Shropshire Council

SHREWSBURY NORTH WEST RELIEF ROAD

Economic Appraisal Report

TR004
DECEMBER 2017

DRAFT

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WSP
Export House
Cawsey Way
Woking, Surrey
GU21 6QX

WSP.com

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Signature				
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1 INTRODUCTION

1.1 BACKGROUND

1.1.1. WSP (formerly Mouchel) was commissioned by Shropshire Council (SC) in March 2017 to prepare an Outline Business Case (OBC) for the proposed North West Relief Road (NWRR) in Shrewsbury.

1.1.2. The NWRR would provide a new single carriageway road in the north-west quadrant of Shrewsbury. Together with the A5 and A49 bypasses, the Oxon Link Road and the Battlefield Link Road, the NWRR would provide the missing link to provide a complete outer bypass of Shrewsbury.

1.1.3. The main effect of the NWRR would be to provide a shorter and more convenient route for long distance through traffic thereby removing this traffic from the town. It will also enable other journeys to transfer to more appropriate routes within the town's road hierarchy, thus releasing highway capacity by freeing-up road space on the north and west approaches to the town centre.

1.2 MODELLING AND ECONOMIC APPRAISAL

1.2.1. A traffic model was developed to provide traffic forecasts for the assessment of the proposed Shrewsbury North West Relief Road (NWRR). The model was developed using the SATURN software for a base year of (2017), using data from a number of sources including mobile phone network data to provide trip origins and destinations. The development and validation of the model to a 2017 base year is described in 'Shrewsbury NWRR, Local Model Validation Report – Ref TR-002, dated December 2017.

1.2.2. The 2017 model was the starting point for the development of traffic forecasts for the opening year of the proposed scheme, 2022 and design year, (15 after scheme opening). The forecasts provided the basis for assessing the operational impacts of the scheme in terms of changes in traffic flows and delays and journey times in the areas affected by the Scheme.

1.2.3. The development of the future year traffic forecasts are described in 'Shrewsbury NWRR, Forecast Report – Ref TR-003, dated December 2017. This also provides details of the future year traffic and operational conditions and an assessment of the impacts of the proposed Scheme. The forecasts provide a key input to the economic evaluation to support of the Outline Business Case (OBC) for the Scheme.

1.2.4. The economic evaluation contained within this report is based on the traffic forecasts reported in the Forecast Report. The forecasts were developed using a 'fixed demand' methodology i.e. demand was assumed not to change in response to changes in the costs of travel.

1.2.5. Forecasts are being prepared using a 'variable demand' methodology that includes behavioural responses to changes in travel costs as a result of the scheme. These forecasts will provide the basis for a further economic assessment that will include variable demand. This assessment will be presented in an update to this report anticipated in January 2018.

1.2.6. The Department for Transport (DfT) requires that an economic appraisal of a proposed scheme is undertaken using WebTAG guidance. The economic assessment determines whether the proposed scheme produces a satisfactory cost benefit ratio in economic terms, taking account of the scheme costs and the benefits and dis-benefits accruing to both users and the wider community.

1.3 PURPOSE AND CONTENTS OF REPORT

1.3.1. This report describes the procedures and data used for the production of the economic appraisal to support the Outline Business Case for the proposed NWRR scheme.

1.3.2. The economic appraisal described in this report is based upon the traffic forecasts developed from the 2017 Base Year model.

1.3.3. The scope of this report covers the derivation of monetary values for transport user benefits, accident benefits, environmental benefits/disbenefits in relation to greenhouse gases, and scheme costs. Value for money is presented in terms of a Benefit to Cost Ratio (BCR).

2 INTRODUCTION TO ECONOMIC APPRAISAL

2.1 SCOPE OF APPRAISAL

2.1.1. The economic appraisal of a highway scheme is an assessment of the net benefits to users and the wider community as a result of the road, set against the capital construction and operational costs, all as incurred over a 'whole life' period.

2.1.2. The economic appraisal of the Shrewsbury NWRR scheme has been prepared in accordance with the Green Book - Appraisal and Evaluation in Central Government ("the Green Book").

2.1.3. A full cost benefit analysis was required so that the proposed scheme could be assessed in 'value for money' terms. The appraisal comprised three components;

- Economic benefits to road users, including time savings and vehicle operating costs
- Accident savings and associated economic benefits
- Monetised benefits/disbenefits from changes to greenhouse gas emissions

2.1.4. The benefits from these 3 categories were combined and compared to costs to produce an initial BCR, as reported in detail in section 3.6 below.

2.1.5. The following additional assessments were carried out as part of the second stage of the value for money assessment:

- Wider economic benefits resulting from the scheme, now termed Wider Benefits. This was carried out using the WITA software.
- Journey time reliability benefits. This comprised economic benefits as a result of more reliable journey times.

2.1.6. This provided the basis for deriving an adjusted BCR, which is reported in section 3.8 below.

2.1.7. As noted in section 1.2 above, the economic evaluation within this report is underpinned by forecasts that have been developed using a 'fixed demand' methodology.

2.1.8. Forecasts are being prepared based upon 'variable demand' that takes into account behavioural responses to changes in travel costs as a result of the scheme that will provide the basis for a further economic assessment. The economic evaluation based upon variable demand forecasts will be presented in an update to this report.

2.2 METHODOLOGY

2.2.1. The calculation of economic benefits to road users (excluding accident benefits) was undertaken using the Department for Transport's (DfT) TUBA V.1.9.9 (Transport Users Benefit Appraisal) program.

2.2.2. TUBA compares the costs associated with the Do Minimum and Do Something scenarios to establish the value of the savings in travel time and vehicle operating costs. By comparing all construction and associated costs with the traffic benefits, conventionally over a 60 year period from the opening of the first phase, a Benefit to Cost Ratio (BCR) is calculated.

2.2.3. The assessment of accident benefits (the reduction in accident costs) as a result of the scheme was undertaken using the DfT's COBALT program. The assessment was undertaken using the current version of the COBALT economic parameter file 2017.1.

2.2.4. The assessment of the Wider Economic Benefits was carried out using the WITA software and is documented in section 3.8.

2.2.5. The assessment of benefits as a result of improvements in journey time reliability was assessed and also documented in section 3.8.

2.3 TRAFFIC MODELLING AND FORECASTS

2.3.1. The scheme has a significant impact in terms of its effect on traffic and has been assessed using a SATURN highway traffic model. As noted in Section 1.2 above, the traffic forecasts for the economic appraisal were derived from the 2017 Base Year traffic model and were developed assuming fixed demand approach i.e. demand did not change in response to changes in travel costs.

2.3.2. The SATURN model developed for the NWRR consists of three separate sub-models, for an AM peak, Inter Peak and PM peak period all of which have been validated at the base year of 2017.

2.3.3. The sub-models represent a peak hour average weekday (Monday to Friday) within the AM peak period (08:00-09:00), PM peak period (17:00-18:00) and average Inter peak period (10:00-16:00). The process by which the benefits identified for each model time period to be expanded to represent a whole year is described in section 2.5 below.

2.3.4. Traffic forecasts were developed for the opening year of each of the scheme (2022) and also for a design year of 2037, 15 years after full opening. The road user benefits were established based on these traffic forecasts by comparing the Do-Minimum and the Do-Something scenarios.

2.3.5. For the appraisal of the Scheme, the evaluation period covered 60 years after the opening year i.e. 2022. The final year of the evaluation period was therefore 2081. Traffic levels are assumed to remain constant after the design year of 2037 for the purpose of the economic appraisal.

2.3.6. The TUBA economic assessment only took account of benefits accruing within the 12 hour period from 7.00 to 19.00 hours on weekdays. While the scheme may continue to bring additional benefits during the off peak and weekends, these are not included in the current assessment.

2.4 EXTENT OF STUDY AREA

2.4.1. The detailed study area that encompasses the simulation area is presented in Figure 1 below. The study area primarily includes all of Shrewsbury with the A5 Felton Roundabout in the North West, Ellesmere Roundabout and the Battlefield Roundabout in the North, A5/ A49 Preston Island Roundabout in the East and A5 corridor in the South.

2.4.2. The wider study area covers the County of Shropshire and encompasses Welshpool and Telford. The remainder of England, Wales and Scotland be modelled as external loading points. The wider study area is illustrated in Figure 2.

2.4.3. The TUBA road user benefits, including the user time and operating costs, were assessed over the whole of the model area.

2.4.4. Accident data was collected and analysed for the detailed study area and this area coverage is presented in Figure 3 below. For the rest of the model area the national average accident rates by road type were adopted.

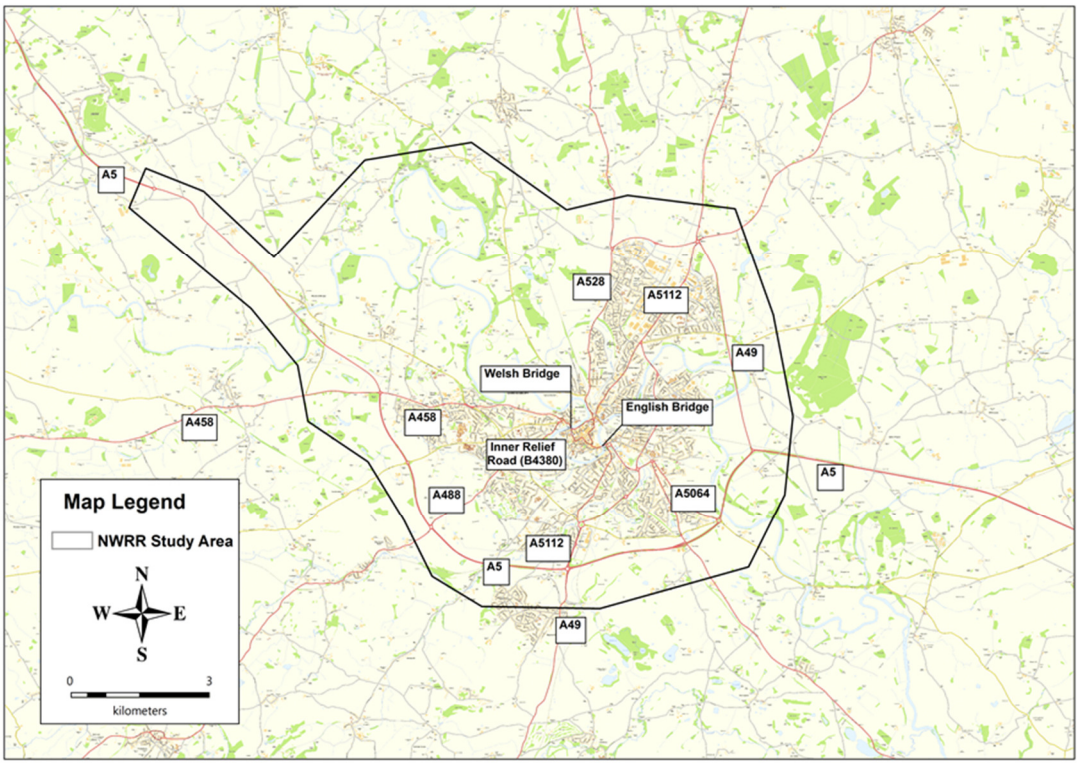

Figure 1 Detailed Study Area

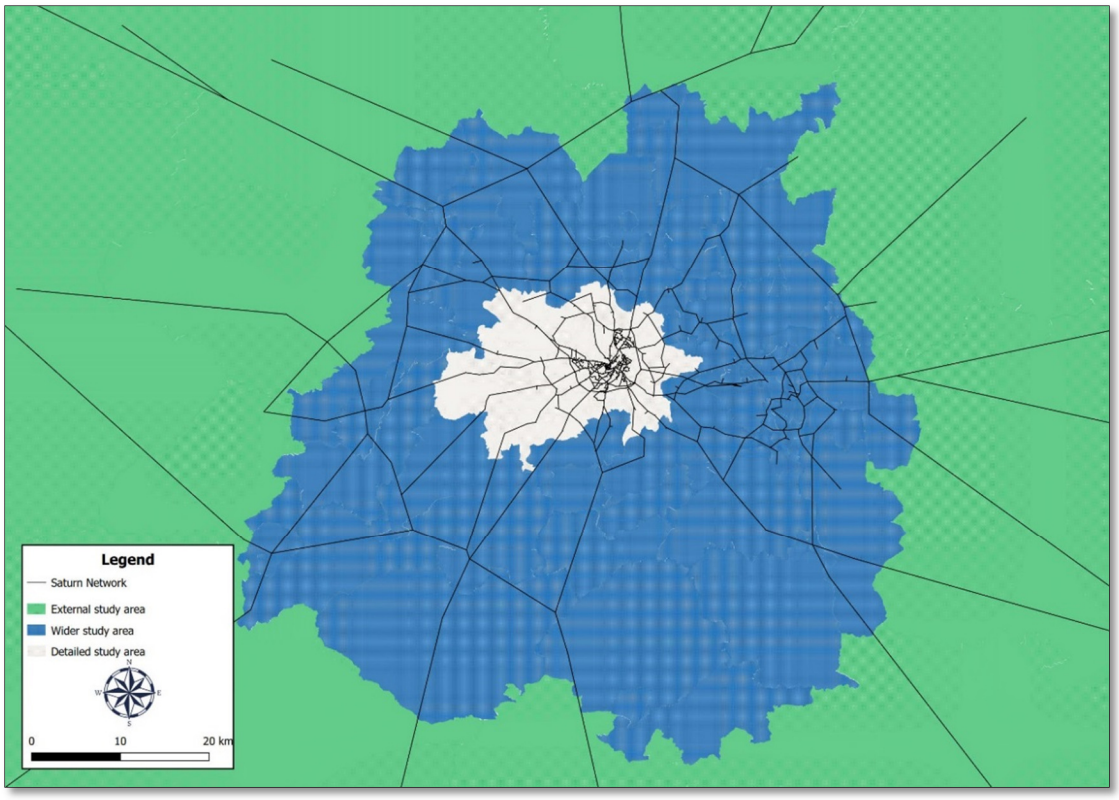

Figure 2 Wider Study Area

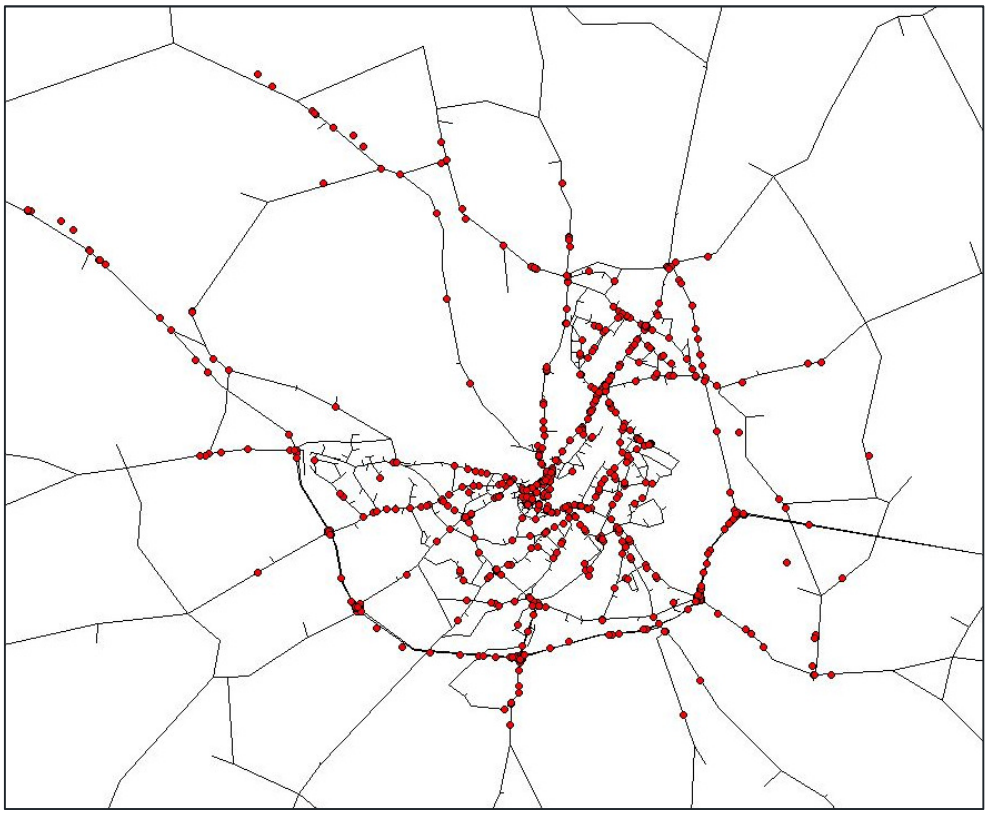

Figure 3 Extent of the Accident Data Collection

2.5 ANNUALISATION FACTORS

2.5.1. Annualisation factors are required so that the benefits identified for each model time period can be expanded to represent a whole year.

2.5.2. The annualisation factor for each TUBA time period also has to incorporate the number of times the period occurs per year, with the year divided up as follows:

- 253 normal weekdays;
- 52 weekends and
- 8 bank holidays

2.5.3. The annualisation factors were derived through analysis of data from long term Automatic Traffic Counters (ATC) and Manual Classified Counts (MCC) data and are presented in Table 1 below.

Table 1 Annualisation Factors

Time Slice	Time Period	Duration (mins)	Annualisation Factor
0700-1000	AM Period	60	648
1000-1600	IP Period	60	1518
1600-1900	PM Period	60	748

2.6 USER CLASSES

2.6.1. The economic appraisal of user time and vehicle operating costs, using TUBA, was based on the following 7 user classes:

- Car – Employers Business
- Car – Journey between home and work ("Commute")
- Car – Other trip purposes
- Light Goods Vehicle (LGV - Personal)
- Light Goods Vehicle (LGV- Freight)
- Heavy Goods Vehicle (OGV1)
- Heavy Goods Vehicle (OGV2)

2.6.2. The 5 user classes defined within the SATURN traffic model were split into the above 7 user classes by disaggregating LGVs and HGVs. LGV's were split into Personal and Freight and HGVs were split into Medium (OGV1) and Heavy Goods Vehicles (OGV2).

2.6.3. The disaggregation factors were derived using the WebTAG assumptions for LGV split between Personal and Freight. For HGVs the local vehicle composition based on traffic counts was used to split between OGV1 and OGV2.

2.6.4. The disaggregation factors are shown in Table 2 below.

Table 2 Disaggregation of LGVs and HGVs

LGVs		HGVs	
Personal	**Freight**	**OGV1**	**OGV2**
12%	88%	44.00%	56.00%

The economic appraisal of accident costs using COBALT was based on all of the user classes combined at AADT level, which is consistent with WebTAG guidance.

3 ECONOMIC APPRAISAL

3.1 INTRODUCTION

3.1.1. This Chapter describes and presents the results of the economic appraisal of the Shrewsbury North West Relief Road. It covers the assessment of transport user costs, monetised costs relating to greenhouse gas emissions, and scheme capital and operating costs.

3.1.2. The appraisal takes into account the costs of constructing the scheme, and the transport user costs. Transport user costs are determined for a) the without scheme scenario referred to as the Do-minimum and b) the with scheme scenario referred to as the Do-Something. Respective cost streams were calculated for each year of the evaluation period. The difference between the total Do-something and Do-minimum costs represents the overall scheme benefit.

3.2 TRANSPORT ECONOMIC EFFICIENCY (TEE) BENEFITS

3.2.1. The Transport Economic Efficiency (TEE) benefits consist of travel time and Vehicle Operating Cost (VOC) benefits as a result of the scheme.

3.2.2. The DfT program TUBA was used to assess the benefits arising from changes in journey times and vehicle operating costs which are calculated separately for Business Users and Consumer Users.

3.2.3. Business Benefits are the benefits accrued by business travellers, including car (and van) occupants travelling on employers business. This group also includes HGV drivers. Consumer Users are non-business travellers, in cars and vans.

3.2.4. Commuters are classed as consumers as they are travelling in their own time, not that of their employers.

3.2.5. TUBA uses standard values of time, based on average earnings, with the values for time in the course of work (employers business) being much higher than personal time (including commuting).

3.2.6. TUBA takes, as its principal input, zone to zone matrices of trip numbers, travel times and distances travelled. Values of time and operating costs are applied over a 60 year period and costs and benefit streams calculated.

3.2.7. WebTAG requires that cost should be presented in the Department for Transport's (DfT) base year which is 2010. These are then discounted to a present value year also defined by the DfT as 2010.

3.2.8. By subtracting the road user costs for the Do-Something case (i.e. with the scheme in place) from those for the Do-Minimum case (i.e. without the scheme in place) the net road user benefits are derived.

3.2.9. For the appraisal of road user costs, standard values of time, operating cost and other related economic parameters for traffic appraisal are applied, using the standard 'economic parameter data' available from the DfT TUBA website.

3.2.10. The journey time and vehicle operating costs represent the economic benefits that accrue to road travellers as a result of the scheme. They include savings in journey time and changes in vehicle operating costs, to Business Users and Consumer Users.

3.2.11. The vehicle operating costs are both distance and speed related, and include fuel costs and non-fuel costs, e.g. tyres, maintenance and depreciation, etc.

3.2.12. The benefits are calculated for all users of the network and include those who travel on the new road and those travelling on all existing roads. For example, while users of the Scheme

could experience time savings, users of the existing road network may also experience benefits as average speeds for journeys increase as a result of traffic relief.

3.2.13. The Transport Economic Efficiency (TEE) benefits of the scheme calculated from TUBA are presented in Table 3. Note that monetary values are shown as (£M) consistent with the TUBA output.

Table 3 Transport User Benefits from TUBA Assessment (£000)

Transport Economic Efficiency (TEE) Benefits		£,000s 2010 prices, discounted to 2010
Consumer – Commuting user benefits	Travel Time	72,556
	Vehicle operating costs	4,658
	Subtotal	**77,214**
Consumer – Other user benefits	Travel Time	117,184
	Vehicle operating costs	9,321
	Subtotal	**126,505**
Business benefits	Travel Time	77,473
	Vehicle operating costs	9,755
	Subtotal	**87,228**
Total TEE benefit		**290,947**

3.2.14. Figure 4 shows the road user benefits for each year of the economic appraisal period, presented in terms of 2010 prices, discounted to 2010.

3.2.15. This shows a steady increase in annual benefit up to 2037. Beyond 2037 no further traffic growth has been assumed so that discounted annual benefits progressively reduce the further they occur in the future.

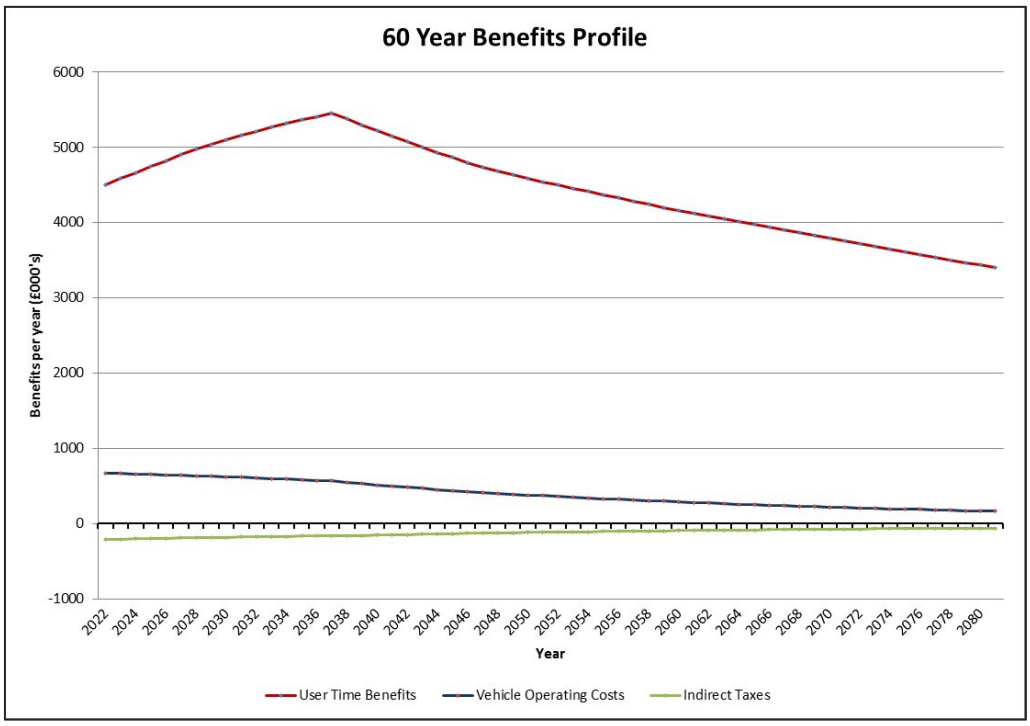

Figure 4 Road User Benefits by Year

3.2.16. Table 4 shows a breakdown of the discounted road user benefits from TUBA for each time period. This shows that the inter-peak accounts for about 30% of the total benefits, with the AM and PM peak periods contributing 34 and 36% respectively. Table 4 also shows that benefits per hour are higher in the AM and PM peak periods than in the Inter-peak, this is due lower congestion levels in the inter peak.

Table 4 TUBA Road User Benefits by Time Period (£000)

Time Period	Annualisation Factor	Total Road User Benefit (£000)	Proportion of Total Benefit	Benefit per hour (£000)
AM peak	648	98,211	34%	2.52
PM peak	748	105,281	36%	2.34
Inter-peak	1518	87,453	30%	0.96
Total	**2914**	290,945	**100%**	

*Above values excludes indirect tax and greenhouse gases

3.2.17. The spatial distribution of the benefits resulting from the scheme on a sector to sector basis is presented in Table 5. The sector pattern used for this analysis is illustrated in Figures 5 and 6.

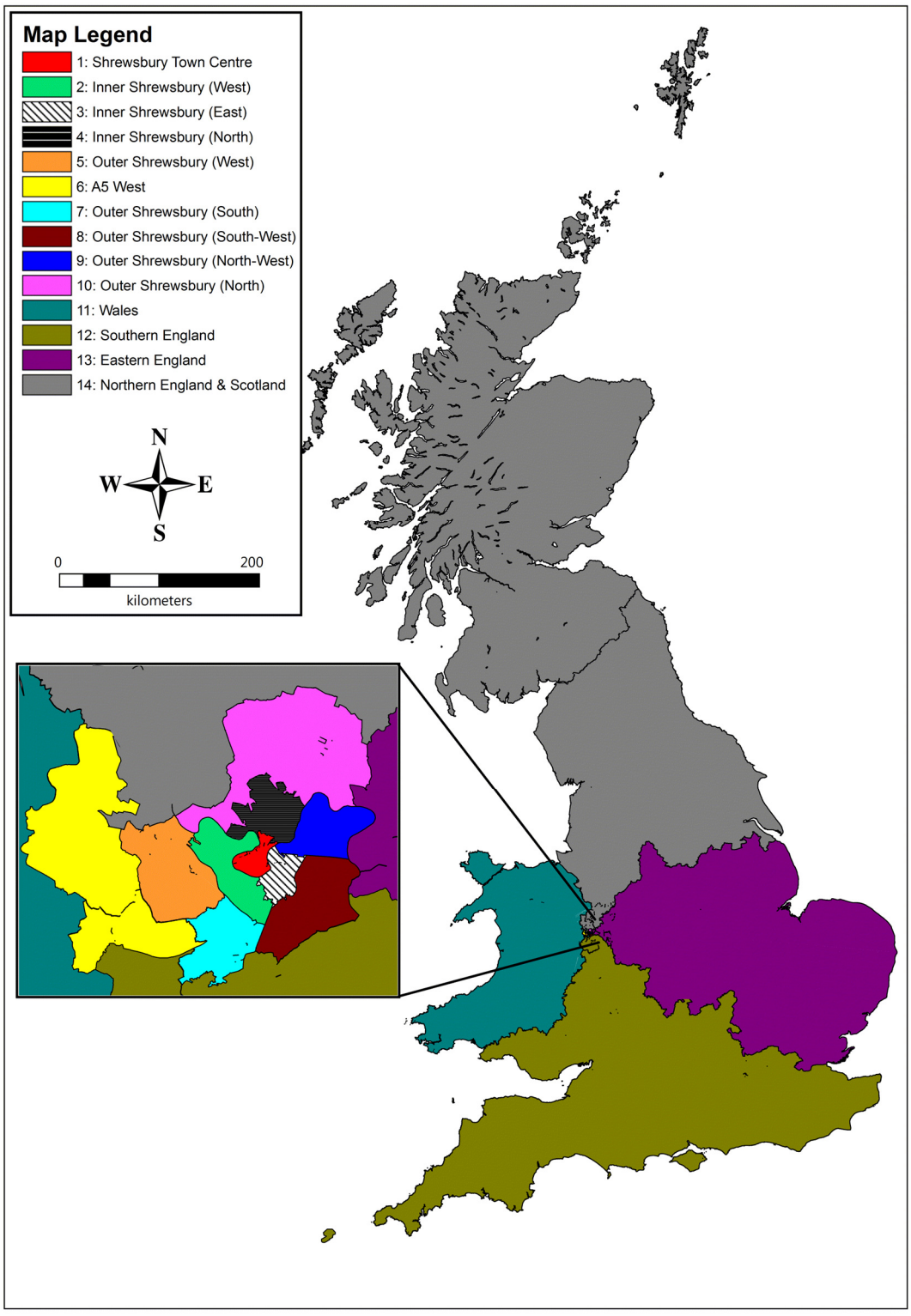

Figure 5 TUBA Sector System

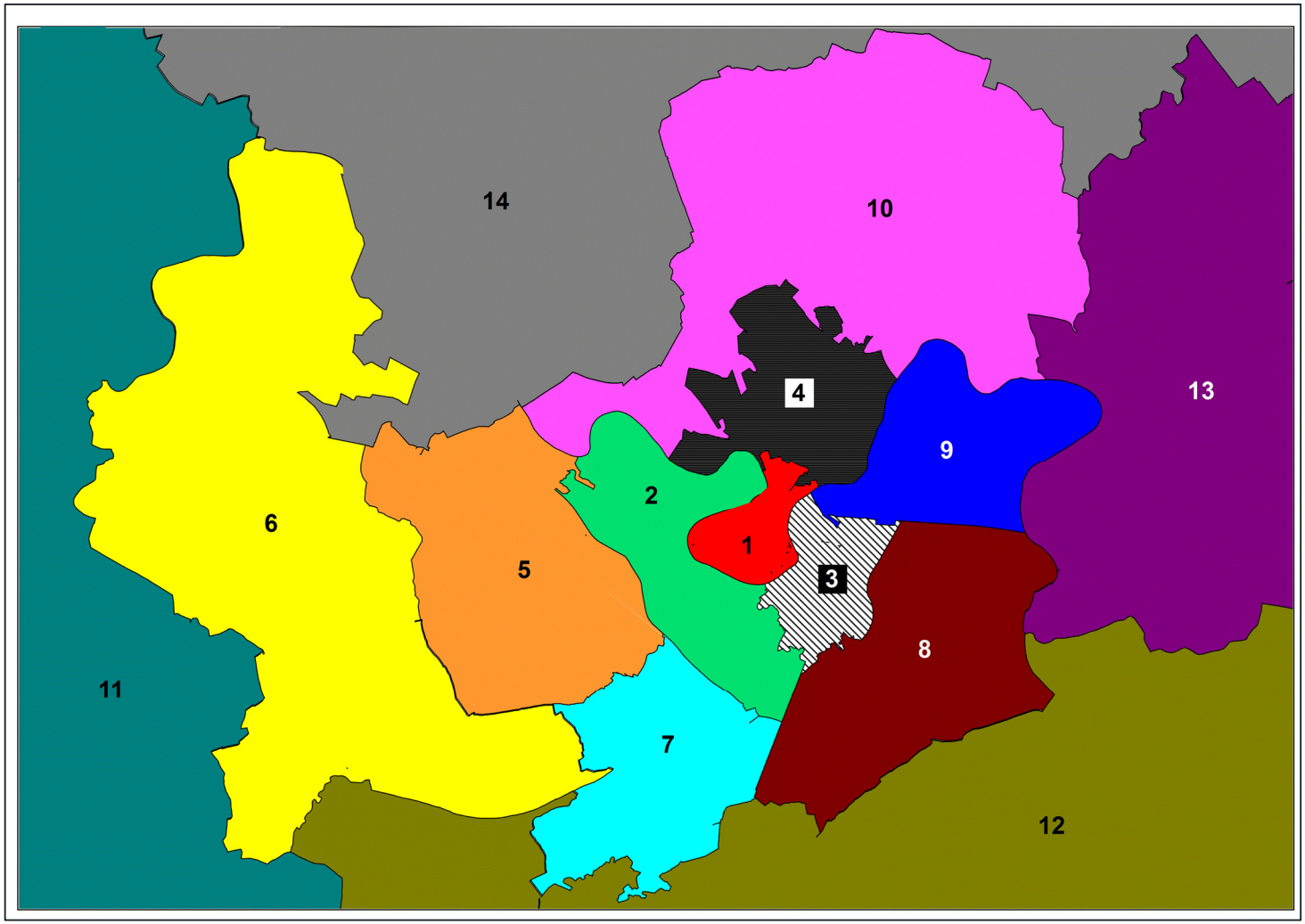

Figure 6 TUBA Sector System –Core Area

Table 5 TUBA Sector Benefits

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	498	1,337	508	696	3,664	902	1,183	583	985	1,837	3,137	898	144	508
2	732	124	146	855	44	-10	205	482	349	2,182	-383	280	790	1,110
3	734	231	136	528	199	37	250	149	174	813	75	143	215	316
4	1,359	1,683	1,006	609	2,950	669	1,389	1,692	582	1,675	1,672	894	602	580
5	2,782	584	266	2,494	-124	-63	422	1,260	529	22,264	-162	1,146	7,083	6,172
6	351	60	34	450	-46	-3	116	169	77	3,535	-32	149	1,370	1,143
7	747	410	440	490	1,322	141	748	679	393	2,100	2,334	2,172	2,571	1,413
8	845	245	151	368	255	57	118	58	88	1,470	183	62	608	804
9	509	309	118	161	259	81	184	57	18	590	164	68	80	118
10	2,419	4,120	2,160	1,362	23,583	3,497	2,201	2,278	1,693	135	12,753	2,609	738	2,151
11	1,965	501	265	2,156	244	16	964	809	440	11,024	122	2,755	7,713	4,043
12	797	181	145	388	397	67	128	132	110	2,306	522	447	2,700	6,725
13	1,838	822	441	840	4,935	315	574	638	442	955	2,848	1,972	-646	-268
14	1,477	3,193	818	516	10,064	798	1,426	1,279	564	2,877	3,656	4,800	2,559	2,893

3.2.18. The patterns of sector to sector travel time benefits shown in Table 5 demonstrates that the benefits reflect the reduction in journey times. There are significant benefits between sectors 5 and10 where the scheme provides a direct connectivity.

3.2.19. The scheme also provides benefits to the the long distance traffic from sector 11 to sectors 10 and 13 and also for the traffic from sectors 13 and 14 to sector 5.

3.3 ACCIDENT APPRAISAL

3.3.1. An assessment of accident benefits was undertaken using COBALT, the DfT cost benefit analysis program that assesses the benefits from accident savings.

3.3.2. COBALT calculates the number of accidents on each link in each year of the evaluation period using Average Annual Daily Traffic flows (AADT) and accidents rate per km and link length.

3.3.3. COBALT was run in combined link and junction mode using assignment results from the traffic model as inputs.

3.3.4. The numbers of accidents on the key links within the study area, collected from recorded accident data over a 5 year period from 1st June 2012 and 31st May 2017, were input to COBALT. For other roads, standard accident rates were adopted for each type of road.

3.3.5. COBALT calculates a severity split using standard factors which estimate the number of accidents classified by injury severity of fatal, serious or slight. COBALT then applies the appropriate costs per accident to establish the economic cost of accidents over the appraisal period.

3.3.6. Average Annual Daily Traffic (AADT) flows were taken from the traffic model assignment for the forecast opening and design years. These flows were input into COBALT.

3.3.7. The projected changes in the numbers of casualties over the appraisal period as a result of the proposed scheme are set out in Table 6 below.

Table 6 Forecast Changes in Casualties

Casualty reduction over 60 years	Do Minimum	Do Something	Reduction in Casualties
Fatal	630	628	2.3
Serious	5,082	4,990	91.9
Slight	46,244	45,386	858.9
Total	51,956	51,003	953.1

3.3.8. The total number of predicted accidents covers all the roads in the study area. The COBALT analysis predicts a reduction of 2.3 fatal accidents and 92 serious accidents over the 60 year appraisal period.

3.3.9. The economic value of the accident savings is set out in Table 7

Table 7 Present Value of Accident Savings (£000)

Accident reduction/ savings over 60 years	Do minimum	Do something	Reduction /Savings
Accident Costs (£000)	1,838,142	1,807,505	30,637

3.3.10. Table 7 demonstrates that the total reduction in the accident costs as a result of the Proposed Scheme is predicted to be **£30.6 million**.

3.4 MONETISED ENVIRONMENTAL BENEFITS

GREENHOUSE GASES

3.4.1. Benefits from the change in greenhouse gas emissions from the Scheme were derived from TUBA. The TUBA program usees estimated changes in fuel consumption to produce the impact in a monetary value at 2010 price base. For the core scenario, the impact of greenhouse gases is £3.35M. This positive benefit is largely due to the reduction in journey distance and fuel consumption.

LOCAL AIR QUALITY

3.4.2. The results of the local air quality assessment has yet to be finalised and has not been included in the current assessment.

NOISE ASSESSMENT

3.4.3. The results of noise assessment yet to be finalised and is not included in the current assessment.

3.5 SCHEME COSTS

3.5.1. For the economic appraisal a whole life Present Value Cost (PVC) is required. This includes future preparation costs, land costs, construction costs, supervision costs and ongoing maintenance costs. All costs are adjusted to market prices and discounted using standard treasury discount rates to a PVC according to when they occur in the future. This is described below.

3.5.2. The base costs for the Proposed Scheme included construction, land, preparation and ongoing maintenance costs plus an allowance for inflation. The latest cost estimates were prepared in 2017 and estimated at 2017:Q4 prices. These base costs were converted to a Present Value of Cost (PVC) through discounting to 2010.

3.5.3. In line with TAG Unit A1.2 (Scheme Costs), it is standard practice to include a risk allowance and optimism bias on top of the scheme estimated costs. The Present Value Cost (PVC) was derived from the base costs, adjusted to take account of risk and optimism bias.

3.5.4. The PVC included the following adjustment factors:

- An adjustment for inflation using the Retail Price Index from 2017 to 2010;
- An adjustment to market prices (gross of indirect tax); and
- Discount factors based on the HM Treasury "Green Book" to adjust costs occurring in different periods to a standard base year of 2010. An annual discount rate of 3.5% was applied for the first 30 years after opening and 3% for years 31 to 60.

3.5.5. The scheme costs expressed in 2017:Q4 prices and 2010 prices are summarised in Table 8.

Table 8 Present Value of Costs (£000)

Risk adjusted costs in £000			
	Scheme Cost	**Operation Cost**	**Total**
Estimated cost at Q4 price base	66,011	11,383	77,394
Cost at 2010 prices	59,085	11,167	70,252
Optimism bias (19%)	70,418	13,736	84,154
Present Value of Costs (PVC)	**58,513**	**3,018**	**61,531**

3.5.6. Table 8 shows that the total discounted value of costs (PVC) is £61.5 million.

3.6 INITIAL BENEFIT TO COST RATIO

3.6.1. An initial Benefit to Cost Ratio (BCR) was calculated from the ratio of benefits (including transport user and accident benefits) to costs.

3.6.2. The initial (termed unadjusted) BCR is presented in Table 9 below. All costs and benefits are expressed in 2010 prices and are discounted to 2010. An appraisal period of 60 years was used, from 2022 to 2081.

Table 9 Economic Appraisal Summary – Unadjusted BCR

Analysis of monetised costs and benefits (Initial BCR)	2010 prices (£,000)
Greenhouse Gases	3,350
Accidents	30,637
Economic Efficiency: Consumer Users (Commuting)	77,214
Economic Efficiency: Consumer Users (Other)	126,505
Economic Efficiency: Business Users and Providers	87,228
Wider Public Finances (Indirect Taxation Revenues)	-7,365
Present Value of Benefits (PVB)	**317,569**
Investment cost	58,513
Operating costs	3,018
Present Value of Costs (PVC)	**61,532**
Net Present Value (NPV)	**256,037**
Initial BCR	**5.16**

3.6.3. Table 9 shows that the transport and economic efficiency benefits to road users amount to **£290.9M**. Further benefits / disbenefits are then included as follows:

- Benefits through accident savings of £30.6M.
- Environmental benefits are assessed as £3.4M from reduced greenhouse gas emissions.
- Indirect tax, accrued through reduced vehicle operating costs, provides a disbenefit of £7.3M.

3.6.4. The total Present Value of Benefits (PVB) amounts to **£317.6M**. This compares to the Present Value Cost (PVC) of **£61.5M.**

3.6.5. The Net Present Value (NPV) of the scheme is the difference between Present Value of Benefits (PVB) and Present Value of Cost (PVC). The NPV for the scheme is calculated as **£256.0M**, which indicates a positive return on investment. The calculated initial Benefit to Cost Ratio (BCR) is 5.16.

3.6.6. The value for money assessment for the Scheme was undertaken with reference to the Value for Money Framework published by the DfT in July 2017.

3.6.7. The DfT Value for Money Framework sets out a process to assign a Value for Money Category that is intended to provide a succinct, overarching summary of the outcome of the scheme.

3.6.8. Six Value for Money (VfM) categories are defined within the Value for Money DfT framework and these are set out in Table 10 below.

Table 10 DfT VfM Categories

Value for Money Category	Implied by
Very High	BCR greater than or equal to 4
High	BCR between 2 and 4
Medium	BCR between 1.5 and 2
Low	BCR between 1 and 1.5
Poor	BCR between 0 and 1
Very Poor	BCR less than or equal to 0

Based upon the calculated initial Benefit to Cost Ratio (BCR) of 5.16, the North West Relief road scheme represents very high value for money.

3.7 WEBTAG TABLES

3.7.1. This section describes how the results of the economic appraisal of the Proposed Scheme are presented using standard WebTAG tables.

TRANSPORT ECONOMIC EFFICIENCY (TEE) TABLE

3.7.2. The TEE table is presented in Appendix A. This shows the present value of the TEE benefits as **£290.9M**. The benefits include consumer user benefits for commuting and other purposes of £77.2M and £126.5M respectively and business user benefits of £87.2M.

PUBLIC ACCOUNTS (PA) TABLE

3.7.3. The PA table is presented in Appendix B. This shows the discounted value of the operating costs as £3.0M and investment cost of the scheme as £58.5M giving a net impact of **£61.5M**. Indirect tax revenues amount to -£7.3M.

ANALYSIS OF MONETISED COSTS AND BENEFITS (AMCB) TABLE

The AMCB table is presented in Appendix C. This shows a PVB of £317.6M, a PVC of £61.5M resulting in a NPV of £256.0M. It confirms the initial BCR of the Proposed Scheme as 5.16.

3.8 ADJUSTED BENEFIT TO COST RATIO

3.8.1. The second stage of the Value for Money assessment process builds on the initial monetised costs and benefits.

3.8.2. As noted in Section 2.1 above, the overall appraisal of the NWRR included an assessment of Wider Impacts and an assessment of the benefits resulting from more reliable journeys.

WIDER IMPACTS

3.8.3. An assessment was been made of wider transport impacts as referred to in TAG unit A2-1 wider impacts (January 2014) using the program WITA.

3.8.4. The WITA assessment indicated very high transport benefits of **£282 million**. However, this value is not considered plausible, generating benefits on a similar scale to transport user benefits. These benefits have therefore **not been included** within adjusted BCR calculation.

JOURNEY TIME RELIABILITY

3.8.5. Reliability has been assessed in line with WebTAG Unit A1.3, Section 6.3 (Reliability – urban roads) using the relationships shown in Figure 7. This is based on the calculation of the standard deviation of journey times from journey time and distance for each O-D (origin-destination) pair.

$$\text{Reliability benefit} = -\sum \Delta\sigma_{ij} \left(\frac{T_{ij}^2 + T_{ij}^1}{2}\right) \times 0.8 \times VOT$$

Where: $\Delta\sigma_{ij} = 0.0018\left(\left(t_{ij}^2\right)^{2.02} - \left(t_{ij}^1\right)^{2.02}\right) d_{ij}^{-1.41}$

VOT = value of time (£/sec)

T = number of trips (1 = before improvement, 2 = after improvement)

t = journey time (s) (1 = before improvement, 2 = after improvement)

d = distance (km)

i,j = subscript denoting quantity from zone I to zone j

Figure 7 Reliability Benefit Calculations

Using the WebTAG formula shown in Figure 7 the present value of the reliability benefits for the North West Relief Road over the 60 year assessment period was calculated as **£10.11 million** (2010 prices discounted to 2010).

3.9 ADJUSTED BCR

3.9.1. The adjusted BCR is derived from the initial BCR and includes the journey time reliability benefits as described in section 3.8 above. The adjusted BCR is presented in Table 11 below.

Table 11 Adjusted BCR Calculation

Adjusted BCR	2010 prices (£,000)
Initial Present Value of Benefits (PVB)	317,569
Reliability Impacts	10,115
Adjusted Present Value of Benefits (PVB)	**327,684**
Investment Cost	58,513
Operating Costs	3,018
Present Value of Costs (PVC)	**61,532**
Net Present Value (NPV)	**266,153**
Adjusted BCR	**5.33**

3.9.2. Table 11 demonstrates that the adjusted BCR amounts to **5.33.** The scheme therefore remains in the **very high** value for money category. Improvements to journey time reliability are a scheme objective, and therefore confirmation of the reliability benefits further justifies the scheme.

3.9.3. It should be noted that the methodology set out within TAG to derive reliability is based on calculation of the standard deviation of journey times from journey time and distance for each O-D (origin-destination) pair. This method does not account for any 'resilience' benefits that the scheme would generate, where a high-quality, appropriately designed alternative route choice would be available, as provided by the scheme. These resilience / accident benefits are not included within either this TAG reliability analysis, nor in the safety benefits appraisal. The reliability benefits are therefore likely to be understated.

3.10 HIGH AND LOW GROWTH BCR

3.10.1. In addition to the Core Growth economics and in accordance with TAG Unit M4, two sets of traffic forecasts and economics were also prepared to represent High and Low traffic growth scenarios.

3.10.2. This high and low growth economic assessment was limited to TUBA and COBALT and excluded journey time reliability.

3.10.3. The variation in the unadjusted BCR between Core, High and Low growth scenario is presented in Table 12 below.

Table 12 BCR for different Low and High growth scenarios

Analysis of monetised costs and benefits	2010 prices discounted to 2010 (£,000)		
	Core	High	Low
Greenhouse Gases	3,350	4,252	2,612
Accidents	30,637	46,892	27,206
Economic Efficiency: Consumer Users (Commuting)	77,214	101,974	58,737
Economic Efficiency: Consumer Users (Other)	126,505	155,763	92,094
Economic Efficiency: Business Users	87,228	108,196	68,350
Wider Public Finances (Indirect Tax Revenues)	-7,365	-9,270	-5,822
Present Value of Benefits (PVB)	**317,569**	**407,807**	**243,177**
Cost to Broad Transport Budget			
Investment cost	58,513	58,513	58,513
Operating costs	3,018	3,018	3,018
Present Value of Costs (PVC)	**61,532**	**61,532**	**61,532**
Net Present Value (NPV)	**256,037**	**346,275**	**181,645**
Initial BCR	**5.16**	**6.63**	**3.95**

3.10.4. The overall balance between benefits and costs is positive under all three scenarios, resulting in BCRs for the Core, High and Low growth scenarios of 5.16, 6.63 and 3.95, respectively, as shown in Table 12 above

3.10.5. Table 12 demonstrates that based upon the low growth scenario, the BCR would reduce to just below 4 however the scheme would still fall into the high value for money category.

4 SUMMARY AND CONCLUSIONS

4.1 SUMMARY

4.1.1. This report has described the methodology and presented the results of the economic appraisal for the Shrewsbury North West Relief Road.

4.1.2. The economic appraisal of the Shrewsbury NWRR scheme was prepared in accordance with the Green Book - Appraisal and Evaluation in Central Government ("the Green Book").

4.1.3. The economic appraisal comprised an assessment of the net benefits to users and the wider community as a result of the road, set against the capital construction and operational costs, all as incurred over a 'whole life' period.

4.1.4. A full cost benefit analysis was required so that the proposed scheme could be assessed in 'value for money' terms. The appraisal included an assessment of economic benefits to road users, including time savings and vehicle operating costs; and assessment of accident savings and associated economic benefits and the monetised benefits from changes to greenhouse gas emissions

4.1.5. The benefits from these 3 categories were combined and compared to costs to produce an initial BCR of 5.1 that with reference to the DfT value for money categorisation, represents very high value for money.

4.1.6. An assessment of wider economic benefits resulting from the scheme, termed Wider Benefits was carried out using the WITA software. Although this demonstrated significant benefits, the results were not included as doubts were cast upon their reliability.

4.1.7. An assessment of the economic benefits as a result of more reliable journey times was undertaken. This demonstrated that the scheme produced modest benefits. These were included within the adjusted BCR, which increased to 5.3, representing very high value for money.

4.2 CONCLUSION

4.2.1. The results of the economic assessment presented within this report are based upon traffic forecasts that have been developed using a 'fixed demand' methodology.

4.2.2. Forecasts are being prepared based upon 'variable demand' that takes into account behavioural responses to changes in travel costs as a result of the scheme. These forecasts will provide the basis for a further economic assessment that will be presented in an update to this report.

4.2.3. It is acknowledged that the inclusion of variable demand forecasts could result in a reduction in economic benefits, since there is likely to be more traffic on the network as a result of traffic induced by the Scheme. However, given the high BCR, it is calculated that based upon the adjusted BCR, benefits would need to reduce by 25% for the BCR to reduce to 4 thereby falling outside the high value for money category.

It is concluded that while the benefits are likely to be reduced once variable demand is taken into account, the high BCR provides some assurance that the Scheme will continue to represent high value for money once the economic assessment based upon variable demand has been completed.

Appendix A

ECONOMIC EFFICIENCY OF TRANSPORT SYSTEM (TEE)

Economic Efficiency of the Transport System (TEE)							
Non-business: Commuting	**ALL MODES**		**Road**		**Bus / Coach**	**Rail**	**Other**
User benefits	**TOTAL**		**Private Cars and LGVs**				
Travel time	£ 72,556,000		£ 72,556,000				
Vehicle operating costs	£ 4,658,000		£ 4,658,000				
User charges	£0		£0				
During Construction & Maintenance	Not assessed		Not assessed				
NET NON-BUSINESS: COMMUTING	**£77,214,000**	*(1a)*	**£77,214,000**				
Non-business: Other	**ALL MODES**		**ROAD**		**Bus / Coach**	**Rail**	**Other**
User benefits	**TOTAL**		**Private Cars and LGVs**				
Travel time	£117,184,000		£117,184,000				
Vehicle operating costs	£9,321,000		£9,321,000				
User charges	£0		£0				
During Construction & Maintenance	Not assessed		Not assessed				
NET NON-BUSINESS: OTHER	**£126,505,000**	*(1b)*	**£126,505,000**				
Business							
User benefits			**Goods Vehicles**	**Cars & LGVs**	**Bus / Coach**	**Rail**	**Other**
Travel time	£77,473,000		£41,663,000	£35,810,000			
Vehicle operating costs	£9,754,000		£5,525,000	£4,230,000			
User charges	£0		£0	£0			
During Construction & Maintenance	Not assessed		N/A	N/A			
Subtotal	**£87,228,000**	*(2)*	**£47,188,000**	**£40,040,000**			
Private sector provider impacts					**Bus / Coach**	**Rail**	
Revenue	£0						
Operating costs	£0						
Investment costs	£0						
Grant/subsidy	£0						
Subtotal	£0	*(3)*					
Other business impacts							
Developer contributions	£0	*(4)*					
NET BUSINESS IMPACT	**£87,228,000**	*(5) = (2) + (3) + (4)*					
Present Value of Transport Economic Efficiency Benefits (TEE)	**£290,947,000**	*(6) = (1a) + (1b) + (5)*					
	Notes: Benefits appear as positive numbers, while costs appear as negative numbers.						

Appendix B

PUBLIC ACCOUNTS (PA)

	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**			
Revenue	£0		£0			
Operating Costs	3,018,000		3,018,000			
Investment Costs	£58,513,000		£58,513,000			
Developer and Other Contributions	£0		£0			
Grant/Subsidy Payments	£0		£0			
NET IMPACT	£61,531,000	*(7)*	£61,531,000			
Central Government Funding: Transport						
Revenue	N/A		N/A			
Operating costs	N/A		N/A			
Investment Costs	£0		£0			
Developer and Other Contributions	£0		£0			
Grant/Subsidy Payments	£0		£0			
NET IMPACT	£0	*(8)*	£0			
Central Government Funding: Non Transport						
Indirect Tax Revenues	£7,365,000	*(9)*	£7,365,000			

TOTALS

Broad Transport Budget	£61,531,000	*(10) = (7) + (8)*
Wider Public Finances	£7,365,000	*(11) = (9)*

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.

All entries are discounted present values in 2010 prices and values

Appendix C

ANALYSIS OF MONETISED COSTS AND BENEFITS (AMCB)

Analysis of Monetised Costs and Benefits

Noise	Not calculated	*(12)*
Local Air Quality	Not calculated	*(13)*
Greenhouse Gases	3,350,000	*(14)*
Journey Quality	Not calculated	*(15)*
Physical Activity	Not calculated	*(16)*
Accidents	£30,637,000	*(17)*
Economic Efficiency: Consumer Users (Commuting)	£77,214,000	*(1a)*
Economic Efficiency: Consumer Users (Other)	£126,505,000	*(1b)*
Economic Efficiency: Business Users and Providers	£87,228,000	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-£7,365,000	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	£317,569,000	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	£61,532,000	*(10)*
Present Value of Costs (see notes) (PVC)	£61,532,000	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£256,037,000	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	5.16	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

Export House
Cawsey Way
Woking, Surrey
GU21 6QX

wsp.com