	3	LW	29/01/2014
Final	Hereford comments	4	LW	27/02/2014
Final	SB Comments	5	LW	29/05/2014

Contents

Tables and Figures

Appendices

1 Introduction

Context and Purpose of this report

1.1 The Herefordshire Local Plan - Core Strategy 2011 – 2031 (draft) was approved by Council in July 2013 subject to the resolution of three issues that included the development of a transport strategy for Hereford. The plan will form part of the Local Development Framework for Herefordshire. The plan is currently at the stage of pre-submission publication prior to submission to the Secretary of State for an Examination in Public. This report outlines the emerging transport evidence supporting the Core Strategy.

1.2 Significant work has been undertaken to date in identifying the justification for a relief road for Hereford. This work culminated in the Local Plan Core Strategy Modelling Note Technical Summary (Amey - June 2013). This concluded that the "with relief road" option (including the western relief road) was an appropriate policy choice of transport measure to allow delivery the Core Strategy development aspirations and meet the requirements of the Highways Agency with regards to the ongoing operation of the A49 as part of the strategic road network in the development scenario proposed in the Core Strategy.

1.3 Our work follows the AMEY report which provided the first stage in the justification of the relief road for Hereford. This report will build on that evidence and examine the potential for delivering the relief road in phases and analyse the case for the build out sequence of the relief road. This report will also analyse outputs from the Hereford transport model to provide a view on the trigger point when the local and strategic transport network requires intervention.

The Herefordshire Core Strategy Context

Transport Proposals

1.4 The LDF polices as set out in the draft Core Strategy of March 2013 provides the context for transport issues.

LDF Policy SS1

1.5 Policy SS1 – A presumption in favour of sustainable development provides the overall vision and indicates that the Core Strategy has a vision and 12 objectives already aligned under the themes of promoting social progress (supporting strong communities by meeting housing, education and health, transport and infrastructure needs), economic prosperity (supporting new jobs, area regeneration, business, tourism and retail) and environmental quality (addressing climate change, protecting and enhancing the environmental assets of the county). The vision indicates further that:

1.6 "Residents and workers in urban and rural areas will have a reduced need to travel by private car with opportunities for "active travel" i.e. walking and cycling promoted, along with improved accessibility to public transport. In Hereford, congestion will be managed and public transport improved through a balanced package of transport measures including the provision of a relief road, park and ride facilities and bus priority schemes".

Policy SS4 – Movement and transportation

1.7 New developments should be designed and located to minimise the impacts on the transport network; ensuring that journey times and the efficient and safe operation of the network are not detrimentally impacted. Furthermore, where practicable, development proposals should be

accessible by, and facilitate a genuine choice of modes of travel including walking, cycling and public transport.

1.8 Development proposals that will generate high journey numbers should be in sustainable locations accessible by means other than private car. Alternatively, such developments will be required to demonstrate that they can be made sustainable by reducing unsustainable transport patterns and promoting travel by walking, cycling and public transport.

1.9 Proposals to provide new and improved existing public transport, walking and cycling infrastructure will be supported; where appropriate, land and routes will be safeguarded and developer contributions sought to assist with the delivery of new sustainable transport infrastructure.

1.10 Herefordshire Council will work with the Highways Agency, national organisations, developers and local communities to bring forward improvements to the local and strategic transport network to reduce congestion, improve air quality and offer greater transport choices, including the provision of the following major schemes:

- Edgar Street Grid Link Road (Safeguarded route) and Transport Hub;
- Hereford Relief Road;
- Southern Leominster Relief Road;
- Park and Ride schemes; and
- Other schemes identified in the Local Transport Plan and Infrastructure Delivery Plan.

1.11 Proposals which enable the transfer of freight from road to rail will be encouraged. Development proposals incorporating commercial vehicular movements that could detrimentally impact on the environmental quality, amenity, safety and character of the surrounding locality will be expected to incorporate evidence demonstrating how the traffic impacts are to be mitigated.

1.12 The LDF strategy proposes further interventions of this nature.

- Cycling and Walking – a network of cycle tracks and opening of new / improvements to existing links across the River Wye are proposed;
- Parking management – the LDF proposes that a Parking Strategy be developed;
- Public transport improvements – development of the public network to cater for new developments is proposed;
- Bus Park and Ride – a three site Park and Ride system is proposed with sites located in the City's three strategic housing urban extensions;
- Highway capacity improvements and junction capacity enhancements;
- A Southern and Western Relief Road – A full outer relief road to the west of the City's urban area is proposed; and
- Behaviour Change - Herefordshire Council is currently delivering a comprehensive behaviour change programme known as Destination Hereford, as part of their Local Sustainable Transport Fund Initiative. Initial monitoring results indicate that the programme is successfully delivering mode shift, although the level is marginal at present.

Structure of this report

1.13 Following this contextual introduction;

- Chapter two details our findings in terms of the point in the plan period when the proposed relief road is required;
- Chapter three provides a description of the proposed relief road corridors under consideration and introduce an assessment of the key issues and strengths of the individual sections;
- Chapter four summarises our approach to prioritisation of sections of the proposed relief road;
- Chapter five includes our strategic assessment of the separate sections of the relief road including our recommendation for the sequential development of the route; and
- Chapter six includes the concluding comments drawing together the analysis within the proceeding chapters.

2 Trigger point analysis

2.1 The Local Plan Core Strategy Modelling Report concluded that the "with road option" is a sensible policy option which can facilitate the delivery the Core Strategy growth proposals". The case for the principle of the relief road is therefore established as the key transport intervention necessary to deliver the Core Strategy growth. Following on from this, part of JMP's brief for the phasing study was to establish at what point within the Local Plan – Core Strategy period the relief road, either whole or in part, is required.

2.2 The methodology established to assess this question was to undertake model runs of the intermediate years 2017, 2022 and 2027 without the relief road but with the committed schemes and including forecast development.

2.3 JMP and Herefordshire Council have agreed a series of criteria for the trigger point (discussed later in this chapter), however it is clear that the A49 and the river crossing, which act as a major constraint within the network, will be key.

2.4 The HA has a statutory duty to manage the free and safe movement of traffic on the strategic road network therefore

The Hereford transport model

2.5 The Hereford Multi Modal model comprises a SATURN Highways assignment model, a Cube Voyager Public Transport, Walking and Cycling assignment models and a variable demand model scripted within Cube Voyager.

2.6 The demand modelling to date has sought to establish 'do minimum' scenario forecasts for the period from 2012 through to 2032 in five year increments. The do minimum network is the base network with the addition of committed and agreed schemes. Specifically this includes the Edgar Street Grid Link road, the recently delivered Highways Agency Pinch Point schemes and the Southern Link. The Southern Link has been included within the 'do minimum' as it has been identified as a priority for Hereford and is being pursued as a separate individual scheme to the Relief Road. Work on identifying the final alignment of the Southern Link is underway as is the production of a strategic outline business case to inform the development of the Marches LEP strategic economic plan. Given this advanced state of development, the commitments made by the Council to provide an scheme for consultation purposes in the near future and the need to ensure continued development of the Hereford Enterprise Zone in the medium term this work has assumed that a scheme would be in place by the first intermediate assessment year of 2017.

2.7 A full list of measures included in the 'do minimum' is provided in Appendix A.

2.8 JMP's view is that the model is reflective of wider strategic transport issues and can be used at this stage to provide a strategic view and appropriate evidence to support the Core Strategy It is therefore considered to be fit for the purpose of providing support to the submission and examination of the Core Strategy . Further refinements to the model are programmed for future detailed testing, business case development and for the assessment of planning applications.

Forecasting

2.9 The Hereford transport model forecasts changes in demand by mode from the 2012 base year. The forecasting has assumed a central "most likely" growth and Local Plan development aspirations[1].

2.10 The process inputs the Local Plan aspirations into the Department for Transport (DfT) TEMPRO tool to obtain trip totals for each forecast year. This approach takes into account changes in trip making as a result of increases in car availability, economic growth and planning policy.

2.11 The output is then loaded into the demand model which takes into account changes in car occupancy, values of time and improvements to transport networks.

2.12 The tables below illustrates the level of change in trip making over the 12 hours represented in the demand model. The data is presented by time period, forecast year and journey purpose:

- HBW – Home based Work,
- HBE – Home based Education,
- HBO – Home based Others,
- EMB – Employers Business,
- NHB – Non Home based,
- LGV – Light Goods Vehicles and
- OGV – Other Goods Vehicles.

2.13 Person trips represent the sum of all non goods vehicle movements.

Table 2.1 Forecast Change in Travel

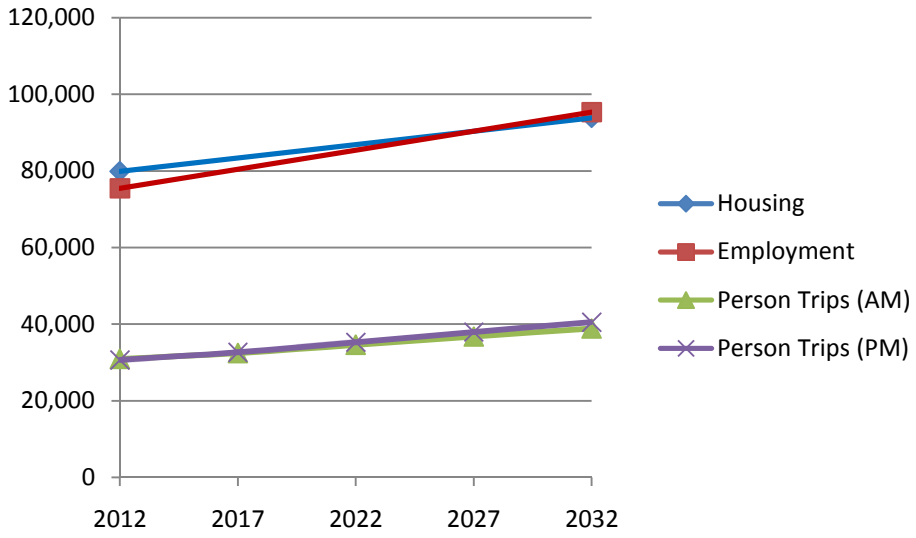
Time Period / Year	Journey Purpose							
	HBW	HBE	HBO	EMB	NHB	LGV	OGV	PERSON
Morning Peak								
2012	12630	2298	8705	3148	4111	2836	1467	30892
2017	12936	2400	9219	3366	4492	3281	1651	32414
2022	13417	2613	10017	3606	4925	3773	1747	34577
2027	14098	2725	10856	3808	5290	4210	1844	36777
2032	14651	2868	11667	4026	5660	4711	1943	38872
Inter Peak								
2012	2562	1810	10847	2609	6344	2383	1699	24172
2017	2726	1891	11475	2838	6965	2758	1912	25895
2022	2934	2052	12470	3082	7663	3171	2023	28201
2027	3061	2068	13730	3228	8382	3538	2136	30469
2032	3243	2150	14819	3425	9028	3959	2250	32666
Evening Peak								
2012	12402	1251	9777	2715	4500	2263	713	30646
2017	13134	1418	10304	2936	4855	2618	802	32647
2022	14152	1612	11090	3175	5261	3011	848	35290
2027	15498	1608	12009	3281	5564	3360	896	37960

[1] supplied by AMEY (former technical advisors to the Council) on 10 September 2013

2032	16605	1722	12827	3454	5893	3759	943	40501

2.14 The above numbers are based on an interpolated growth rate to develop from today to full build out of the LDF by 2032. The growth is applied pro-rata across all sites for this assessment. This is illustrated in Figure 2.1.

Figure 2.1 Rate of housing and employment delivery alongside person trips.



2.15 Table 2.2 provides the percentage growth by year, time period and journey purpose.

Table 2.2 Percentage change in travel

Time Period / Year	Journey Purpose							
	HBW	HBE	HBO	EMB	NHB	LGV	OGV	PERSON
Morning Peak								
2017	102%	104%	106%	107%	109%	116%	112%	105%
2022	106%	114%	115%	115%	120%	133%	119%	112%
2027	112%	119%	125%	121%	129%	148%	126%	119%
2032	116%	125%	134%	128%	138%	166%	132%	126%
Inter Peak								
2017	106%	104%	106%	109%	110%	116%	112%	107%
2022	115%	113%	115%	118%	121%	133%	119%	117%
2027	119%	114%	127%	124%	132%	148%	126%	126%
2032	127%	119%	137%	131%	142%	166%	132%	135%
Evening Peak								
2017	106%	113%	105%	108%	108%	116%	112%	107%
2022	114%	129%	113%	117%	117%	133%	119%	115%
2027	125%	128%	123%	121%	124%	148%	126%	124%
2032	134%	138%	131%	127%	131%	166%	132%	132%

2.16 The table above illustrates the percentage change relative to the 2012 base year. The table shows that by far the greatest growth is in goods vehicles and light goods vehicles. This is a direct outcome of applying Department for Transport guidance through their published Road Traffic Forecasts, though the LGV forecasts are caveated in the notes to the Road Traffic Forecasts and

consequently a sensitivity test with lower LGV growth may be required as part of the development of a full business case.

2.17 The next largest growth rates are for the discretionary trips within 'Home Based Others' and Non home based trip making that reflect the general trend of an ageing population. This is also reflected in the lower growth rate for home based work.

2.18 The figures above represent the changes in the quantum of demand, changes to the choice of mode used and the application of Department for Transport guidance on changes in car occupancy which will result in different percentage changes in quantum of demand by specific modes.

2.19 A key outcome of the analysis is that the high quantum of road travel demand seen in the peak periods in 2012 is forecast to be exceeded in the interpeak in 2032 without any mitigation / policy interventions in place. In the peaks demand continues to increase with demand increasing by just under a third by 2032.

2.20 The plots below represents the difference in the trip productions and attractions for each time period within Hereford by 2032. The largest changes in demand relate to the Hereford Enterprise Zone development site. The redevelopment sites to the north of the city centre and the impact of the strategic urban extensions at Three Elms and Holmer West are also clearly visible in the figures.

Figure 2.2 2032 AM peak Hereford change in trip producers and attractors

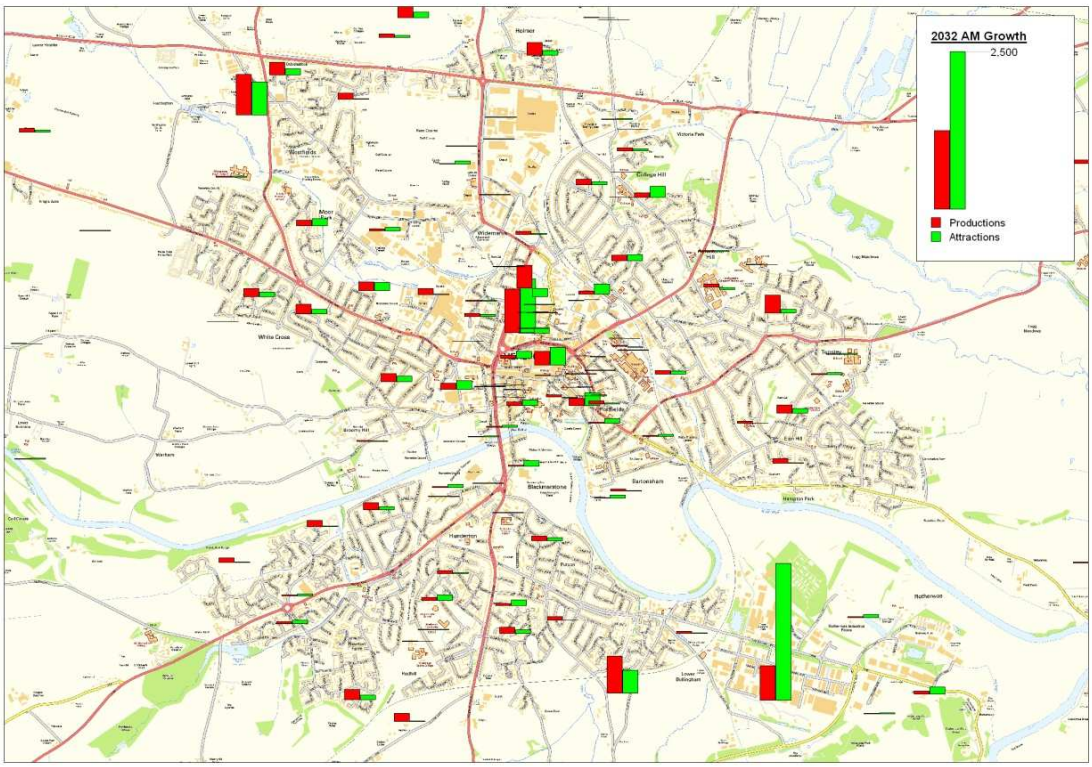


Figure 2.3 2032 Inter peak Hereford change in trip producers and attractors

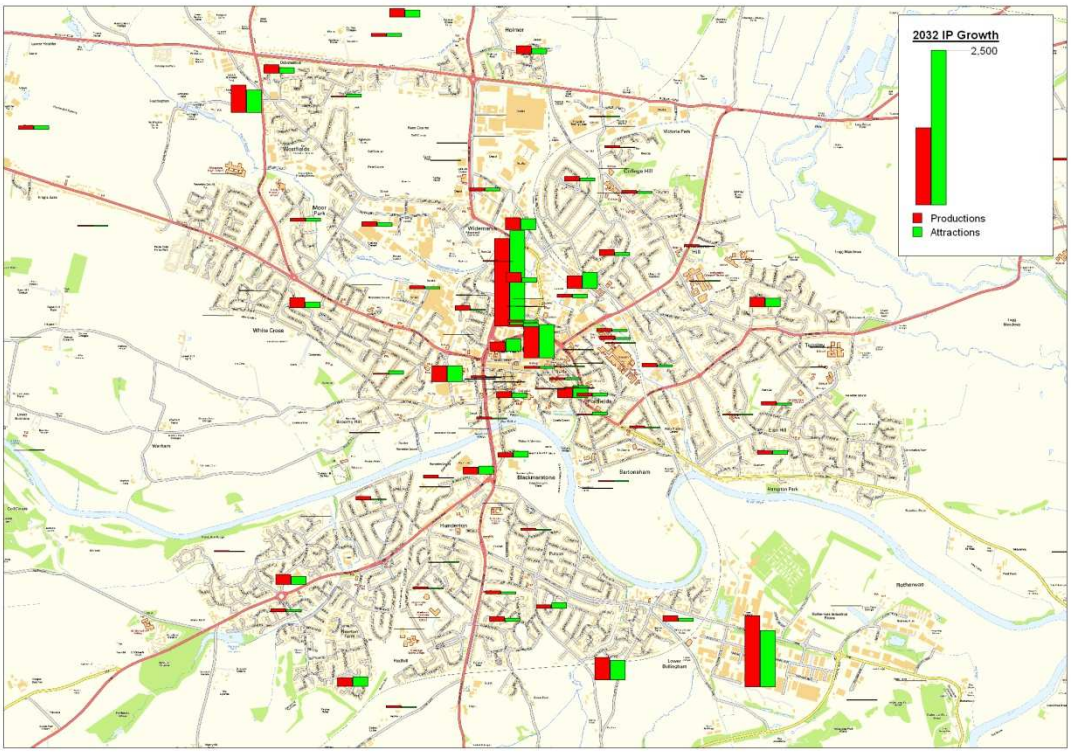
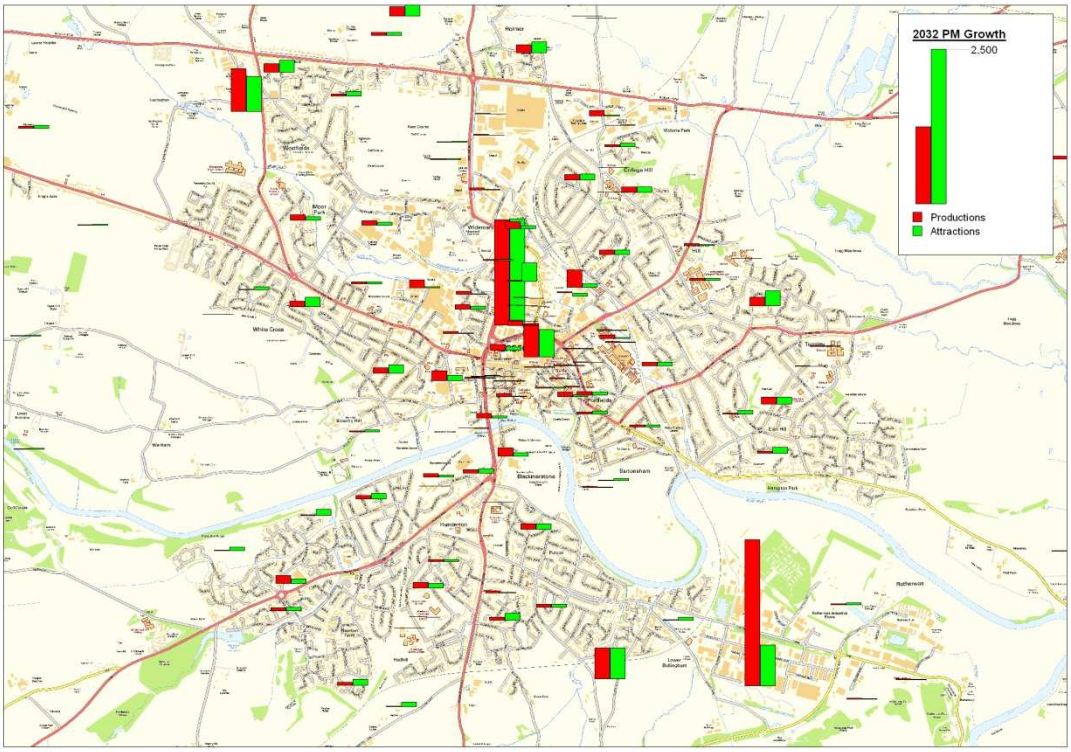


Figure 2.4 2032 PM peak Hereford change in trip producers and attractors



Trigger point indicators

2.21 A number of indicators have been established and agreed by the Council which will be used to identify the trigger point for the relief road these are summarised below:

- Journey time on A49 through Hereford including analysis of the central section between the junction of the A49 with Holme Lacy Road to the junction of the A49 Edgar Street / A438 Newmarket Street;
- Journey time on A438/Holme Road; and
- Journey time on A465.

2.22 The rationale for these indicators as the trigger for the relief road is summarised below alongside analysis of the model outputs. It is worth highlighting at this point that the analysis has not defined a threshold for these indicators i.e. a specific journey time or speed above or below which the relief road will be required.

2.23 The key starting principle of this analysis is that the relief road is not present in the base year but it is clear from the LDF Core Strategy Modelling Work that the relief road is required in 2032. The analysis therefore considers the intermediate years in five year blocks (2017, 2022 and 2027) to establish at what point in time the relief road is required. The analysis focuses on changes in journey time and speed to identify where a negative step change in these indicators occurs.

Journey time on A49 through Hereford

2.24 The Highways Agency is responsible for operating, maintaining and improving the A49. The Highways Agency's policy[2] is that *"development proposals are likely to be acceptable if they can be accommodated within the existing capacity of a section (link or junction) of the strategic road network, or they do not increase demand for use of a section that is already operating at over capacity levels".* The National Planning Policy Framework indicates that *"development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe"*. Therefore, the capacity of the A49 is a critical component in terms of accommodating future development aspirations. However the Highways Agency also has a statutory function to allow for the safe and free movement of strategic traffic.

2.25 The Highways Agency is currently working with Herefordshire Council to assess the long term capacity of the A49 and what incremental level of development may be acceptable in the short term. The Highways Agency's draft Route Based Strategy evidence report (February 2014) indicates that *"The A49 at Hereford Bridge (between A465 and A438) performs poorly in relation to other links within the route and was raised by stakeholders as an on-going issue. As with most of the A49, this section is single carriageway, which constrains the ability of traffic to flow through Hereford where it meets a significant amount of local traffic."* The report identifies the A49 link between the A438 and A465 as the 77th most unreliable on the strategic road network in England.

2.26 The Highways Agency in a letter to Herefordshire Council (dated 19 June 2013) indicated a number of key parameters for analysis of the local plan including A49 journey times, total vehicle flows across north/south and east/west screen lines and flow volume differences between future year scenarios. The letter also identifies that on the basis of the information available at that time an increase in journey time of 38.1% in the AM peak represents "a severe detrimental effect to the ability of the A49 (T) to function as an element of the strategic road network".

2.27 The journey time analysis presented has been measured over a distance of 4.6 miles from the A49 immediately south of its junction with the B4399 to the A49 North of Hereford at Church Road. This section of the route includes the potential access points for a proposed western relief road and the river crossing within central Hereford which has been identified as a critical pinch point in the network. For the purpose of this analysis the route has been divided into three sections:

[2] The Strategic Road Network and the Delivery of Sustainable Development, September 2013, DfT.

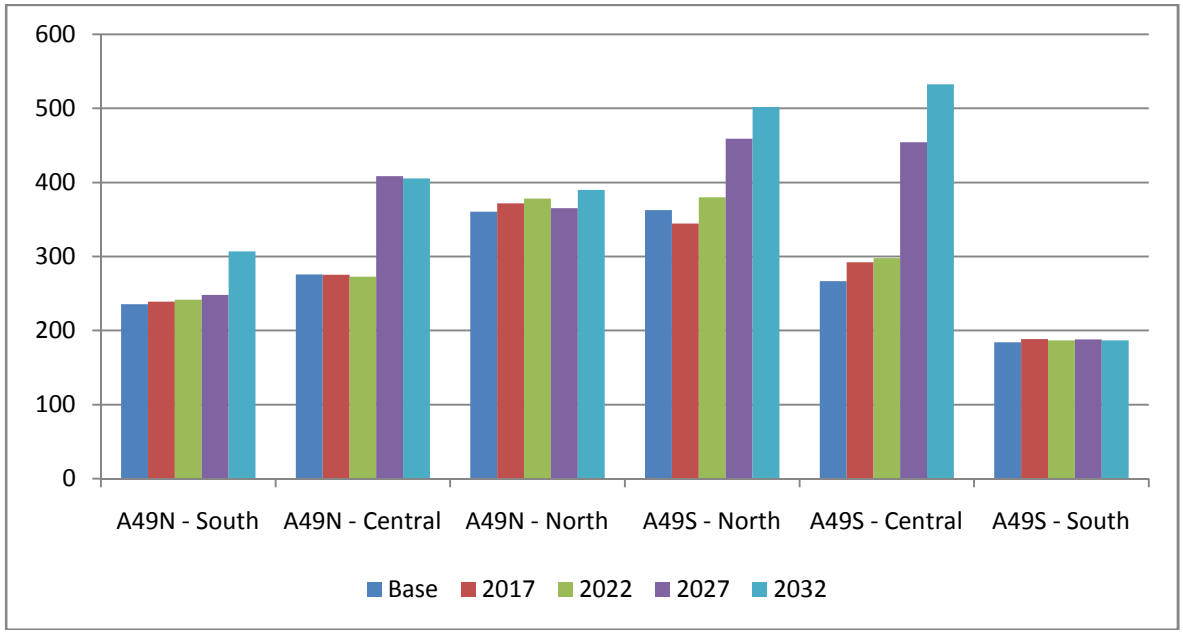
- The southern section runs from the A49 immediately south of its junction with the B4399 / South Wye Link to the A49 / Holme Lacy Road junction;
- The central section runs from the junction of the A49 with Holme Lacy Road to the junction of the A49 Edgar Street / A438 Newmarket Street;
- The northern section runs from the junction of the A49 Edgar Street / A438 Newmarket Street the A49 North of Hereford at Church Road to the north of the proposed junction with Holmer West / Holmer East sections;

2.28 In the base year AM peak with no relief road Figure 2.4 illustrates that the journey time northbound on the A49 equates to 872 seconds (14.5 minutes) for a 4.6 mile section[3], an average speed of 18.9 mph, while the southbound journey time for the same stretch is 813 seconds (13.6 minutes), with an average speed of 20.4 mph. This masks significant variation in conditions along the route the section with the worst conditions is the northbound central section of the A49 (between the junction of the A49 with Holme Lacy Road to the junction of the A49 Edgar Street / A438 Newmarket Street). This section of the route has an average speed of 8.9 mph in the base year. The figure 2.5 and 2.6 illustrates a deterioration in journey time up to 2022 and a significant increase in journey time by 2027, Particularly in the A49 southbound northern and central sections.

2.29 Given these findings the Highways Agency position based on the June 2013 modelling work would appear to remain valid across the length of the Core Strategy.

2.30 The trends are mirrored in the PM peak with the northbound northern and central sections again showing significant deterioration in journey time through the plan period.

Figure 2.5 A49 AM Journey Times (Do Minimum)



[3] Based on JMP model runs Jan 2014 not AMEY report June 2013

Figure 2.6 A49 PM Journey Times (Do Minimum)

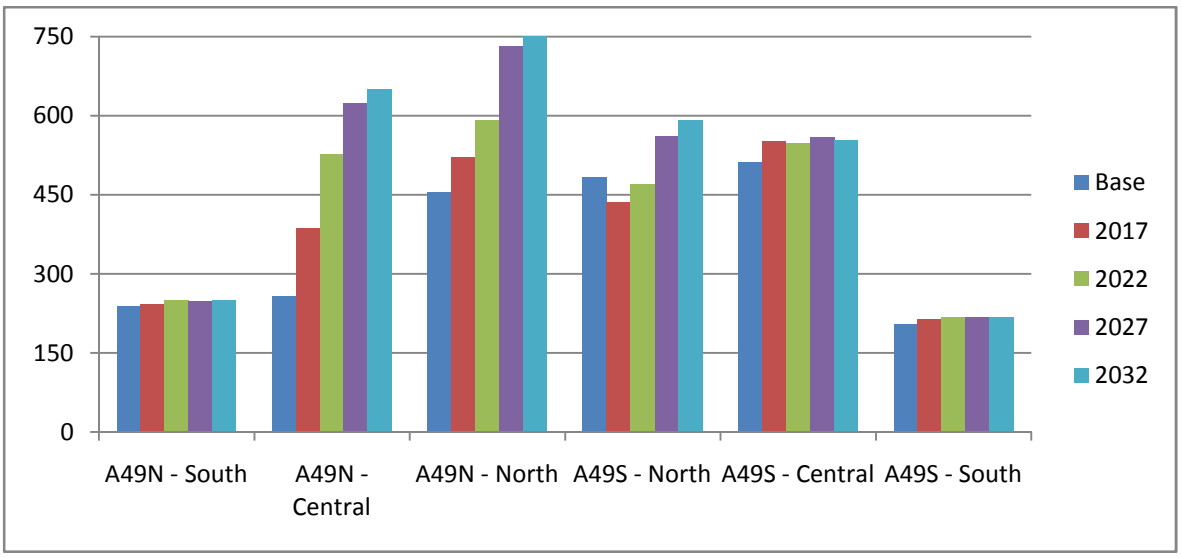


Table 2.3 % Change in Journey Time AM peak

% change from the base year	Base year time (minutes)	2017	2022	2027	2032
A49 Southbound (whole route)	13.6	1%	6%	**35%**	**50%**
A49 southbound (central section)	4.4	10%	12%	**70%**	**100%**
A49 northbound (whole route)	14.5	2%	2%	17%	26%
A49 northbound (central section)	4.6	0%	-1%	**48%**	47%

*Bold and underlined figures denote step change

Table 2.4 MPH in the AM peak

Mph	Base	2017	2022	2027	2032
A49 Southbound (whole route)	20.4	20.1	19.2	15.1	13.6
A49 southbound (central section)	15.2	13.9	13.6	8.9	7.6
A49 northbound (whole route)	18.9	18.6	18.5	16.2	15.0
A49 northbound (central section)	8.9	8.9	9.0	6.0	6.1

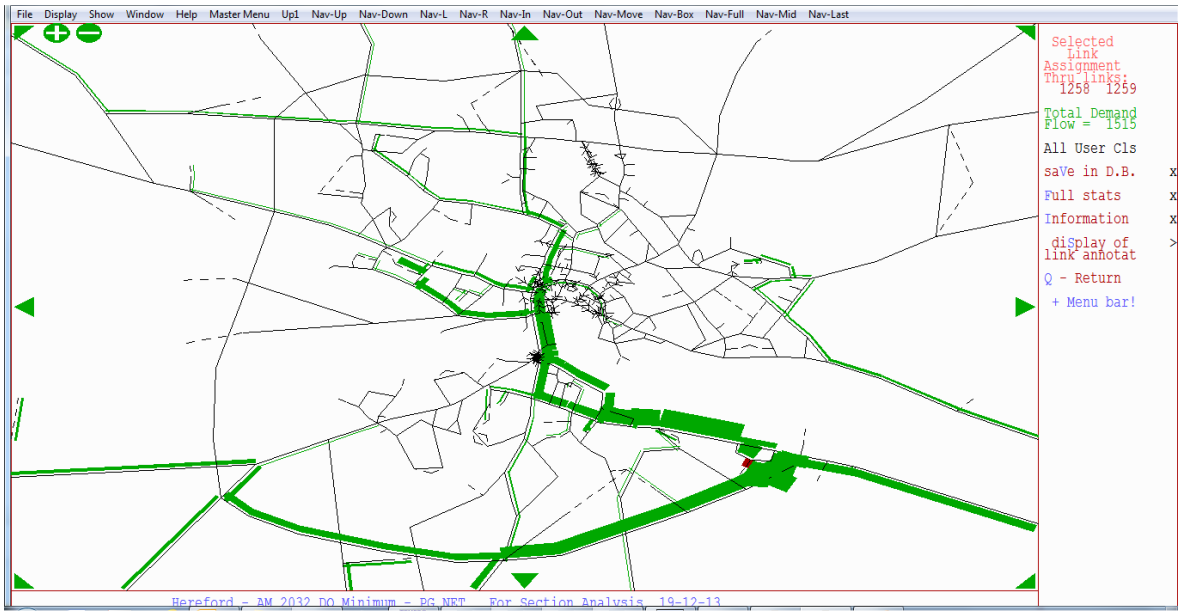
2.31 The analysis has considered the change in journey time and speed. In the AM peak the journey time increase is relatively small up to 2022, however there is a step change in increased journey times and decreasing speeds on the A49 southbound between 2022 and 2027 and then again between 2027 and 2032. This is particularly pronounced in the central section in the AM peak where the speed drops below 10mph in 2027 in the southbound direction and by a third to 6mph in the northbound direction. These factors indicate interventions to relieve the A49 are required by 2027.

2.32 The focus on the A49 southbound in the AM peak is a reflection on the concentration of housing development in the north and north-west of Hereford and the increase in employment opportunities to the south of the city.

The influence of the Enterprise Zone

2.33 The plot below illustrates the routes taken to Hereford Enterprise Zone in 2032 for the morning peak.

Figure 2.7 Model plot of routes to Hereford Enterprise Zone 2032



2.34 It should be noted that although the Western Relief Road is present in the SATURN model, only the Southern Link road is open in this model run, other sections of the link road are inaccessible by car in this scenario. Thus the above represents traffic conditions with the 'Do Minimum' road network and the Southern Link road open.

2.35 The key points are:

- The use of the Southern Link road as a key access route to the site from the West;
- The crossing of the River Wye to the east of the model (B4399 / B4224, off image) which indicates the scale of the delays crossing Greyfriars Bridge and supports the need for a new river crossing; and
- The splitting of the flows from Greyfriars Bridge to the site via Holme Lacy Road and Hinton Road, which indicates the level of congestion on the main A49 / Holme Lacy Road corridor.

2.36 Key movements in the future years are between the new urban extensions in the north west of the city and the Enterprise Zone.

2.37 The pace of development at the Enterprise Zone is therefore a key determinant of when the relief road will be required, as highlighted earlier development forecast within the strategic modelling are based on an interpolated growth rate to develop from today to full build out of the LDF by 2032. The growth is applied pro-rata across all sites for this assessment. Were the Enterprise zone to be delivered earlier within the plan period the requirement for the relief road would come forward. A sensitivity exercise using the strategic modelling indicated that with the full Enterprise Zone

development built out in 2022 the journey time issues are equivalent to those experienced in 2027 in the original modelling scenario. These findings are summarised in table 2.5 and 2.6.

Table 2.5 % Change in Journey Time AM peak

% change from the base year	Base year time (minutes)	2017	2022	2027	2032
A49 Southbound (whole route)	13.6	6%	**32%**	35%	**50%**
A49 southbound (Central section)	4.4	12%	**76%**	70%	**100%**
A49 northbound (whole route)	14.5	2%	14%	17%	26%
A49 northbound (central section)	4.6	-1%	**44%**	48%	47%

*Bold and underlined figures denote step change

Table 2.6 MPH in the AM peak

Mph	Base	2017	2022	2027	2032
A49 Southbound (whole route)	20.4	19.2	15.4	15.1	13.6
A49 southbound (central section)	15.2	13.6	8.6	8.9	7.6
A49 northbound (whole route)	18.9	18.5	16.5	16.2	15.0
A49 northbound (central section)	8.9	9.0	6.2	6.0	6.1

Journey time on A438 / Holme Lacy Road and A465

2.38 A large proportion of the future employment growth will be accommodated at the Hereford Enterprise Zone. A Key movement in the future years are between the new urban extensions in the north west of the city and the Enterprise Zone. Consequently the journey time along Holme Lacy Road to Rotherwas is therefore a key indicator. This is demonstrated in Figure 2.6 above which plots the routes to Hereford Enterprise Zone in 2032.

2.39 As with the Enterprise Zone the centre of Hereford is a key location for future employment development (see Figures 2.1 to 2.3 above). This location is therefore an important destination and trip generator in the future years.

2.40 Figure 2.8 illustrate the journey times in seconds along A438 and Holme Lacy Road and the A465 in the AM Peak. Both these routes pass through the central area of Hereford. Figure 2.9 and 2.10 illustrates the extents of corridors used in this journey time analysis.

2.41 In the 2012 base year AM peak with no relief road table 2.5 illustrates that the journey time eastbound on the A438 / Holme Lacy Road equates to 964 seconds (16 minutes) for a 4 mile section between the A438 junction with the A480 and Vincent Cary Road junction with Holme Lacy Road. The westbound journey time for the same stretch is 919 seconds (15 minutes) including the peak flow of trips to Hereford centre. The graph illustrates an improvement in journey time between the base and 2017 which continues to 2022 this improvement represents the impact of the pinch

point scheme at the A438 / A49 Edgar Street junction. The graph illustrates significant increases in journey time on the eastbound A438 / Holme Lacy Road between 2022 and 2027.This effect reflects new residential trips from the north west of Hereford making the movement to Hereford centre and towards the Enterprise Zone in the morning peak, where there is a large increase in trip attractors through the plan period.

Figure 2.8 AM Journey Times (Do Minimum)

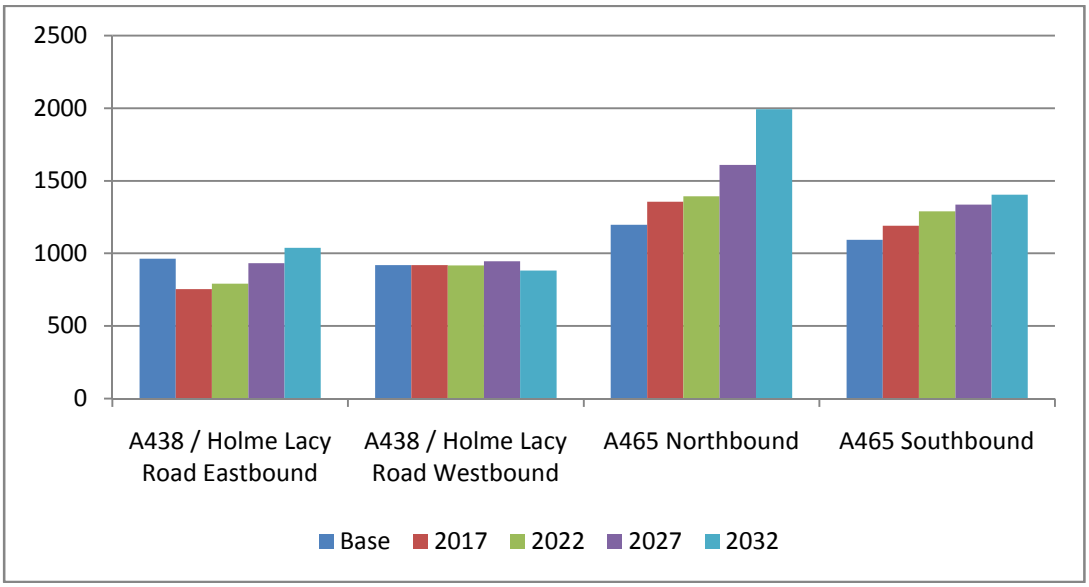


Figure 2.9 A438/Holme lacy Road corridor for journey time analysis

Figure 2.10 A465 corridor for journey time analysis

Table 2.7 % Change in Journey Time in AM peak

% change from the base year	Base year time (minutes)	2017	2022	2027	2032
A438 / Holme Lacy Road Eastbound	16	-22%	-18%	**-3%**	8%
A438 / Holme Lacy Road Westbound	15	0	0	3%	4%
A465 Southbound	18	9	**18**	22	28
A465 Northbound	20	13	**17**	**35**	**67**

*Bold and underlined figures denote step change

Table 2.8 MPH in the AM peak

MPH	Base	2017	2022	2027	2032
A438 / Holme Lacy Road Eastbound	14.2	18.2	17.3	14.7	13.2
A438 / Holme Lacy Road Westbound	14.9	14.9	14.9	14.5	15.6
A465 Southbound	14.0	12.9	11.9	11.5	10.9
A465 Northbound	12.9	11.4	11.1	9.6	7.8

2.42 The analysis has considered the change in journey time and speed. In the AM peak the journey time increases by 19% between 2017 and 2027 indicating a clear change in journey time increase and speed decrease on A438 / Holme Lacy Road. This is set against the backdrop of an improvement in journey times by 2017 as a result of the pinch point scheme at A438 / A49 junction. The journey time increase between 2022 and 2027 therefore takes the journey back to the base year position, i.e. the capacity created by the Pinch Point scheme has been completely eroded by 2027. These factors indicate interventions are required to relieve the A438 / Holme Lacy Road by 2027.

2.43 The A465 Southbound experiences a significant journey time increase in the period up to 2017 and 2022 followed by a consistent but smaller increase from 2022. This increase is focused on the

ASDA Roundabout with queuing back along Greyfriars Bridge and is commensurate with the increase in the A438 / Holme Lacy Road eastbound journey time.

2.44 The A465 Northbound journey times show a significant journey time increase up to 2022 followed by step change in journey time between 2027 and 2032. With speeds dropping below 10mph. These factors indicate interventions beyond those currently assessed are required to relieve the A465 Northbound by 2027.

2.45 Analysis of the other routes indicates that A438 / Holme Lacy Road Westbound shows relatively small journey time increases up to 2032.

River crossing flow analysis

2.46 The analysis below (Figure 2.11) indicates the level of flow on the A49 Greyfriars Bridge river crossing without the relief road. The graph indicates very little increase in vehicle flow in the northbound direction through the plan period, this reflects the fact that the link is operating at or close to capacity within the model, through the plan period. The same situation is reflected in the southbound direction by the end of the plan period.

2.47 Once this level of flow is reached then queues begin to form. The level of vehicles who wish to use the river crossing but cannot due to capacity restrictions is represented within SATURN via Queued Flow. Figure 2.12 indicates the queued flow.

2.48 It is clear that the southbound queued flow increases dramatically through the plan period, doubling by 2022 and over quadrupling by 2032. This represents the build out of Hereford Enterprise Zone and provides evidence of the link between the Enterprise Zone and the need for an additional river crossing.

Figure 2.11 AM peak vehicle flows on the river crossings without relief road

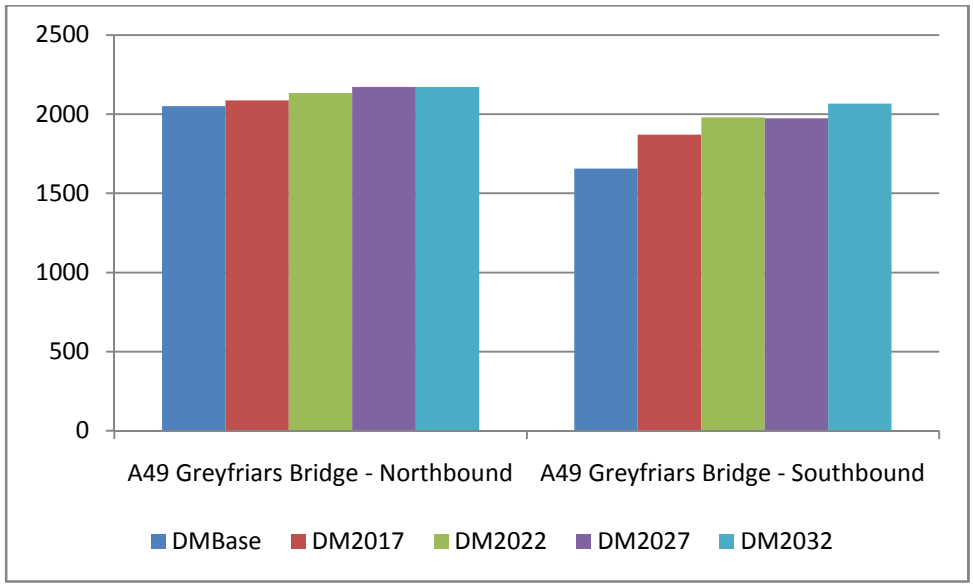
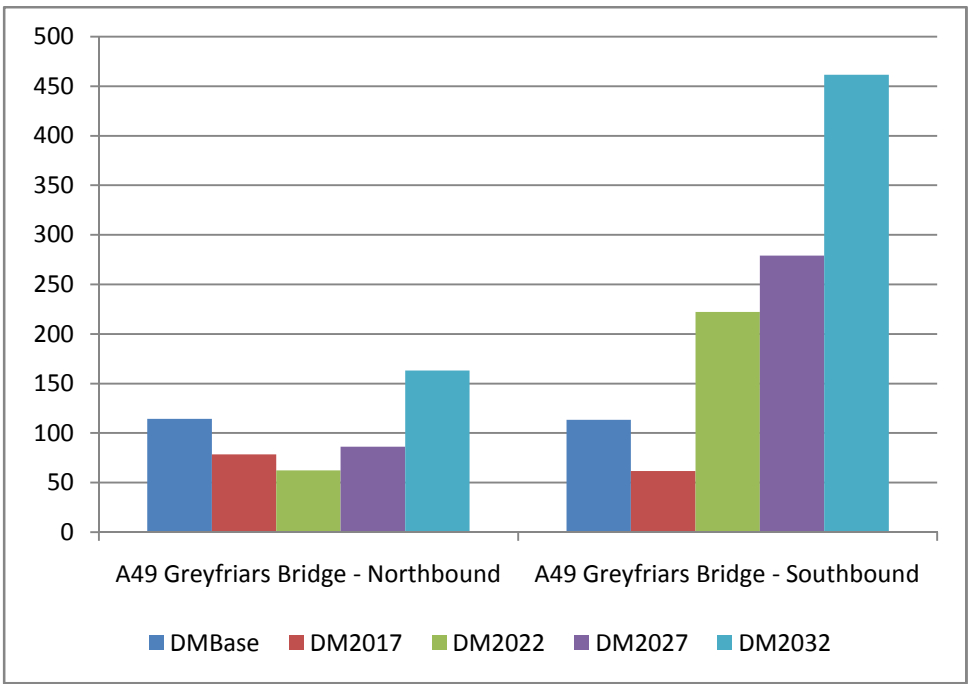


Figure 2.12 AM peak queued flow on the river crossings without river crossing



2.49 The analysis below (Figure 2.13) indicates the flows in the AM peak for the A49 Greyfriars Bridge and new relief road river crossing when the relief road is in place. It can be seen that with relief road the flows on the A49 reduce significantly.

2.50 There is still growth on the southbound river crossings as the Enterprise Zone builds out, but the additional river crossing created by the relief road provides the capacity for this to be achieved without substantial queuing. Flows on the A49 southbound are up to 20% lower with the relief road in place through the plan period.

Figure 2.13 AM peak vehicle flows on the river crossings with relief road

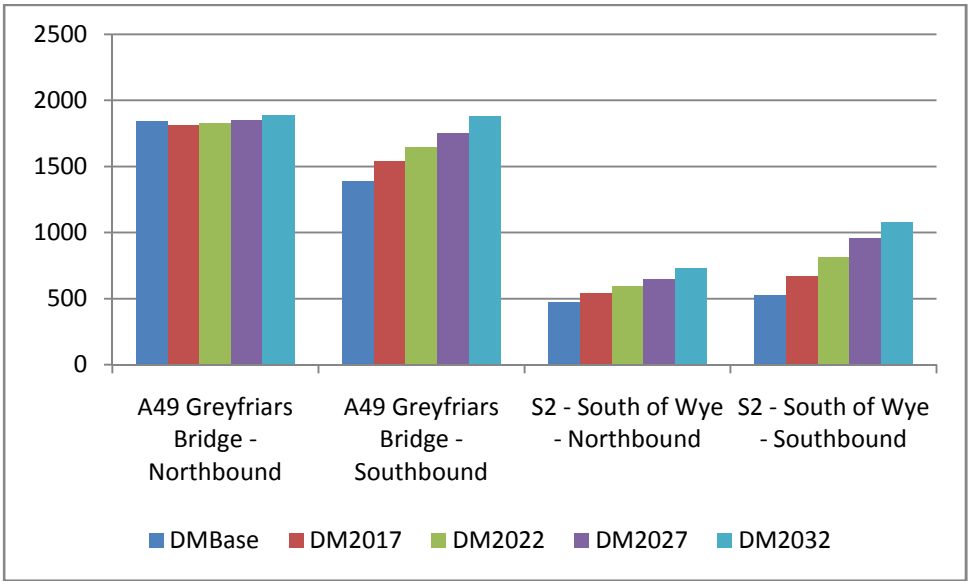
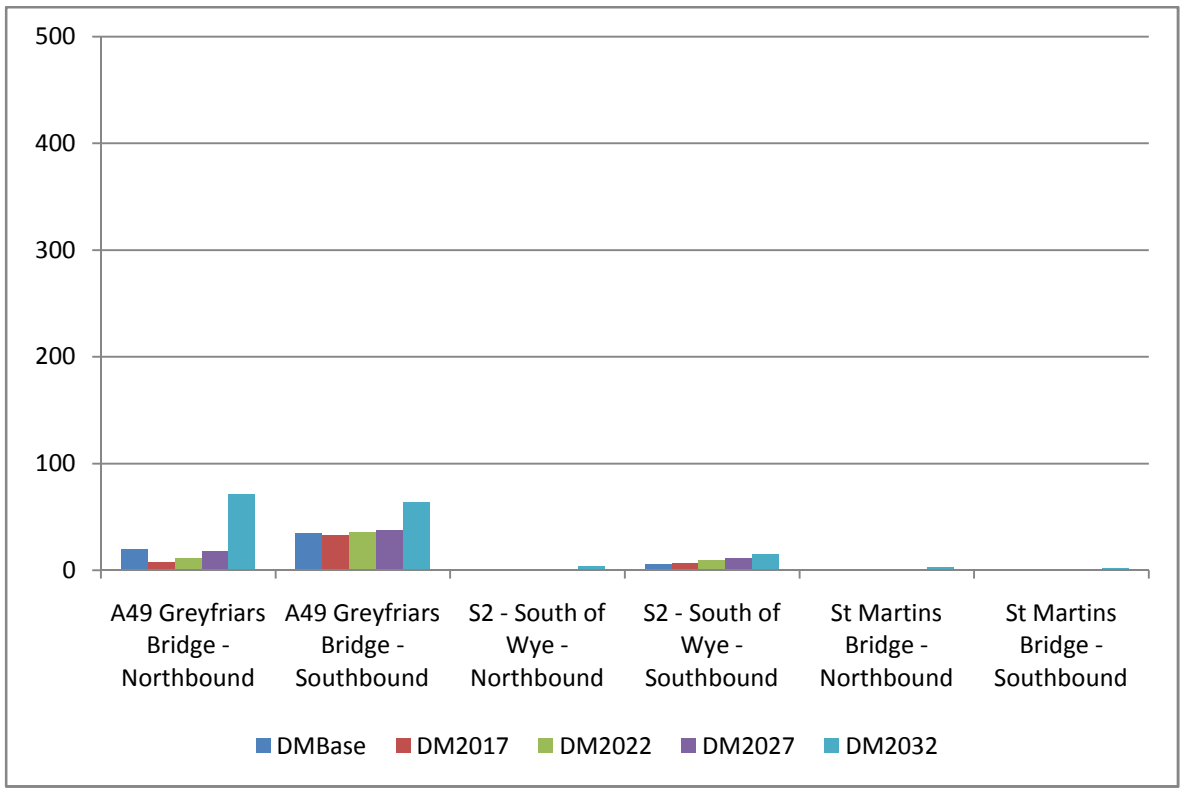


Figure 2.14 AM peak queued flow on the river crossings with river crossing



2.51 The Figure 2.15 below illustrates the 2032 traffic flows accessing the Hereford Enterprise Zone post opening of the relief road. As can be seen the flows from north-west of Hereford use the new river crossing. Figure 2.16 illustrates the flow difference in 2032 between the with and without relief road. The blue lines illustrate a significant reduction in flow on key areas of stress within Hereford including the A49, A438, A465 and A4103 Roman Road. The green lines illustrate a significant increase in flows along the new relief road.

Figure 2.15 Model plot of 2032 flows accessing Hereford Enterprise Zone

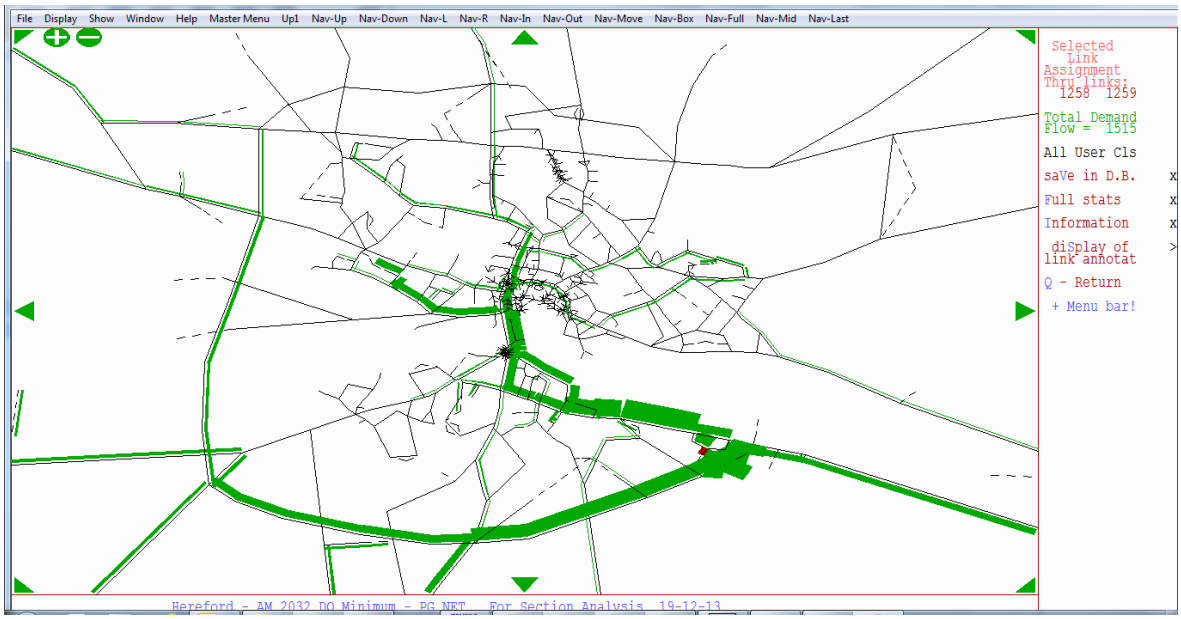
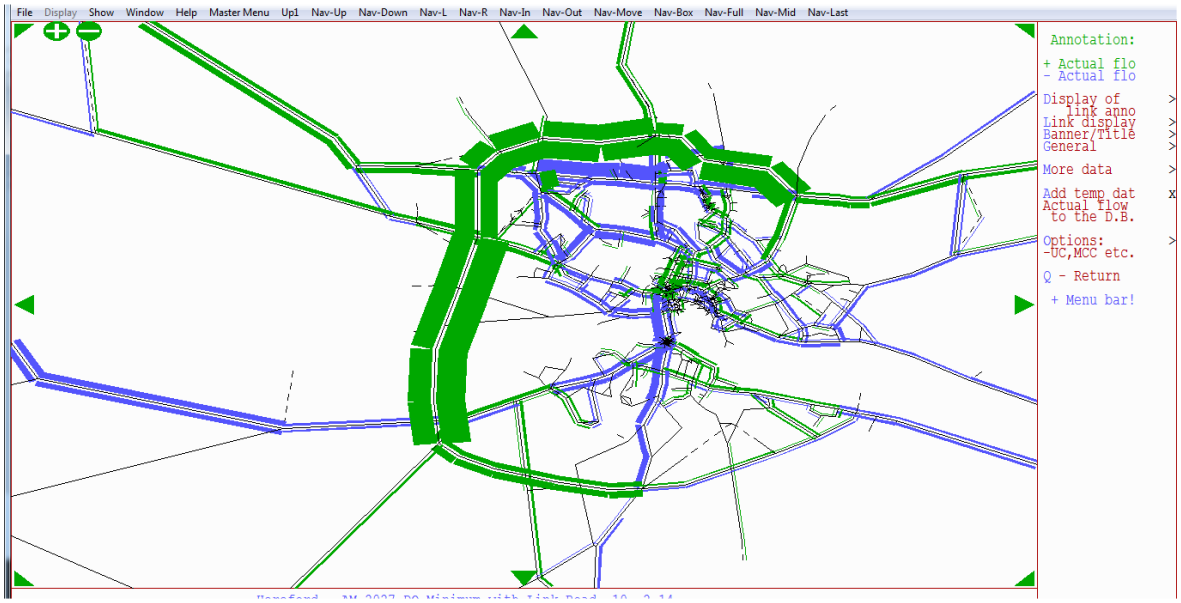


Figure 2.16 Model plot of 2032 flows accessing Hereford Enterprise Zone



Summary

Holme Lacy Road / A438

2.52 The analysis of A438/Holme Lacy Road indicates a step change in journey time by 2027, this is indicative that a trigger point has been reached and an intervention is required by this point in the AM peak. This corresponds with the analysis of the A49 corridor which again indicates a step change in journey time by 2027.

A49 and River Crossing

2.53 It is clear that the southbound queued flow increases dramatically through the plan period, doubling by 2022 and quadrupling by 2032.This represents the build out of Hereford Enterprise Zone and provides evidence of the link between the Enterprise Zone and the need for an additional river crossing.

2.54 In conclusion the evidence to date indicates an intervention is required by 2027. The analysis suggests that there has been a deterioration in network conditions by 2022. It is therefore suggested that should a phased approach to developing the relief road be adopted there would be significant benefit in the progressing early phases ahead of 2022, specifically the additional river crossing within the Wye link provides significant relief on key corridors within Hereford. It is recommended that the half moon relief road should be in place by 2027 at the latest.

2.55 The pace of development at the Enterprise Zone is a key determinant of when the relief road will be required, the strategic modelling is based on an interpolated growth rate to develop from today to full build out of the LDF by 2032. The growth is applied pro-rata across all sites for this assessment. However a sensitivity test looking at the impact of the Enterprise Zone indicates that were the Enterprise Zone to be delivered earlier within the plan period the requirement for the relief road would come forward. This is reinforced by the journey time analysis on the A49 which indicates an intervention is required by 2022 if the Enterprise zone is fully built out at by this time.

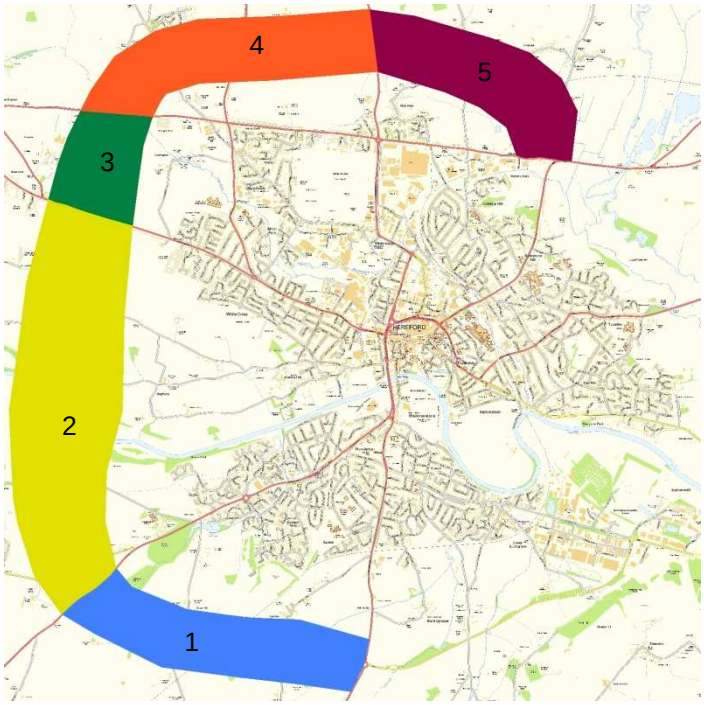
3 Western Relief Road

Introduction

3.1 The proposal for a relief road around Hereford has a long history. The present proposal relates to a relief road to the west of the city. This scheme proposes to link the road network to the south of the city with the north of the city via a new alignment to the west. There are four key sections to the proposal, which together may be justified as a single scheme, or may alternatively be justified as individual sections. The four links that form the proposal are discussed in more detail below. It is important to note that at this stage none of the links have an agreed alignment. All the routes are currently based on a corridor of search which was identified by AMEY in their options report (September 2010).

3.2 The following chapters of the report assume that the Southern link section (between the A49 and A465) of the western relief road is already in place, as this has been identified as a priority for Hereford and development of this section is being progressed ahead of the remaining phases of the relief road. This link is being considered in a separate exercise looking at a package of transport improvement measures to support development in that area. This link joins the A49 south of Hereford to the A465 Belmont Road. The Southern link is illustrated in Figure 3.1 as the blue section.

Figure 3.1 Western Relief Road corridor of search



3.3 The corridor of search for each of the links is illustrated on Figure 3.1. The corridors are known as:

1. Southern Link (blue)
2. Wye Corridor (yellow)
3. Three Elms Corridor (green)
4. Holmer West Corridor (orange)
5. Holmer East Corridor (red)

Wye Corridor

Route corridor description

3.4 The Wye corridor (marked section 2 on figure 3.1) is the largest single element of the proposal and is also likely to be the most costly element. The link is proposed to run from the A465 to the south west of the town to the A438 on the west of the town. To achieve this a second crossing of the River Wye is required, which will require the construction of significant earthworks and a new bridge to cross the river.

3.5 Strategically this section of the scheme would seem to be of some importance as it provides an alternative route from the north to the south of the town relieving the A49 which is the only other link to cross the river. Given the development of the Enterprise Zone to the south east of the city at Rotherwas and the location of a high proportion of housing growth to the north of the city the link across the River Wye is a critical capacity limitation on the road network. Were the entire relief road to be developed the Wye Link would link in the north with the Three Elms Link, discussed further below. In the south it would join with the Southern Link. While being developed separately this latter link is of relevance to the case for the Wye corridor as it would act as the main access from Hereford Enterprise zone to the relief road, and therefore be a source of considerable demand.

Three Elms Corridor

3.6 The Three Elms corridor (marked section 3 on figure 3.1) is a relatively short section of the proposed relief road scheme and will link the A438 in the west of the city with the A4103 Roman Road, also to the west of the city. The link would on its own provide a partial strategic link for flows from the west heading to the north by allowing traffic to route from the A438 to the A49 via the A4103 and the Starting Gate junction. This strategic link would be enhanced further if developed in parallel with the other links, and would serve to relieve Hereford city centre of some west to north movements and strategic “through city centre” traffic.

3.7 The proposed location of employment land in the Three Elms area in addition to housing development will generate some strategic traffic that would benefit from the Three Elms Link rather than being routed through the centre of Hereford.

Holmer West Corridor

3.8 The Holmer West corridor (marked section 4 on figure 3.1) is proposed to run from the A4103 Roman Road in the North West of the city to the A49 in the north of the city. This would provide a strategic link from the west to north and would help to reduce the volume of traffic using the A49/A4103 Starting Gate junction. At present much of the area that this corridor traverses is Greenfield land, however an urban extension to the north of Hereford will deliver significant quantities of housing in this area. The link will support this development by alleviating the effect of the development on key pinch points in the network including Starting Gate junction.

Holmer East Corridor

3.9 The Holmer East corridor (marked section 5 on figure 3.1) is proposed to run from the A49 north of the city to the A4103 Roman Road in the north east of the city. This, in parallel with the Holmer West Link would have the effect of removing traffic from the congested A49 Starting Gate junction, in addition were the relief road in its entirety to be developed it would provide some connectivity between the south and east of the city without requiring access to the city centre. The strategic urban extension to the north of the city would be supported by this link.

4 Prioritisation Approach

The need for prioritisation

4.1 To assist in developing a way forward for the relief road and to understand the likely benefits of the route, it is appropriate to assess separate sections of the Relief Road. This will:

- help to develop an understanding of the benefits of individual sections and also the benefits of the relief road in its entirety;
- it will also help to contribute towards an understanding of the requirements for the phasing of the sections; and
- help understand if the relief road in its entirety is required to satisfactorily mitigate the impact of the Core Strategy and allow the network to operate effectively within the centre of Hereford.

4.2 There is also a need to understand the interaction between each of the proposed links. This interaction is likely to be fundamental to both the strategic policy and value for money cases for the links as they will provide mitigation of the effect of new development on the existing road network. In addition the phasing of development is important to understand the timeframe for the delivery of the links.

4.3 The information presented will provide a useful starting point for the development of a strategic outline business case(s) for the relief road. The strategic outline business case is the first of three phases in the Department for Transport's investment decision making process and sets out the need for intervention, how this will further national and local aims and objectives and provides a rationale for developing the scheme further from this early stage.

The Approach

4.4 The prioritisation approach has three dimensions:

- Policy;
- Value for Money; and
- Deliverability.

4.5 The three dimensions provide evidence to inform recommendations on the phasing of the link road. Each dimension is described in greater detail below.

Corridor Assessment

Policy

4.6 Each corridor will be assessed to show how they contribute to local and national policy objectives, including those of the Council, Local Transport Body and Local Enterprise Partnership. Given the government emphasis on economic growth and climate change, the assessment includes consideration of job creation and carbon reduction.

4.7 JMP have derived a number of policy criteria to act as a framework for the policy assessment, these criteria reflect national and local key themes, a table demonstrating how the policy criteria align with national, emerging sub region and local themes is provided in Appendix B. These criteria are:

PC1 - Contribute towards safeguarding or creation of jobs or supply of land for employment;

PC2 - Assist in accommodating future housing development within Herefordshire;

PC3 - Contribute to an overall reduction in carbon emissions;

PC4 - Ensure journey time reliability and capacity of transport links including consideration of operational performance of the strategic road network;

PC5 - Contribute to the uptake of active travel modes that may contribute to a reduction in obesity and overall improvement in health;

PC6 - Improve accessibility from residential areas to employment, education or other opportunities;

PC7 - Improve local environmental conditions.

4.8 Each section of the link road will be assessed against the policy criteria using a scoring scale of -3 to +3. The score is based on the level of impact where 3 indicates a significant positive impact, -3 a significant negative impact, while 1 indicates a minor positive impact and -1 a minor negative impact. The assessment is based on a meta analysis of evidence gathered by a desk based review of existing evidence.

Value for Money

4.9 Existing and emerging funding sources from DfT include a clear expectation that the Transport Business Case development guidance and WebTAG will be used. The level of funding likely to be required for the relief road is significant with a strong probability that public funding will be required to support planning gain collected locally. Notwithstanding the delegation of some transport funding to the Marches Local Enterprise Partnership through the Strategic Economic Plan 'Single Pot' and Local Transport Body the need for a HM Treasury 'green book' appraisal of the scheme(s) will remain on the basis of the costing currently available.

4.10 At this stage JMP proposes that the value for money assessment be based on an outlined Benefit / Cost Ratio based on TUBA analysis[4]. More detailed analysis will be required to develop the economic case within the Outline Business Case(s).

4.11 Value for money will be assessed based on DfT Guidance[5] The categories are outlined below:

- Poor value for money if the BCR is less than 1.0;
- Low value for money if the BCR is between 1.0 and 1.5;
- Medium value for money if the BCR is between 1.5 and 2.0;
- High value for money if the BCR is between 2.0 and 4.0;
- Very high value for money if the BCR is greater than 4.0.

Deliverability

4.12 Deliverability is a key element of the methodology. JMP proposes to assess each section of the relief road in relation to the level of risk associated with their deliverability, it is important to highlight

[4] TUBA is transport economic appraisal software. It stands for "transport user benefit appraisal". The purpose of TUBA is to carry out transport scheme economic appraisal in accordance with the DfT's published guidance in Unit 3.5 of the WebTAG appraisal guidance. It implements a 'willingness to pay' approach to economic appraisal for multi-modal schemes with fixed or variable demand.

[5] http://assets.dft.gov.uk/publications/value-for-money-assessments-guidance/vfmguidance.pdf

that the whole corridor of search has been considered for each link rather than a particular alignment. JMP has previously used assessments of deliverability based around three areas:

- Risk to programme;
- Risk to cost; and
- Risk to acceptability.

4.13 JMP have developed a number of key deliverability components and undertaken a Red-Amber-Green (RAG) assessment of each component based on the level of risk associated with that component. Red would tend to indicate a “showstopper” illustrating that it is unlikely that the proposed link could be delivered within the Plan period.

4.14 A large amount of the deliverability assessment is based on the relief road risk registers which were derived from a risk workshop which took place on 19 September 2013. The risk workshop was led by JMP and attended by key stakeholders from Herefordshire Council and their contractors. The workshop considered a wide range of project risks categorising the risks and providing an assessment in terms of the likelihood of occurrence and the potential impact. It is important to note that the workshop examined each link separately, the workshop also considered which risks were common to all links, and if risks were common to each link would they occur only once or for each link were the route to be constructed in one go. Details of the risk workshop and subsequent analysis including risk registers can be found in Appendix C of this report.

5 The Corridor Assessment

5.1 The following section summarises the assessment of each of the Western Relief Road Links. No analysis is provided on the Southern Link, as discussed previously this report assumes that the Southern Link section of the western relief road is already in place, as this has been identified as a priority for Hereford. Development of this section is being progressed ahead of the remaining phases of the relief road through a stand-alone assessment programme.

Wye Corridor

Policy

5.2 **Policy Criteria 1 and 2:** The Three Elms urban extension lies to the north of the northern junction of this section of the relief road. The Wye Link will form a significant link between this development and the Hereford Enterprise Zone to the south of Hereford. Three Elms development also includes the expansion of the Three Elms Trading estate, a further 10ha are identified for development. The Wye Link would contribute to mitigating the impact of this employment site and by improving accessibility make the Three Elms site more attractive to investors. The link therefore supports the creation of jobs at Hereford Enterprise Zone, Three Elms Trading Estate and Westfield Trading Estate, alongside supporting the delivery of houses at Three Elms (1000 dwellings).

5.3 Table 5.1 below summarises the total job capacity at the sites which the Wye link will support. This should be considered in the context of the Highways Agency's position on the Hereford Enterprise Zone which has triggered a study by the Council to consider how much capacity can be made available for Enterprise Zone related traffic in the short term and in the context of refreshing the Hereford transport strategy.

Table 5.1 Job Creation

	Total jobs capacity
Hereford Enterprise Zone	5719
Three Elms Trading Estate	73
Westfield Trading Estate	120
Three Elms urban expansion	716
Total	6628

5.4 **Policy Criterion 3:** A monetary value (in present value) for greenhouse gases has been produced through TUBA analysis undertaken for the Wye link. This is the net present value of the change in CO2e emissions from road based fuel consumption that is in the non traded sector. A positive number would suggest there has been an overall reduction in CO2e[6] emissions and conversely a negative number would suggest that there has been an overall increase in CO2e emissions. The value for the Wye Link is £7.7million[7], as outlined above this indicates an overall reduction in CO2 emissions through the introduction of the Wye Link.

5.5 **Policy Criterion 4:** In terms of the link's contribution towards journey time reliability and capacity of transport links, analysis using the Hereford Saturn model has indicated that the introduction of the

[6] CO_2e is CO_2 equivalent
[7] For the 60 year appraisal period.

Wye link as a standalone scheme could generate the equivalent of an 8% time saving across Hereford in 2032 compared with the 2032 do-minimum.

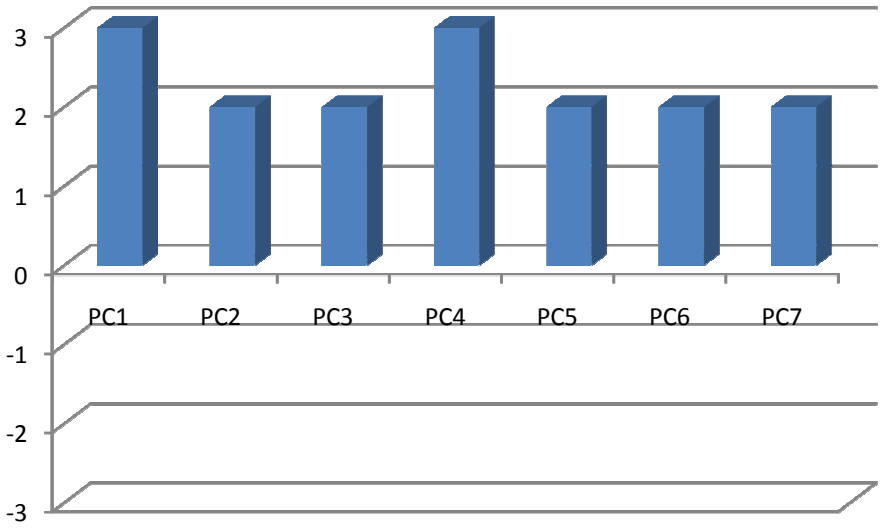
5.6 **Policy Criterion 5:** The introduction of this link will reduce vehicle demand in the city centre, in particular over the river crossing. As a consequence walking and cycling within central Hereford will become more attractive. The link will therefore have an indirect benefit on the uptake of active travel modes.

5.7 **Policy Criterion 6:** The link will provide an additional river crossing and therefore a new route for those travelling to employment and residential areas within Hereford. The link will however only directly improve access by private car. As noted previously this link will indirectly improve access for walkers and cyclists through the removal of traffic from the central Hereford area.

5.8 **Policy Criterion 7:** The introduction of the Wye Link will provide an alternative route to those travelling on the A49 corridor through the centre of Hereford. The link will have a positive impact on the environmental conditions within Hereford Centre. There will be an improvement in noise impact on central residential areas, a reduction in severance in the central Hereford area and improvement in townscape particularly around the historic core of Hereford. Finally as this corridor is a designated Air Quality Management Area[8], the removal of traffic will also deliver a significant improvement to air quality along the A49.

5.9 However, the risk assessment indicated that the Wye Link may have ecological implications as the River Wye is a designated Special Area of Conservation (SAC) in the current corridor of search due to the presence of a number of habitats and species including transition mires and quaking bogs and White Clawed Crayfish. The River Wye is also a Site of Special scientific Interest (SSSI) and it has been identified that the corridor of search covers the south bank of the River Wye at a Special Wildlife Site. Mitigation has yet to be identified for these ecological designations, however, these ecological implications have been factored into the deliverability assessment (see risk and statutory consultees).

Figure 5.1 Wye Link Policy Assessment



[8] extending from Holmer Road in the north to Belmont Road in the south and extending east along New Market/Blue School Street and west along Eign Street as far as Barton Yard.

Value for Money

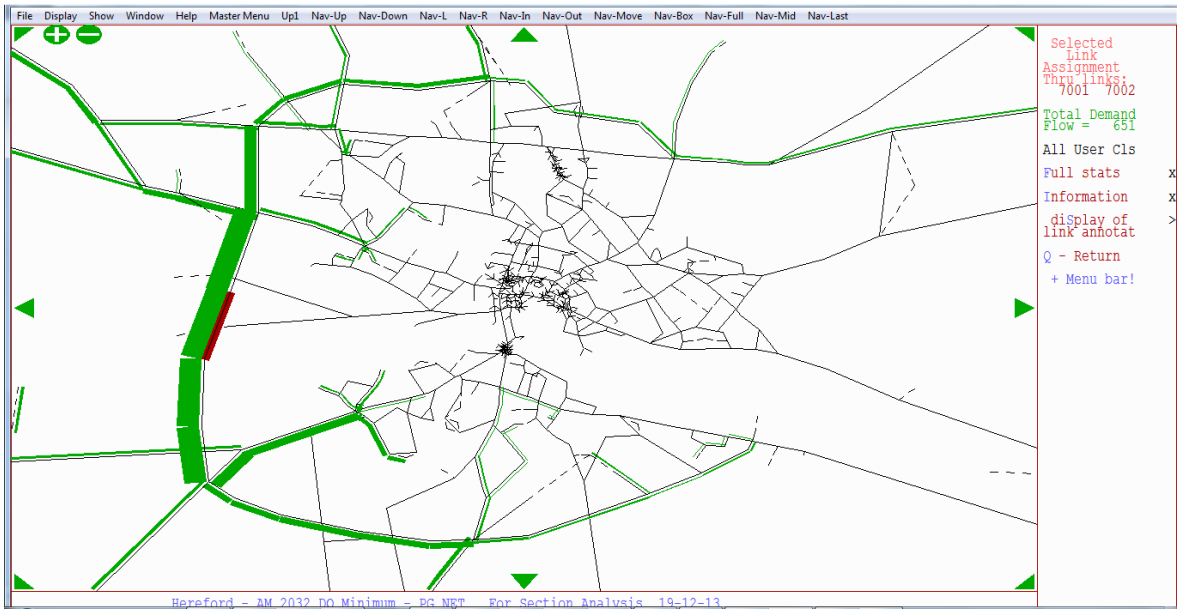
5.10 The outline cost for this scheme is £42.864 million with a quantified risk estimate of £23.792 million giving a total cost at this stage of £66.656 million. The Wye link is therefore the most expensive individual link within the relief road. This is a result of both its length and the need to bridge the River Wye.

5.11 The TUBA analysis has indicated that the benefit cost ratio for this link is 13.4. Based on the DfT Value for Money Guidance this link therefore provides very high value for money (BCR is greater than 4).

5.12 This higher cost is off set with a higher level of benefit and therefore demonstrates a strong value for money case. The case is justified based on the effect of an additional river crossing given the levels of existing queuing for the northbound approach to ASDA roundabout and the forecast levels of queuing due to the build out of the Enterprise Zone for southbound traffic.

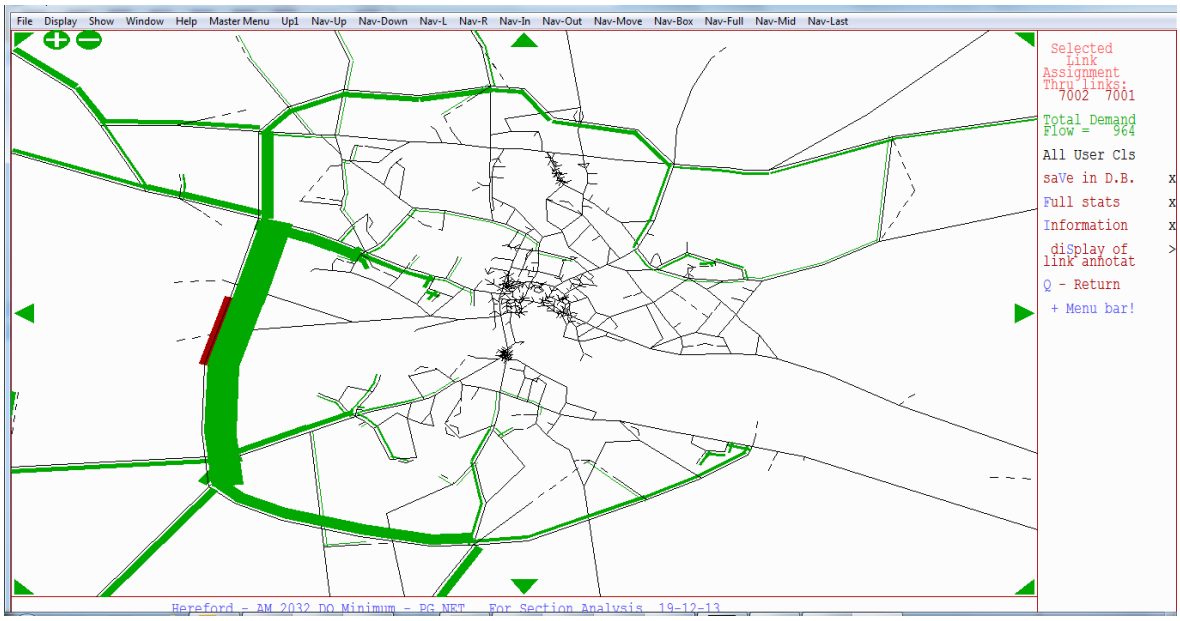
5.13 The following two images illustrate the volumes and sources of traffic using the Wye Link northbound and southbound respectively. Visual inspection would suggest that a large proportion of these movements using the Wye Link would save both time but crucially also distance (and thus vehicle operating cost reductions) through the introduction of the additional river crossing.

Figure 5.2 Volume of traffic using the Wye link southbound



*The red section indicates the link which has been selected

Figure 5.3 Volume of traffic using the Wye link northbound



*The red section indicates the link which has been selected

Deliverability

Risk to Cost

Table 5.2 Risk to Cost

Risk	RAG Assessment
Costs	Amber
Level of design	Red – Amber
Risk register	Red - Amber

5.14 The scheme has outline costs available although a quantified risk assessment value has been calculated based on an up to date risk workshop. A full risk register is available for this section of the route in Appendix C. The level of design is limited as the development of the alignment is still at the 'corridor of search' stage.

5.15 A risk workshop was undertaken in September 2013. A number of significant risks were identified. The key risks which were specific to the Wye Link are summarised below:

- Ecological implications (SAC River Wye, River Wye SSSI, south bank of River Wye Special Wildlife Site);
- Crossing the River Wye – ground conditions;
- Impact on local Business – the corridor of search covers a local golf course; and
- Impact of setting of listed buildings/parks and gardens.

5.16 None of the Wye corridor specific risks were considered to be 'show stoppers', although there were significant implications in terms of timescales for delivery, scheme costs and public acceptance should these risks be realised.

Risk to Programme

Table 5.3 Risk to Programme

Risk	RAG Assessment
Practicality /buildability/complexity	Amber
Legal Powers	Red - Amber
Resource availability/Governance organisation structure	Red - Amber

5.17 This section of the relief road is likely to have a complex build due to need for a structure over the River Wye. The vertical alignment of the route is also likely to require a high river bridge crossing.

5.18 A number of legal risks were identified including the high likelihood of the route requiring compulsory purchase orders. There is also a likelihood of a legal challenge from one of the following: the public, landowner, local action group(s) or town/parish council. The risk of legal proceedings, if occurring, could likely to lead to significant delays to the implementation timescales. Early consultation with all key stakeholder groups and the public is recommended to manage and mitigate this risk where possible.

Risk to Acceptability

Table 5.4 Risk to Acceptability

Risk	RAG Assessment
Stakeholder and public acceptability	Red – Amber
Statutory consultees	Red – Amber
Value for Money	Green

5.19 The influences on stakeholder and public acceptability include the formation of a local action group in the area which opposes the link and the likelihood of significant land take from a local golf club. The risk workshop also identified the potential risk around political support for the route.

5.20 In terms of statutory consultees the impact of the route on the River Wye SAC, River Wye SSSI, Special Wildlife Site south bank of the River Wye and Scheduled Ancient Monument (moated site close to the Church in Breinton) need to be assessed and mitigated as necessary. There is also an aspiration by the Council that the new route would be adopted by the Highways Agency which require consideration of Highways Agency processes and design standards.

5.21 In value for money terms this link provides very high value for money (BCR is greater than 4).

Wye Corridor Summary

5.22 In summary this link provides a very strong policy fit, scoring at a high or the highest level for a number of the criteria. The value for money case is strong despite the high scheme costs as this link relives key pinch points on the network including the A49 river crossing and the A49/A465 junction.

5.23 The deliverability analysis has not identified any show stoppers at this stage, although a number of significant risks were identified including the level of design, ecological risks and acceptability by stakeholders, the public and statutory consultees.

Three Elms Corridor

Policy

5.24 **Policy Criteria 1 and 2:** In isolation the benefit of the Three Elms link to both the northern urban extension Holmer West and the Hereford Enterprise Zone are limited as the largest benefit in terms of a northwest to south movement comes from the provision of an additional river crossing. The link does however support the Thee Elms urban expansion and access to the adjacent trading estate

5.25 The table 5.5 below summarises the total job capacity at the sites which the Three Elms link will support. It is unlikely that all these additional jobs could be delivered without the implementation of the another of the relief road links as on its own the Three Elms link does not address any of the key pinch points on the network.

Table 5.5 Job Creation

	Total jobs capacity
Three Elms Trading Estate	73
Westfield Trading Estate	120
Three Elms urban expansion	716
Total	909

5.26 **Policy Criterion 3:** A monetary value (in present value) for Greenhouse gases has been produced through TUBA analysis undertaken for the Three Elms Link. This is the net present value of the change in CO2e emissions from road based fuel consumption that is in the non traded sector. The value for the Three Elms Link is -£0.9million[9], as outlined above this indicates an overall increase in CO2 emissions through the introduction of the Three Elms Link.

5.27 **Policy Criterion 4:** This section of the route would not substantively relieve any of the city's key pinch points (Starting Gate junction or the A49 river crossing). This is demonstrated in the Saturn model analysis which indicates that construction of the Three Elm Link would generate a 2% timesaving across Hereford overall network. Therefore the impact of this section of the route on journey time reliability and capacity of links within Hereford is limited.

5.28 **Policy Criterion 5:** No impact

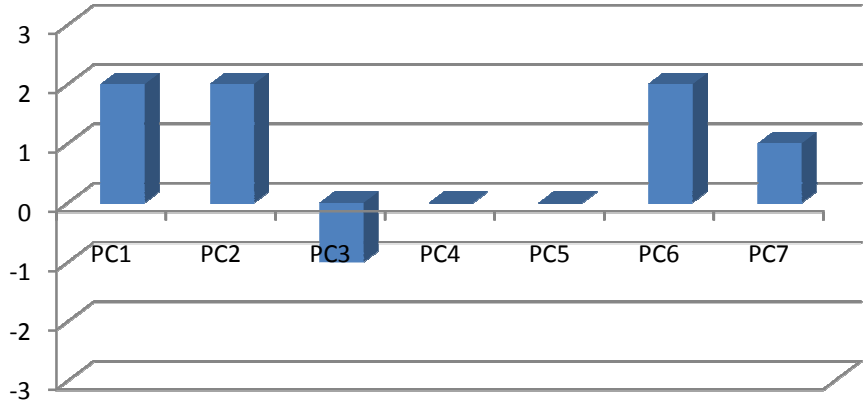
5.29 **Policy Criterion 6**: The link will provide a new route for those travelling to employment and residential areas within Hereford. The link will however only directly improve access by private car.

5.30 **Policy Criterion 7:** The introduction of the Three Elms Link is unlikely in isolation to provide an attractive alternative route to those travelling on the northern section of the A49 corridor through the centre of Hereford. The impact on air quality and the designated Air Quality Management Area[10] will therefore be negligible.

[9] For the 60 year appraisal period.

[10] Extending from Holmer Road in the north to Belmont Road in the south and extending east along New Market/Blue School Street and west along Eign Street as far as Barton Yard.

Figure 5.4 Three Elm Link Policy Assessment



Value for Money

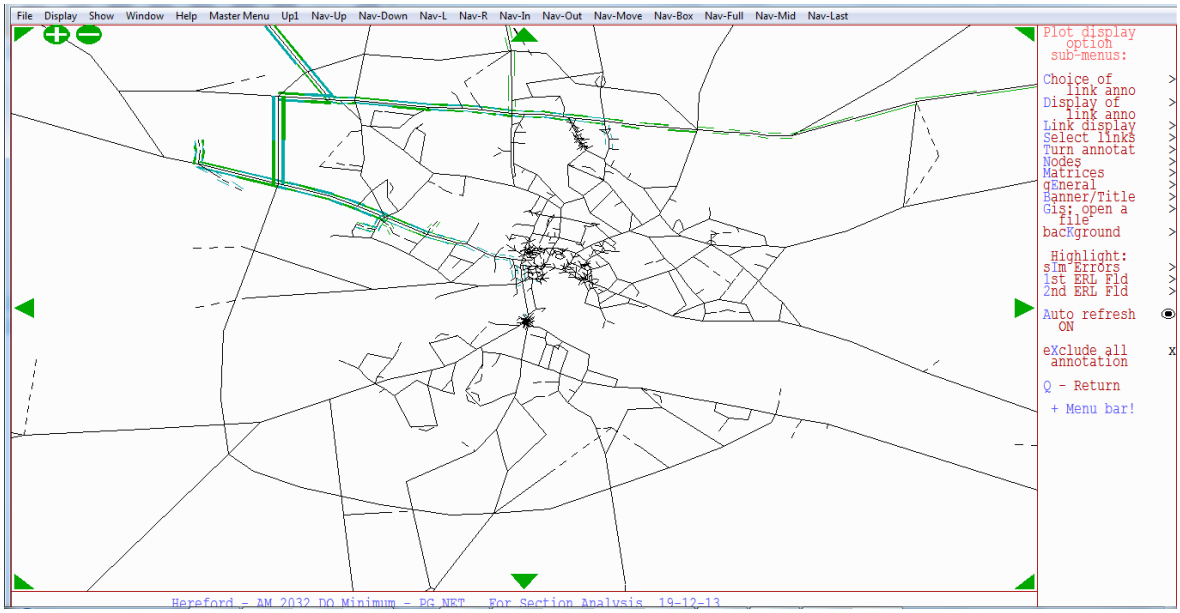
5.31 The outline cost for this scheme is £6.242 million with a quantified risk contingency of £9.042 million giving a total cost at this stage of scheme development of £15.284 million. The Three Elms link is therefore the least expensive individual link within the relief road. This is a result of its short length, relatively simple route and associated low risk.

5.32 The TUBA analysis has indicated that the benefit cost ratio for this link is 8.7. Based on the DfT Value for Money Guidance this link therefore provides very high value for money (BCR is greater than 4).

5.33 The Three Elms Link is significantly lower in cost than the Wye Link, however its potential benefits as a standalone scheme are also lower. In isolation the scheme would support the Three Elms urban expansion and the expansion of the Three Elms Trading Estate. The link also provides a link from the A438 to the A4103 which would only be of use to local traffic, and strategic traffic linking from the A438 to the A49. Some of these benefits might be offset if the effect was to further congest the A49 Starting Gate roundabout which is already identified as having congestion problems at the current time.

5.34 An indication of the extent of traffic on this link is illustrated in the figure below. As before, although the image shows the rest of the relief road sections, only the Three Elms link is open to traffic in this scenario.

Figure 5.5 Volume of traffic using the Three Elms link



5.35 The image illustrates the local level of trips attracted with the longer distance trips being related to north west to north east and vice versa trips that are rerouted away from the congested city centre but now via the Starting Gate junction.

5.36 In a situation where the full scheme could not be delivered an alternative might be to merge the Three Elm Link with the Holmer West link as this would deliver the benefits described above while removing the issues associated with the Starting Gate junction. The alternative of combining the Wye Link with the Three Elms Link would bring more benefits overall but could be offset by serious issues at the Starting Gate junction brought about by the introduction of more conflicting movements with the diversion of all strategic traffic onto the A4103 Roman Road.

Deliverability

Risk to Cost

Table 5.6 Risk to Cost

Risk	RAG Assessment
Costs	Amber
Level of design	Red - Amber
Risk Register	Amber

5.37 The scheme has outline costs available although a quantified risk estimate has been calculated based on an up to date risk workshop. A full risk register is available for this section of the route in Appendix C. The level of design is limited as the route is still at the 'corridor of search' stage.

5.38 A risk workshop was undertaken in September 2013. Very few risks were identified which were specific to the Three Elms Link and none of these are considered to be significant. The key risk related to the involvement of the Ministry of Defence as a statutory consultee.

5.39 None of the Three Elms specific risks were considered to be show stoppers, although a number of the common to all link risks are significant and would have significant implications in terms of timescales for delivery and scheme costs should these risk be realised.

Risk to Programme

Table 5.7 Risk to Programme

Risk	RAG Assessment
Practicality /buildability/complexity	Green
Legal Powers	Red - Amber
Resource availability/Governance organisation structure	Red - Amber

5.40 This section of the relief road is likely to have a relatively simple build process.

5.41 A number of legal risks were identified including the high likelihood of the route requiring compulsory purchase orders. There is also a high likelihood of a legal challenge from one of the following: public, landowner, local action group or town/parish council. These legal risk are likely to lead to significant delays to the implementation timescales. Early consultation with all key stakeholder groups and the public is recommended to manage and mitigate this risk where possible.

Risk to Acceptability

Table 5.8 Risk to Acceptability

Risk	RAG Assessment
Stakeholder and public acceptability	Red – Amber
Statutory consultees	Red – Amber
VfM	Green

5.42 The influences on stakeholder and public acceptability include the formation of a local action group in the area which opposes the link, the likelihood of disruption to a commercial nursery. The risk workshop also identified the potential risk around political support for the route.

5.43 In terms of statutory consultees the Ministry of Defence has an interest in this area and there is also a Council aspiration for the Highway Agency to adopt the new route on completion of the full relief road. The alignment corridor currently under consideration has the potential to impact on an aquifer.

5.44 In value for money terms provides very high value for money (BCR is greater than 4).

Three Elms Corridor Summary

5.45 In summary this link provides a fit with policy, scoring at a high but not the highest level for a small number of the criteria. The value for money case is very high with a relatively low cost.

5.46 The deliverability analysis has not identified any show stoppers at this stage, although a number of significant risks were identified including the level of design and acceptability by stakeholders, the public and statutory consultees.

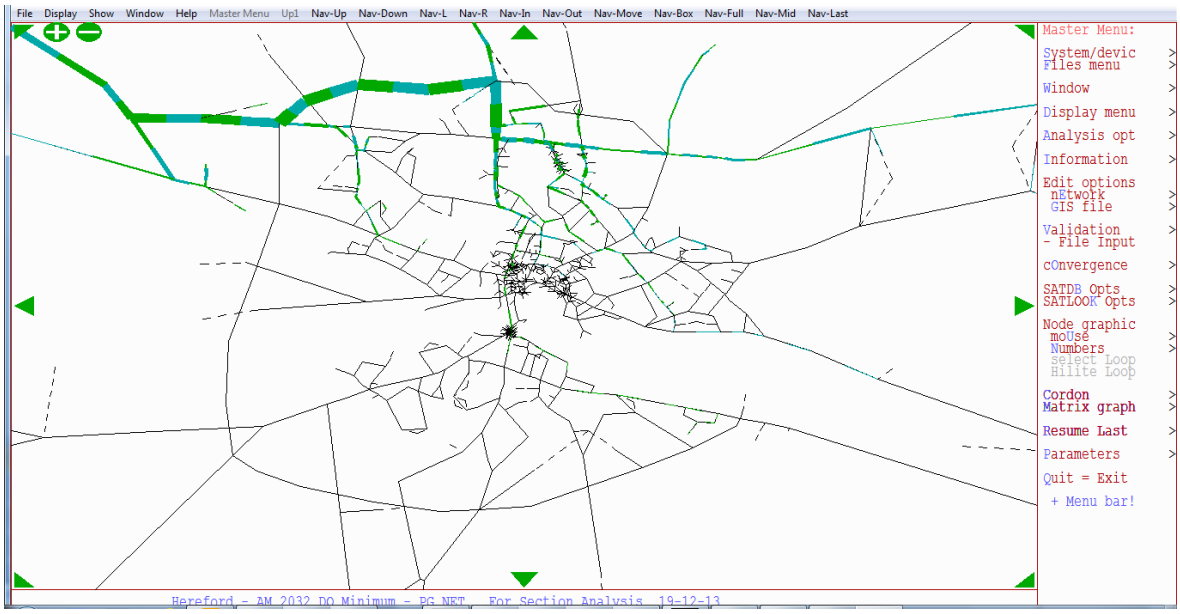
Holmer West Corridor

Policy

5.47 **Policy Criteria 1 and 2:** The Holmer West Link would provide some limited benefits in isolation. By diverting some local and strategic trips that currently move from the A4103 to the A49 north of Hereford the A49 Starting Gate junction would be partially relieved.

5.48 This is illustrated by the select link analysis for trips on the Holmer West link if it was built in isolation. As can be seen, the majority of the flows on the link make use of Starting Gate junction which would indicate that Holmer West and Holmer East could be brought forward as a separate package.

Figure 5.6 Volume of traffic using the Holmer West link



5.49 However the scale of these benefits would be relatively limited compared to the full benefits if the Three Elms and Wye Links were also completed.

5.50 The Northern Urban Extension is proposed to contain up to 500 dwellings. While smaller than other extensions the most likely route for traffic generated by this site at the present time is the A49 towards Hereford City Centre, particularly when the case for linked trips to the Hereford Enterprise Zone is considered. The Western Urban Extension (Three Elms) will also have an impact on the Holmer West Link. While the Western Urban Extension is located in close proximity to the Three Elms Link, the Holmer West Link provides connectivity from the area to the A49 the main route out of the city to the north.

5.51 The developer of the Holmer West site is proposing to construct as part this development an internal road linking the A49 north of the Starting Gate roundabout to A4103 west of the Starting Gate roundabout. The developer is aware that this would provide relief to the roundabout and the re-routing of traffic would need to be analysed. The Highways Agency has confirmed that the principle of a new access to trunk road would be appropriate in these circumstances. The developer is aware that when the Holmer west link is delivered this section of road within the development would need to be downgraded.

5.52 The table 4.3 below summarises the total jobs capacity at the sites which the Holmer West link would support.

Table 5.9 Job Creation

	Total jobs capacity
Three Elms Trading Estate	73
Three Elms urban expansion	716
Total	789

5.53 **Policy Criterion 3:** A monetary value (in present value) for greenhouse gases has been produced through TUBA analysis undertaken for the Holmer West Link. This is the net present value of the change in CO2e emissions from road based fuel consumption that is in the non traded sector. The value for the Holmer West Link is £2.2million[11], as outlined above this indicates an overall reduction in CO2 emissions through the introduction of the Holmer West Link.

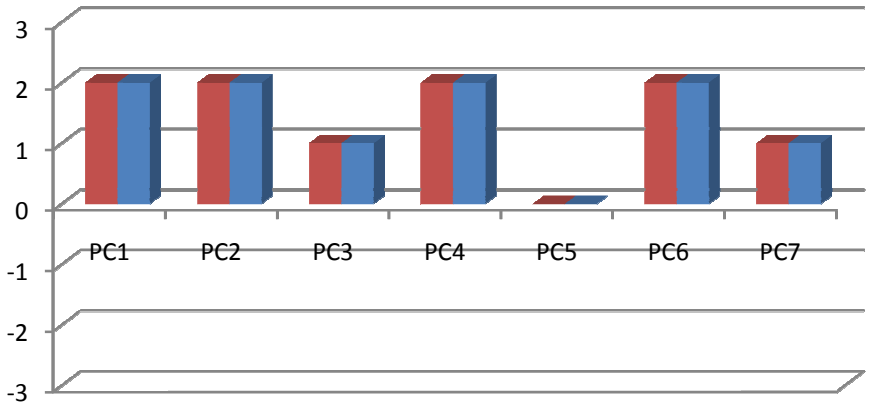
5.54 **Policy Criterion 4:** The introduction of the Holmer West Link will provide an alternative route to those travelling on the northern section of the A49 corridor through the centre of Hereford, providing benefits in terms of journey time reliability and capacity on the A49. Analysis using the Saturn model indicates that this link could generate the equivalent of a 3% time saving across Hereford.

5.55 **Policy Criterion 5**: No impact

5.56 **Policy Criterion 6:** the link will provide an additional route for those travelling to employment and residential areas within Hereford in the north west of the city. The link will however only directly improve access by private car.

5.57 **Policy Criterion 7:** The link has potential to relieve traffic on the A49 northern section, a designated Air Quality Management Area[12]. The link will therefore have a positive impact on the environmental conditions within Hereford City Centre.

Figure 5.7 Holmer West Link Policy Assessment



[11] For the 60 year appraisal period.

[12] extending from Holmer Road in the north to Belmont Road in the south and extending east along New Market/Blue School Street and west along Eign Street as far as Barton Yard.

Value for Money

5.58 The outline cost for this scheme is £17.368 million with a quantified risk estimate of £6.332 million giving a total cost at this stage of £23.7 million. The cost is reflective of both its length and relatively simple route in engineering terms.

5.59 The TUBA analysis has indicated that the benefit cost ratio for this link is 12.0. Based on the DfT Value for Money Guidance this link therefore provides very high value for money (BCR is greater than 4).

5.60 The Holmer West link provides less benefits than the Wye link if developed in isolation, although the scheme costs are relatively low. Its greatest benefit if constructed in isolation would be to mitigate the effects of development on the Starting Gate junction.

5.61 Some useful benefits would be derived from developing the link with the Three Elm Link to provide a strategic link from the A49 to the A438 Kings Acre Road. This would be of benefit to both strategic and local traffic and would reduce the scale of the issues associated with the Starting Gate junction and have some impact on the junctions in the centre of the city.

5.62 Were the Three Elm and Wye Links to be delivered the Holmer West Link would enable a large portion of the benefits to be delivered in full by relieving the Starting Gate junction that would become a constraint in the network.

Deliverability

Risk to Cost

Table 5.10 Risk to Cost

Risk	RAG Assessment
Costs	Amber
Level of design	Red - Amber
Risk Register	Amber

5.63 The scheme has outline costs available although a quantified risk layer has been calculated based on an up to date risk workshop. A full risk register is available for this section of the route in Appendix C. The level of design is limited as the route is still at the corridor of search stage.

5.64 Very few risks were identified which were specific to the Holmer West Link. The key risks relate to the vertical alignment of the structure over Tillington Road connected to the issue of overhead cables.

5.65 None of the Holmer West specific risks were considered to be show stoppers, although a number of the common to all links risks are significant would have significant implications in terms of timescales for delivery and scheme costs should these risk be realised.

Risk to Programme

Table 5.11 Risk to Programme

Risk	RAG Assessment
Practicalilty /buildability/complexity	Green
Legal Powers	Red - Amber
Resource availability/Governance organisation	Red - Amber

structure	

5.66 This section of the relief road is likely to have a relatively simple build. There are considerations in terms of the vertical alignment of the route over Tillington Road and in relation to the overhead cables that would need consideration in detailed design.

5.67 A number of legal risks were identified including the high likelihood of the route requiring compulsory purchase orders. There is also a high likelihood of a legal challenge from one of the following: public, landowner, local action group or town/parish council. These legal risks, if occurring, are likely to lead to significant delays to the implementation timescales. Early consultation with all key stakeholder groups and the public is recommended to manage and mitigate this risk where possible.

Risk to Acceptability

Table 5.12 Risk to Acceptability

Risk	RAG Assessment
Stakeholder and public acceptability	Red – Amber
Statutory consultees	Amber
Value for Money	Green

5.68 The influences on stakeholder and public acceptability include the formation of a local action group in the area which opposes the link. The risk workshop also identified the potential risk around political support for the route.

5.69 In terms of statutory consultees there is an aspiration for the Highway Agency to adopt the new route. However no further issues in relation to statutory consultees have been identified at this stage.

5.70 In value for money this link provides very high value for money (BCR is greater than 4).

Holmer West Corridor Summary

5.71 In summary this link provides a fit with policy, scoring at a high but not the highest level for a number of the criteria. The value for money case very high and reflects the benefits to relieving congestion at the Starting Gate junction.

5.72 The deliverability analysis has not identified any show stoppers at this stage, although a number of significant risks were identified including the level of design and acceptability by stakeholders and the public.

Holmer East Corridor

Policy

5.73 **Policy Criteria 1 and 2:** The Northern Urban Extension will lie to the west of the A49, the link road would be of importance to mitigating the urban extension by working in tandem with the Holmer West link road to remove trips from the A49 Starting Gate junction which is identified as a capacity issue. The scheme will therefore support development at the Holmer Trading Estate.

5.74 The table 5.13 below summarises the total job capacity at the sites which the Holmer East link would support.

Table 5.13 Job Creation

Jobs	Total jobs capacity
Holmer Trading Estate	276

5.75 **Policy Criterion 3:** A monetary value (in present value) for Greenhouse gases has been produced through TUBA analysis undertaken for the Holmer East Link. This is the net present value of the change in CO2e emissions from road based fuel consumption that is in the non traded sector. The value for the Holmer East Link is £2.4million[13], as outlined above this indicates an overall reduction in CO2 emissions through the introduction of the Holmer East Link.

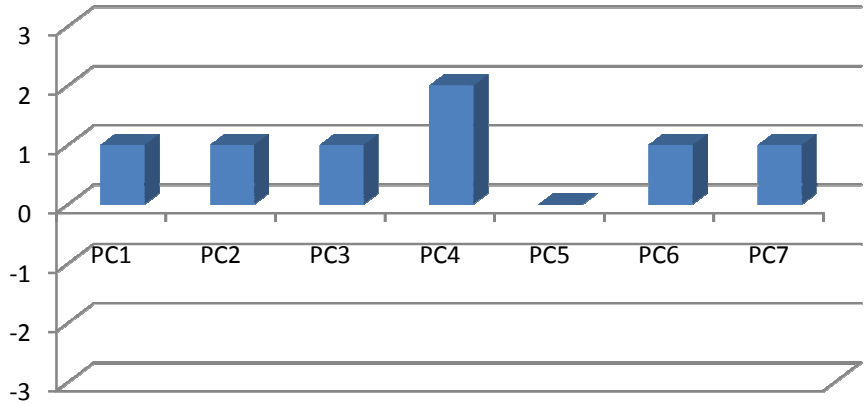
5.76 **Policy Criterion 4:** In terms of the links contribution towards journey time reliability and capacity of transport links, analysis using the Hereford Saturn model has indicated that the introduction of the Wye link could generate the equivalent of an 3% time saving across Hereford in 2032 compared with the 2032 'do minimum'.

5.77 **Policy Criterion 5**: No impact

5.78 **Policy Criterion 6:** The alignment of the Holmer East Link is such that its strategic value will only benefit strategic traffic coming from the north with destinations in the east of the city, indeed for many destinations using Starting Gate junction and the A4103 might still be preferable. The link will therefore provide a new route for those travelling to employment and residential areas within Hereford. The link will however only directly improve access by private car.

5.79 **Policy Criterion 7:** The introduction of the Holmer East Link will provide an alternative route for some travelling on the northern section of the A49 corridor through the centre of Hereford. This corridor is a designated Air Quality Management Area[14]. The impact on local environmental conditions within Hereford is therefore likely to be positive.

Figure 5.8 Holmer East Link Policy Assessment



Value for Money

5.80 The outline cost for this scheme is £22.439 million with a risk adjusted cost estimate of £9.564 million. Giving a total cost at this stage of £32.003 million. The Holmer East link has a high risk adjusted cost estimate. This is a result of a number significant risks associated with the link.

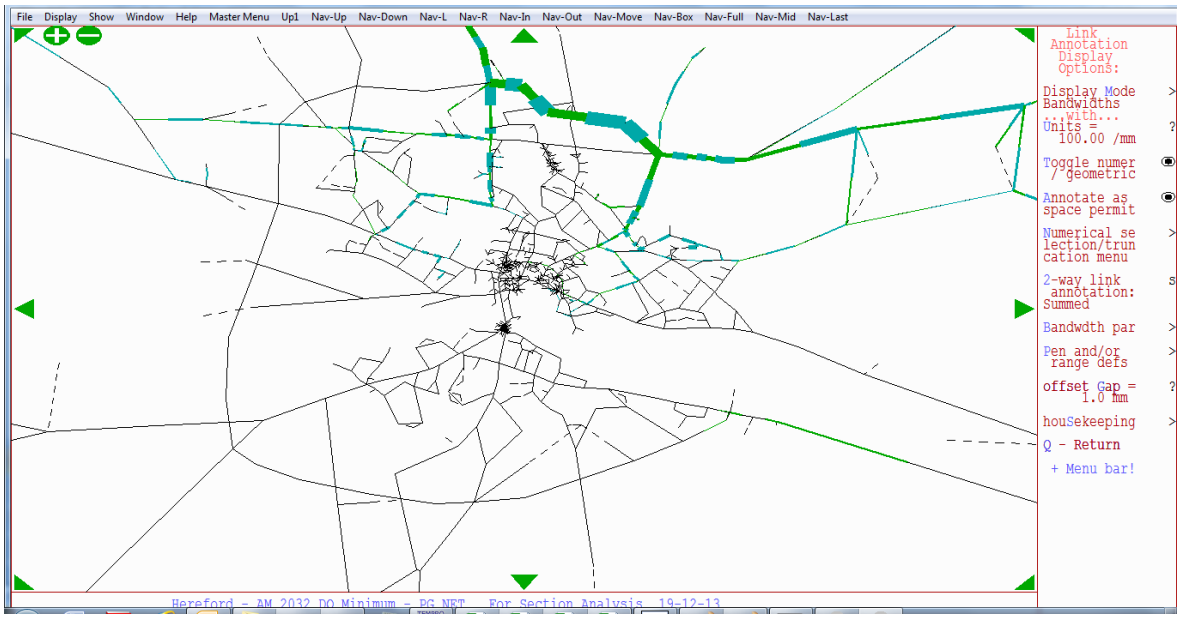
[13] For the 60 year appraisal period.

[14] extending from Holmer Road in the north to Belmont Road in the south and extending east along New Market/Blue School Street and west along Eign Street as far as Barton Yard.

5.81 The TUBA analysis has indicated that the benefit cost ratio for this link is 7.8. Based on the DfT Value for Money Guidance this link therefore provides very high value for money (BCR is greater than 4).

5.82 As with the Holmer West link, the Holmer East link provides less benefits than the Wye link if developed in isolation, although the scheme costs are relatively low. Its greatest benefit if constructed in isolation would be to mitigate the effects of development on the Starting Gate junction.

Figure 5.9 Volume of traffic using Holmer East link



5.83 However this would not provide full mitigation as the majority trips with origins or destinations to the west of the A465 Aylestone Hill would continue using the Starting Gate Junction and Old School Lane, rather than the Holmer East link.

5.84 If delivered with the Holmer West Link the two links would provide a useful mitigation of the Starting Gate junction but would deliver few other benefits. This would therefore suggest that the Holmer East Link would only deliver a reasonable level of benefit if constructed as part of the full scheme, as it would allow traffic heading from the south to the A4103 east to use the relief road, however the case for this would be dependent on two separate issues. The first would be that the decongestion benefits from the rest of the scheme would not have reduced journey times via the City Centre for traffic to heading to the east to such a level that the existing route would be more attractive than the new route to users. The second issue is that the scale of the additional benefit would have to offset the higher than average costs expected for this section as a result of its interaction with various other infrastructure. It is not impossible that the costs of the link relative to the potential benefits would serve to damage the overall business case for the whole relief road scheme.

Deliverability

Risk to Cost

Table 5.14 Risk to Cost

Risk	RAG Assessment
Costs	Amber
Level of design	Red - Amber
Risk	Red

5.85 The scheme has outline costs available although a quantified risk layer has been calculated based on an up to date risk workshop. A full risk register from this workshop is available in Appendix C. The level of design is limited as the route is still at the 'corridor of search' stage.

5.86 A number of significant risks were identified which were specific to the Holmer East Link. These are summarised below:

- Impact on a local businesses including a pub;
- Issues relating to vertical alignment and overhead cables when crossing minor routes;
- Location of gas line and need for consideration of blast zone; and
- Implications of crossing a rail line and a former canal protected for restoration.

5.87 A number of the specific risks associated with the Holmer East link were considered to be 'show stoppers', or would have significant implications in terms of timescales for delivery and scheme costs should these risks be realised.

Risk to Programme

Table 5.15 Risk to Programme

Risk	RAG Assessment
Practicality / buildability / complexity	Red - Amber
Legal Powers	Red - Amber
Resource availability/Governance organisation structure	Red - Amber

5.88 This section of the relief road is likely to have a relatively complex build.There is a need to consider crossing a rail line and canal. In addition the issue of high pressure gas pipe is likely to cause issues in terms of the design and construction planning.

5.89 A number of legal risks were identified including the high likelihood of the route requiring compulsory purchase orders. There is also a high likelihood of a legal challenge from one of the following: public, landowner, local action group or town/parish council. These legal risks are likely to lead to significant delays to the implementation timescales. Early consultation with all key stakeholder groups and the public is recommended to manage and mitigate this risk where possible.

Risk to Acceptability

Table 5.16 Risk to Acceptability

Risk	RAG Assessment
Stakeholder and public acceptability	Red – Amber
Statutory consultees	Red – Amber
Value for Money	Green

5.90 The influences on stakeholder and public acceptability include the formation of a local action group in the area which opposes the link. The risk workshop also identified the potential risk around political support for the route.

5.91 In terms of statutory consultees overhead electricity cables and high pressure gas line (blast zone) are likely to be an issue on this link. Network Rail will also be a key consultee for this section of the route as the corridor of search crosses a rail line. The corridor of search also crosses a former canal which may retain a statutory right of navigation therefore the Hereford and Gloucester Canal and River Trust will also be an important consultee.

5.92 In value for money terms this link provides very high value for money (BCR is greater than 4).

Holmer East Corridor Summary

5.93 In summary this link provides a relatively poor fit with policy, scoring at a high but not the highest level for one criterion. The value for money case is very high and reflects the benefits to relieving congestion at the Starting Gate junction. However the outline costs and risk adjusted cost estimate are higher for this section than for the Holmer West section. The scale of benefit would therefore have to offset the higher than average costs expected for this section. The value for money case is therefore weaker than the Holmer West section.

5.94 The deliverability analysis has identified a number of 'show stopper' risks which based on the level of design cannot be ruled out at this stage. In addition to the 'show stoppers' there are a number of additional significant risks which have been identified including the level of design, buildability and acceptability by stakeholders the public and statutory consultees.

Whole Relief Road Assessment

Policy

5.95 **Policy Criteria 1 and 2:** Should the whole relief road be implemented, the previous work by Amey in June 2013 identified that this would facilitate the strategic growth identified within the Local Plan Core Strategy (Draft).

5.96 The table 5.17 below summarises the total jobs capacity at the sites which the whole relief road would support. Again, these figures should be considered in the light of the current Highways Agency view that the effective long term operation of the A49 in the Council's Core Strategy growth scenario will require the delivery of the relief road. The current Council study to look at short term growth at the Enterprise Zone is also an important consideration that may influence the ability to deliver jobs at the Enterprise Zone.

Table 5.17 Job Creation

	Total jobs capacity
Hereford Enterprise Zone	5719
Three Elms Trading Estate	73
Holmer Trading Estate	276
Westfield Trading Estate	120
Three Elms urban expansion	716
Urban extensions – service jobs associated with housing increase	950
Total	7854

5.97 **Policy Criterion 3:** A monetary value (in present value) for Greenhouse gases has been produced through TUBA analysis undertaken for the whole relief road. This is the net present value of the change in CO2e emissions from road based fuel consumption that is in the non traded sector. The value for the whole relief road is £10.5 million[15], as outlined above this indicates an overall reduction in CO2 emissions through the introduction of the whole relief road.

5.98 **Policy Criterion 4:** In terms of journey time reliability, analysis using the Saturn model has indicated that the introduction of the whole relief road could generate the equivalent of an 11% time saving across Hereford network as a whole in 2032 compared with the 2032 'do minimum'. The route will provide an additional river crossing and relief for key pinch points in the city, particularly those along the A49.

5.99 **Policy criterion 5:** The introduction of this link will reduce vehicle demand in the city centre including over the river crossing, consequently walking and cycling within central Hereford will become more attractive. The link will therefore have an indirect benefit on the uptake of active travel modes. The Transport Strategy for the city will build upon this and introduce measure to support increased walking and cycling.

5.100 **Policy Criterion 6**: The route will provide an additional route for those travelling to employment and residential areas within Hereford and the Enterprise Zone. The link will however only directly improve access by private car. As noted previously the link with indirectly improve access for walkers and cyclists through the removal of traffic from the central Hereford area. The Transport Strategy for the city will build upon this and introduce measure to support improved access for walking and cycling.

5.101 **Policy Criterion 7:** The introduction of the whole relief road will provide an alternative route to those travelling on the A49 corridor through the centre of Hereford. The whole relief road will therefore have a positive impact on the environmental conditions within Hereford City Centre. Namely an improvement in noise impact on central residential areas, a reduction in severance in the central Hereford area and improvement in townscape particularly around the historic core of Hereford. The Transport Strategy for the city will build upon this and introduce measure to support sustainable travel and reduce the impact of transport on the city's historic core. Finally as this corridor is a designated Air Quality Management Area[16], the removal of traffic will also make a significant improvement to air quality along the A49.

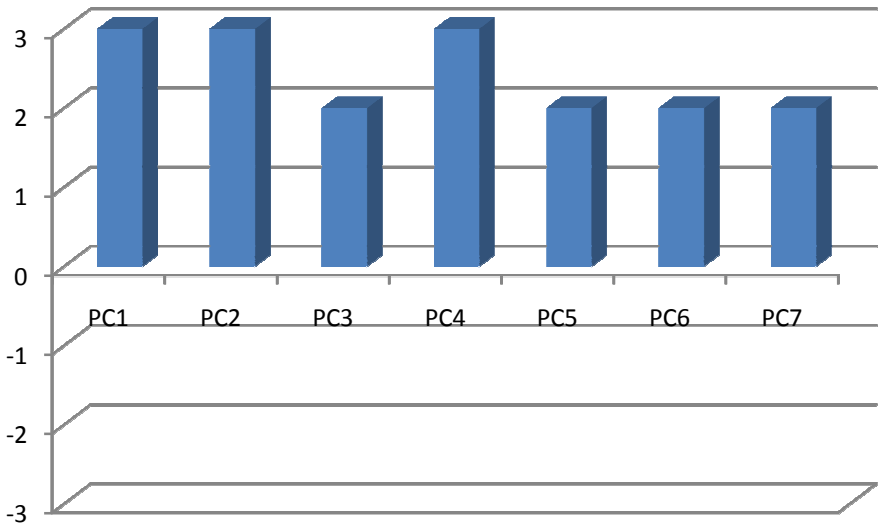
5.102 However the risk assessment indicated that the whole relief road may have ecological implications as the River Wye is a designated Special Area of Conservation (SAC) in the current corridor of

[15] For the 60 year appraisal period.

[16] extending from Holmer Road in the north to Belmont Road in the south and extending east along New Market/Blue School Street and west along Eign Street as far as Barton Yard.

search due to the presence of a number of habitats and species including transition mires and quaking bogs and White Clawed Crayfish. The River Wye is also a Site of Special scientific Interest (SSSI) and it has been identified that the corridor of search covers the south bank of the River Wye at a Special Wildlife Site. Mitigation has yet to be identified for these ecological risks however the implications have been factored into the deliverability assessment (see risk and statutory consultees).

Figure 5.10 Whole Relief Road Policy Assessment



Value for Money

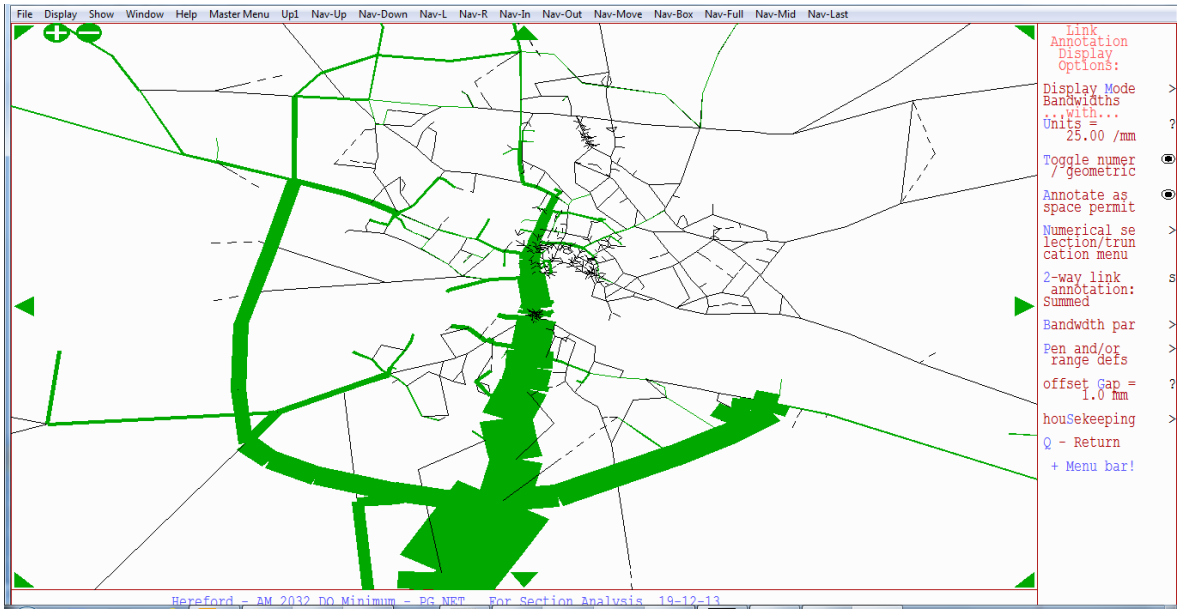
5.103 The outline costs of the whole relief road is £88.913 million with a risk adjusted cost estimate of £47.357 million. A large proportion of this risk comes from the Wye link as this section has a lot of cost risk associated with it. A large amount of this cost risk is associated with the lack of fixed alignment for the route and the potential need to dual the route. Further work is therefore required to establish a preferred route and the required capacity of the relief road.

5.104 The TUBA analysis has indicated that the benefit cost ratio for this link is 10.5. Based on the DfT Value for Money Guidance this link therefore provides very high value for money (BCR is greater than 4).

5.105 There are a number of general issues that will contribute to the Value for Money case of the Relief Road. The first issue relates to the nature of the trips that presently use the road network in the Hereford area. There is a relatively low number of strategic movements across Hereford on the full length of the A49, nevertheless the analysis to date reveals that completion of the link road would result in the majority of these movements switching to the new route.

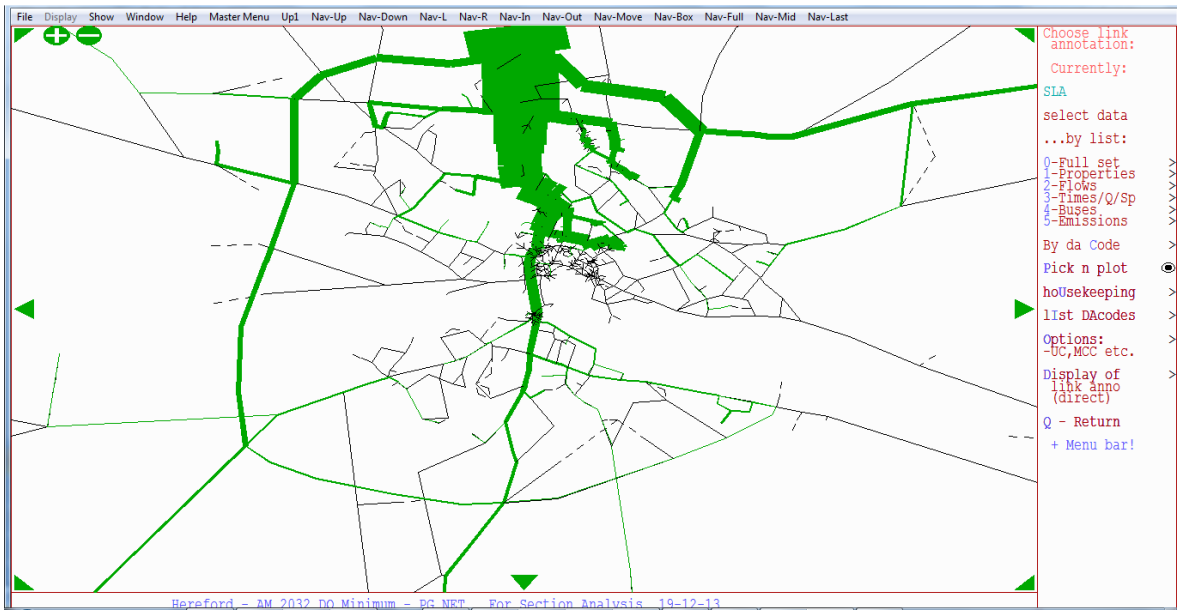
5.106 The image below illustrated northbound traffic on the A49 at its junction with the South Wye link. As can be seen, a greater proportion of trips for the A49 north use the relief road.

Figure 5.11 Volume northbound traffic using the relief road versus A49



5.107 Similar analysis is presented below for trips heading south along the A49 north of Hereford.

Figure 5.12 Volume of southbound traffic using the relief road versus A49



5.108 The results for southbound trips are not as conclusive for strategic movements but it should also be borne in mind that the model seeks to balance routes whereas in reality such strategic trips are likely to decide to be influenced to use the new route through signage and seek to avoid the central area.

5.109 It is possible that if the majority of trips using the network start or terminate within Hereford the potential for significant volumes of strategic traffic to be diverted onto the link road will be relatively limited. Given that Hereford is an important regional centre this is a not unrealistic issue. It is compounded further by the lack of a link from the relief road to the A438 Ledbury Road which will necessitate any strategic traffic using that link to continue to use the city centre network.

5.110 The whole route delivers a very high value for money case based on the journey time benefits accruing to users and decongestion and journey time benefits accruing to users of the city centre network and those using the Starting Gate junction.

Deliverability

Risk to Cost

Table 5.18 Risk to Cost

Risk	RAG Assessment
Costs	Amber
Level of design	Red - Amber
Risk Register	Red

5.111 The scheme has outline costs available although a quantified risk cost has been calculated based on an up to date risk workshop. A full risk register for the whole link road is available in Appendix C. As identified previously in this report pervasive risks are not double counted within the analysis. The level of design is limited as the route is still at the corridor of search stage.

5.112 A number of significant risks were identified. These are summarised below:

- Need to consider the scheme as a Nationally Significant Infrastructure Project;
- Limited engineering design at this stage of scheme development;
- Limited understanding of required capacity for the relief road;
- Ecological implications;
- Crossing the River Wye;
- Impact on a local businesses including a pub, commercial nursery and golf club;
- Issues relating to vertical alignment and overhead cables when crossing minor routes;
- Location of gas line and need for consideration of blast zone; and
- Implication of crossing a rail line and a former canal.
- Impact on landscape and historical assets

5.113 A number of the risks were considered to be show stoppers (specifically those relating to the Holmer East section of the route), or would have significant implications in terms of timescales for delivery and scheme costs should these risk be realised.

Risk to Programme

Table 5.19 Risk to Programme

Risk	RAG Assessment
Practicality / buildability / complexity	Red - Amber
Legal Powers	Red - Amber
Resource availability/Governance organisation structure	Red - Amber

5.114 This whole relief road is likely to have a relatively complex build. There is a need to cross the River Wye, a rail line and a former canal. In addition the issue of power lines and high pressure gas pipe is likely to cause issues in terms of the construction plan.

5.115 A number of legal risks were identified including the high likelihood of the route requiring compulsory purchase orders. There is also a high likelihood of a legal challenge from one of the following: public, local action group or town/parish council. These legal risks are likely to lead to significant delays to the implementation timescales. Early consultation with all key stakeholder groups and the public is recommended to manage and mitigate this risk where possible.

Risk to Acceptability

Table 5.20 Risk to Acceptability

Risk	RAG Assessment
Stakeholder and public acceptability	Red – Amber
Statutory consultees	Red – Amber
VfM	Green

5.116 The influences on stakeholder and public acceptability include the formation of a local action group in the area which opposes route and general concept of a relief road. The risk workshop also identified the potential risk around political support for the route.

5.117 In terms of statutory consultation the presence of overhead electricity cables and high pressure gas line (blast zone) are likely to be an issue. Network Rail will also be a key consultee for this section of the route as the corridor of search crosses a rail line. The corridor of search also crosses a canal which may have a statutory right of navigation therefore the Hereford and Gloucester Canal and River Trust will also be an important consultee. Also the impact of the route on the River Wye SAC, River Wye SSSI, Special Wildlife Site and Scheduled Ancient Monument needs to be assessed and mitigation identified where appropriate through the Habitat Regulations Assessment. Finally there is a Council aspiration for the Highway Agency to adopt part of the new route if completed fully.

5.118 In value for money terms this link provides very high value for money (BCR is greater than 4).

A465 south to A49 north (half moon) Assessment

5.119 Given the issues associated with the value for money and deliverability of the Holmer East Link consideration has been given below to the relief road without the Holmer East section.

Policy

5.120 **Policy Criteria 1 and 2:** Should the relief road be implemented between A465 and A49 north, known as the half moon alignment, be implemented this would to support the delivery of the strategic urban expansion areas directly and indirectly. Directly in the case of Three Elms and Holmer West urban extensions and the Hereford Enterprise Zone and indirectly in the case of the developments such as Holmer trading estate and Westfield trading estate through the removal of traffic from the central area.

5.121 The table 5.21 below summarises the total job capacity at the sites which the half moon would support. As noted previously the quantum of jobs identified should be considered in the context of the current Highways Agency view that the effective long term operation of the A49 in the Council's Core Strategy growth scenario will require the delivery of the relief road. The current Council study to look at short term growth at the Enterprise Zone is also an important consideration that may influence the ability to deliver jobs at the Enterprise Zone prior to the relief road or sections of the relief road being delivered.

Table 5.21 Job Creation

	Total jobs capacity
Hereford Enterprise Zone	5719
Three Elms Trading Estate	73
Holmer Trading Estate	276
Westfield Trading Estate	120
Three Elms urban expansion	716
Urban extensions – service jobs associated with housing increase	950
Total	7854

5.122 **Policy Criterion 3:** A monetary value (in present value) for Greenhouse gases has been produced through TUBA analysis undertaken for the half moon relief road. This is the net present value of the change in CO2e emissions from road based fuel consumption that is in the non traded sector. The value for the half moon relief road is £10.4 million, as outlined above this indicates an overall reduction in CO2 emissions through the introduction of the half moon relief road.

5.123 **Policy Criterion 4:** Analysis using the Saturn model has indicated that the introduction of the Half moon relief road could generate the equivalent of a 9% time saving across Hereford in 2032 compared with the 2032 'do minimum'.

5.124 **Policy Criterion 5:** The introduction of this link will reduce vehicle demand in the city centre including over the river crossing, consequently walking and cycling within central Hereford will become more attractive. The link will therefore have an indirect benefit on the uptake of active travel modes. The Transport Strategy for the city will build upon this and introduce measure to support increased walking and cycling.

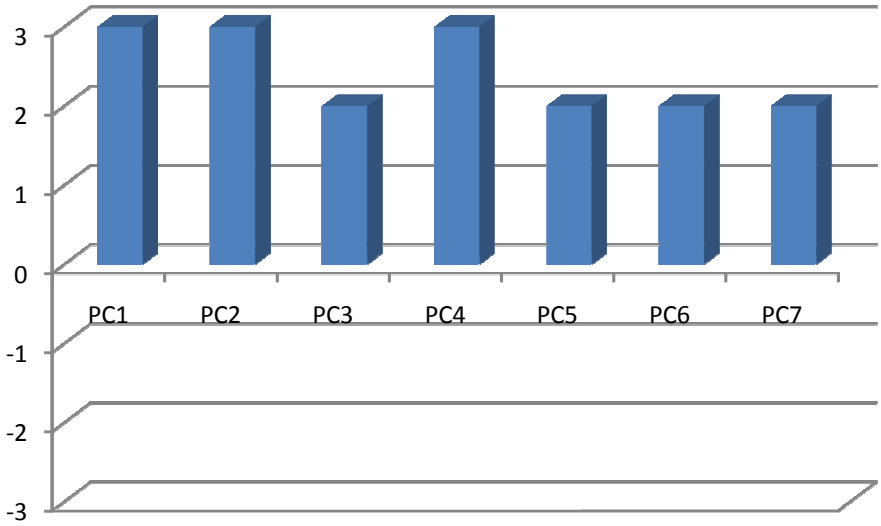
5.125 **Policy Criterion 6:** The link will provide an additional river crossing and therefore a new route for those travelling to employment and residential areas within Hereford. The link will however only directly improve access by private car. As mentioned previously the link with indirectly improve access for walkers and cyclists through the removal of traffic from the central Hereford area. The Transport Strategy for the city will build upon this and introduce measure to support improved access for walking and cycling.

5.126 **Policy Criterion 7:** The introduction of the half moon relief road will provide an alternative route to those travelling on the A49 corridor through the centre of Hereford. The whole relief road will therefore have a positive impact on the environmental conditions within Hereford Centre. Namely an improvement in noise impact on central residential areas, a reduction in severance in the central Hereford area and improvement in townscape particularly around the historic core of Hereford.

Finally as this corridor is a designated Air Quality Management Area[17], the removal of through traffic will also make a significant improvement to air quality along the A49.

5.127 However, the risk assessment indicated that the half moon relief road may have ecological implications as the River Wye is a designated Special Area of Conservation (SAC) in the current corridor of search due to the presence of a number of habitats and species including transition mires and quaking bogs and White Clawed Crayfish. The River Wye is also a Site of Special scientific Interest (SSSI) and it has been identified that the corridor of search covers the south bank of the River Wye at a Special Wildlife Site. Mitigation has yet to be identified for these ecological risks, however the implications have been factored into the deliverability assessment (see risk and statutory consultees).

Figure 5.13 Half Moon Link Policy Assessment



Value for Money

5.128 The outline costs of the half moon relief road is £66.474 million with a risk adjusted cost estimate of £37.801 million i.e. a potential total capital cost of £104.275 million. A large proportion of this risk comes from the Wye link as this section has a lot of cost risk associated with it. A large amount of this cost risk is associated with the lack of fixed alignment for the route and the potential need to dual the route.

5.129 The TUBA analysis has indicated that the benefit cost ratio for this link is 12.6. Based on the DfT Value for Money Guidance this link therefore provides very high value for money (BCR is greater than 4).

5.130 There are a number of general issues that will contribute to the Value for Money case of the Relief Road. As discussed for the full route the main issue is the nature of the trips that presently use the road network in the Hereford area.

5.131 The half moon route however is likely to deliver a value for money case based on the journey time benefits accruing to users and decongestion and journey time benefits accruing to users of the city centre network and those using the Starting Gate junction.

[17] extending from Holmer Road in the north to Belmont Road in the south and extending east along New Market/Blue School Street and west along Eign Street as far as Barton Yard.

Deliverability

Risk to Cost

Table 5.22 Risk to Cost

Risk	RAG Assessment
Costs	Amber
Level of design	Red – Amber
Risk Register	Red - Amber

5.132 The scheme has outline costs available although a quantified risk estimate has been calculated based on an up to date risk workshop. The level of design is limited as the route is still at the 'corridor of search' stage.

5.133 A risk workshop was undertaken in September 2013. A number of significant risks were identified. Theseare summarised below:

- Ecological implications (SAC River Wye, SSSI, Special Wildlife site);
- Impact on Special Wildlife Site (south bank of river Wye);
- Crossing the River Wye – ground conditions;
- Impact on local Business – the corridor of search covers a local golf course; and
- Involvement of Ministry of Defence as a statutory consultee.

5.134 None of the half moon specific risks were considered to be show stoppers, although there were significant implications in terms of timescales for delivery and scheme costs should these risk be realised.

Risk to Programme

Table 5.23 Risk to Programme

Risk	RAG Assessment
Practicality /buildability/complexity	Amber
Legal Powers	Red - Amber
Resource availability/Governance organisation structure	Red - Amber

5.135 This half moon relief road is likely to have a complex build due to the need for a structure over the River Wye.

5.136 A number of legal risks were identified including the high likelihood of the route requiring compulsory purchase orders. There is also a likelihood of a legal challenge from one of the following: the public, local action group or town/parish council. These legal risks are likely to lead to significant delays to the implementation timescales. Early consultation with all key stakeholder groups and the public is recommended to manage and mitigate this risk where possible.

Risk to Acceptability

Table 5.24 Risk to Acceptability

Risk	RAG Assessment
Stakeholder and public acceptability	Red – Amber
Statutory consultees	Red – Amber

VfM	Green

5.137 The influences on stakeholder and public acceptability include the formation of a local action group in the area which opposes the link and the likelihood of significant land take from a number of local businesses. The risk workshop also identified the potential risk around political support for the route.

5.138 In terms of statutory consultees the impact of the route on the River Wye SAC, SSSI, Special Wildlife Site south bank of the River Wye and Scheduled Ancient Monument (moated site close to the Church in Breinton) need to be assessed and mitigated as necessary. There is also a Council aspiration for the Highway Agency to adopt the new route if completed. The Ministry of Defence also had an interest in the corridor of search.

5.139 In value for money terms, this link provides very high value for money (BCR is greater than 4).

Strategic Outline Business Case Summary

5.140 The development of Strategic Outline Business Case(s) for all or sections of the western relief road will be dependent on the information in this report and the previous AMEY 'options report'.

5.141 The Strategic Outline Business Case(s) will be essential to take forward the securing of the necessary funding for the relief road.

5.142 The Strategic Outline Business Case(s) should:

- define the scope of the project/programme and its outputs and benefits;
- make the case for change;
- confirm the strategic fit with the Departmental business plan and wider Government objectives;
- state the assumptions made;
- set out how achievements will be measured;
- outline options, including innovative options, to tackle the problem and carry out initial sift of options;
- consider and confirm that a robust project governance structure is in place and that the project is affordable;
- outline the sequence in which the project and benefits will be delivered;
- identify and analyse its stakeholders; and
- confirm the assurance arrangements.

5.143 The Strategic Outline Business Case(s) will be required to consider:

- The Strategic Case
- The Economic Case
- The Financial Case
- The Commercial Case
- The Delivery Case

5.144 JMP has made an assessment of the current evidence available for the development of the Strategic Outline Business Case(s) against the requirements in WebTag Summary document "The Transport Business Cases".

		Current Evidence	RAG Assessment for completion of SOBC
Strategic Case	business strategy	Providing context - information in LDF Core Strategy and draft SEP	
	problem identification	Partly in Core Strategy / 2032 Do Min model and limited life of current network investments e.g. HA pinch-point schemes	
	impact of doing nothing	2032 Do - minimum model	
	objectives	Information in LDF CoreStrategy regarding City ambitions and Growth Strategy. Also in draft SEP	
	measures for success	Yes, in HA correspondence and Core Strategy targets	
	scope	This report and previous AMEY reports but more work needed on transport conditions at end of Core Strategy process	
	constraints	Core Strategy, this report and previous AMEY reports	
	interdependencies	links to refresh of transport strategy and LTP established, need for WRR predicted on Core Strategy levels of the growth	
	stakeholders	Considered in Core Strategy consultations and in risk workshop	
	options	Yes considered in AMEY report and do-something model with maximum PT / sustainable modes	
Economic Case	introduction	Information available from Core Strategy, Draft SEP and HCC economic data	
	options appraised	In AMEY report and this report. 2032 Do-Something model run with maximum PT / sustainable modes interventions & with / without WRR available	
	AST	More information needed, headline costs and strategic assessment of environmental issues available, TUBA outputs to be available January 2014	
	VfM	More information needed, headline costs and strategic assessment of environmental issues available.	
Financial	introduction	Information available from Core	

Case		Strategy, Draft SEP and HCC economic data.	
	costs	In AMEY report, initial QRA conducted	
	budget / funding strategy	Detailed costs to be confirmed - public money likely to be needed to support third party contributions collected by the Council	
	accounting implications	Details to be confirmed by the Council as the scheme(s) develop. Requirement is to describe the expected impact on the Council's balance sheet.	
Commercial Case	introduction	Information available but scale of works and alignment TBC which will affect the commercial approach taken	
	output / specification	Information in LDF Core Strategy and AMEY report / this report. Preferred alignment to be agreed	
	procurement strategy	To be confirmed - use of HCC highway supply chain at this stage	
Delivery Case	introduction	Information available from various HCC / BB sources	
	track record	Rotherwas Access Road, Edgar Street Link Road ?	
	programme dependencies	Risk workshop held which has identified some dependencies, links to other HCC areas of activity to be established	
	governance	Hereford transport delivery project board established	
	project plan	To be developed - key current milestone is Core Strategy examination due mid 2014	
	approvals programme	To be developed but HCC transport delivery project board established for decision making in current work programme	
	comms plan	To be developed	
	risk management plans	Risk Workshop and initial QRA developed - current work to reduce risk by confirming phasing	
	management options	Hereford transport delivery project board established	

5.145 The development of the Strategic Outline Business Case(s) even in areas where a green rating has been given will require a significant input to ensure that the final SEP for the Marches is fully informed.

Funding Sources

5.146 The funding of the Relief Road will, as noted above, in all likelihood require public funding to secure delivery. An overview of the potential sources of funding is given below. The overall funding

required will undoubtedly be drawn from a package made up from several of the potential sources discussed in more detail below.

5.147 Developer funding – planning gain – either through Community Infrastructure Levy or section 106 / section 278 agreements. This will allow a pot of funds to be developed over time but it would also be required for other uses e.g. education and other transport requirements. A suitably sized pot would take time to be achieved and the level of funds likely to be available will be key to demonstrating the Core Strategy is viable in planning terms.

5.148 LTB major scheme funding. The LTB has set priorities for funding for 2015 to 2019. Due to current stage of development of the western relief road it does not feature in the agreed list of schemes, however, given the long development period of the western relief road funding from this source may become available in the future if the priorities are reassessed.

5.149 LEP 'single pot' economic development funding. The Marches Growth Deal and the emerging SEP both provide for funding to be available in a 'single pot' to support economic growth. The draft SEP supports the western relief road as key to accessing the Hereford Enterprise Zone and supporting housing growth.

5.150 Highways Agency funding for 5 year block from 2015 to 2021 and subsequent funding blocks. The Cook Review of the Highways Agency and the government's supportive response to its findings indicate that the Highways Agency will receive a significant increase in funding for schemes and be freed from HMT 'annualisation' by changing the status of the Agency. Route based strategies are currently under development by the Highways Agency to allow this increase investment to be targeted.

5.151 Direct DfT funding through national infrastructure plan. The recent announcement in the governments' 2013 autumn statement regarding a significant upgrade to the A50 in Staffordshire implies that a direct announcement of central government funding may be possible irrespective of the delivery mechanism to be employed if the economic development case is sufficiently strong.

5.152 In addition to the above, it is essential that other funding to secure the necessary and supportive transport interventions will be required from local and national sources.

Summary

5.153 The Council has a number of strategic choices to make regarding the delivery of the relief road. It is intended that the analysis here is a starting point for discussion providing evidence to support decision makers. The prioritisation approach has considered three dimensions; policy fit, value for money and deliverability. The analysis of the evidence for each of these dimensions has informed the recommendations for phasing of the link road. Should a phased approach not be pursued, the prioritisation has also provided a number of options for considering the delivery of the whole or partial route.

5.154 All of the links contribute in some way to the delivery of Herefordshire's policy outcomes, however not all are considered to be transformational or catalytic, instead providing incremental improvements to the network.

5.155 To synthesize this analysis the link assessments have been sifted, the bullets below summarise the prioritisation categories:

- Sift 1: Very strong policy fit, very high value for money, deliverable within the plan period;

- Sift 2: Good policy fit, very high value for money, deliverable within the plan period;
- Sift 3: Policy fit (but not at a high level), very high value for money, deliverable within the plan period; and
- Sift 4: Policy fit (but not at a high level), very high value for money, high risk to delivery within the plan period

Sift 1

5.156 Initial sifting of the links based on identifying those which provide a very strong policy fit, are likely to provide good value for money and are deliverable within the plan period identified only one link within this category, the **Wye Corridor**. It is therefore clear that should a phased approach be adopted the Wye Link which secures the greatest benefit in terms of traffic operation of the A49 due to the currently congested river crossing, the capacity limitations on the A49 in the city centre area and the creation of a vital alternative link to the Hereford Enterprise Zone from the major new housing sites north and north-west of the city centre is the logical first element.

Sift 2

5.157 A second sift to identify links with a good policy fit, that are likely to provide very high value for money and are deliverable within the plan period identifies **Holmer West Corridor**.

Sift 3

5.158 The assessment of **Three Elms Corridor** identified that whilst the scheme demonstrates a policy fit through supporting development of jobs and housing and improving accessibility. This fit is not at a high level. However it is clear from the analysis that the link provides high value for money and would be deliverable within the plan period.

Sift 4

5.159 The assessment of the **Holmer East Corridor** has identified a policy fit, although not at a high level. As a stand-alone case the value for money of the link has been assessed as very high, however significant risks were identified within the deliverability which were considered to be showstoppers, resulting in a high risk to delivery within the local plan period. It is therefore recommended that this link is pursued as a longer term aspiration post 2032. There is merit however in continuing to develop the Holmer East case as a number of the risks may be addressed through more detailed work on the alignment and design of the link which is not currently available.

Full and Half Moon Assessment

5.160 An assessment has also been made of the full relief road and the half moon relief road (excluding the Holmer East link). The conclusion of this assessment is that the majority of benefits can be achieved through the half moon relief road and whilst the full relief road provides the maximum benefit to the Starting Gate junction the inclusion of the Holmer East Link brings with it a disproportionate level of programme and project risk. At this stage in the analysis the evidence indicates that a very high value for money case would be available for both alignments. In terms of the deliverability of the scheme the full relief road has a number of significant risks associated with it which were identified as show stoppers at the risk workshop, these risk are principally associated with the Holmer East section of the relief road. It is therefore recommended that the half moon relief road is taken forward within the plan period.

Funding Sources

5.161 The funding of the Relief Road will, as noted above, in all likelihood require public funding to secure delivery. The overall funding required will undoubtedly be drawn from a package made up from several of the potential sources and funders.

5.162 Given the timescales necessary for the development, funding and construction of the relief road or sections of it our key recommendation is that progress in this area is made immediately following a successful outcome to Core Strategy Examination in Public. The resource implications for the development of the relief road should be considered by Council as a priority item.

6 Conclusions

6.1 This report builds on the AMEY report in June 2013 which provided the first stage in the justification of the relief road for Hereford. This report has examined the potential for delivering the relief road in phases and analysed the case for the build out sequence of the relief road. This report has also analysed outputs from the Hereford transport model to provide a view on the trigger point when the local and strategic transport network requires intervention.

6.2 The report analysis is principally based on model runs from the 'do minimum' network. Initial analysis by JMP established that the model was generally "fit for purpose". JMP's view is that the model is reflective of wider strategic transport issues and can be used at this stage to provide a strategic view and appropriate evidence to support the Core Strategy.

Trigger Point Analysis

6.3 The key starting principle of this analysis has been that the relief road is not required in the base year but it is clear from the Local Plan - Core Strategy Modelling Work that the relief road is required in 2032. The analysis therefore focuses on the intermediate years, analysing key indicators to establish if the relief road is still required.

6.4 The analysis of A438 / Holme Lacy Road indicates a step change in journey time by 2027, this is indicative that a trigger point has been reached and an intervention is required by this point in the AM peak. This corresponds with the analysis of the A49 corridor which again indicates a step change in journey time by 2027 in both the AM and PM peak.

6.5 Additional analysis was undertaken examining the vehicle flow and queued flow at the A49 Greyfriars Bridge river crossing. This analysis indicates the A49 southbound queued flow increases dramatically through the plan period, doubling by 2022 and quadrupling by 2032.

6.6 In conclusion the evidence to date is clear the relief road is required by 2027. The analysis suggests that there has been a deterioration in network conditions by 2022 but the analysis to date is not sufficient to suggest that the complete relief road is required by 2022. It is therefore suggested that should a phased approach be adopted there could be significant benefit in the progressing early phases ahead of 2022, however, the key elements of the relief road need to be in place by 2027 on the current projections of traffic and housing growth.

6.7 The pace of development at the Enterprise Zone is a key determinant of when the relief road will be required, the strategic modelling is based on an interpolated growth rate to develop from today to full build out of the LDF by 2032. The growth is applied pro-rata across all sites for this assessment. However a sensitivity test looking at the impact of the Enterprise Zone indicates that were the Enterprise Zone to be delivered earlier within the plan period the requirement for the relief road would come forward. This is reinforced by the journey time analysis on the A49 which indicates an intervention is required by 2022 if the Enterprise zone is fully built out at by this time.

Strategic prioritisation

6.8 The link by link analysis has identified that the Wye Link provides the strongest individual case, with the best policy fit and value for money case. There are significant risks to delivery of this scheme but no show stoppers identified to date. Of particular relevance is the level of cost risk associated with the lack of fixed route and potential requirement for dualling of the route.

6.9 The Three Elm and Holmer West links provide a more limited benefit then the Wye link when delivered in isolation. The Holmer East link has a limited policy fit and significant risks were

identified in terms of delivery. Given the significant risks associated with the Holmer East Link the recommendation is that this link is viewed as a long term aspiration for beyond the local plan period. It is recommended that work is undertaken on route alignment to ascertain if a deliverable route can be achieved which addresses the risks currently classified as showstoppers.

6.10 An assessment has also been made of the full relief road and the half moon relief road (excluding the Holmer East link). The conclusion of this assessment is that the majority of benefits can be achieved through the half moon relief road and whilst the full relief road provides the maximum benefit to the Starting Gate junction the inclusion of the Holmer East Link brings with it a disproportionate level of programme and project risk. As such we recommend the Holmer East link is not pursued further at this stage.

6.11 The funding of the Relief Road will, as noted above, in all likelihood require public funding to secure delivery. The overall funding required will undoubtedly be drawn from a package made up from several of the potential sources, given this need the development of a full case for the relief road should be pursued as early as possible to give certainty to the development community and stakeholders as to relief road scheme.

Conclusion

6.12 In conclusion, the journey time and flow analysis has indicated that the relief road is required by 2027 and based on the modelling output to date the network in Hereford suffers deterioration by 2022. Therefore should a phase approach be pursued it is recommended sections of the relief road could usefully be delivered by 2022 followed by the completion of the half moon relief road no later than 2027. The prioritisation analysis has indicated that the Wye Link must be pursued early within the programme as part of a phased approach as the complexity of developing and delivering a new river crossing is likely to be resource intensive and time critical for the delivery of the Core Strategy growth.

6.13 The pace of development at the Enterprise Zone is a key determinant of when the relief road will be required, a sensitivity test looking at the impact of the Enterprise Zone indicates that were the Enterprise Zone to be delivered earlier within the plan period the requirement for the relief road would come forward. The journey time analysis on the A49 which indicates an intervention is required by 2022 if the Enterprise zone is fully built out at by this time.

6.14 This recommendation is made based on the growth outlined within the Core Strategy distributed throughout the plan period. However the implementation of the relief road would be required sooner should growth be accelerated to earlier in the plan period due to increased economic activity. The current ssshigh level of pre-planning application activity concerning the City's major development sites suggests that 2027 is latest point at which a fully open and functioning relief road is necessary to deliver the Core Strategy's outcomes.

6.15 Should the Council not pursue a phased approach, the prioritisation process identified significant risks which could undermine the delivery of the scheme should the whole scheme be delivered. These risks were principally connected with the Holmer East link, it is therefore recommended that the half moon relief road is pursued at this stage and Holmer East is considered for delivery beyond this plan period.

6.16 Given the timescales necessary for the development, funding and construction of the relief road or sections of it our key recommendation is that tangible progress on development of the relief road scheme and assembly of its funding package is made immediately following a successful outcome

to Core Strategy Examination in Public. The resource implications for this development work of the relief road should be considered by Council as a priority item.

Appendix A

Measures included in the ‘Do Minimum’ Model Inputs

Measures included in the ‘Do Minimum’ Model Inputs

- Connect 2 Greenway Wye River crossing between Eign Rd and Holme Lacy Rd
- Newmarket St / Blueschool St pedestrian / cyclist initiatives with ESGLR
- Kilvert Rd - Usk Close / Escley Dr cycle link Newton Farm
- Destination Hereford - Belmont Abbey - Hunderton cycleway SE Hereford
- Kings Acre Rd - Barton Rd cycleway
- Eign Rd - Ledbury Rd link
- Greenway - Lower Bullingham (off street Goodwin Wy - Greenway)
- HATS - A3 Rotherwas- Holme Lacy feasibility report (off street Rotherwas IE)
- HATS - B1 Grafton Depot (A49 Grafton Depot-Bullingham Lane) (P&C)
- HATS - B7 Riverside School- GWW to Belmont Avenue (off street)
- HATS - B8 ASDA riverside path realignment ** (off street riverside Asda - St Martins St)
- HATS - C2 City Core including High Town, St Owen's St, Offa St (on street plus Commercial St ped area)
- HATS - D4 The Straight Mile (Twyford Rd-Fir Tree Lane) (on street Holme Lacy Rd)
- Destination Hereford - Victoria Pk to Overbury Rd
- Edgar Street Grid Link Road (ESGLR)
- HA PPP - A49/A465 Asda
- HA PPP - A49/A438 Newmarket St
- HA PPP - A49/A4103 Roman Rd

Appendix B

Policy criteria aligned with national sub regional and local themes

National Creating Growth Cutting Carbon: Making sustainable local transport growth happen (Jan 2011)	Sub-regional The Marches 'Strategy for Growth 2013 – 2022'	Marches LTB - Independent Technical Evaluator Next Steps Report Key economic indicators	Connected Marches (Draft SEP) key objectives for transport investment	Local Local Transport Plan	Core Strategy Objectives	Criteria
Economic growth – reducing congestion and enabling access		Safeguarding or creation of jobs (via investment from existing or new companies). Reduction in exclusion from jobs and training (especially for people without access to private transport). Supply of land for employment (based on the optimum balance of different use categories).	Help existing and new businesses to invest and create jobs by reducing financial costs that result from congested and unreliable networks			Contribute towards safeguarding or creation of jobs or supply of land for employment
		Supply of affordable housing.	Help provide enough affordable and high quality houses, which are accessible to jobs and essential services by a range of transport modes.		To meet the housing needs of all sections of the community (especially those in need of affordable housing), by providing a range of quality, energy efficient homes in the right place at the right time.	Assist in accommodating future housing development within Herefordshire
	Achieving connectivity across the marches, across the UK and across world markets			Reducing congestion in Hereford City and increasing accessibility by less polluting and healthier forms of transport than the private car.		Ensure journey time reliability and capacity of transport links including consideration of operational performance of the strategic road network
Carbon Dioxide – reducing emission of greenhouse gases	A low carbon approach to delivering economic growth across the Marches LEP				To address the causes and impacts of climate change by ensuring new development: uses sustainable design and construction methods to conserve natural resources, does not increase flood risk to new or existing property, increases the use of renewable forms of energy to reduce carbon emissions, minimises waste and pollution, manages water supply and conservation and conserves and protects biodiversity and geodiversity.	Contribute to an overall reduction in carbon emissions
Health – encouraging physical activity, reducing accidents, improving air quality and reducing noise			Develop socially cohesive and health communities where people feel safe to travel by walking, cycling and public transport.	Reducing congestion in Hereford City and increasing accessibility by less polluting and healthier forms of transport than the private car.	To improve the health, well-being and quality of life of all residents by ensuring new developments positively contribute towards better access to, provision and use of, improved public open	Contribute to the uptake of active travel modes that may contribute to a reduction in obesity and overall improvement in health

				spaces, sport and recreation, education, cultural and health facilities.	
Access to public transport		Enable people to live full, independent and economically productive lives through providing links between where they live and where they need to get to (for a range of journey purposes).	Reducing congestion in Hereford City and increasing accessibility by less polluting and healthier forms of transport than the private car. Maintaining access for rural residents and people without access to a car	To improve access to services in rural areas and movement and air quality within urban areas by ensuring new developments support the provision of an accessible, integrated, safe and sustainable transport network and improved traffic management schemes.	Improve accessibility from residential areas to employment, education or other opportunities
		Protect the natural and built environment which makes The Marches a special place to live, work and play.	Reducing congestion in Hereford City and increasing accessibility by less polluting and healthier forms of transport than the private car.	To reduce the need to travel and lessen the harmful impacts from traffic growth, promote active travel and improve quality of life by locating significant new development where access to employment, shopping, education, health, recreation, leisure and other services are, or could be made available by walking, cycling or public transport. To achieve sustainable communities and protect the environment by delivering well-designed places, spaces and buildings, which use land efficiently, reinforce local distinctiveness and are supported by the necessary infrastructure including green infrastructure. To conserve, promote, utilise and enjoy our natural, built, historic and cultural assets for the fullest benefits to the whole community by safeguarding the county's current stock of environmental assets from loss and damage, reversing negative trends, ensuring best condition and encouraging expansion, as well as appropriately managing future assets.	Improve environmental conditions

Appendix C

Risk Workshop and Assessment

Appendix C

Risk Workshop and Assessment

File Note

Date	14 October 2013
Job No/ Name	NEA6100
Subject	Risk

Introduction

1. A risk can be identified as any uncertain event or condition which if it occurs, has an adverse effect on one or more of the project objectives. Every project has a mix of risks and opportunities associated with it.
2. In order to provide Herefordshire Council with a clear understanding of the risks and uncertainties associated with the development of the Hereford Western Relief Road, JMP led a risk identification and analysis exercise. This risk analysis forms part of a structured approach to identifying assessing and responding to risks that occur through development of the project. The risk analysis should support better decision making through an improved understanding of the risks to the project and their likely impact.
3. The first stage of the risk analysis was the compilation of a risk register. The risk register was compiled at a detailed risk workshop which took place on 19th September 2013, the following people attended the risk workshop:
    - Jeremy Callard, Transport Strategy Herefordshire Council
    - Yvonne Coleman, Development Management Herefordshire Council
    - Adrian Smith, Area Engineer Herefordshire Council
    - Andrew Walford, Parson Brinckerhoff
    - Lee White, JMP
    - Emma Young, JMP
    - Amy Sykes, JMP
4. The risk workshop considered a wide range of project risks including:
    - Legislative risk;
    - Policy risk;
    - Construction risk;
    - Planning risk;
    - Operational risk;
    - Inflation risk;
    - Demand risk;
    - Design risk.
5. The risk register includes the following information. For each risk the category of risk was considered (for example project, cost, programme). Some risks were relevant to more than one category. In addition to this each risk was assessed in terms of its likelihood of occurring and the potential impact should it occur. For cost risks additional analysis was provided on the minimum cost, the maximum cost and the likely cost of the risk should it occur. The categories used for this classification are illustrated below:

Wye Link A465 – A438

Risk Classification									
Likelihood				Impact					
Scale	Typical Range (%)		Value	Scale	Time (mths)		Cost (£)		Value
Very Low	0%	10%	1	Insignificant	0	3	0	£250k	1
Low	10%	30%	2	Low	3	6	£250k	£500k	2
Medium	30%	50%	3	Medium	6	9	£500k	£1m	3
High	50%	70%	4	Serious	9	12	£1m	£5m	4
Very High	70%	100%	5	Very Serious	12	-	£5m	-	5

Three Elms A438 – A4103

Risk Classification									
Likelihood				Impact					
Scale	Typical Range (%)		Value	Scale	Time (mths)		Cost (£)		Value
Very Low	0%	10%	1	Insignificant	0	3	0	£100k	1
Low	10%	30%	2	Low	3	6	£100k	£250k	2
Medium	30%	50%	3	Medium	6	9	£250k	£500k	3
High	50%	70%	4	Serious	9	12	£500k	£750k	4
Very High	70%	100%	5	Very Serious	12	-	£750k	-	5

Holmer West A4103 - A49

Risk Classification									
Likelihood				Impact					
Scale	Typical Range (%)		Value	Scale	Time (mths)		Cost (£)		Value
Very Low	0%	10%	1	Insignificant	0	3	0	£100k	1
Low	10%	30%	2	Low	3	6	£100k	£500k	2
Medium	30%	50%	3	Medium	6	9	£500k	£1m	3
High	50%	70%	4	Serious	9	12	£1m	£2m	4
Very High	70%	100%	5	Very Serious	12	-	£2m	-	5

Holmer East A49 – A4103

Risk Classification									
Likelihood				Impact					
Scale	Typical Range (%)		Value	Scale	Time (mths)		Cost (£)		Value
Very Low	0%	10%	1	Insignificant	0	3	0	£100k	1
Low	10%	30%	2	Low	3	6	£100k	£500k	2
Medium	30%	50%	3	Medium	6	9	£500k	£1m	3
High	50%	70%	4	Serious	9	12	£1m	£2m	4
Very High	70%	100%	5	Very Serious	12	-	£2m	-	5

6. The risk register has demonstrated where there are major risks with the scheme elements and has provided an initial foundation to understanding the risks and managing them. It is recommended that the risk register is kept under review throughout the development of the scheme.

Key risks

7. Five risk registers have been developed one for each section of the route and one for the whole route. The following paragraphs provide an indication of the key risks for each section. The type of risk is presented in brackets, * Indicates that a risk was assessed as the highest level of risk i.e. very high likelihood of occurring and very high impact. This summary highlights that a number of the same risks

will occur in each of the sections of the route, in some cases however were the scheme to be progressed as one phase the risk would only appear once:

Wye Link (A465 to A438 including the River Wye crossing)

- No fixed alignment (Cost)*
- Local Action Groups (Project and Programme)*
- Public inquiry/legal challenge to the Core Strategy (Project and Programme)
- Compulsory Purchase Orders (Project and Programme)*
- Changing political administration locally (Project)
- Programme management and governance (Project)*
- Political approval and project decisions (Project and Programme)*
- Ecological implications - SAC River Wye, white clawed cray fish (Environmental)*
- Impact of setting of listed buildings/parks and gardens (Environmental)
- Impact on Special wildlife site (Environmental)
- Property Blight (Cost)
- Consent of statutory undertakers (Programme)
- Delivery of development - premature or delayed (Commercial)
- Redistribution of traffic as a result of phased approach (Safety)
- Connection of successive phases – design (Project)
- Impact on local business – golf course (Cost)
- Timing and availability of public funding (Programme)*
- Council staff resources (Project and Programme)*
- Connections to existing roads (Costs)

Three Elms link (A438 to A4103)

- No fixed alignment (Cost)*
- Local Action Groups (Project and Programme)*
- Public inquiry/legal challenge to the Core Strategy (Project and Programme)
- Compulsory Purchase Orders (Project and Programme)*
- Acceptable economic case based on phasing - as defined in the 5 case model (Project)
- Changing political administration locally (Project)
- Programme management and governance (Project)*
- Political approval and project decisions (Project and Programme)*
- Impact of setting of listed buildings/parks and gardens (Environmental)
- Property Blight (Cost)
- Consent of statutory undertakers (Programme)
- Connection of successive phases – design (Project)
- Timing and availability of public funding (Programme)*
- Council staff resources (Project and Programme)*

Holmer West (A4103 to A49 - west of the A49)

- No fixed alignment (Cost)*

- Local Action Groups (Project and Programme)*
- Public inquiry/legal challenge to the Core Strategy (Project and Programme)
- Compulsory Purchase Orders (Project and Programme)*
- Acceptable economic case based on phasing - as defined in the 5 case model (Project)
- Changing political administration locally (Project)
- Programme management and governance (Project)*
- Political approval and project decisions (Project and Programme)*
- Impact of setting of listed buildings/parks and gardens (Environmental)
- Delivery of development –premature or delayed (Commercial)
- Connection of successive phases – design (Project)
- Timing and availability of public funding (Programme)*
- Council staff resources (Project and Programme)*

Holmer West (A49 to A4103 – east of the A49)

- No fixed alignment (Cost)*
- Local Action Groups (Project and Programme)*
- Public inquiry/legal challenge to the Core Strategy (Project and Programme)
- Compulsory Purchase Orders (Project and Programme)*
- Acceptable economic case based on phasing - as defined in the 5 case model (Project)
- Changing political administration locally (Project)
- Programme management and governance (Project)*
- Political approval and project decisions (Project and Programme)*
- Consent of statutory undertakers (Cost and Programme)
- Delivery of development –premature or delayed (Commercial)
- Connection of successive phases – design (Project)
- Timing and availability of public funding (Programme)*
- Council staff resources (Project and Programme)*
- Connections to existing roads (Cost)
- High pressure gas line – blast zone (Project, Programme and Cost)*
- Rail crossing (Project, Programme and Cost)*
- Electricity lines (Project, Programme and Cost)*
- Canal crossing – it is a statutory right of navigation (Project, Programme and Cost)*

Risk adjusted cost estimate

8. One of the key functions of the risk analysis work is to adjust the project base cost for the risk associated with the cost of the scheme. The risk adjusted cost estimate takes the average of all the possible outcomes, taking account of the different probabilities of those outcomes occurring. JMP have used the programme @RISK to analyse this element of the cost.

9. @RISK uses a technique known as Monte Carlo simulation to take all possible outcomes into account and to provide a statistically robust sample of potential risk occurrences and costs. The analysis uses a

PERT distribution, this approach is used for modelling expert estimates as this distribution is more sensitive to the most likely value than the minimum and maximum.

10. The risk adjusted cost estimate has been calculated for the following sections of the route:
    - Wye Link
    - Three Elms link
    - Holmer West
    - Holmer West
11. The risk adjusted cost estimate has also been calculated for the whole scheme, this figure is less than the cumulative risk adjusted cost of the individual sections as a number of the risks are common to each of the sections and should the scheme be completed in its entirety would only occur once however if the scheme is developed in individual sections these risks could occur for each section.
12. Table 1 below illustrates the risk adjusted cost estimate for each section and the whole route:

Table 1 Risk Adjusted Cost Estimate

Scheme	Outline cost (not including risk adjusted cost estimate) (millions)	Risk Adjusted Cost Estimate	% Risk Adjusted Cost Estimate (millions)
Whole scheme	62.844	47.357	75.4
Wye Link	30.145	23.792	78.9
Three Elm Link	4.489	9.042	201.6
Holmer West	12.330	6.332	51.3
Holmer East	15.880	9.564	60.2

13. It can be seen that the risk adjustment estimate is high at this stage, this is reflective of the stage of development of the scheme. JMP has undertaken additional sensitivity analysis of the risk adjusted estimate to understand which risks from within the risk register are amongst the most influential in the risk adjustment estimate. This analysis has revealed that the risk connected with the lack of fixed alignment of the route make up a large amount of risk adjusted cost estimate this is in line with the fact that this risk has a very high likelihood and large impact, with significant cost implications.
14. Table 2 below illustrates the effect of removing this risk (i.e the level of risk adjusted estimate once the alignment has been fixed[1]).

Table 2 Risk Adjusted Cost Estimate excluding no fixed alignment

Scheme	Outline cost (not including risk adjusted cost estimate) (millions)	Risk Adjusted Cost Estimate	% Risk Adjusted Cost Estimate (millions)
Whole scheme	62.844	31.731	50.5

[1] It is important to note that some of the risk layer may be realised in the fixing of the alignment so the outline cost at this stage may change.

Wye Link	30.145	14.958	49.6
Three Elm Link	4.489	3.518	78.4
Holmer West	12.330	5.694	46.2
Holmer East	15.880	8.928	56.2

15. In addition the risk associated with the potential requirement for the route to be dualled was also a key influence. Table 3 below illustrates the implications of removing both the fixed alignment and dualling risk on the risk adjusted estimate.

Table 3 Risk Adjusted Cost Estimate excluding no fixed alignment and need to dual route

Scheme	Outline cost (not including risk adjusted cost estimate) (millions)	Risk Adjusted Cost Estimate	% Risk Adjusted Cost Estimate (millions)
Whole scheme	62.844	25.482	40.5
Wye Link	30.145	11.194	37.1
Three Elm Link	4.489	3.309	73.7
Holmer West	12.330	3.972	32.2
Holmer East	15.880	N/A	N/A

Summary and findings

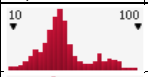
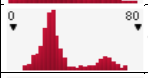
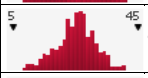
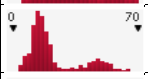
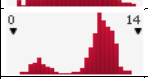
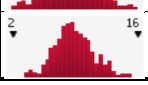
16. This risk analysis has indicated that the scheme and its individual phases have a high risk adjusted cost estimate at this stage, but that is reflective of the current stage of development of the scheme. The Three Elm Link has the greatest contingency in proportion to the scheme cost.
17. Sensitivity analysis of the risks within the risk register indicated that the lack of fixed alignment and potential to have to dual the route have a large impact particularly on the Whole scheme adjusted cost estimate and especially on the Wye link.
18. It is important that as the scheme progresses the project team look to manage and mitigate all the risks identified in the risk register and identify new risks. However it is recommended at this stage that particular attention is paid to the fixed alignment and dualling risk in order to manage down the risk adjusted cost estimate.

Distribution

Name/ Signed Amy Sykes

@RISK Output Results

Performed By: JMP Consultants Ltd
Date: 02 January 2014 09:41:58

Name	Worksheet	Cell	Graph	Min	Mean	Max	5%	95%	Errors
Contingency-WRR	Whole Link	M146		10.83028	47.41971	96.77002	25.29875	79.72842	0
Contingency-WRR2	Whole Link	M149		9.539935	31.7262	71.59029	16.22293	61.75882	0
Contingency-WRR3	Whole Link	M151		9.539935	25.51155	40.42669	16.10373	34.02789	0
Contingency-Half Moon	Half Moon	M130		8.14682	37.80141	78.01786	16.57627	67.56195	0
Contingency-Half Moon2	Half Moon	M133		5.644865	22.77544	64.1386	10.01351	50.65572	0
Contingency-Half Moon3	Half Moon	M135		5.644865	16.7498	29.12597	9.755965	23.30478	0
Contingency-Wye Link	A465-A438 Wye Link	M115		5.34324	23.92249	48.95463	9.969047	43.13921	0
Contingency-Wye Link2	A465-A438 Wye Link	M117		3.331439	14.97843	40.05782	6.457778	32.46877	0
Contingency-Wye Link3	A465-A438 Wye Link	M119		3.331439	11.1616	19.22026	6.028049	15.69014	0
Contingency-Elm Link	A438-A4103 3 Elm link	M107		1.401916	9.031241	12.93557	3.107279	11.53042	0
Contingency-Elm Link2	A438-A4103 3 Elm link	M109		1.401916	3.507974	6.036643	2.244171	4.852669	0
Contingency-Elm Link3	A438-A4103 3 Elm link	M111		1.401916	3.304779	5.227968	2.121565	4.428422	0
Contingency-North West	A4103-A49	M99		2.151685	6.320646	17.1451	3.01695	14.29269	0
Contingency-North West2	A4103-A49	M101		1.393048	5.686269	16.54135	2.519554	13.64812	0
Contingency-North West3	A4103-A49	M103		1.393048	3.94256	6.615059	2.286361	5.445648	0
Contingency-North East	A49 - A4103	M107		4.408665	9.593535	15.61733	6.335975	13.10321	0
Contingency-North East2	A49 - A4103	M109		3.80312	8.956099	15.0202	5.931578	12.43318	0

Project Title:
A465-A438 Wye Link

Design Stage

Likelihood			
Scale	Typical Range (%)		Value
Project Env	Very Low	0%	10%	1
Cost	Low	10%	30%	2
Prog	Medium	30%	50%	3
Comm'l	High	50%	70%	4
Safety	Very High	70%	100%	5

Ref	Risk Description	Type	Risk Rating		
			Likelihood	Impact	Risk
1a	No fixed alignment (corridor of search)	Project	5	1	5
1b	No fixed alignment (corridor of search)	Cost	5	5	25
1c	No fixed alignment (corridor of search)	Programme	5	1	5
13	Need for additional capacity (Dualiling)	cost	2	5	10
2a	Public acceptability	Project	5	2	10
2b	Public acceptability	Programme	5	2	10
2c	Public acceptability	Cost	5	1	5
3a	Local action groups	Project	5	3	15
3b	Local action groups	programme	5	5	25
3c	Local action groups	cost	5	1	5
4a	Town and parish Council acceptability	project	5	4	
4b	Town and parish Council acceptability	Programme	5	5	
4c	Town and parish Council acceptability	cost	5	1	
5a	Public inquiry/Legal challenge Core Strategy	Project	4	5	20
5b	Public inquiry/Legal challenge Core Strategy	Programme	4	5	20
5c	Public inquiry/Legal challenge Core Strategy	Cost	4	3	12
6a	CPO	Project	5	4	20
6b	CPO	Programme	5	5	25
6c	CPO	Cost	5	1	5
8a	Acceptable economic case based on phasing (as defined in the 5 case model)	Project	2	5	10
8b	Acceptable economic case based on phasing (as defined in the 5 case model)	Cost	2	1	2
9	Changing Political administration (locally)	Project	3	5	15
10	Political lack of support for the western corridor	Project	4	2	8
11	Programme management and Governance	project	5	5	25
12a	Political approval for project decisions	project	5	3	15
12b	Political approval for project decisions	programme	5	5	25
14a	Adoption of the route by the Highways Agency (i.e if Agency require redesign or impro	project	1	1	1
14b	Adoption of the route by the Highways Agency (i.e if Agency require redesign or impro	cost	1	1	1
14c	Adoption of the route by the Highways Agency (i.e if Agency require redesign or impro	commercia	1	1	1
15a	Highways Agency agreement	project	2	5	10
15b	Highways Agency agreement	programme	2	2	4
17a	crossing the River Wye - ground conditions	cost	3	4	12
17b	crossing the River Wye - ground conditions	Programme	3	1	3
18a	crossing the River Wye - flood issue (flooding during construction)	cost	2	1	2
18b	crossing the River Wye - flood issue (flooding during construction)	programme	2	1	2
18c	crossing the River Wye - flood issue (flooding during construction)	nvironment	2	1	2
19a	Acceptable design of the river crossing (design of the bridge is unacceptable)	programme	2	3	6
19b	Acceptable design of the river crossing (design of the bridge is unacceptable)	cost	2	2	4
20a	Acceptable design of the river crossing (visual)	nvironment	2	2	4
20b	Acceptable design of the river crossing (visual)	commercia	2	2	4
21a	ecological implications (SAC River Wye, White clawed cray fish, etc)	environamta	5	5	25
21b	ecological implications (SAC River Wye, White clawed cray fish, etc)	project	5	2	10
21c	ecological implications (SAC River Wye, White clawed cray fish, etc)	cost	5	1	5
22a	Impact of setting of listed buildings/parks and gardens	nvironment	5	4	20
22b	Impact of setting of listed buildings/parks and gardens	cost	5	2	10
22c	Impact of setting of listed buildings/parks and gardens	project	5	2	10
23a	Impact on Special wildlife site - southern bank of river Wye	nvironment	5	3	15
23b	Impact on Special wildlife site - southern bank of river Wye	cost	5	2	10
23c	Impact on Special wildlife site - southern bank of river Wye	programme	5	1	5
24a	Impact on residential community (amenity)	cost	4	2	8
24b	Impact on residential community (amenity)	programme	4	1	4
25a	Property Blight	cost	5	4	20
25b	Property Blight	programme	5	1	5
25c	Property Blight	nvironment	5	1	5
26a	waiting for the lands tribunial	commerica	5	2	10
26b	waiting for the lands tribunial	programme	5	1	5
27a	Ground conditions	cost	4	2	8
27b	Ground conditions	programme	4	2	8
28a	Changes in design standard (updated)	cost	2	2	4
28b	Changes in design standard (updated)	programme	2	2	4
29a	Changes in design standard (as a result of external influences such as climate change)	cost	2	2	4
29b	Changes in design standard (as a result of external influences such as climate change)	programme	2	2	4
30a	Local severence issues	nvironment	5	2	10
30b	Local severence issues	cost	5	1	5
31a	consent of statutory undertakers	cost	5	2	10
31b	consent of statutory undertakers	programme	5	3	15
32a	consent of statutory bodies (non approval of statutory bodies)	Programme	4	2	8
32b	consent of statutory bodies (non approval of statutory bodies)	project	4	2	8
32c	consent of statutory bodies (non approval of statutory bodies)	cost	4	2	8
33a	unexpected statutory consent required (eg unexpected Archeaological, ecological etc.)	cost	2	1	2
33b	unexpected statutory consent required (eg unexpected Archeaological, ecological etc.)	programme	2	4	8
34a	inaccuracy of demand forecasting	safety	2	4	8
34b	inaccuracy of demand forecasting	cost	2	2	4
34c	inaccuracy of demand forecasting	project	2	2	4
35a	Delivery of development (premature or delayed)	project	4	2	8
35b	Delivery of development (premature or delayed)	programme	4	3	12
35c	Delivery of development (premature or delayed)	commercia	4	5	20
36a	Redistribution of traffic as a result of phased approach	safety	4	4	16
36b	Redistribution of traffic as a result of phased approach	cost	4	1	4
37	Timing of CIL paymant (potential funding gap)	commercia	4	3	12
38	Section 106 timing	commercia	4	3	12
39	inflation	commercia	4	3	12
34a	contractors risk items	cost	5	2	10
34b	contractors risk items	programme	5	1	5
34c	contractors risk items	commercia	5	2	10
35a	Impact on aquifer (Water source protection)	nvironment	5	2	10
35b	Impact on aquifer (Water source protection)	cost	5	1	5
36	connection of successive phases (design)	project	3	5	15
37a	Impact on local Business (Golf Course)	cost	5	4	20
37b	Impact on local Business (Golf Course)	programme	5	1	5
37c	Impact on local Business (Golf Course)	project	5	1	5
38	timing and availability of public funding	programme	5	5	25
39a	Council staff resources	project	5	4	20
39b	Council staff resources	cost	5	1	5
39c	Council staff resources	programme	5	5	25
40a	Public rights of way (confirmation/identification and treatment)	Cost	5	1	5
40b	Public rights of way (confirmation/identification and treatment)	Programme	5	1	5
41a	connections to existing roads	cost	5	4	20
41b	connections to existing roads	programme	5	1	5
42a	unknown land ownership	cost	3	1	3
42b	unknown land ownership	programme	3	2	

Project Title:
A438-A4103 Three Elm Link
Design Stage

Likelihood			
Scale	Typical Range (%)		Value
Very Low	0%	10%	1
Low	10%	30%	2
Medium	30%	50%	3
High	50%	70%	4
Very High	70%	100%	5

Ref	Risk Description	Type	Risk Rating		
			Likelihood	Impact	Risk
1a	No fixed alignment (corridor of search)	Project	5	1	5
1b	No fixed alignment (corridor of search)	Cost	5	5	25
1c	No fixed alignment (corridor of search)	Programme	5	1	5
13	Need for additional capacity (Dualiling)	cost	2	5	10
2a	Public acceptability	Project	2	1	2
2b	Public acceptability	Programme	2	1	2
2c	Public acceptability	Cost	2	1	2
3a	Local action groups	Project	5	2	10
3b	Local action groups	programme	5	5	25
3c	Local action groups	cost	5	1	5
4a	Town and parish Council acceptability	project	5	4	
4b	Town and parish Council acceptability	Programme	5	5	
4c	Town and parish Council acceptability	cost	5	1	
5a	Public inquiry/Legal challenge Core Strategy	Project	4	5	20
5b	Public inquiry/Legal challenge Core Strategy	Programme	4	5	20
5c	Public inquiry/Legal challenge Core Strategy	Cost	4	3	12
6a	CPO	Project	5	4	20
6b	CPO	Programme	5	5	25
6c	CPO	Cost	5	1	5
8a	Acceptable economic case based on phasing (as defined	Project	3	5	15
8b	Acceptable economic case based on phasing (as defined	Cost	3	1	3
9	Changing Political administration (locally)	Project	3	5	15
10	Political lack of support for the western corridor	Project	4	2	8
11	Programme management and Governance	project	5	5	25
12a	Political approval for project decisions	project	5	3	15
12b	Political approval for project decisions	programme	5	5	25
14a	Adoption of the route by the Highways Agency (i.e if Agenc	project	1	1	1
14b	Adoption of the route by the Highways Agency (i.e if Agenc	cost	1	1	1
14c	Adoption of the route by the Highways Agency (i.e if Agenc	commercia	1	1	1
15a	Highways Agency agreement	project	2	5	10
15b	Highways Agency agreement	programme	2	2	4
43a	crossing the Yazor Brook - flood issue (flooding during con	cost	2	1	2
43b	crossing the Yazor Brook - flood issue (flooding during con	programme	2	1	2
43c	crossing the Yazor Brook - flood issue (flooding during con	nvironment	2	1	2
21d	ecological implications	nvironamta	3	3	9
21e	ecological implications	project	3	2	6
21f	ecological implications	cost	3	1	3
22a	Impact of setting of listed buildings/parks and gardens	nvironment	5	4	20
22b	Impact of setting of listed buildings/parks and gardens	cost	5	2	10
22c	Impact of setting of listed buildings/parks and gardens	project	5	2	10
24a	Impact on residential community (amenity)	cost	4	2	8
24b	Impact on residential community (amenity)	programme	4	1	4
25a	Property Blight	cost	5	4	20
25b	Property Blight	programme	5	1	5
25c	Property Blight	nvironment	5	1	5
26a	waiting for the lands tribunial	commerica	5	2	10
26b	waiting for the lands tribunial	programme	5	1	5
27a	Ground conditions	cost	3	2	6
27b	Ground conditions	programme	3	2	6
28a	Changes in design standard (updated)	cost	2	2	4
28b	Changes in design standard (updated)	programme	2	2	4
29a	Changes in design standard (as a result of external influen	cost	2	2	4
29b	Changes in design standard (as a result of external influen	programme	2	2	4
30a	Local severence issues	nvironment	5	2	10
30b	Local severence issues	cost	5	1	5
31a	consent of statutory undertakers (including MOD)	cost	5	2	10
31b	consent of statutory undertakers	programme	5	3	15
32a	consent of statutory bodies (non approval of statutory bodi	Programme	4	2	8
32b	consent of statutory bodies (non approval of statutory bodi	project	4	2	8
32c	consent of statutory bodies (non approval of statutory bodi	cost	4	2	8
33a	unexpected statutory consent required (eg unexpected Arc	cost	2	1	2
33b	unexpected statutory consent required (eg unexpected Arc	programme	2	4	8
34a	inaccuracy of demand forecasting	safety	2	4	8
34b	inaccuracy of demand forecasting	cost	2	2	4
34c	inaccuracy of demand forecasting	project	2	2	4
35a	Delivery of development (premature or delayed)	project	4	2	8
35b	Delivery of development (premature or delayed)	programme	4	3	12
35c	Delivery of development (premature or delayed)	commercia	4	5	20
36a	Redistribution of traffic as a result of phased approach	safety	1	4	4
36b	Redistribution of traffic as a result of phased approach	cost	1	1	1
37	Timing of CIL paymant (potential funding gap)	commercia	4	3	12
38	Section 106 timing	commercia	4	3	12
39	inflation	commercia	4	3	12
34a	contractors risk items	cost	5	2	10
34b	contractors risk items	programme	5	1	5
34c	contractors risk items	commercia	5	2	10
35a	Impact on aquifer (Water source protection)	nvironment	5	2	10
35b	Impact on aquifer (Water source protection)	cost	5	1	5
36	connection of successive phases (design)	project	3	5	15
38	timing and availability of public funding	programme	5	5	25
39a	Council staff resources	project	5	4	20
39b	Council staff resources	cost	5	1	5
39c	Council staff resources	programme	5	5	25
44a	Impact on the Roman Road	environmer	3	2	6
44b	Impact on the Roman Road	cost	3	2	6
44c	Impact on the Roman Road	programme	3	4	12
40a	Public rights of way (confirmation/identification and treatme	Cost	5	1	5
40b	Public rights of way (confirmation/identification and treatme	Programm	5	1	5
41a	connections to existing roads	cost	5		0
41b	connections to existing roads	programme	5	1	5
42a	unknown land ownership	cost	3	1	3
42b	unknown land ownership	programme	3	2	6

Project Title:
A4103-A49
Design Stage

Likelihood			
Scale	Typical Range (%)		Value
Very Low	0%	10%	1
Low	10%	30%	2
Medium	30%	50%	3
High	50%	70%	4
Very High	70%	100%	5

Project
Env
Cost
Prog
Comm'l
Safety

Ref	Risk Description	Type	Risk Rating		
			Likelihood	Impact	Risk
1a	No fixed alignment (corridor of search)	Project	5	1	5
1b	No fixed alignment (corridor of search)	Cost	5	5	25
1c	No fixed alignment (corridor of search)	Programme	5	1	5
13	Need for additional capacity (Dualiling)	cost	2	5	10
2a	Public acceptability	Project	5	2	10
2b	Public acceptability	Programme	5	2	10
2c	Public acceptability	Cost	5	1	5
3a	Local action groups	Project	5	3	15
3b	Local action groups	programme	5	5	25
3c	Local action groups	cost	5	1	5
4a	Town and parish Council acceptability	project	5	4	
4b	Town and parish Council acceptability	Programme	5	5	
4c	Town and parish Council acceptability	cost	5	1	
5a	Public inquiry/Legal challenge Core Strategy	Project	4	5	20
5b	Public inquiry/Legal challenge Core Strategy	Programme	4	5	20
5c	Public inquiry/Legal challenge Core Strategy	Cost	4	3	12
6a	CPO	Project	5	4	20
6b	CPO	Programme	5	5	25
6c	CPO	Cost	5	2	10
8a	Acceptable economic case based on phasing (as defined in	Project	3	5	15
8b	Acceptable economic case based on phasing (as defined in	Cost	3	2	6
9	Changing Political administration (locally)	Project	3	5	15
10	Political lack of support for the western corridor	Project	4	2	8
11	Programme management and Governance	project	5	5	25
12a	Political approval for project decisions	project	5	3	15
12b	Political approval for project decisions	programme	5	5	25
14a	Adoption of the route by the Highways Agency (i.e if Agency	project	1	1	1
14b	Adoption of the route by the Highways Agency (i.e if Agency	cost	1	1	1
14c	Adoption of the route by the Highways Agency (i.e if Agency	commercia	1	1	1
15a	Highways Agency agreement	project	2	5	10
15b	Highways Agency agreement	programme	2	2	4
21d	ecological implications	environamta	3	3	9
21e	ecological implications	project	3	2	6
21f	ecological implications	cost	3	1	3
22a	Impact of setting of historic parks and gardens	nvironment	5	4	20
22b	Impact of setting of historic parks and gardens	cost	5	2	10
22c	Impact of setting of historic parks and gardens	project	5	2	10
24a	Impact on residential community (amenity)	cost	5	2	10
24b	Impact on residential community (amenity)	programme	5	1	5
25a	Property Blight	cost	3	2	6
25b	Property Blight	programme	3	1	3
25c	Property Blight	nvironment	3	1	3
26a	waiting for the lands tribunial	commerica	5	2	10
26b	waiting for the lands tribunial	programme	5	1	5
27a	Ground conditions	cost	3	2	6
27b	Ground conditions	programme	3	2	6
28a	Changes in design standard (updated)	cost	2	2	4
28b	Changes in design standard (updated)	programme	2	2	4
29a	Changes in design standard (as a result of external influenc	cost	2	2	4
29b	Changes in design standard (as a result of external influenc	programme	2	2	4
30a	Local severence issues	nvironment	5	2	10
30b	Local severence issues	cost	5	1	5
31a	consent of statutory undertakers (overhead cables)	cost	5	2	10
31b	consent of statutory undertakers	programme	5	2	10
32a	consent of statutory bodies (non approval of statutory bodie	Programme	4	2	8
32b	consent of statutory bodies (non approval of statutory bodie	project	4	2	8
32c	consent of statutory bodies (non approval of statutory bodie	cost	4	2	8
33a	unexpected statutory consent required (eg unexpected Arcl	cost	2	1	2
33b	unexpected statutory consent required (eg unexpected Arcl	programme	2	4	8
34a	inaccuracy of demand forecasting	safety	2	4	8
34b	inaccuracy of demand forecasting	cost	2	2	4
34c	inaccuracy of demand forecasting	project	2	2	4
35a	Delivery of development (premature or delayed)	project	4	2	8
35b	Delivery of development (premature or delayed)	programme	4	3	12
35c	Delivery of development (premature or delayed)	commercia	4	5	20
36a	Redistribution of traffic as a result of phased approach	safety	2	2	4
36b	Redistribution of traffic as a result of phased approach	cost	2	1	2
37	Timing of CIL paymant (potential funding gap)	commercia	4	3	12
38	Section 106 timing	commercia	4	3	12
39	inflation	commercia	4	3	12
34a	contractors risk items	cost	5	2	10
34b	contractors risk items	programme	5	1	5
34c	contractors risk items	commercia	5	2	10
36	connection of successive phases (design)	project	3	5	15
38	timing and availability of public funding	programme	5	5	25
39a	Council staff resources	project	5	4	20
39b	Council staff resources	cost	5	1	5
39c	Council staff resources	programme	5	5	25
40a	Public rights of way (confirmation/identification and treatmer	Cost	5	1	5
40b	Public rights of way (confirmation/identification and treatmer	Programme	5	1	5
41a	connections to existing roads	cost	5	4	20
41b	connections to existing roads	programme	5	1	5
42a	unknown land ownership	cost	3	1	3
42b	unknown land ownership	programme	3	2	6
45	Review of vertical alignment in relation to structureover Tillir	project	5	2	10

Project Title:
A49 - A4103
Design Stage

Likelihood			
Scale	Typical Range (%)		Value
Very Low	0%	10%	1
Low	10%	30%	2
Medium	30%	50%	3
High	50%	70%	4
Very High	70%	100%	5

Ref	Risk Description	Type	Risk Rating		
			Likelihood	Impact	Risk
1a	No fixed alignment (corridor of search)	Project	5	1	5
1b	No fixed alignment (corridor of search)	Cost	5	5	25
1c	No fixed alignment (corridor of search)	Programme	5	1	5
2a	Public acceptability	Project	5	2	10
2b	Public acceptability	Programme	5	2	10
2c	Public acceptability	Cost	5	1	5
3a	Local action groups	Project	5	3	15
3b	Local action groups	programme	5	5	25
3c	Local action groups	cost	5	1	5
4a	Town and parish Council acceptability	project	5	4	
4b	Town and parish Council acceptability	Programme	5	5	
4c	Town and parish Council acceptability	cost	5	1	
5a	Public inquiry/Legal challenge Core Strategy	Project	4	5	20
5b	Public inquiry/Legal challenge Core Strategy	Programme	4	5	20
5c	Public inquiry/Legal challenge Core Strategy	Cost	4	3	12
6a	CPO	Project	5	4	20
6b	CPO	Programme	5	5	25
6c	CPO	Cost	5	2	10
8a	Acceptable economic case based on phasing (as defined i	Project	3	5	15
8b	Acceptable economic case based on phasing (as defined i	Cost	3	2	6
9	Changing Political administration (locally)	Project	3	5	15
10	Political lack of support for the western corridor	Project	4	2	8
11	Programme management and Governance	project	5	5	25
12a	Political approval for project decisions	project	5	3	15
12b	Political approval for project decisions	programme	5	5	25
15a	Highways Agency agreement	project	1	5	5
15b	Highways Agency agreement	programme	1	2	2
21d	ecological implications	nvironamta	3	3	9
21e	ecological implications	project	3	2	6
21f	ecological implications	cost	3	1	3
24a	Impact on residential community (amenity)	cost	5	2	10
24b	Impact on residential community (amenity)	programme	5	1	5
25a	Property Blight	cost	4	3	12
25b	Property Blight	programme	4	1	4
25c	Property Blight	nvironment	4	1	4
26a	waiting for the lands tribunial	commerica	5	2	10
26b	waiting for the lands tribunial	programme	5	1	5
27a	Ground conditions	cost	3	2	6
27b	Ground conditions	programme	3	2	6
28a	Changes in design standard (updated)	cost	2	2	4
28b	Changes in design standard (updated)	programme	2	2	4
29a	Changes in design standard (as a result of external influen	cost	2	2	4
29b	Changes in design standard (as a result of external influen	programme	2	2	4
30a	Local severence issues	nvironment	5	2	10
30b	Local severence issues	cost	5	1	5
31a	consent of statutory undertakers (overhead cables)	cost	5	4	20
31b	consent of statutory undertakers	programme	5	4	20
32a	consent of statutory bodies (non approval of statutory bodi	Programme	4	2	8
32b	consent of statutory bodies (non approval of statutory bodi	project	4	2	8
32c	consent of statutory bodies (non approval of statutory bodi	cost	4	2	8
33a	unexpected statutory consent required (eg unexpected Arc	cost	2	1	2
33b	unexpected statutory consent required (eg unexpected Arc	programme	2	4	8
34a	inaccuracy of demand forecasting	safety	2	4	8
34b	inaccuracy of demand forecasting	cost	2	2	4
34c	inaccuracy of demand forecasting	project	2	2	4
35a	Delivery of development (premature or delayed)	project	4	2	8
35b	Delivery of development (premature or delayed)	programme	4	3	12
35c	Delivery of development (premature or delayed)	commercia	4	5	20
36a	Redistribution of traffic as a result of phased approach	safety	2	2	4
36b	Redistribution of traffic as a result of phased approach	cost	2	1	2
37	Timing of CIL paymant (potential funding gap)	commercia	4	3	12
38	Section 106 timing	commercia	4	3	12
39	inflation	commercia	4	3	12
34a	contractors risk items	cost	5	2	10
34b	contractors risk items	programme	5	1	5
34c	contractors risk items	commercia	5	2	10
36	connection of successive phases (design)	project	3	5	15
37d	Impact on local Business Rose Garden public house	cost	5	1	5
37e	Impact on local Business Rose Garden public house	programme	5	1	5
37f	Impact on local Business Rose Garden public house	project	5	1	5
38	timing and availability of public funding	programme	5	5	25
39a	Council staff resources	project	5	4	20
39b	Council staff resources	cost	5	1	5
39c	Council staff resources	programme	5	5	25
40a	Public rights of way (confirmation/identification and treatm	Cost	5	1	5
40b	Public rights of way (confirmation/identification and treatm	Programme	5	1	5
41a	connections to existing roads	cost	5	4	20
41b	connections to existing roads	programme	5	1	5
42a	unknown land ownership	cost	3	1	3
42b	unknown land ownership	programme	3	2	6
46	Review of vertical alignment	project	5	3	15
47a	gas line (high pressure) - blast zone	project	5	5	25
47b	gas line (high pressure) - blast zone	programme	5	4	20
47c	gas line (high pressure) - blast zone	cost	5	4	20
48a	Rail crossing	project	5	5	25
48b	Rail crossing	programme	5	5	25
48c	Rail crossing	cost	5	4	20
49a	electricity lines	project	5	5	25
49b	electricity lines	programme	5	5	25
49c	electricity lines	cost	5	4	20
50a	canal crossing (Hereford and Glouster canal trust) is it a st	project	5	4	20
50b	canal crossing (Hereford and Glouster canal trust) is it a st	programme	5	5	25
50c	canal crossing (Hereford and Glouster canal trust) is it a st	cost	5	3	15

Project Title:
WRR

Design Stage

Likelihood			
Scale	Typical Range (%)		Value
Very Low	0%	10%	1
Low	10%	30%	2
Medium	30%	50%	3
High	50%	70%	4
Very High	70%	100%	5

Ref	Risk Description	Type	Risk Rating		
			Likelihood	Impact	Risk
1a	No fixed alignment (corridor of search)	Project	5	1	5
1b	No fixed alignment (corridor of search)	Cost	5	5	25
1c	No fixed alignment (corridor of search)	Programme	5	1	5
13	Need for additional capacity (Dualliling)	cost	2	5	10
2a	Public acceptability	Project	5	2	10
2b	Public acceptability	Programme	5	2	10
2c	Public acceptability	Cost	5	1	5
3a	Local action groups	Project	5	3	15
3b	Local action groups	programme	5	5	25
3c	Local action groups	cost	5	1	5
4a	Town and parish Council acceptability	project	5	4	
4b	Town and parish Council acceptability	Programme	5	5	
4c	Town and parish Council acceptability	cost	5	1	
5a	Public inquiry/Legal challenge Core Strategy	Project	4	5	20
5b	Public inquiry/Legal challenge Core Strategy	Programme	4	5	20
5c	Public inquiry/Legal challenge Core Strategy	Cost	4	3	12
6a	CPO	Project	5	4	20
6b	CPO	Programme	5	5	25
6c	CPO	Cost	5	1	5
7a	National Planning Framework Comission (DCO)	Programme	1	5	5
7b	National Planning Framework Comission (DCO)	Cost	1	1	1
7c	National Planning Framework Comission (DCO)	Project	1	2	2
8a	Acceptable economic case based on phasing (as defined in the 5 case model)	Project	2	5	10
8b	Acceptable economic case based on phasing (as defined in the 5 case model)	Cost	2	1	2
9	Changing Political administration (locally)	Project	3	5	15
10	Political lack of support for the western corridor	Project	4	2	8
11	Programme management and Governance	project	5	5	25
12a	Political approval for project decisions	project	5	3	15
12b	Political approval for project decisions	programme	5	5	25
14a	Adoption of the route by the Highways Agency (i.e if Agency require redesign or improve	project	1	1	1
14b	Adoption of the route by the Highways Agency (i.e if Agency require redesign or improve	cost	1	1	1
14c	Adoption of the route by the Highways Agency (i.e if Agency require redesign or improve	commercial	1	1	1
15a	Highways Agency agreement	project	2	5	10
15b	Highways Agency agreement	programme	2	2	4
16a	Scheme definition and relationship with the the transport strategy - detrunking of the A4	project	1	1	1
16b	Scheme definition and relationship with the the transport strategy - detrunking of the A4	commercial	1	2	2
17a	crossing the River Wye - ground conditions	cost	3	4	12
17b	crossing the River Wye - ground conditions	Programme	3	1	3
18a	crossing the River Wye - flood issue (flooding during construction)	cost	2	1	2
18b	crossing the River Wye - flood issue (flooding during construction)	programme	2	1	2
18c	crossing the River Wye - flood issue (flooding during construction)	nvironment	2	1	2
19a	Acceptable design of the river crossing (design of the bridge is unacceptable)	programme	2	3	6
19b	Acceptable design of the river crossing (design of the bridge is unacceptable)	cost	2	2	4
20a	Acceptable design of the river crossing (visual)	nvironment	2	2	4
20b	Acceptable design of the river crossing (visual)	commercial	2	2	4
21a	ecological implications (SAC River Wye, White clawed cray fish, etc)	nvironamta	5	5	25
21b	ecological implications (SAC River Wye, White clawed cray fish, etc)	project	5	2	10
21c	ecological implications (SAC River Wye, White clawed cray fish, etc)	cost	5	1	5
21d	ecological implications (Elm Link - A49-A4103)	nvironamta	3	3	9
21e	ecological implications (Elm Link - A49-A4103)	project	3	2	6
21f	ecological implications (Elm Link - A49-A4103)	cost	3	1	3
22a	Impact of setting of listed buildings/parks and gardens	nvironment	5	4	20
22b	Impact of setting of listed buildings/parks and gardens	cost	5	2	10
22c	Impact of setting of listed buildings/parks and gardens	project	5	2	10
23a	Impact on Special wildlife site - southern bank of river Wye	nvironment	5	3	15
23b	Impact on Special wildlife site - southern bank of river Wye	cost	5	2	10
23c	Impact on Special wildlife site - southern bank of river Wye	programme	5	1	5
24a	Impact on residential community (amenity)	cost	4	2	8
24b	Impact on residential community (amenity)	programme	4	1	4
25a	Property Blight	cost	5	4	20
25b	Property Blight	programme	5	1	5
25c	Property Blight	nvironment	5	1	5
26a	waiting for the lands tribunial	commerical	5	2	10
26b	waiting for the lands tribunial	programme	5	1	5
27a	Ground conditions	cost	4	2	8
27b	Ground conditions	programme	4	2	8
28a	Changes in design standard (updated)	cost	2	2	4
28b	Changes in design standard (updated)	programme	2	2	4
29a	Changes in design standard (as a result of external influences such as climate change)	cost	2	2	4
29b	Changes in design standard (as a result of external influences such as climate change)	programme	2	2	4
30a	Local severence issues	nvironment	5	2	10
30b	Local severence issues	cost	5	1	5
31a	consent of statutory undertakers	cost	5	2	10
31b	consent of statutory undertakers	programme	5	3	15
32a	consent of statutory bodies (non approval of statutory bodies)	Programme	4	2	8
32b	consent of statutory bodies (non approval of statutory bodies)	project	4	2	8
32c	consent of statutory bodies (non approval of statutory bodies)	cost	4	2	8
33a	unexpected statutory consent required (eg unexpected Archeaological, ecological etc.)	cost	2	1	2
33b	unexpected statutory consent required (eg unexpected Archeaological, ecological etc.)	programme	2	4	8
34a	inaccuracy of demand forecasting	safety	2	4	8
34b	inaccuracy of demand forecasting	cost	2	2	4
34c	inaccuracy of demand forecasting	project	2	2	4
35a	Delivery of development (premature or delayed)	project	4	2	8
35b	Delivery of development (premature or delayed)	programme	4	3	12
35c	Delivery of development (premature or delayed)	commercial	4	5	20
36a	Redistribution of traffic as a result of phased approach	safety	4	4	16
36b	Redistribution of traffic as a result of phased approach	cost	4	1	4
37	Timing of CIL paymant (potential funding gap)	commercial	4	3	12
38	Section 106 timing	commercial	4	3	12
39	inflation	commercial	4	3	12
34a	contractors risk items	cost	5	2	10
34b	contractors risk items	programme	5	1	5
34c	contractors risk items	commercial	5	2	10
35a	Impact on aquifer (Water source protection)	nvironment	5	2	10
35b	Impact on aquifer (Water source protection)	cost	5	1	5
36	connection of successive phases (design)	project	3	5	15
37a	Impact on local Business (Golf Course)	cost	5	4	20
37b	Impact on local Business (Golf Course)	programme	5	1	5
37c	Impact on local Business (Golf Course)	project	5	1	5
37d	Impact on local Business Rose Garden public house	cost	5	1	5
37e	Impact on local Business Rose Garden public house	programme	5	1	5
37f	Impact on local Business Rose Garden public house	project	5	1	5
38	timing and availability of public funding	programme	5	5	25
39a	Council staff resources	project	5	4	20
39b	Council staff resources	cost	5	1	5
39c	Council staff resources	programme	5	5	25
40a	Public rights of way (confirmation/identification and treatment)	Cost	5	1	5
40b	Public rights of way (confirmation/identification and treatment)	Programme	5	1	5
41a	connections to existing roads	cost	5	4	20
41b	connections to existing roads	programme	5	1	5
42a	unknown land ownership	cost	3	1	3
42b	unknown land ownership	programme	3	2	
43a	crossing the Yazor Brook - flood issue (flooding during construction)	cost	2	1	2
43b	crossing the Yazor Brook - flood issue (flooding during construction)	programme	2	1	2
43c	crossing the Yazor Brook - flood issue (flooding during construction)	nvironment	2	1	2
44a	Impact on the Roman Road	environmer	3	2	6
44b	Impact on the Roman Road	cost	3	2	6
44c	Impact on the Roman Road	programme	3	4	12
45	Review of vertical alignment in relation to structureover Tillington Road		5	2	10
46	Review of vertical alignment	project	5	3	15
47a	gas line (high pressure) - blast zone	project	5	5	25
47b	gas line (high pressure) - blast zone	programme	5	4	20
47c	gas line (high pressure) - blast zone	cost	5	4	20
48a	Rail crossing	project	5	5	25
48b	Rail crossing	programme	5	5	25
48c	Rail crossing	cost	5	4	20
49a	electricity lines	project	5	5	25
49b	electricity lines	programme	5	5	25
49c	electricity lines	cost	5	4	20
50a	canal crossing (Hereford and Glouster canal trust) is it a statutory right of navigation	project	5	4	20
50b	canal crossing (Hereford and Glouster canal trust) is it a statutory right of navigation	programme	5	5	25
50c	canal crossing (Hereford and Glouster canal trust) is it a statutory right of navigation	cost	5	3	15

Project Title:
WRR - Half Moon
Design Stage

Ref	Risk Description	Type	Risk Rating		
			Likelihood	Impact	Risk
1a	No fixed alignment (corridor of search)	Project	5	1	5
1b	No fixed alignment (corridor of search)	Cost	5	5	25
1c	No fixed alignment (corridor of search)	Programme	5	1	5
13	Need for additional capacity (Dualiling)	cost	2	5	10
2a	Public acceptability	Project	5	2	10
2b	Public acceptability	Programme	5	2	10
2c	Public acceptability	Cost	5	1	5
3a	Local action groups	Project	5	3	15
3b	Local action groups	programme	5	5	25
3c	Local action groups	cost	5	1	5
4a	Town and parish Council acceptability	project	5	4	
4b	Town and parish Council acceptability	Programme	5	5	
4c	Town and parish Council acceptability	cost	5	1	
5a	Public inquiry/Legal challenge Core Strategy	Project	4	5	20
5b	Public inquiry/Legal challenge Core Strategy	Programme	4	5	20
5c	Public inquiry/Legal challenge Core Strategy	Cost	4	3	12
6a	CPO	Project	5	4	20
6b	CPO	Programme	5	5	25
6c	CPO	Cost	5	1	5
7a	National Planning Framework Comission (DCO)	Programme	1	5	5
7b	National Planning Framework Comission (DCO)	Cost	1	1	1
7c	National Planning Framework Comission (DCO)	Project	1	2	2
8a	Acceptable economic case based on phasing (as defined in the 5 case model)	Project	2	5	10
8b	Acceptable economic case based on phasing (as defined in the 5 case model)	Cost	2	1	2
9	Changing Political administration (locally)	Project	3	5	15
10	Political lack of support for the western corridor	Project	4	2	8
11	Programme management and Governance	project	5	5	25
12a	Political approval for project decisions	project	5	3	15
12b	Political approval for project decisions	programme	5	5	25
14a	Adoption of the route by the Highways Agency (i.e if Agency require redesign or impr	project	1	1	1
14b	Adoption of the route by the Highways Agency (i.e if Agency require redesign or impr	cost	1	1	1
14c	Adoption of the route by the Highways Agency (i.e if Agency require redesign or impr	commercia	1	1	1
15a	Highways Agency agreement	project	2	5	10
15b	Highways Agency agreement	programme	2	2	4
16a	Scheme definition and relationship with the the transport strategy - detrunking of the	project	1	1	1
16b	Scheme definition and relationship with the the transport strategy - detrunking of the	commercia	1	2	2
17a	crossing the River Wye - ground conditions	cost	3	4	12
17b	crossing the River Wye - ground conditions	Programme	3	1	3
18a	crossing the River Wye - flood issue (flooding during construction)	cost	2	1	2
18b	crossing the River Wye - flood issue (flooding during construction)	programme	2	1	2
18c	crossing the River Wye - flood issue (flooding during construction)	nvironment	2	1	2
19a	Acceptable design of the river crossing (design of the bridge is unacceptable)	programme	2	3	6
19b	Acceptable design of the river crossing (design of the bridge is unacceptable)	cost	2	2	4
20a	Acceptable design of the river crossing (visual)	nvironment	2	2	4
20b	Acceptable design of the river crossing (visual)	commercia	2	2	4
21a	ecological implications (SAC River Wye, White clawed cray fish, etc)	nvironamta	5	5	25
21b	ecological implications (SAC River Wye, White clawed cray fish, etc)	project	5	2	10
21c	ecological implications (SAC River Wye, White clawed cray fish, etc)	cost	5	1	5
21d	ecological implications (Elm Link - A49-A4103)	nvironamta	3	3	9
21e	ecological implications (Elm Link - A49-A4103)	project	3	2	6
21f	ecological implications (Elm Link - A49-A4103)	cost	3	1	3
22a	Impact of setting of listed buildings/parks and gardens	nvironment	5	4	20
22b	Impact of setting of listed buildings/parks and gardens	cost	5	2	10
22c	Impact of setting of listed buildings/parks and gardens	project	5	2	10
23a	Impact on Special wildlife site - southern bank of river Wye	nvironment	5	3	15
23b	Impact on Special wildlife site - southern bank of river Wye	cost	5	2	10
23c	Impact on Special wildlife site - southern bank of river Wye	programme	5	1	5
24a	Impact on residential community (amenity)	cost	4	2	8
24b	Impact on residential community (amenity)	programme	4	1	4
25a	Property Blight	cost	5	4	20
25b	Property Blight	programme	5	1	5
25c	Property Blight	nvironment	5	1	5
26a	waiting for the lands tribunial	commerica	5	2	10
26b	waiting for the lands tribunial	programme	5	1	5
27a	Ground conditions	cost	4	2	8
27b	Ground conditions	programme	4	2	8
28a	Changes in design standard (updated)	cost	2	2	4
28b	Changes in design standard (updated)	programme	2	2	4
29a	Changes in design standard (as a result of external influences such as climate chang	cost	2	2	4
29b	Changes in design standard (as a result of external influences such as climate chang	programme	2	2	4
30a	Local severence issues	nvironment	5	2	10

30b	Local severence issues	cost	5	1	5
31a	consent of statutory undertakers	cost	5	2	10
31b	consent of statutory undertakers	programme	5	3	15
32a	consent of statutory bodies (non approval of statutory bodies)	Programme	4	2	8
32b	consent of statutory bodies (non approval of statutory bodies)	project	4	2	8
32c	consent of statutory bodies (non approval of statutory bodies)	cost	4	2	8
33a	unexpected statutory consent required (eg unexpected Archeaological, ecological etc	cost	2	1	2
33b	unexpected statutory consent required (eg unexpected Archeaological, ecological etc	programme	2	4	8
34a	inaccuracy of demand forecasting	safety	2	4	8
34b	inaccuracy of demand forecasting	cost	2	2	4
34c	inaccuracy of demand forecasting	project	2	2	4
35a	Delivery of development (premature or delayed)	project	4	2	8
35b	Delivery of development (premature or delayed)	programme	4	3	12
35c	Delivery of development (premature or delayed)	commercia	4	5	20
36a	Redistribution of traffic as a result of phased approach	safety	4	4	16
36b	Redistribution of traffic as a result of phased approach	cost	4	1	4
37	Timing of CIL paymant (potential funding gap)	commercia	4	3	12
38	Section 106 timing	commercia	4	3	12
39	inflation	commercia	4	3	12
34a	contractors risk items	cost	5	2	10
34b	contractors risk items	programme	5	1	5
34c	contractors risk items	commercia	5	2	10
35a	Impact on aquifer (Water source protection)	nvironment	5	2	10
35b	Impact on aquifer (Water source protection)	cost	5	1	5
36	connection of successive phases (design)	project	3	5	15
37a	Impact on local Business (Golf Course)	cost	5	4	20
37b	Impact on local Business (Golf Course)	programme	5	1	5
37c	Impact on local Business (Golf Course)	project	5	1	5
38	timing and availability of public funding	programme	5	5	25
39a	Council staff resources	project	5	4	20
39b	Council staff resources	cost	5	1	5
39c	Council staff resources	programme	5	5	25
40a	Public rights of way (confirmation/identification and treatment)	Cost	5	1	5
40b	Public rights of way (confirmation/identification and treatment)	Programme	5	1	5
41a	connections to existing roads	cost	5	4	20
41b	connections to existing roads	programme	5	1	5
42a	unknown land ownership	cost	3	1	3
42b	unknown land ownership	programme	3	2	
43a	crossing the Yazor Brook - flood issue (flooding during construction)	cost	2	1	2
43b	crossing the Yazor Brook - flood issue (flooding during construction)	programme	2	1	2
43c	crossing the Yazor Brook - flood issue (flooding during construction)	nvironment	2	1	2
44a	Impact on the Roman Road	environme	3	2	6
44b	Impact on the Roman Road	cost	3	2	6
44c	Impact on the Roman Road	programme	3	4	12
45	Review of vertical alignment in relation to structureover Tillington Road		5	2	10