West of England Cycle Transformation Cycle City Ambition Grant Funding Bid

Scheme Economic Appraisal Report

Document: Version: 2.0

Final Report

Bath and North East Somerset Council

Bristol City Council

South Gloucestershire Council

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Bath and North East Somerset Council

Bristol City Council

South Gloucestershire Council

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Contents

Summary for Section B7 of Scheme Proforma 1

1 Introduction 3
1.1 Report Purpose 3
1.2 West of England Cycle City Scheme 3
1.3 Guidance and References 3
1.4 Report Structure 4

2 Scheme Costs 5
2.1 Introduction 5
2.2 Scheme and Scheme Costs 5
2.3 Other Funding Sources 6
2.4 Evaluation Costs 6
2.5 Cost Sign-Off 6
2.6 Quantitative Risk Assessment 7
2.7 Optimism Bias 7
2.8 Cost Profiles and Funding Model 7

3 Scheme Modelling Results 9
3.1 Scheme Modelling 9
3.2 GBATS Modelling 9
3.3 Modelling Results 9
3.4 B&NES Scheme Forecast 11
3.5 Scheme Proformas 11
3.6 Benchmarking of Impacts 15
3.7 Do-Minimum Transport Network 15
3.8 Demand Build-up and Annualisation 15

4 Economic Appraisal 17
4.1 Appraisal Methodology 17
4.2 Scheme Benefits 18
4.3 Economic Results 20
4.4 TUBA Files and Checking 24

5 Appraisal Summary Table 26
5.1 Introduction 26
5.2 Economy 26
5.3 Environmental 28
5.4 Social 29
5.5 Public Accounts 32

List of Tables

Table 2.1: Scheme and Scheme Capital Costs
Table 2.2: Scheme and Scheme Operating Costs
Table 2.3: Scheme and Scheme Maintenance and Renewal Costs
Table 2.4: Summary of the Funding Model
Table 2.5: Scheme Out-Turn Scheme Costs
Table 3.1: Modelled Scheme Impacts
Table 3.2: Headline Impacts for Scheme and Schemes
Table 3.3a: DfT Scheme Proforma - Cribbs Causeway to Emerson's Green
Table 3.3b: DfT Scheme Proforma - Seven Dials National Cycle Route Scheme
Table 3.3c: DfT Scheme Proforma - City Promenade and River Crossings Cycle Ambition
Table 3.3d: DfT Scheme Proforma – Cycle Transformation Scheme
Table 3.4: Summary of Cycle Scheme Evidence
Table 3.5: Annualisation Factors
Table 4.1: Benefits Estimates for Different Appraisal Lengths
Table 4:2: Scheme Economic Efficiency of the Transport System
Table 4.3: Scheme Public Accounts
Table 4:4: Scheme AMCB Table
Table 4.5: Sensitivity Test Results
Table 4.6: Scheme Test Results
Table 4.7: Cost Ratio Checking
Table 4.8: Distribution of Benefits by Ratio Bands
Table 4.9: Distribution of Net Benefits by Ratio Bands
Table 5.1: Enterprise Zones & Areas
Table 5.2: Regeneration Areas in Local Plans
Table 5.3 Designated Heritage Assets
Table 5.4: Examples of scheme components that enhance cycle journey quality
Table 5.5: Appraisal Summary Table

List of Figure

Figure 4.1: Economic Appraisal Flowchart
Figure 4.2: Profile of Time Benefits

Appendix A – Plots to Support AST Analysis

Appendix B – Forecasting Report

Summary for Section B7 of Scheme Proforma

Value for Money Assessment

The value for money assessment of the proposed cycling scheme has been prepared in accordance with the "City Deals – Guidance on Applications for Cycle City Ambition Grants" issued in February 2013, and ongoing feedback provided by the DfT. The assessment uses a combination of data and transport models, including evidence of similar schemes in the West of England area, to estimate demand and a wide range of benefits covering time savings, health, ambience, decongestion and air quality. All assessments have been completed in accordance with WebTAG. The main modelling tool, G-BATS, has previously been passed as "fit for purpose" by DfT. The HEAT tool was used to assess physical fitness benefits.

Modelling Approach

The approach to assessing the cycle schemes in G-BATS is the same as that used in the WEST LSTF bid, where adjustments in the highway and PT matrices were applied to represent a level of mode shift to cycling. Adjustments were applied to the catchment of the scheme, in terms of trip length and trip origin / destination pattern and to relevant demand segments that could transfer to cycle. The basic adjustment for cycle schemes in the LSTF is for every £10 per person gives a 4% increase in cycle, resulting in a 1% reduction in car trips. Outputs from the 2016 and 2031 forecasting year G-BATS models were used to estimate benefits using TUBA. The impacts from G-BATS have been benchmarked to evidence for previous local schemes and the results from the Cycle Demonstration Towns, and results are considered to understate to likely impacts in terms of new cycling demands and benefits.

Headline Impacts

The headline impacts of the scheme, and main elements are summarised below, for forecast year 2031.

Scheme	Full Cycle Transformation Scheme	Cribbs-Emerson's Green Trunk Cycle Route	Seven Dials National Cycle Route Scheme	City Promenade and River Crossings Cycle Ambition
Base Cycle Mode Share	**6.4%**	5.2%	3.4%	9.3%
Scheme Cycle Mode Share	**6.7%**	5.5%	3.6%	9.7%
Increase in Cycle Trips pa (million)	**2.9**	0.7	0.3	1.9
Reduction on Car Trips pa (million)	**2.1**	0.5	0.2	1.4
Reduction on Car km pa (million)	**7.4**	1.7	0.8	4.9
Cost of Scheme £m's	**£10.73**	£1.60	£1.15	£7.97

Scheme Costs

The total scheme cost is £11.096m (outturn). The economic appraisal includes risk, optimism bias, market price adjustments, plus on-going annual costs for operating and maintaining the proposed schemes. Project evaluation costs at £60,000 are also included in the appraisal.

Headline Appraisal Results

The results of the economic appraisal are reported below for the full scheme and each of the three main elements. Results apply to an appraisal length of 60 years, with optimism bias assumed at 44%. The main benefits for the scheme are comprised of decongestion (49%), health (44%) and other (7%).

All show "very high" value for money with BCR values greater than 4.0.

Sensitivity Test (2010 prices and values)	PVB	PVC	BCR	VFM band
Cycle Transformation Scheme	£399.0	£31.8	12.56	**Very High**
Cribbs Causeway to Emersons Green (Cycle Trunkn Route	£63.3	£4.7	13.54	**Very High**
Seven Dials National Cycle Route Scheme	£55.3	£3.4	16.16	**Very High**
City Promenade and River Crossings Cycle Ambition	£280.5	£23.7	11.84	**Very High**

A series of sensitivity tests have been completed in the central case. The results of the tests show the scheme remains "very high" value for money even allowing for the key uncertainties in the modelling and appraisal processes.

Sensitivity Test (2010 prices and values)	PVB	PVC	BCR	VFM band
Cycle Transformation Scheme	£399.0	£31.8	12.56	**Very High**
ST1 - High Mode Share to Cycling at 25% greater than the central case	£502.6	£31.8	15.82	**Very High**
ST2 - Decay in Cycle Demand assuming a 2%pa, instead of 1% growth pa.	£291.3	£31.8	9.17	**Very High**
ST3 - Increased Capital Costs + 20%	£399.0	£34.9	11.44	**Very High**
ST4 - Include GVA and NHS Benefits	£455.6	£31.8	14.34	**Very High**
ST5 - Exclude HEAT Benefits	£223.4	£31.8	7.03	**Very High**
ST6 - 20 year Appraisal Length	£135.6	£23.7	5.73	**Very High**
ST7 – Lower Rate of Highway Decongestion	£350.5	£31.8	11.03	**Very High**

The appraisal of the scheme is reported in the Appraisal Summary Table. This reports the main positive benefits as travel time, reliability, physical fitness and wider economic impacts. No adverse benefits are reported in the table.

1 Introduction

1.1 Report Purpose

Halcrow Group Limited has been retained by Bath and North East Somerset Council, Bristol City Council and South Gloucestershire Council to act as Technical Advisor for the West of England Cycle Transformation submission as part of the Cycle City Ambition Grant (CCAG) funding bid. Bristol City Council is acting as the lead authority.

This scheme appraisal report has been prepared as part of the submission to Department for Transport (DfT) on 30 April 2013.

It has been prepared in accordance with the "City Deals – Guidance on Applications for Cycle City Ambition Grants" issued in February 2013, and ongoing feedback provided by the DfT.

1.2 West of England Cycle City Scheme

The proposed scheme is made up of the following main schemes within each of the council areas:

- Provision of sections of a cycle trunk route from Cribbs Causeway to Emerson's Green in South Gloucestershire; and
- Improved access at Seven Dials National Cycle Route in Bath (including contra flow cycle routes) schemes in Bath and North East Somerset ; and
- Bristol City Centre City Promenade and River Crossings Cycle Ambition.

The scheme capital cost is a total of £11.096 million (out-turn costs).

1.3 Guidance and References

The modelling and appraisal work is defined around the requirements of the DfT guidance, and the following supporting documents:

- WebTAG units:
  - Transport Business Case guidance of the five cases for a business case;
  - 3.14.1 - Appraisal of Walk and Cycle Scheme, including monitoring;
  - 3.10.6 - Modelling Smarter Choices;
  - 3.5.9 - Decongestion Benefits;
  - 3.17 – Social Distributional Impacts;
  - 3.5.6 - Values of Time and Vehicle Operating Costs;
  - 3.9.3, 3.9.4, 3.9.5 - Treatment of costs, Risk and Optimism Bias (OB);
  - 3.4.1 – Accidents; and
  - 3.3 - Carbon and Emissions.

- World Health Organisation Health Economics Assessment Tool (HEAT) for walking and cycling projects.

- Evidence of Benefits (additional to the demand change evidence) – on the wider impacts and benefits of cycling schemes, including:

  - Cycling Demonstration Towns, Sloman et al, 2009;
  - The Effects of Smarter Choices Programmes in the Sustainable Travel Towns, 2010;
  - Evaluation of Cycling City and Town Programme, Jan 2011, Centre for Transport Studies, Tavistock Institute, AECOM for DfT;
  - Advice on the Prioritisation of Smaller Transport Schemes, Atkins for DfT, including the case studies referenced in the funding guidance; and
  - Cycling in the City Regions: Modelling the Impacts of Step Changes in Delivery of Measures to Support Cycling in PTE Areas.

- Local Authority Knowledge Hub – referencing best practice in monitoring and evaluation work.

1.4 Report Structure

This report is presented in four chapters, as described below:

- Chapter 1 – Introduction and Report Structure;
- Chapter 2 – Scheme Costs;
- Chapter 3 – Modelling and Forecasting Results;
- Chapter 4 – Economic Appraisal; and
- Chapter 5 – Appraisal Summary Table.

2 Scheme Costs

2.1 Introduction

This Chapter provides details of the scheme costs, including the associated capital costs, maintenance costs, risk assumptions, optimism bias uplifts and cost inflation assumptions.

2.2 Scheme and Scheme Costs

This section provides detail of the capital, operating, and maintenance and renewals costs. Values are estimated in accordance with WebTAG unit 3.5.9.

Capital Costs

The capital costs of different schemes within the schemes are shown in Table 2.1, including risk based on the Quantified Risk Assessment (QRA) and preparation and supervision costs. All values are reported in 2013 values.

An average of 18% uplift on capital costs for preparation and supervision costs is assumed. The QRA is an average of 16% of the total costs. These rates used have been benchmarked to existing recent schemes developed by the client team.

Table 2.1: Scheme and Scheme Capital Costs (2013 prices, excluding inflation)

Scheme Element	Base Cost	Supervision and Preparation Only	QRA	Total
Cribbs Causeway-Emerson Green Cycle Trunk Route	£1,048,770	£275,756	£278,126	£1,602,652
Seven Dials National Cycle Route Scheme	£743,210	£203,513	£203,093	£1,149,816
City Promenade and River Crossings Cycle Ambition	£5,403,704	£954,809	£1,614,884	£7,973,396
Cycle Transformation Scheme	**£7,195,684**	**£1,434,077**	**£2,096,103**	**£10,725,865**

Operating Costs

The operating costs associated with each scheme are shown in Table 2.2. These are assumed to be 1% of the capital costs. The rate is based on existing schemes and evidence from other similar schemes and studies available to Halcrow from around the UK. Furthermore the costs are net of the do-minimum operating costs. Values are presented in 2013 values.

Table 2.2: Scheme and Scheme Operating Costs (2013 prices)

Scheme Element	Annual Operating Cost	First Full Year of Operation
Cribbs - Emerson Green Cycle Trunk Route	£16,000	2016
Seven Dials National Cycle Route Scheme	£11,400	2016
City Promenade and River Crossings Cycle Ambition	£79,700	2016
Cycle Transformation Scheme	**£107,100**	

Maintenance and Renewals Costs

The maintenance and renewal costs, over and above annual operating costs, associated with each scheme are listed in Table 2.3. The costs are based on existing schemes and evidence from other schemes and studies available to Halcrow. Furthermore the costs are net of the do-minimum maintenance and renewal costs. Values are presented in 2013 values.

Table 2.3: Scheme and Scheme Maintenance and Renewal Costs (2013 Prices)

Scheme Element	Total 60 Years Renewals and Maintenance	Average Annual Renewals and Maintenance
Cribbs - Emerson Green Cycle Trunk Route	£1,152,000	£19,200
Seven Dials National Cycle Route Scheme	£822,000	£13,700
City Promenade and River Crossings Cycle Ambition	£5,736,000	£95,600
Cycle Transformation Scheme	**£7,710,000**	**£128,500**

2.3 Other Funding Sources

Third party Section 106 contributions totalling £0.216m (outturn) have been secured for the scheme.

- Provision of sections of a cycle trunk route from Cribbs Causeway to Emersons Green £108,000 of S106 funding; and
- Bristol City Centre Promenade and River Crossings improvements - £108,000 of S106 funding.

2.4 Evaluation Costs

A total of £60,000 is assumed to be proportional to the cost of each scheme. All costs apply to year 2015/16. The plan reflects the requirements of the recent Monitoring and Evaluation guidance issued by DfT in March 2013.

2.5 Cost Sign-Off

The appointed Section 151 Officer of each council has verified the relevant cost estimates for the scheme.

In accordance with the DfT guidance the officer has:

- Confirmed the accuracy of the cost estimates; and
- Confirmed that the authority has the means to accept financial liability of the scheme going ahead.

The application form includes the signed Section 151 Officer Declaration.

2.6 Quantitative Risk Assessment

The accurate evaluation and pro-active mitigation of risk is critical to the success of the project. To ensure that all risks were captured at an early stage in the project a Quantified Risk Assessment was undertaken for the scheme.

The register covered the following objectives:

- Estimate risks;
- Environmental risks;
- Planning and third party risks;
- Third party agreement risks;
- Section agreements;
- Programme risks;
- Future development risks;
- Construction/existing services risks; and
- Design risks.

2.7 Optimism Bias

Optimism Bias has been applied to capital, preparation and supervision, plus QRA estimates using the WebTAG rate of 44%.

2.8 Cost Profiles and Funding Model

In general, construction and operating costs are increasing at a rate above inflation. For the purposes of the appraisal, it is assumed that the real construction cost increase is 2.0% p.a. until 2031 and 0% after this time. For operating costs, it is assumed that the real cost increase are the same as capital costs. Overall, inflation is assumed at 4.7%p.a., with RPI at 2.7% p.a.

The out-turn costs of the schemes are summarised below in Table 2.4. The breakdown on costs for the scheme is shown in Table 2.5.

Table 2.4: Summary of the Funding Model

Source £m's	Cycle City Scheme
DfT Contribution	£7.766
Third Party	£0.216
Local Contribution	£3.113
Total Cost	**£11.096**
Percentage DFT	**70.0%**

Note: Out-turn costs, including preparation, supervision, QRA, excluding OB (£'s)

Table 2.5: Scheme Out-Turn Scheme Costs

Cost	2013/14	2014/15	2015/16	Total
Cribbs - Emerson Green Cycle Trunk Route				
Capital Costs	£0.000	£1.087	£0.012	**£1.099**
Preparation and Supervision	£0.232	£0.046	£0.000	**£0.278**
Contingency (QRA)	£0.098	£0.189	£0.000	**£0.287**
Total	**£0.330**	**£1.322**	**£0.012**	**£1.663**
Funding Split				
DfT funding sought	£0.330	£1.214	£0.000	**£1.543**
Local Authority contribution	£0.000	£0.000	£0.012	**£0.012**
Third Party contribution	£0.000	£0.108	£0.000	**£0.108**
Total	**£0.330**	**£1.322**	**£0.012**	**£1.663**
Seven Dials National Cycle Network Scheme				
Capital Costs	£0.186	£0.576	£0.008	**£0.770**
Preparation and Supervision	£0.020	£0.192	£0.000	**£0.212**
Contingency (QRA)	£0.000	£0.213	£0.000	**£0.213**
Total	**£0.206**	**£0.980**	**£0.008**	**£1.195**
Funding Split				
DfT funding sought	£0.156	£0.980	£0.000	**£1.136**
Local Authority contribution	£0.050	£0.000	£0.008	**£0.058**
Third Party contribution	£0.000	£0.000	£0.000	**£0.000**
Total	**£0.206**	**£0.980**	**£0.008**	**£1.195**
City Promenade and River Crossings Cycle Ambition and RPZ and CPZ				
Capital Costs	£1.428	£4.124	£0.040	**£5.592**
Preparation and Supervision	£0.955	£0.000	£0.000	**£0.955**
Contingency (QRA)	£0.000	£1.691	£0.000	**£1.691**
Total	**£2.383**	**£5.815**	**£0.040**	**£8.238**
Funding Split				
DfT funding sought	£1.101	£3.986	£0.000	**£5.087**
Local Authority contribution	£1.230	£1.773	£0.040	**£3.043**
Third Party contribution	£0.052	£0.056	£0.000	**£0.108**
Total	**£2.383**	**£5.815**	**£0.040**	**£8.238**
Total Cycle Transformation Scheme				
Capital Costs	£1.614	£5.787	£0.060	**£7.461**
Preparation and Supervision	£1.207	£0.238	£0.000	**£1.445**
Contingency (QRA)	£0.098	£2.092	£0.000	**£2.190**
Total	**£2.918**	**£8.117**	**£0.060**	**£11.096**
Funding Split				
DfT funding sought	£1.586	£6.180	£0.000	**£7.766**
Local Authority contribution	£1.280	£1.773	£0.060	**£3.113**
Third Party contribution	£0.052	£0.164	£0.000	**£0.216**
Total	**£2.918**	**£8.117**	**£0.060**	**£11.096**

3 Scheme Modelling Results

3.1 Scheme Modelling

No single tool was available to complete the modelling and appraisal of the proposed scheme. A number of different data sources and models were used to derive the key benefits of the scheme, namely health, journey quality and decongestion.

The most appropriate tool for travel patterns and highway decongestion impacts was the G-BATS model that has been successfully used to assess the Major Scheme Business Cases notably the North Fringe - Hengrove (NFH) BAFB submission, and was used for the WEST LSTF bid in 2012. Hence, the model is WebTAG compliant and approved by DfT.

The G-BATS model covers only the Bristol City Council (BCC) and South Gloucestershire (SGC) Council areas. For the Bath and North East Somerset (B&NES) a bespoke approach was applied based on the level of expenditure for the schemes in the area, the impacts from the G-BATS model for the BCC and SG areas, baseline cycle demands and demand forecasting method defined in WebTAG 3.14.1 section 1.5.

3.2 GBATS Modelling

Details of the G-BATS modelling are reported in the "CCAG Forecasting Report" dated April 2013. This is provided as an Appendix B to this report.

The model represents AM, inter-peak and PM peaks with forecast years of 2016 and 2031. The approach to assessing the cycle schemes in G-BATS is the same as that used in the WEST LSTF bid, where adjustments in the highway and PT matrices are applied to represent a level of mode shift to cycling. Adjustments were applied to the catchment of the scheme, in terms of trip length and trip origin / destination pattern and to relevant car demand segments that could transfer to cycle. No adjustments were made to business purpose matrices, including car, LGV and OGV.

The resulting highway and PT matrices were re-assigned to their respective networks to obtain model results. Hence the mode shift impacts of the measures are reflected in the matrix adjustments rather than via the demand model.

The basic adjustment for cycle schemes in the LSTF is for every £10 per person gives a 4% increase in cycle, resulting in a 1% reduction in car trips, with the growth in cycle trips applying over 3 years *(reference Cycling Demonstration Towns, Sloman et al, 2009 and The Effects of Smarter Choices Programmes in the Sustainable Travel Towns, 2010)*

The outputs of the modelling have been benchmarked to the evidence of impacts of other schemes and the number of new cycle trips, increase from the case and the mode shift – including abstraction from car and other modes, compared to ensure the results of the modelling were robust.

3.3 Modelling Results

Table 3.1 reports the impact of the proposed scheme using the G-BATS models and applying the modal shift impacts based on the proposed levels of expenditure for the Cribbs Causeway to Emersons Green cycle trunk route and Bristol City Centre Promenade and River Crossings improvements.

Table 3.1a: Modelled Scheme Impacts – GBATS 2016

	Annual Trips (millions)			Annual Vehicle hours (millions)			Annual Vehicle Km (millions)		
Time Period	DM	DS	Change	DM	DS	Change	DM	DS	Change
AM peak	108.9	108.6	-0.3	21.4	21.3	-0.1	816.2	814.9	-1.2
Inter peak	208.4	207.8	-0.6	34.5	34.4	-0.1	1584.8	1583.2	-1.7
PM peak	103.4	103.0	-0.3	20.7	20.6	-0.1	802.8	801.6	-1.3
Off Peak	34.6	34.5	-0.1	5.7	5.7	0.0	262.9	262.7	-0.3
Weekends	52.2	52.1	-0.2	8.6	8.6	0.0	397.0	396.6	-0.4
Total	**507.5**	**505.9**	**-1.6**	**91.0**	**90.6**	**-0.4**	**3863.7**	**3858.9**	**-4.8**
Change percentage			**-0.31%**			**-0.39%**			**-0.13%**
Change absolute / trip lost						**13.6**			**3.1**

Table 3.1b: Modelled Scheme Impacts – GBATS 2031

	Annual Trips (millions)			Annual Vehicle hours (millions)			Annual Vehicle Km (millions)		
Time Period	DM	DS	Change	DM	DS	Change	DM	DS	Change
AM peak	129.5	129.1	-0.4	32.6	32.4	-0.2	981.3	980.0	-1.3
Inter peak	260.1	259.4	-0.8	49.9	49.7	-0.2	2005.6	2003.5	-2.1
PM peak	124.1	123.7	-0.4	31.9	31.6	-0.3	971.5	970.2	-1.3
Off Peak	43.2	43.0	-0.1	8.3	8.3	0.0	332.7	332.4	-0.3
Weekends	65.2	65.0	-0.2	12.5	12.5	0.0	502.4	501.9	-0.5
Total	**622.1**	**620.2**	**-1.9**	**135.2**	**134.4**	**-0.8**	**4793.5**	**4787.9**	**-5.5**
Change percentage			**-0.30%**			**-0.58%**			**-0.12%**
Change absolute / trip lost						**25.0**			**3.0**

The changes in car time and distance per trip lost to cycling are typically 3.0km, and between 14 and 25 mins. The higher time is in forecast year 2031 and reflects a more congestion highway network. The scale of change noted is typical for a cycle trips showing the adjustments to the car trip matrices are realistic.

If the change in car trips is converted to cycle trips, assuming an occupancy rate of 1.2 person per car and 80% of the forecast cycle demand comes from car abstraction, based on the evidence of existing schemes in Bristol and the CDTs, the annual number of new cycle trips generated by the BCC and SG schemes will be 2.1m in 2016 and 2.6m in 2031.

The population of the BCC and SG area is forecast to be 707,000 persons in 2016. Assuming at cycle mode share of 7.7% for all trip purposes (BCC share is 9.3% and SGC is 5.2%), based on 2011 census data, the annual number of cycle trips per annum in the areas without the scheme is estimated to by 49.1m.

The increases in cycle trip as a result of the scheme represent 4.5% increase in cycle trips, with the cycle mode share increasing to 8.0%.

The total spend for the BCC and SG areas is £9.9m, hence the spend per new cycle trip is 27p, assuming new demand at annual average of 2.5m trips. If a new cyclist makes 250 trips per annum, or 5 single trip per week, then the spend per new cyclist is £68. This compares to a rate of £80 per new cyclist in the Cycle Demonstration Towns projects.

3.4 B&NES Scheme Forecast

As the B&NES area is not included in detail in the G-BATS model, a bespoke demand forecast approach has been used to estimate impacts of the schemes in this area.

The total spend in the B&NES area is £1.19m, or 12.1% more than the total of £9.90m for the BCC and SG areas combined. The total scheme cost is £11.10m

Current cycle mode shares in B&NES is lower than for the BCC and SG areas, mainly due to the topography of the area, at 3.4% of trips, taken from 2011 census data. The BCC share is 9.3% and the SG share is 5.2%.

Adopting the forecasting approach in WebTAG 3.14.1. section 1.5, and assuming an average cycle trip length of 3.5km, speed of 14kph and maximum cycle share of 25%, the cycle share in the B&NES area would increase to 3.6% from 3.4%, an increase of 7%. This compares to growth of 4.5% for the BCC and SG schemes using the same model. Hence, given the lower baseline demand, the scope for growth in cycling in B&NES is higher than the BCC and SG areas.

Applying the level of growth to the B&NES population and forecast cycle share, will generate 0.3m new cycle trips, so increase the overall scheme for the three schemes to 2.9m cycle trips per year. The B&NES scheme increase is 15.6% over the GBATS estimate for the BCC and SG schemes, and compares to 12.1% increase in costs.

3.5 Scheme Proformas

The headline impact statistics for the scheme and each scheme are provided in Table 3.2 below.

Table 3.2: Headline Impact Statistics – Forecast Year 2031

Scheme	Full Cycle Transformation Scheme	Cribbs-Emerson's Green Trunk Cycle Route	Seven Dials National Cycle Route Scheme	City Promenade and River Crossings Cycle Ambition
Base Cycle Mode Share	6.4%	5.2%	3.4%	9.3%
Scheme Cycle Mode Share	6.7%	5.5%	3.6%	9.7%
Increase in Cycle Trips pa (million)	2.9	0.7	0.3	1.9
Reduction on Car Trips pa (million)	2.1	0.5	0.2	1.4
Reduction on Car km pa (million)	7.4	1.7	0.8	4.9
Cost of Scheme £m's	£10.73	£1.60	£1.15	£7.97

The DfT proforma for each scheme is provided in the following tables.

Table 3.3a: DfT Scheme Proforma - Cribbs Causeway to Emersons Green cycle trunk route

Input data	Without Scheme	With Scheme	Reference to supporting information
Description of infrastructure/facilities		East – West trunk route linking Cribbs Causeway, major new development sites, Parkway rail station and via the A4174 Ring Road to Emerson's Green, forming link directly to the existing ring road cycle path and provide a crucial link to Parkway rail Station. The M32 Junction 1 scheme addresses a major barrier to cyclists using the existing Ring Road cycle path to access the University of the West of England (UWE), Filton Abbey Wood (the MOD). Schemes complement existing network developed with funding from Cycle City and the LSTF.	
Route length (km)	Cribbs – Emersons Route 12.2 km B4058 Bristol Road Scheme - 0km Cycling with traffic on B4058 Bristol Road. M32 J 1 - n/a	Cribbs – Emersons Route - 12km The route through the East of Harry Stoke New neighbourhood will reduce length and time. B4058 Bristol Road Scheme 0.38km of new shared-surface path M32 J 1 - n/a	
Average trip length (km)	3.5	3.5	GBATS Model Changes
Average cycling speed	14	14	WebTAG
Number of users (per day)	0	1,900	Change in Cycle Trips only
Percentage of additional cyclists that would have driven a car otherwise.	N.A.	80%	Based on Evidence of Cycle Schemes (CDT, Bristol)
Car Traffic vehicle kilometres (per average day)	0	-6,000	Reduction on Car Km Only

Table 3.3b: DfT Scheme Proforma - Seven Dials National Cycle Route Scheme

Input data	Without Scheme	With Scheme	Reference to supporting information
Cycling is currently prevented from passing through Kingsmead Square and Seven Dials by a combination of traffic islands and one way restrictions	Cyclists would need to dismount to cross Kingsmead Square and Seven Dials to reach Westgate Street and Saw Close and vice-verca.	Cyclists would be able to travel between Kingsmead Square, Westgate Street and Swa Close without having to dismount. Cyclist would be able to hire a cycle from a new docking station in Kingsmead Square to travel around the city.	
Route length (km)	0.130km west bound via Monmouth Street 0.220km eastbound via Beaufort Square and Saw Close	0.130km both directions Contraflow cycling full length of Monmouth Street	
Average trip length (km)	3.5	3.5	GBATS Model Changes
Average cycling speed	14	14	WebTAG
Number of users (per day)	0	900	Change in Cycle Trips only
Percentage of additional cyclists that would have driven a car otherwise.	N.A.	80%	Based on Evidence of Cycle Schemes (CDT, Bristol)
Car Traffic vehicle kilometres (per average day)	0	-2,800	Reduction on Car Km Only

Table 3.3c: DfT Scheme Proforma - Promenade and River Crossings improvements

Input data	Without Scheme	With Scheme	Reference to supporting information
Promenade Route: Shared Use ped/cycle ways including retention of Chocolate Blocks element, Segregated cycleways, new pavements/footpath space River crossings / Connections: Road space reallocated to segregated cycle way in railway tunnel, new cycle bridge, new ramped accesses to existing footbridges, renewed cycle/ped bridge and path connections.	Promenade Route: cycling along poor quality riverside Chocolate Path, narrow pathway/pavement shared with pedestrians. Cycling in general traffic. River crossings / Connections: cycling across busy road bridges, through busy road tunnels and narrow footbridges shared with pedestrians. Limited space alongside pedestrians and traffic. Stepped and difficult access to road and footbridges.	Promenade Route: cycling along high quality, wide dedicated and shared cycle ways alongside river with additional space for pedestrians. River Crossings / Connections: Separate new wide river crossings and bridges for cyclists and pedestrians. Segregated cycleway under railway bridge. Step free access across river bridges linking to existing cycle corridors. Schemes will link to RPZ and CPZ schemes to provide wider benefits from an integrated package of measures.	

Route length (km) (Approx)	Promenade Route: 2.8km (Chocolate Path, Cumberland Rd, Commercial Rd, Clarence Rd) River Crossings /Connections: 0.35km (0.05km Langton Street Bridge, 0.09km Vauxhall Bridge, 0.05km Gaol Ferry Bridge, 0.08km Junction Lock Bridge, 0.08km St Lukes Rd Tunnel)	Promenade Route: 2.8km (Chocolate Path, Cumberland Rd, Commercial Rd, Clarence Rd) River Crossings / Connections: 0.35km (0.05km Langton Street Bridge, 0.09km Vauxhall Bridge, 0.05km Gaol Ferry Bridge, 0.08km Junction Lock Bridge, 0.08km St Lukes Rd Tunnel)	
Average trip length (km)	3.5	3.5	GBATS Model Changes
Average cycling speed	14	14	WebTAG
Number of users (per day)	0	5,500	Change in Cycle Trips only
Percentage of additional cyclists that would have driven a car otherwise.	N.A.	80%	Based on Evidence of Cycle Schemes (CDT, Bristol)
Car Traffic vehicle kilometres (per average day)	0	-17,500	Reduction on Car Km Only

Table 3.3d: DfT Scheme Proforma – Cycle Transformation Scheme

Input data	Without Scheme	With Scheme	Reference to supporting information
Description of infrastructure/facilities	See tables above on each scheme within the full scheme	See tables above on each scheme within the full scheme	
Route length (km)	See tables above on each scheme within the full scheme	See tables above on each scheme within the full scheme	
Average trip length (km)	3.5	3.5	GBATS Model Changes
Average cycling speed	14	14	WebTAG
Number of users (per day)	0	8,300	Change in Cycle Trips only
Percentage of additional cyclists that would have driven a car otherwise.	N.A.	80%	Based on Evidence of Cycle Schemes (CDT, Bristol)
Car Traffic vehicle kilometres (per average day)	0	-26,400	Reduction on Car Km Only

3.6 Benchmarking of Impacts

The forecasts impacts for the scheme from the G-BATS modelling have been compared to the evidence of similar cycle schemes in the UK. Evidence is summarised in Table 3.4. This shows a range of impacts from Cycle City Ambition Grant (CCAG) scheme are at or below those observed for other schemes, hence the demand and benefits are likely to the slightly understated.

Table 3.4: Summary of Cycle Scheme Evidence

Evidence	Source	CCAG Impact
C2W mode shares increased from 6.7% to 9.8% between 2007 and 2010. Spend of £22.8m over 2.5 years.	Greater Bristol Cycling city June 2011	CCAG scheme will result mode share change of 0.9% for £11.1m investment. Change of 3.1% for £22.8m in 2011. Hence CCAG impact is lower than previously achieved in the same area.
Investment of £500k pa per town, averaging £10 per head. Resulted in 4.7% growth pa.	The Effects of Smarter Choices in Sustainable Travel Towns 2011	Growth in cycle demand is forecast to be 4.5%, so is consistent with the £10 spend evidence.
Spend of £80 per new cyclist	Cycle Demonstration Towns	£68 per new cyclist for CCAG estimated, so a similar rate to other areas.
Mode share change from 11.8% to 15.1% in 2 years, of 1.7%pa.	Cycle Demonstration Towns	CCAG scheme will result mode share change of 0.9%, and is below that achieved for CDT projects.

3.7 Do-Minimum Transport Network

The proposed scheme has been considered in the appraisal against the do-minimum case that includes the LSTF scheme.

3.8 Demand Build-up and Annualisation

The following build-up in demand is assumed in the scheme appraisal.

- Year 1 – 50%;
- Year 2 – 75%;
- Year 3 – 90%; and
- Year 4 onwards – 100%.

The annualisation of modelled demands, revenue and benefits is as summarised in Table 3.4 and is based on highway count data in the Bristol urban area, and were derived for the NFHP major scheme business case developed in 2011.

The values used are highly comparable to annualisation factors used in previous Halcrow studies for other cities of a similar size to Bristol.

Table 3.5: Annualisation Factors

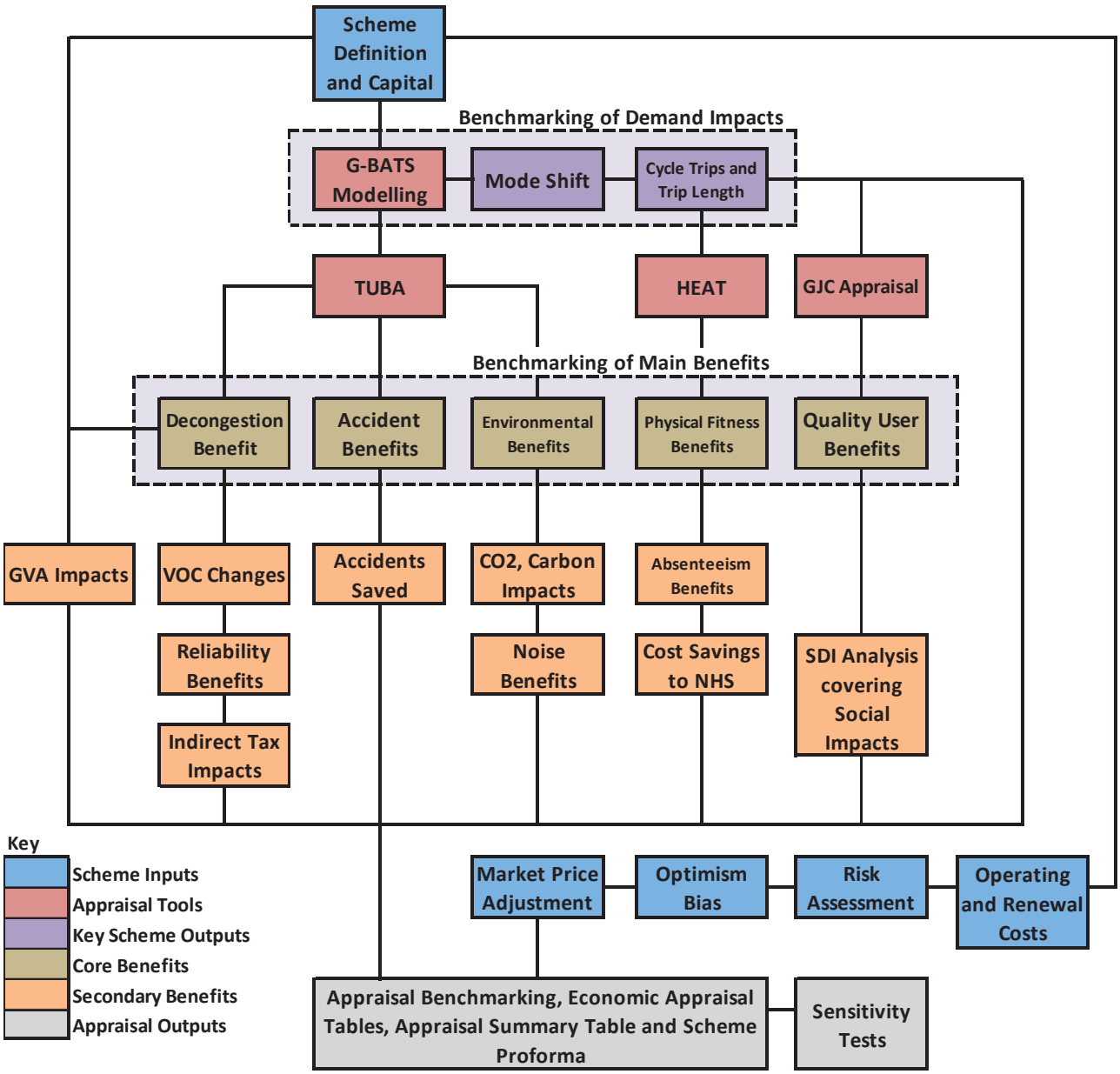
Period	Modelled Hours	Days	Hour to Period Factor	Annual Factor
Weekday AM peak	AM	253	2.55	645
Weekday Interpeak	IP	253	6.00	1,518
Weekday PM peak	PM	253	2.56	648
Weekday Off Peak	IP	365	0.69	252
Weekends and Bank Holidays	IP	56	6.79	380
Equivalent Peak Hours				**1,293**
Equivalent Inter-Peak Hours				**2,150**

4 Economic Appraisal

4.1 Appraisal Methodology

The case for improving the current the scheme is investigated in this economic appraisal. The process for deriving the benefits is defined in Figure 4.1.

Figure 4.1: Economic Appraisal Flowchart



To produce the economic appraisal for the scheme, the DfT's economic appraisal scheme, TUBA, was used. The latest version (v1.9) has been utilised, with the economic assumptions file updated to reflect the recent changes made in WebTAG. The inputs to TUBA included G-BATS car demand (vehicles per hour), time

(minutes) and distance (kilometres) matrices for all scenarios tested for the years 2016 (first modelled year) and 2031 (second modelled year).

Seven sensitivity tests have been carried out on the Scheme, as described below

- ST1 - High Mode Share to Cycling, at 25% greater than the central case;
- ST2 - Decay in Demand, assuming 2% loss pa in cycle demand, instead of 1% increase pa to 2031. This decay in effect assumes that by 2031, the level of cycle is at the dominimum level by the end of the scheme and there is no benefit at year 60
- ST3 - Increased Capital Costs, at 20% higher costs than the central case;
- ST4 – including GVA and NHS benefits;
- ST5 – excluding HEAT physical fitness benefits;
- ST6 - 20 year appraisal length; and
- ST7 – Lower rate of highway decongestion, at 25% lower

In addition, scheme tests have been conducted on the main schemes within the scheme for each local authority area. The tests are as follows:

- Cribbs Causeway to Emersons Green cycle trunk route ;
- Seven Dials National Cycle Route Scheme; and
- Promenade and River Crossings improvements.

4.2 Scheme Benefits

Time Saving Benefits – the highway decongestion time savings have been estimated using TUBA from outputs of the G-BATS model. Outputs from TUBA report the distribution of time savings using the standard time bands, and the spatial distribution of the benefits through mapping of results. Results were checked and found to be sensible. The decongestion rate per km removed was checked against WebTAG values, and realistic at 25p per km lost to the network.

Vehicle Operating Costs (VOC) – the change in costs from vehicles using less fuel per kilometre due to lower congestion levels was computed in TUBA, based on the G-BATS model outputs.

Quality Measures – a rate of 8p per new cycle has been adopted in the appraisal to reflect the quality benefits of cycling. This value is consistent with the average cycle trip generalised costs and the overall change in cycle mode share. The relationship between cost and demand is assumed to have an elasticity of -1.0. The growth in cycle demand at 4.5% results from a 0.9 minute saving for a 20 minute cycle trip.

Public transport revenue changes – it is assumed there will be no net change in revenues, with any loss due to full trip transfer from bus or rail to cycle being offset by the increase in revenue from new interchange trips between cycle and bus / rail modes.

Externality Benefits – these benefits were estimated using WebTAG 3.5.9 based on the decongestion impacts computed in TUBA. These benefits cover emission, air quality, highway accidents, noise and indirect tax.

Health Benefits – physical fitness benefits have been estimated using the HEAT tool, using inputs from the GBATS modelling and other local data for the West of England area. The assessment reflect the build-up in fitness benefits over a 10 year period.

The assessment of health benefits excludes absenteeism. If 2.5 new cycle trips are generated per year, from 10,000 new cyclists, then up to 68,000 days less morbility and sickness could result. This equates to £0.7m pa or over £25m over 60 years.

Reliability savings – benefits are based on the highway time saving benefits, with a 10% uplift to benefits is included to represent reliability in highway trips. This approach is consistent with other MSBCs and is consistent with the percentage as adopted by DfT.

Wider Economic Benefits (WEBs) have also been estimated and applied within the appraisal as a 30% increase in time savings benefits. The research by Feldman et al (2008) demonstrates that the agglomeration and labour supply impacts ranges between 10% and 66% of the business user time savings for infrastructure and public transport schemes. Total GVA benefit is £30m, equating to 75 new jobs, excluding direct labour to plan, design and construct the schemes. The value generated excludes absentieesm benefits, estimated to be around £25m, hence is likely to be an understatement of the overall impact on the economy.

The GVA benefit equates to £2.80 per £1 of cost expenditure for the scheme. Analysis was completed by Atkins for a range of major transport infrastructure schemes in the West of England and reported an average rate of GVA benefit of £3.60 per £1 of cost expenditure.

NHS Cost Savings have been reflected as a proportion of the physical fitness benefits, and are assumed to be 12% additional benefit based on evidence from Cycle England and Sustrans.

Summary of Benefits

Table 4.1 reported the benefit values for a 10, 20 and 60 year appraisal lengths. Overall, 49% of the benefits are time savings from decongestion on the highway network and 44% is from health benefits. Other benefits make up the remaining 7% of the total benefits.

The results are consistent with the Case Studies from the Assessment of Small Schemes completed by ITS / Aktins for DfT, where physical fitness, journey ambience and congestion relief were the three main benefits, accounting for over 90% of the total scheme benefits.

Table 4.1: Benefits Estimates for Different Appraisal Lengths

Benefits	10 years	20 years	30 years
Time Saving	£26,004	£66,961	£194,297
Accident	£1,175	£3,026	£8,779
Local Air Quality	£190	£489	£1,420
Greenhouse Gases	£84	£215	£625
Noise	£380	£979	£2,840
Reliability	£2,350	£6,051	£17,558
Physical Fitness	£29,270	£58,540	£175,620
Quality	£865	£2,226	£6,460
Indirect Tax	-£1,117	-£2,877	-£8,349
Total	**£59,200**	**£135,610**	**£399,251**
GVA	£4,015	£10,339	£30,000
NHS	£3,526	£9,079	£26,343
Total	**£60,976**	**£157,012**	**£455,594**
Scheme Totals (excluding GVA and NHS benefits)			
Cribbs Causeway to Emersons Green trunk route (SG)	£8,470	£21,810	£63,285
Seven Dials National Cycle Route Scheme (B&NES)	£7,410	£19,081	£55,366
City Promenade and River Crossings Cycle Ambition (BCC)	£37,555	£96,704	£280,601

Note: Values on £000's at 2010 prices and values

4.3 Economic Results

Presented in Table 4.2 are the headline economic appraisal results for the Scheme under new appraisal conditions. These results are reported in more detail in the accompanying Economic Efficiency of the Transport System (TEE), Public Accounts and Analysis of Monetised Costs and Benefits (AMCB) in Table 4.3 to 4.5.

Table 4.2: Headline Economic Results for the Scheme (£m's, 2010 Prices andValues)

Sensitivity Test	PVB	PVC	BCR	VFM band
Cycle Transformation Scheme	£399.0	£31.8	12.56	**Very High**

The Scheme provides a strong case for consideration with a benefit to cost ratio (BCR) of above 4.0, indicating very high value for money under DfT classification.

Table 4.3: Scheme Economic Efficiency of the Transport System (2010 Discounted Values)

Economic Efficiency of the Transport System (TEE)

Consumers - Commuting	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£87,593		£87,593			
Vehicle operating costs	£12,311		£12,311			
User charges	£0					
During Construction & Maintenance	£0					
NET CONSUMER BENEFITS	£99,904	*(1a)*	£99,904	£0	£0	£0

Consumers - Other	**ALL MODES**		**ROAD**	**BUS and COACH**	**RAIL**	**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**	**Passengers**	**Passengers**	
Travel time	£0					
Vehicle operating costs	£0					
User charges	£0					
During Construction & Maintenance	£0					
NET CONSUMER BENEFITS	£0	*(1b)*	£0	£0	£0	£0

Business								
			Goods Vehicles	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	**Other**
User benefits								
Travel time	£87,987			£52,628		£35,359		
Vehicle operating costs	£6,406			£2,544		£3,862		
User charges	£0							
During Construction & Maintenance	£0							
Subtotal	£94,393	*(2)*	£0	£55,172	£0	£39,221	£0	£0
Private sector provider impacts						**bus**	**rail**	**Other**
Revenue	£0							
Operating costs	£0							
Investment costs	£0							
Grant/subsidy	£0							
Subtotal	£0	*(3)*			£0	£0	£0	£0
Other business impacts								
Developer contributions	-£212	*(4)*	-£212		£0	£0		£0
NET BUSINESS IMPACT	£94,181	*(5) = (2) + (3) + (4)*						

TOTAL		
Efficiency Benefits (TEE)	£194,085	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in £000's 2010 prices and values

Table 4.4: Scheme Public Accounts (2010 Discounted Values)

Public Accounts

	ALL MODES TOTAL		PACKAGE INFRASTRUCTURE	BUS and COACH	RAIL		OTHER
Local Government Funding							
Revenue	£0						
Operating Costs	£16,310		£16,310				
Investment Costs	£7,869		£7,869				
Developer and Other Contributions	£0						
Grant/Subsidy Payments	£0						
NET IMPACT	**£24,179**	*(7)*	**£24,179**	**£0**	**£0**		**£0**
Central Government Funding							
Revenue	£0						
Operating costs	£0						
Investment Costs	£7,594		£7,594				
Developer and Other Contributions	£0						
Grant/Subsidy Payments	£0						
NET IMPACT	**£7,594**	*(8)*	**£7,594**	**£0**	**£0**		**£0**
Central Government Funding: Non-Transport							
Indirect Tax Revenues	£8,349	*(9)*	£8,349				
TOTALS							
Broad Transport Budget	**£31,773**	*(10) = (7) + (8)*					
Wider Public Finances	**£8,349**	*(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 £000's, 2010 prices and values.

Table 4.5: Scheme AMCB Table (2010 Discounted Values)

Analysis of Monetised Costs and Benefits

Noise	£2,840	*(12)*
Local Air Quality	£1,420	*(13)*
Greenhouse Gases	£625	*(14)*
Journey Ambience	£6,460	*(15)*
Accidents	£8,779	*(16)*
Physical Fitness	£175,620	
Economic Efficiency: Consumer Users (Commuting)	£99,904	*(1a)*
Economic Efficiency: Consumer Users (Other)	£0	*(1b)*
Economic Efficiency: Business Users and Providers	£94,181	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-£8,349	*- (11) - sign changed from PA*
Reliability	£17,558	*(17)*
Present Value of Benefits (PVB)	£399,039	*(PVB) = (12) + (13) + (14) +*
Broad Transport Budget	£31,773	*(10)*
Present Value of Costs (PVC)	£31,773	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£367,266	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	12.56	BCR=PVB/PVC

Six sensitivity tests have been carried out against the scheme as described earlier in this Chapter. The headline results of these tests are presented in Table 4.6, and show a higher BCR with +25% greater cycle mode shares and with the inclusion of NHS and GVA benefits. The lowest BCR is for the 20 year appraisal, at a value of X.X. All tests show the scheme is "very high" value for money.

Table 4.6: Sensitivity Test Results (£m's, 2010 Prices and Values)

Sensitivity Test	PVB	PVC	BCR	VFM band
Cycle Transformation Scheme	£399.0	£31.8	12.56	**Very High**
ST1 - High Mode Share to Cycling at 25% greater than the central case	£502.6	£31.8	15.82	**Very High**
ST2 - Decay in Cycle Demand assuming a 2%pa, instead of 1% growth.	£291.3	£31.8	9.17	**Very High**
ST3 - Increased Capital Costs +20%	£399.0	£34.9	11.44	**Very High**
ST4 - Include GVA and NHS Benefits	£455.6	£31.8	14.34	**Very High**
ST5 - Exclude HEAT Benefits	£223.4	£31.8	7.03	**Very High**
ST6 - 20 year Appraisal Length	£135.6	£23.7	5.73	**Very High**
ST7 – Lower Decongestion Rate	£350.5	£31.8	11.03	**Very High**

Three scheme tests have been carried out to show the value for money of each main element within the scheme. The headline results of these tests are presented in Table 4.7, and all scheme are very high value for money. The B&NES area schemes show the largest BCR as the increase in cycle demand is greater for this area given the current low base number of cycle trips.

Table 4.7: Scheme Test Results (£m's, 2002 Prices and Values)

Sensitivity Test	PVB	PVC	BCR	VFM band
Cycle Transformation Scheme	£399.0	£31.8	12.56	**Very High**
Cribbs Causeway to Emersons Green trunk route(SG)	£63.3	£4.7	13.54	**Very High**
Seven Dials National Cycle Route Scheme (B&NES)	£55.3	£3.4	16.16	**Very High**
City Promenade and River Crossings Cycle Ambition (BCC)	£280.5	£23.7	11.84	**Very High**

4.4 TUBA Files and Checking

The following processes were completed in the checking of TUBA results:

- Checking of model input results by examining the key network and assignment statistics for each modelled time period and mode.
- Economic parameters - checking of values applied;
- Checking of TUBA warnings;
- Sense-checking of outputs through the relative size of impacts across different schemes;
- Spreadsheet analysis of the results using processes applied in the preliminary appraisal stage of the WTS study;
- Plotting of scheme impacts;
- Benchmarking of results to other appraisal results;
- Distribution of time savings analysis;
- Distributional analysis of social impacts, including by market sector.

The outputs of the TUBA runs were checked for warnings, in terms of the ratio of DM (do-minimum) and DS (do something) costs (time and distance). The ratios were externally checked to establish the proportion of benefits and trips falling in the defined bands in the TUBA guidance.

The analysis reported in Table 4.8 shows the number of trips in the "serious" and warning" bands to be very low. All results are based on the AM 2026 Car Commuting run for the scheme against the DM.

Over 99% of trips and benefits fall in the central band with a ratio between 0.67 and 1.5. 0% of benefit falls in the "serious" range of ratio "less than 0.33" or "greater than 3.00".

The results demonstrates that the TUBA run is robust, with the reason for most of the errors being due to zero costs or no trips associated with an OD pair.

Table 4.8: Cost Ratio Checking

Ratio of DM to DS costs	Number of OD Pairings	Number of OD Pairings with Trips	Do-Minimum Trips	Do-Something Trips	Overall Benefit
Less than 0.33	0	0	0	0	0.000%
Between 0.33 and 0.67	13	13	1.81652	1.78312	-0.018%
Between 0.67 and 1.5	1,500,865	1,498,459	212,350.8	211,261.4	100.013%
Between 1.5 and 3	10	10	0.70967	0.69549	0.005%
Greater than 3	0	0	0	0	0.000%
Total	0	0	0	0	0.000%

Note: Ratio is DM / DS time, hence if ratio is <1, then DM < DS time.

The key distributional analysis results are reported below and can also be found in the Economic Appraisal Report from April 2010. Overall, the scale of benefits is realistic, with 75% ore more of trips gaining and only 25% showing an increase in cost, with the vast majority of those losses being less than 2 minutes.

Table 4.9: Distribution of Benefits by Ratio Bands

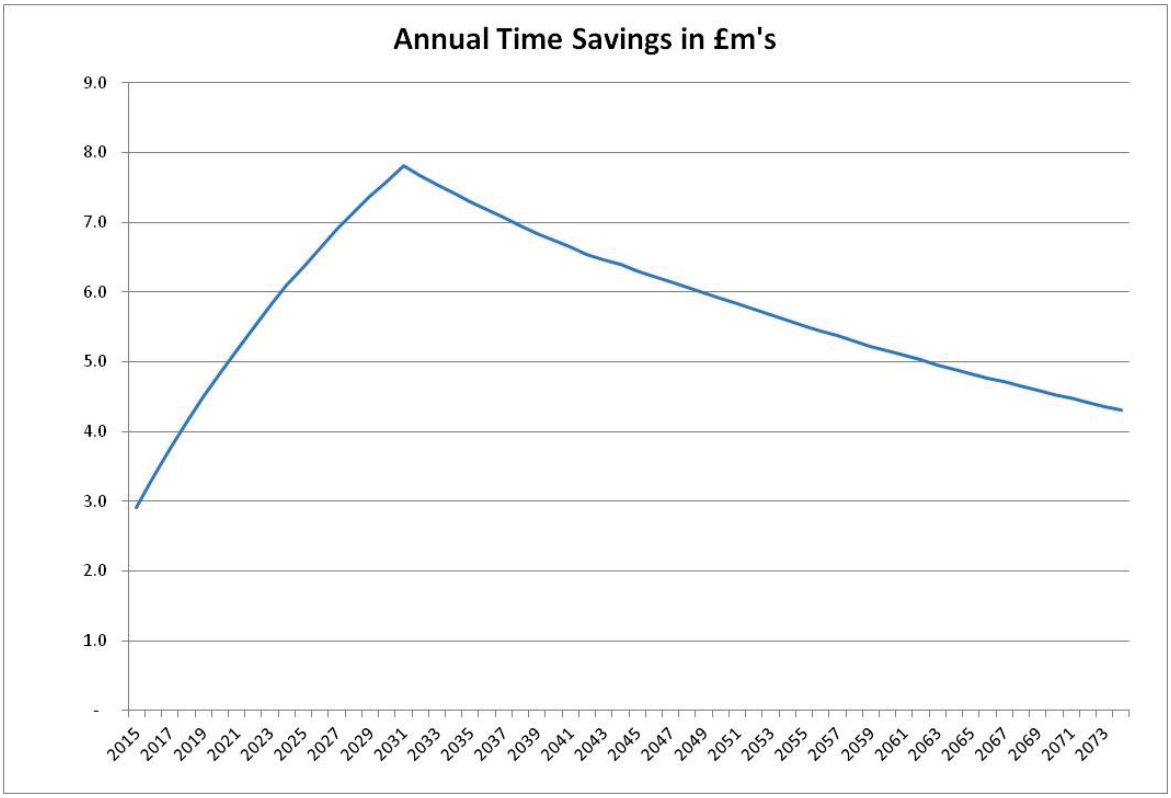
Band	Business	Commuting and Other
Over 5 minutes saving	0.0%	0.0%
Between 5 and 2 minutes saving	3.3%	3.5%
Between 2 and 0 minutes saving	126.8%	123.0%
Between 0 and 2 minutes increase	-27.6%	-25.3%
Between 2 and 5 minutes increase	-2.2%	-1.2%
Over 5 minutes increase	-0.3%	0.0%
Total	**100.0%**	**100.0%**

Table 4.10: Distribution of Net Benefits by Ratio Bands

Band	Business	Commuting and Other
Between 0 - 2 Minutes Net Benefit	-0.3%	0.0%
Between 2 - 5 Minutes Net Benefit	1.1%	2.3%
Over 5 Minutes Net Benefit	99.2%	97.7%
Total	**100.0%**	**100.0%**

The scale of discounted benefits over time is shown in Figure 4.2. The figures demonstrate the benefits for the Scheme.

Figure 4.2: Profile of TUBA Time Benefits



5 Appraisal Summary Table

5.1 Introduction

This Chapter of the report includes the Appraisal Summary Table (AST) for the scheme, and analysis as to how it performs in regards to a number of key objectives under the headings Economy, Environmental, Social and Public Accounts. The AST is reported in Table 5.5 based on the latest WebTAG.

5.2 Economy

Business Users and Transport Providers – The TEE, Transport Economic Efficiency for the Scheme shows the time savings benefits of £88.0m for business. The highway benefits are consistent with change in vehicle kilometres generated from the scheme and the DfT's advice on estimating the Marginal Economic Cost of Congestion at a rate of 25p/km removed.

The distribution of business time savings shows the percentage of trips in each category for the AM peak in. This shows 98% of trips to have a time saving, and 2% of trips having a significant saving over 2 minutes. Some 0.1% of trips have a saving over 5 minutes. Disbenefits are very small, with the majority from highway changes of a few seconds only. **Overall Assessment – Large Beneficial.**

Reliability Impact on Business Users – The benefits computed are £8.8m for highway trips, including business and freight. The latter is based on detailed analysis of bus journey times. These values are 10% of respective time savings, so are within ranges seen in previous studies and agreed with DfT. **Overall Assessment – Moderate Beneficial.**

Regeneration –WebTAG Unit 2.8 states that "There is no national designation of regeneration areas". Within the West of England nationally/regionally recognised regeneration areas are as follows:

- Bristol's Temple Quarter was designated by government as an Enterprise Zone, in which business taxes will be reduced and planning controls will be relaxed. After a successful application from the Local Economic Partnership (LEP) it is therefore a national designation;
- Priority 3A of the Regional Economic Strategy is to improve transport networks, with emphasis on enhancing connectivity, providing access to markets and tackling connectivity;
- Priority 2B of the Regional Economic Strategy is to regenerate the most deprived communities such as those located within the region's major cities, including Bristol; and
- The Local Economic Partnership has also designated 5 Enterprise Areas as other priority locations for job creation as follows:
  - Bath City Riverside;
  - Avonmouth / Severnside
  - Weston-super-Mare Gateway;
  - Emerson's Green Science Park; and
  - Filton/A38.

Mapping showing these regeneration areas in the areas on the schemes are provided in Table 5.1 and Figure A1 of Appendix A.

Table 5.1: Enterprise Zones & Areas

Scheme Area	Impact on Regeneration Areas
Bath	Straddles the boundary of Bath City Riverside Enterprise Area, designated by the West of England LEP
Bristol	Within 1 mile of nationally designated Temple Quarter Enterprise Zone
South Gloucestershire	2 miles east of Filton Enterprise Area and 1.5 miles west of Emerson's Green Enterprise Area, both designated by the West of England LEP.

The schemes are also well-related to key areas identified in local plans for regeneration and growth. The relevant defined zones are:

- Bristol City Centre;
- South Bristol;
- Bristol's Inner East and Northern Arc regeneration areas;
- Bath City Centre and Western Riverside; and
- Cribbs/Patchway.

The links between these areas and the schemes are provided in Table 5.2 and Figure A2 of Appendix A.

Table 5.2: Regeneration Areas in Local Plans

Scheme Area	Impact on identified areas for regeneration in local plans
Bath	Within the Bath Central Area Connected to the Western, Newbridge & Twerton Riverside policy areas by National Cycle Network (NCN) Route 4.
Bristol	Adjacent to South Bristol (Policy BCS1) Within 1 mile of City Centre Gateways and City Centre Extensions (Policies BCS2) and Inner East Bristol (Policy BCS3)
South Gloucestershire	Within 2 and 4 miles of the Patchway, Filton, Staple Hill & Kingwood Priority neighbourhoods. 3 miles from the Cribbs/Patchway new neighbourhood (Policy CS26) and 2 miles from Bristol's Northern Arc for regeneration (Policy BCS3)

Many of these areas aim to improve a combination of employment, housing, facilities and environmental quality.

In addition to the regeneration areas defined in planning policy, there are a number of additional major employment areas which act as strong trip attractors and house some of the region's major employers. This includes a series of sites safeguarded by South Gloucestershire Council for employment in the north and east fringe, including Aztec West, Patchway Trading Estate, The British Aerospace and Rolls-Royce sites at Filton Airfield, employers between Filton Abbey Wood at Bristol Parkway Stations (including the MoD and Friends Life) and the Science Park at Emerson's Green. All of

these are within 4 miles of the South Gloucestershire scheme location. **Overall Assessment – Moderate Beneficial**

Wider Impacts – with the reduced traffic congestion on the network, travel times will reduce for highway trips. The increase in speed of 0.8% is forecast from the GBATS modelling. This will result in benefits to business trips and journeys will be faster and more reliable. Based on the evidence from WebTAG and the local work completed in the West of England for other major scheme bids, the GVA benefit of the scheme is assumed to be 30% of the time savings, hence £30m. The benefit equates to £2.80 per £1 of cost expenditure for the scheme. Analysis completed by Atkins for the MSBC for a range of major transport infrastructure schemes in the West of England reported an average rate of GVA benefit of £3.60 per £1 of cost expenditure. The level of benefit equates to 75 jobs, excluding those required for the planning, construction and operation of the proposed scheme. **Overall Assessment – Moderate Beneficial.**

5.3 Environmental

Noise – There is an overall reduction in exposure to noise from reduced traffic levels. The estimate of benefits has been derived from the TUBA results and the WebTAG externality benefit rates. Overall, this benefit is 1% of total benefits. **Overall Assessment – Slight Beneficial**

Air Quality– The scheme leads to a decrease in the overall NO2 and PM10 score based on the TUBA and WebTAG assessments. The majority of the schemes fall within AQMA areas, as shown in Figure A3 in Appendix A. Benefits equate to less than 1% of the overall scheme benefits. **Overall Assessment – Slight Beneficial**

Greenhouse Gases – The scheme is predicted to lead to a decrease in carbon emissions due to a reduction in vehicle trips. Benefits equate to less than 1% of the overall scheme benefits and is 6,000 tonnes of carbon lost. **Overall Assessment – Slight Beneficial.**

Landscape – Two of the three schemes are proposed to be implemented within an urban environment and will not have a negative impact on the surrounding landscape. Special attention will be given to the South Gloucestershire scheme which falls within the Green Belt, where preserving the land's characteristic openness, safeguarding countryside from encroachment and urbanising features and preserving setting of the individual settlements is of prime importance. The works will take place within the highway boundary and they will be designed in a manner to ensure that any potential negative impact is avoided or mitigated. **Overall Assessment – Neutral**

Townscape – Of the schemes in the three authorities, Bath's 7- Dials scheme is the one anticipated to have the greatest effect on the townscape of the area. The scheme lies at the heart of one of a number of important destination spaces identified in the Council's Public Realm and Movement Strategy and lies strategically at the convergence of seven streets outside the historic Westgate of the former Roman city. The proposed scheme will transform the existing tired, cluttered and divided public space into a dynamic high quality shared space, which is anticipated to improve the townscape. **Overall Assessment - Slight Beneficial**

Heritage – Plot of heritage asset areas in each authority area are provided in Table 5.3 and Appendix A Figures A4 to A6 which shows listed buildings, conservation areas,

scheduled ancient monuments, registered parks and gardens, and the Bath World Heritage Site.

Table 5.3: Designated Heritage Assets

Scheme Area	Relationship of schemes to Designated Heritage Assets
Bath	Within City of Bath World Heritage Site and Bath Conservation Area. Close to scheduled ancient monuments (parts of The Roman Baths and site of Roman town designation) and several listed buildings (5 Grade II* listed within 100m)
Bristol	Schemes are within Bedminster or City Docks Conservation Areas. Some scheme elements are listed structures (Vauxhall & Langton Street Bridges) and many of the scheme locations are closed to other listed buildings or structures. The Chocolate Path is adjacent and above the Underfall, a scheduled ancient monument.
South Gloucestershire	Adjacent to Hambrook Conservation Area. One listed building within 250m. Within 250m of four entries on the list of locally important buildings

All scheme sites are proposed to be implemented within or adjacent to conservation areas and most are close to, or are themselves, designated heritage assets. In South Gloucestershire the scheme works will take place within the highway boundary and that they will be designed in a manner to ensure that any potential negative impact is avoided or mitigated. **Overall Assessment – Neutral**

Biodiversity – The Bristol schemes are close to or straddle the River Avon Site of Nature Conservation Interest (SNCI). The design of the schemes will take into account the designations or the potential presence of protected species and the authorities will, where appropriate, prepare and implement an Ecological Management Plan. **Overall Assessment – Neutral**

Water Environment – Many of the Bristol scheme locations are within flood risk zones and schemes in the other authorities are close to flood risk areas. The Bristol schemes, and the proposed new bridge in particular, will be designed so as not to impact on or make worse the flood risk in the area. **Overall Assessment – Neutral**

5.4 Social

Commuting and Other Users – The TEE, Transport Economic Efficiency reported in Figure 4.2 for the Scheme shows the time savings benefits as a split of £87.6m for commuters and others.

The distribution of commuting and other time savings shows the percentage of trips in each category for the AM peak in 2026 to be as below in Table 5.4. This shows 98% of trips to have a time saving and 2% of trips having a significant saving over 2 minutes. **Overall Assessment – Large Beneficial**

Reliability Impacts on Commuting and Other Users – The benefits computed are £8.8m for highway trips and bus passenger trips. These values are 10% of respective time savings, so are within ranges seen in previous studies and agreed with DfT. **Overall Assessment – Moderate Beneficial**

Physical Activity – A HEAT assessment has been completed to assess the physical fitness benefits. This used the HEAT tool and is based on a 60 year appraisal period

assumming up to 80% of new cycle demand is generated by the scheme. Key assumptions are as below:

- Critically, it has been concluded in the main economic assessment that there would be an additional 8,300 cycle trips per day (2.9 million per year);
- This increase would be achieved with 4 years and 75% of the increase would be achieved within 2 years;
- The benefits are derived from the savings in premature deaths using the DfT value of a statistical life (£1,654,000);
- The increase in cycling is averaged at 34 minutes for a two-way trip which requires that the increase in cycle trips is halved to 4,150;
- For each new cycle user there is a reduced risk of premature mortality of 45% compared with those not being active through cycling.

The benefit is £175.6m over 60 years, or £58.5m over 20 years. Further details of the HEAT assessment are provided in supporting documents to the bid. **Overall Assessment – Large Beneficial**

Journey Quality – A level of benefit of 8p per new cycle trip is assumed to cover the wider amenity benefits of cycling. This is based on the value of quality measures provided in WebTAG and has been checked by comparison of the change in cycle mode share against the equivalent change in travel costs. The benefits equal 2% of total scheme benefits.

All the schemes in this submission will enhance the journey quality for new and existing pedestrian and cycle journeys. Emphasis is being given to improving the quality of the whole journey experience. Such components are shown in Table 5.4.

Table 5.4: Examples of scheme components that enhance cycle journey quality

Scheme Area	Scheme component	Impact
Bristol	Brunel Way / Vauxhall / Gaol Ferry & Langton Street Bridges	Improving north-south links across the river, including constructing step-free routes and segregation
Bath	Seven Dials	Route quality across square
South Gloucestershire	M32 slip road signalised crossing	Improved crossing opportunities

With cycle schemes, the effect on vehicular uses cannot be assessed. However the schemes could result in a negative impact on these users as there may be an increase in the number of times motorists are required to give way to pedestrians/cyclists. Hence overall all it is considered that the schemes will have a neutral effect on journey quality. **Overall Assessment – Slight Beneficial**

Accidents – The impacts of the scheme on the number of accidents will be very small due to the low change in vehicle kilometres over the network. The estimate of savings is based on COBA outputs and is £8.8m, equal to an average of 8 accidents per annum. **Overall Assessment – Slight Beneficial**

Security – The scheme will include the implementation of better lighting, improved footways and facilities at interchanges. There will also be an increase in travel demand for cycling on key route resulting in a greater number of users and less feeling of isolation. **Overall Assessment –Slight Beneficial**

Access to Services – There will be a moderate beneficial impact on accessibility experienced across West of England as a result of the scheme of measures, which will increase journey time reliability and reduce journey times, so increasing the opportunities to access jobs and key services. The following plots are provided in Appendix A to show the impacts to selected vulnerable groups groups:

Figure A7: IMD Areas (to show transport improvements to those lowest income areas)

Figure A8: Disability Living Allowance Claimants

Figure A9: Older People

Figure A10: Black & Minority Ethnic (BME) Population

Income deprivation occurs in areas close to the scheme locations in South, Inner East and Outer North Bristol and parts of central Bath. Likewise high concentrations of Disability Living Allowance Claimants occur in areas close to the scheme locations in South and Inner East Bristol, and parts of central Bath.

High concentrations of older people are identified close to the scheme locations in south-west Bristol and parts of North Somerset adjacent to the city boundary, in Bath, and close to the South Gloucestershire schemes in Hambrook, Frenchay and Downend. The scheme areas are well-related to the higher concentrations of black and minority ethnic population, found in inner city Bristol, the M32 corridor into South Gloucestershire and parts of central Bath. **Overall Assessment – Moderate Beneficial**

Affordability – no change in the cost of travel is expected from the scheme. Savings will be made in car operating and running costs from reduced car travel, however new cyclists will incur costs from purchase of new cycles and the general running costs of the bike. At the most local level, the enhancement of walking and cycling networks will improve accessibility at minimal cost to the end user and hence providing value for money. For longer cycle trips, the focus on employment areas, and providing new routes linking employment areas will give the opportunity to access employment areas hitherto out of reach. **Overall Assessment - Neutral**

Severance – The scheme includes a new crossing over the river in Bristol so will have a slight positive impact to severance. . The schemes within the scheme that will help reduce severance are the multi-modal corridor measures through better and easier access for pedestrians and cyclist. Vulnerable groups, including those with learning difficulties, will benefit from reduced conflict with traffic (as a result of decongestion), which will improve safety and ease of movement. All the schemes will contribute to overcoming severance and it is a key benefit of the proposed schemes. In South Gloucestershire the two scheme locations are part of much larger planned route which will help cyclists avoid the A4174 Avon Ring Road entirely.

Many of the Bristol scheme elements will give cyclists improved crossings over the River Avon, helping them to avoid the heavily trafficked Bedminster Bridge and Cumberland Basin road systems, which are barriers to cycling between north and south Bristol. **Overall Assessment -Slight Beneficial**

Option Values – The scheme offers minimal option value benefits as the schemes within the scheme are making better use of existing infrastructure and services, and are not adding new modes and services to the network. Whilst the scheme will

ensure more demand by sustainable modes and other more attractive travel choices by rail and bus, such services are available at the moment. **Overall Assessment - Neutral**

5.5 Public Accounts

Cost to Board Transport Budget: The public accounts summary for the scheme includes for the following:

- The local government cost is made up of £7.87m local contribution and £16.31m operating and maintenance costs. The central Government cost is £7.59m.
- **Indirect Tax Revenues**: The loss of indirect tax includes £8.35m from less fuel due to a reduction in highway mileage.

Table 5.5: Appraisal Summary Table

Appraisal Summary Table		Date produced:	22-Apr-13	Contact:	
Name of scheme:	West of England Cycle Transformation - Cycle City Ambition Funding Bid			Name	Duncan Laird
Description of scheme:	Package of Cycle Infrastructure Measures in the Bristol City Council, South Gloucestershire Council and Bath and North East Somerset Council areas,			Organisation	Bristol City Council
				Role	

Impacts		Summary of key impacts	Assessment			
			Quantitative	Qualitative	Monetary £000's £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The schemes will create transfer of trips from car to cycle. In total, 1.9m car trips per annum are forecast to the lost on the network, equal to 7m car km. The time savings will result from reduced traffic flows and congestion levels.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min: £ 86.14 / 2 to 5min: £ 1.76 / > 5min: £ 0.09	Large Beneficial	£ 87,987	Large Beneficial
	Reliability impact on Business users	with the reduced levels of congstion, travel time are expected to reduce and also become less variation and less subject to congestion at critical pinch points on the network.	Assumed to be 10% of time saving benefits	Moderate Beneficial	£ 8,799	
	Regeneration	The location of the schemes are located close to a number of major regeneration areas, and will provide improved transport access to such areas.	n/a	Moderate Beneficial	n/a	
	Wider Impacts	Benefits expected from reduced congestion from transfer from car to cycle, hence business travel will be more efficient at key pinch points on the network. The GVA rate per spend is low in comparison for other major schemes in the Bristol area, and reflects the lower imapcts of the cycle package.	Based on the Decongestion Levels and Scheme Spend	Moderate Beneficial	£ 30,000	
Environmental	Noise	Noise benefits are expected from reduced traffic flows on the highway network.	Based on GBATS modelling and TUBA	Slight Beneficial	£ 2,840	Slight Beneficial
	Air Quality	A reduction of 7m car km per annum is forecasts as a result of the increase in cycle trips. This is reduce vehcile emissions. Schemes are within AQMA's in Bristol and Bath.	Based on GBATS modelling and TUBA	Slight Beneficial	£ 1,420	Slight Beneficial
	Greenhouse gases	A reduction of 7m car km per annum is forecasts as a result of the increase in cycle trips. This is reduce vehcile emissions.	Change in non-traded carbon over 60y (CO2e): n/k Change in traded carbon over 60y (CO2e): n/k	Slight Beneficial	£ 625	
	Landscape	No negative impacts expected, Works are within existing highway boundary.	n/a	Neutral	n/a	
	Townscape	Wider positive benefits in Bath linked to Public Realm and Walking Strategy.	n/a	Slight Beneficial	n/a	
	Heritage of Historic resources	Bath is World Hertitage Site, scheme design to avoid adverse impacts.	n/a	Neutral	n/a	
	Biodiversity	Schemes will be designed to ensure no minor negative impacts	n/a	Neutral	n/a	
	Water Environment	Schemes will be designed to ensure no minor negative impacts	n/a	Neutral	n/a	
Social	Commuting and Other users	The schemes will create transfer of trips from car to cycle. In total, 1.9m car trips per annum are forecast to the lost on the network, equal to 7m car km. The time savings will result from reduced traffic flows and congestion levels.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min: £ 85.75 / 2 to 5min: £ 1.75 / > 5min: £ 0.09	Large Beneficial	£ 87,593	Large Beneficial
	Reliability impact on Commuting and Other users	with the reduced levels of congstion, travel time are expected to reduce and also become less variation and less subject to congestion at critical pinch points on the network.	Assumed to be 10% of time saving benefits	Moderate Beneficial	£ 8,759	
	Physical activity	A HEAT assessment of the benefits was completed. Overall, 2.9m new cycle trips are expected to be generated by the scheme, equal to 1.0 new cyclists. The average trip length is 3.5km or 18 mins,	Based on a HEAT Assessment	Large Beneficial	£ 175,620	
	Journey quality	A level of benefit of 8p per new cycle trip is assumed to cover the wider amenity benefits of cycling.	Based on WEbTAG rates of quality measures	Slight Beneficial	£ 6,460	
	Accidents	With the reduction in highway traffic, the number of accident is expect to reduce. The savings equate to saving of 8 average accidents per year on the highway network.	Based on the Rate of Decongestion	Slight Beneficial	£ 8,779	Slight Beneficial
	Security	There will also be an increase in travel demand for cycling on key route resulting in a greater number of users and less feeling of isolation.	n/a	Slight Beneficial	n/a	Slight Beneficial
	Access to services	BCC schemes close to low IMD areas within the city. Access to all services will improve due to reduced traffic congestion, that will also result in faster bus speeds.	n/a	Slight Beneficial	n/a	Slight Beneficial
	Affordability	No significant change in the cost of travel to user is expected from the scheme.	n/a	Neutral	n/a	Neutral
	Severance	Improvements to cyclists and pedestrains from decidated measures. New Bridge in Bristol.	n/a	Slight Beneficial	n/a	Slight Beneficial
	Option values	No benefits expected	n/a	Neutral	n/a	
Public Accounts	Cost to Broad Transport Budget	Central Government - £7.59m, Local Government - £7.87m, Operating and Maintenance costs - £16.31m	Based on Scheme Cost Analysis	Cost	£ 31,773	
	Indirect Tax Revenues	Indirect Tax Change - £8.35m	Based on GBATS modelling and TUBA	Cost	£ 8,349	

Appendix A – Supporting Figures for AST

Figure A1 : Regeneration Zones

Figure A2 : Regeneration Areas in Local Plans

Figure A3 : AQMAs

Figure A4 : Heritage Assets – Bath and North East Somerset

Figure A5 : Heritage Assets – South Gloucestershire

Figure A6 : Heritage Assets – Bristol City

Figure A7: IMD Areas to show transport improvements to those lowest income areas

Figure A8: Disability Living Allowance Claimants

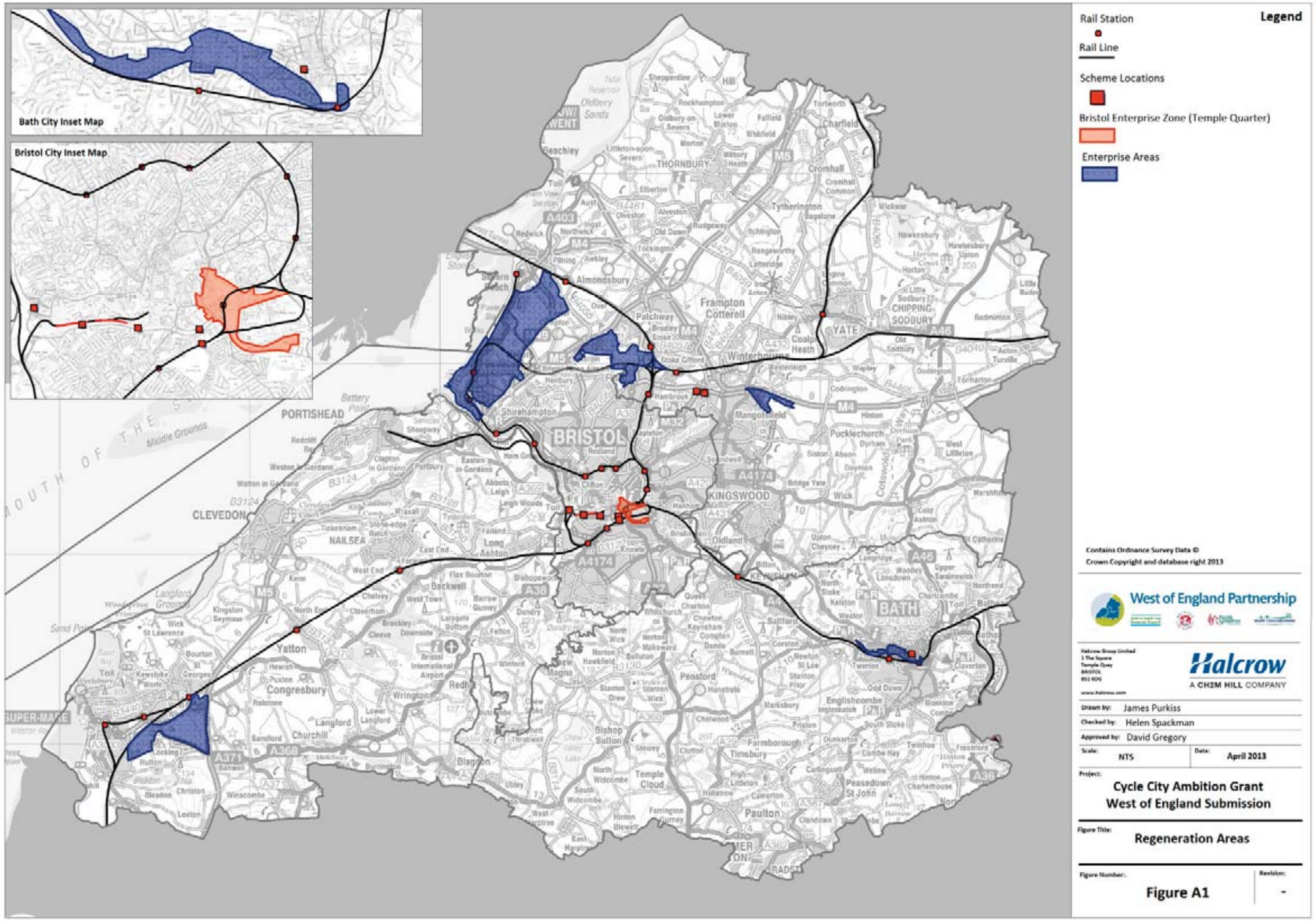
Figure A9: Older People

Figure A10: Black & Minority Ethnic (BME) Population

West of England - Cycle City Ambition Grant Funding Bid

Scheme Economic Appraisal Report

Appendix A – Supporting Figures for Appraisal Summary Table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Bristol City Inset Map
Legend
Rail Station
Rail Line
Scheme Locations
Bristol Enterprise Zone (Temple Quarter)
Enterprise Areas
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Halcrow
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Checked by: Helen Spackman
Approved by: David Gregory
Scale: NTS
Date: April 2013
Project: Cycle City Ambition Grant
West of England Submission
Figure Title: Regeneration Areas
Figure Number: Figure A1
Revision: -
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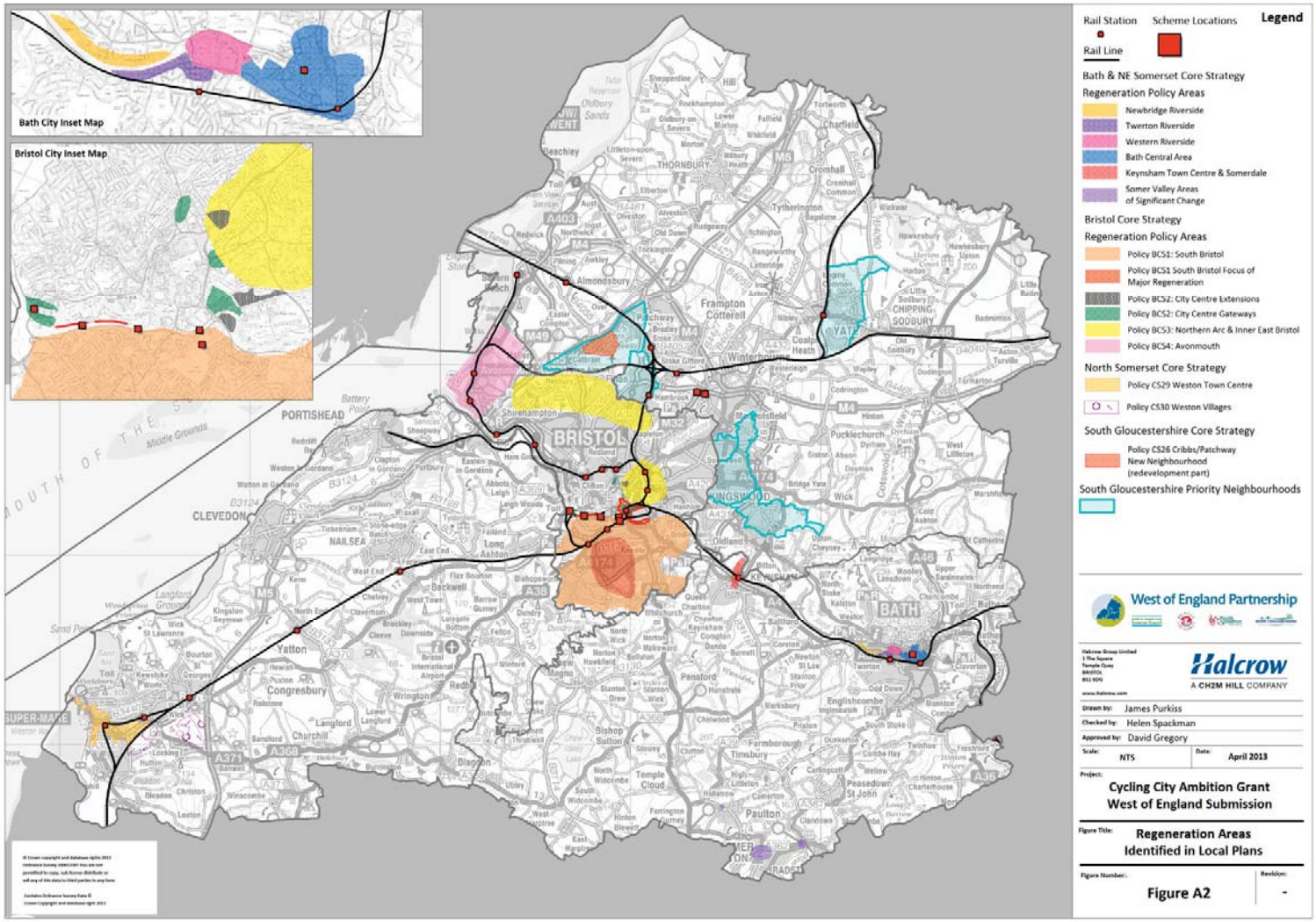
BATH
PORTISHEAD
CLEVEDON
NAILSEA
KINGSWOOD
YATE
THORNBURY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Churchill
Frampton Cotterell
Almondsbury
THORNBURY
CHIPPING SODBURY
Legend
Rail Station
Scheme Locations
Rail Line
Bath & NE Somerset Core Strategy
Regeneration Policy Areas
Newbridge Riverside
Twerton Riverside
Western Riverside
Bath Central Area
Keynsham Town Centre & Somerdale
Somer Valley Areas of Significant Change
Bristol Core Strategy
Regeneration Policy Areas
Policy BCS1: South Bristol
Policy BCS1 South Bristol Focus of Major Regeneration
Policy BCS2: City Centre Extensions
Policy BCS2: City Centre Gateways
Policy BCS3: Northern Arc & Inner East Bristol
Policy BCS4: Avonmouth
North Somerset Core Strategy
Policy CS29 Weston Town Centre
Policy CS30 Weston Villages
South Gloucestershire Core Strategy
Policy CS26 Cribbs/Patchway New Neighbourhood (redevelopment part)
South Gloucestershire Priority Neighbourhoods
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Project:
Cycling City Ambition Grant
West of England Submission
Figure Title:
Regeneration Areas Identified in Local Plans
Figure Number:
Figure A2
Revision:
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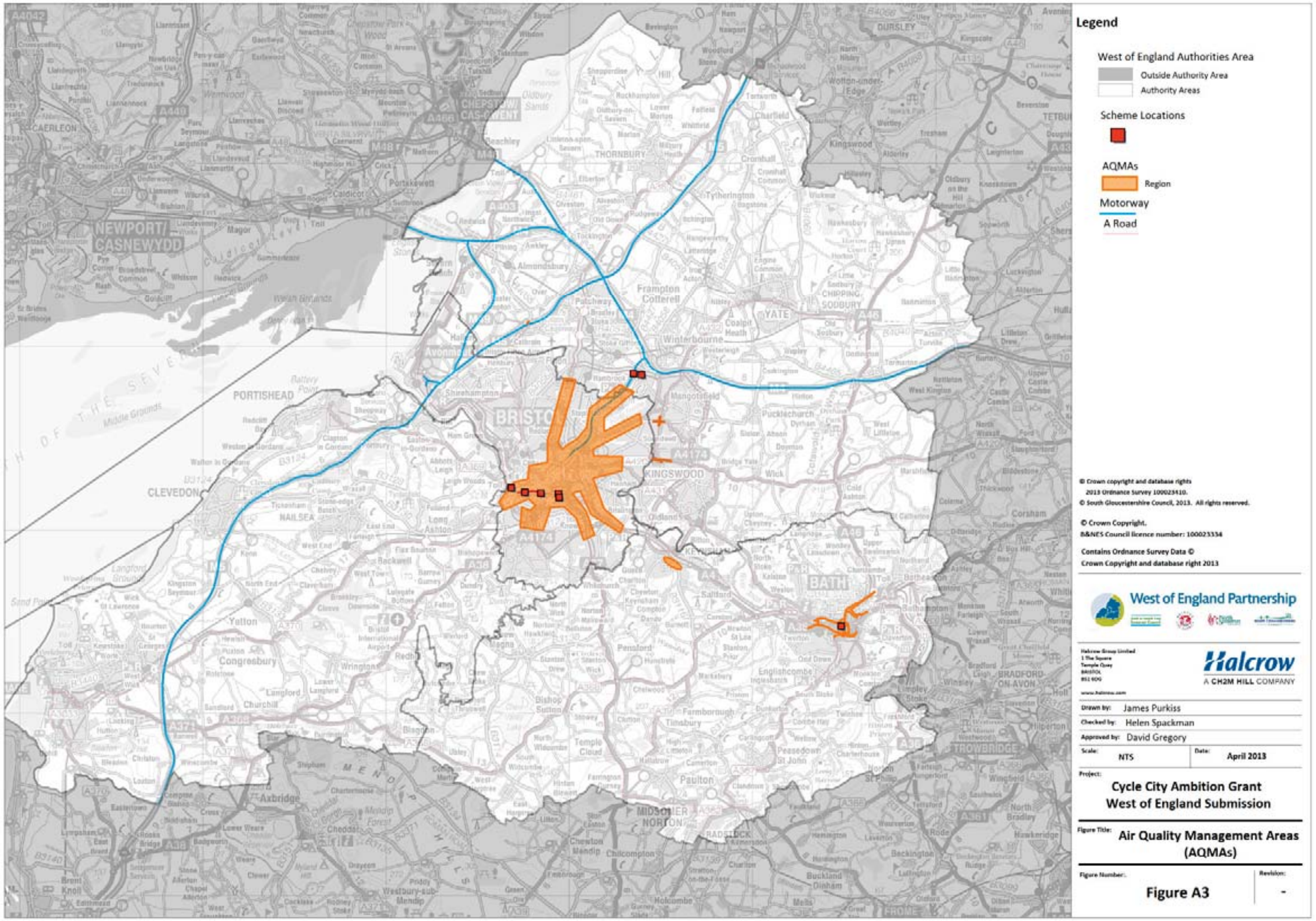
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Project: Cycle City Ambition Grant West of England Submission
Figure Title: Air Quality Management Areas (AQMAs)
Figure Number: Figure A3
Revision: -
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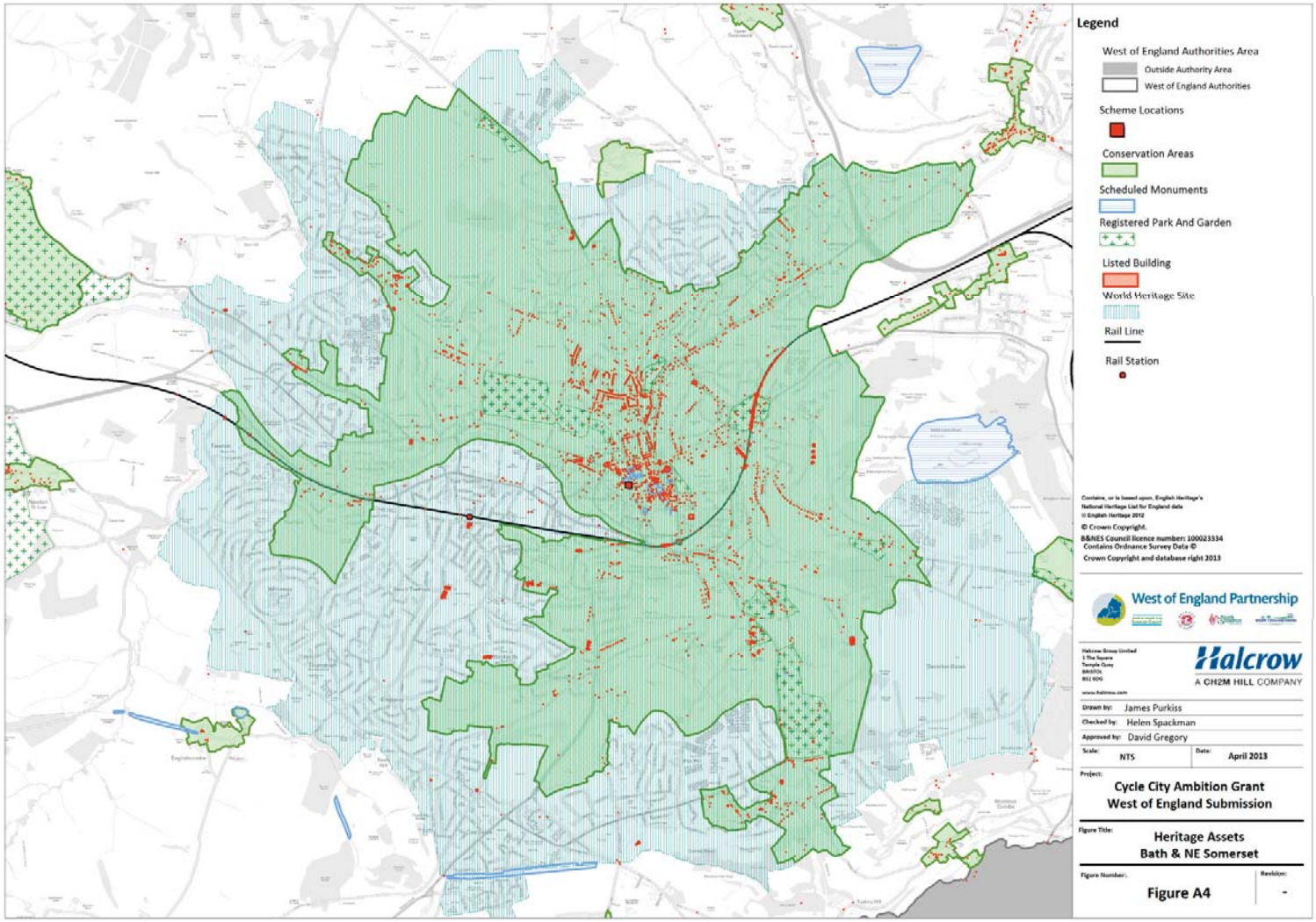
BRISTOL
KINGSWOOD
BATH
YATE
THORNBURY
NEWPORT/CASNEWYDD
MIDSOMER NORTON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Rail Station
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Project:
Cycle City Ambition Grant
West of England Submission
Figure Title:
Heritage Assets
Bath & NE Somerset
Figure Number:
Figure A4
Revision:
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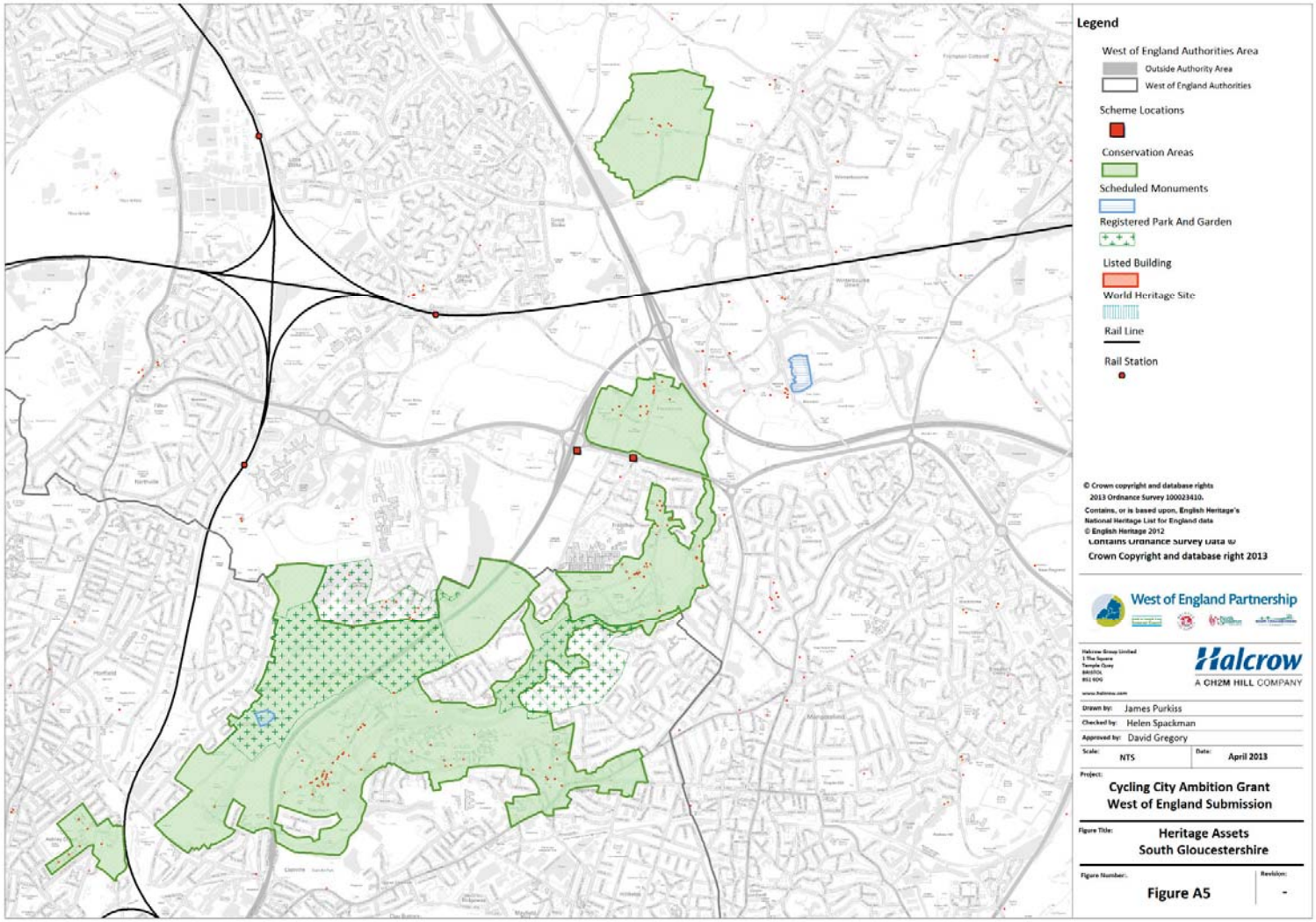
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Rail Station
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Revision:
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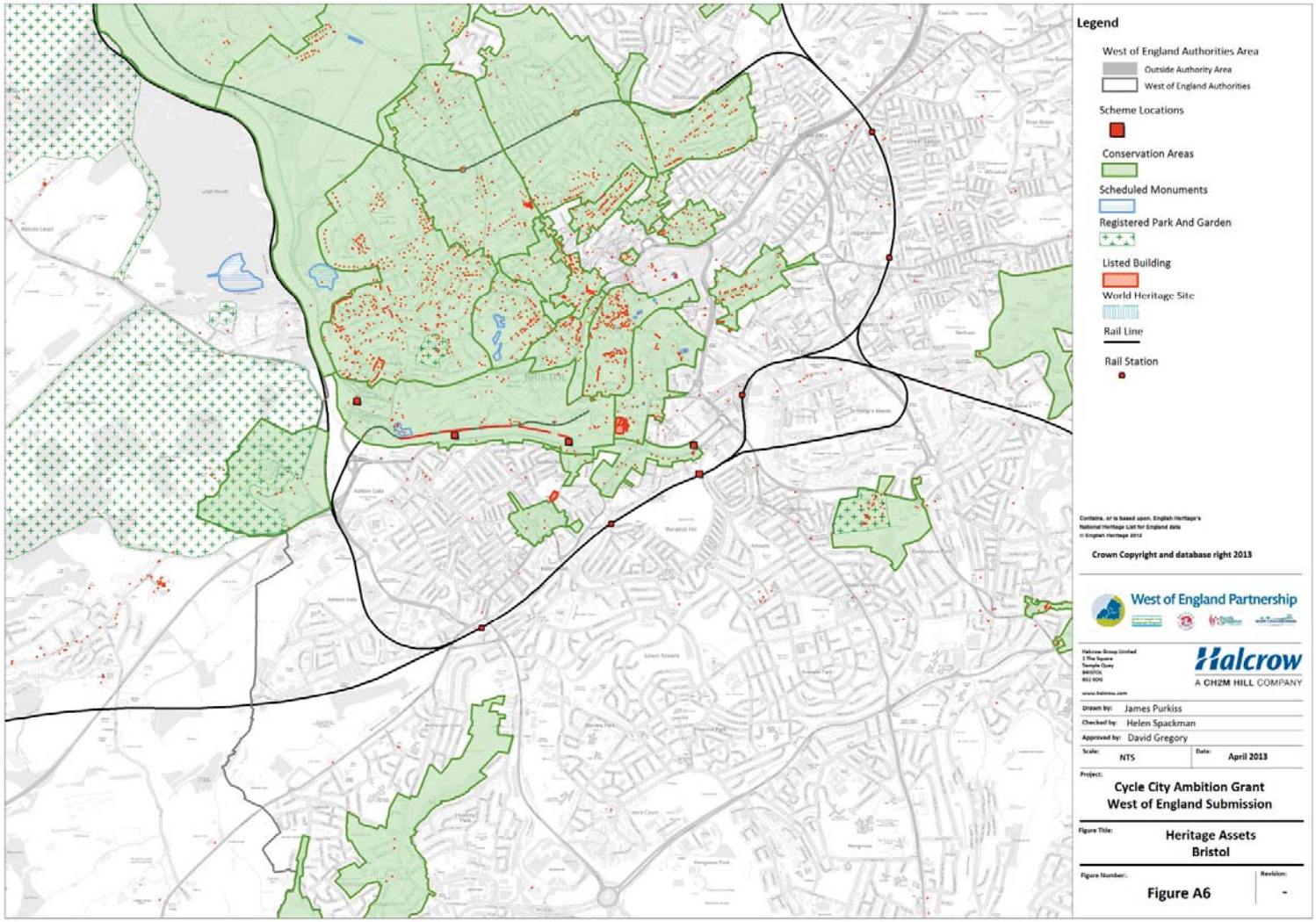
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Figure Number:
Figure A6
Revision:
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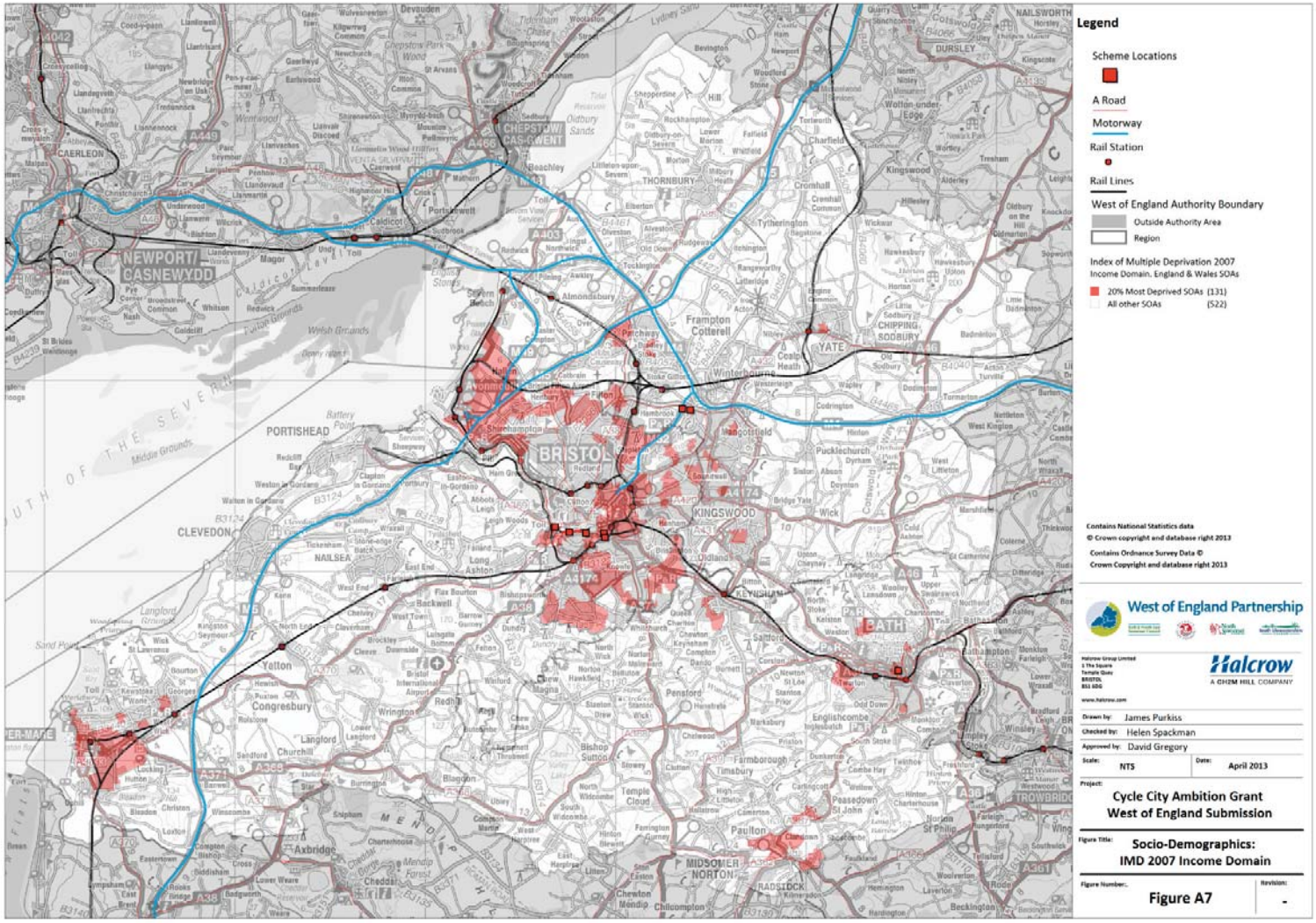
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Contains National Statistics data
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Figure Number:
Figure A7
Revision:
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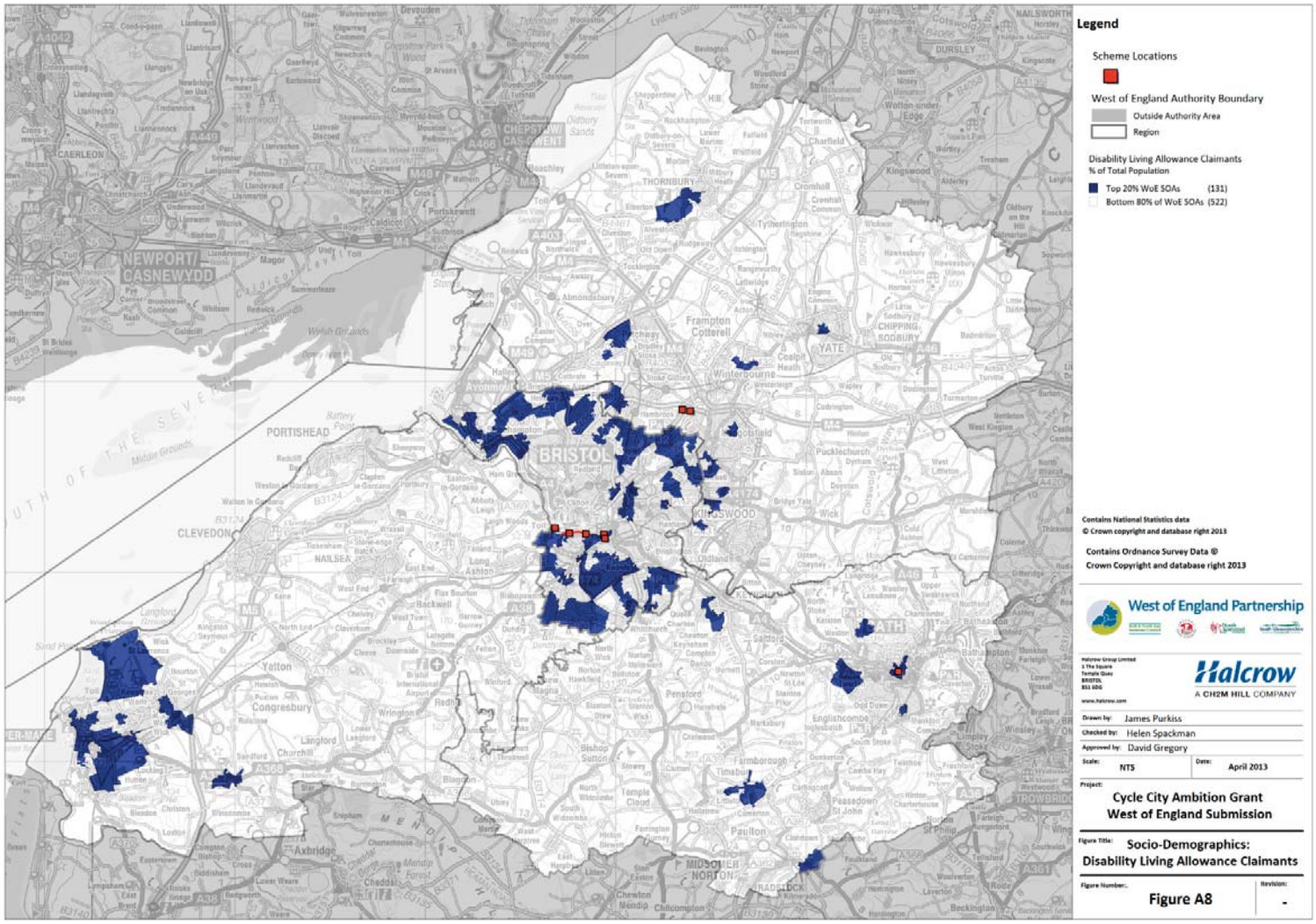
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Bottom 80% of WoE SOAs (522)
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Figure Number:
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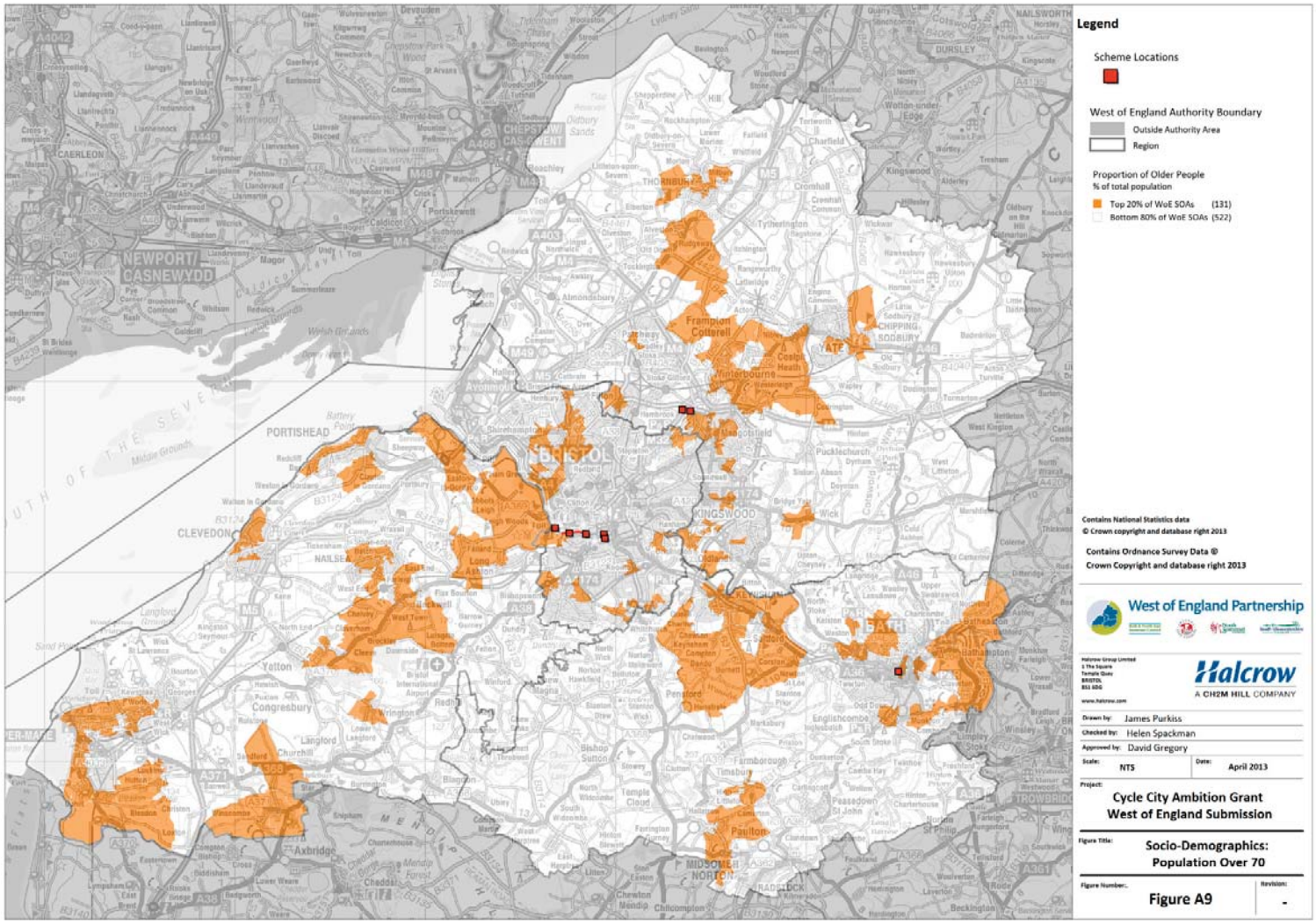
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Top 20% of WoE SOAs (131)
Bottom 80% of WoE SOAs (522)
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Project:
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West of England Submission
Figure Title:
Socio-Demographics:
Population Over 70
Figure Number:
Figure A9
Revision:
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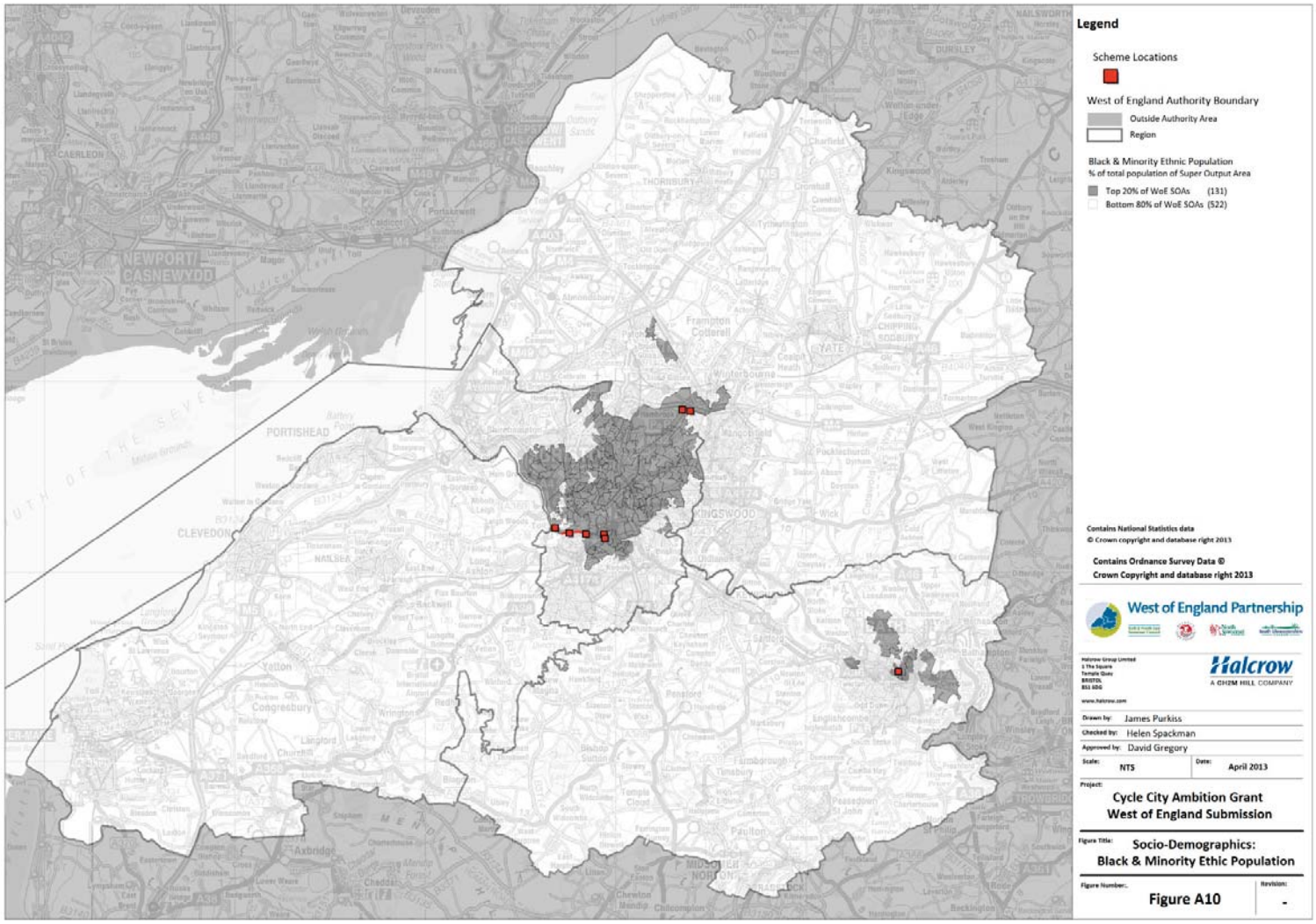
Legend
Scheme Locations
West of England Authority Boundary
Outside Authority Area
Region
Black & Minority Ethnic Population
% of total population of Super Output Area
Top 20% of WoE SOAs (131)
Bottom 80% of WoE SOAs (522)
Contains National Statistics data
© Crown copyright and database right 2013
Contains Ordnance Survey Data ©
Crown Copyright and database right 2013
West of England Partnership
Halcrow
A CH2M HILL COMPANY
Drawn by: James Purkiss
Checked by: Helen Spackman
Approved by: David Gregory
Scale: NTS
Date: April 2013
Project:
Cycle City Ambition Grant
West of England Submission
Figure Title:
Socio-Demographics:
Black & Minority Ethic Population
Figure Number:
Figure A10
Revision:
-

Appendix B – Forecasting Report

West of England
Cycle City Ambition Grant Funding Bid

Forecasting Report

Document: Version: 1.0

Bristol City Council

South Gloucestershire Council

Bath and North East Somerset Council

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Forecasting Report

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Bristol City Council

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Document history

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Cycle City Ambition Grant Funding Bid

Forecasting Report

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Bristol City Council

South Gloucestershire Council

Bath and North East Somerset Council

This document has been issued and amended as follows:

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Contents

1	**Introduction**	**1**
1.1	Background	1
1.2	Modelling Overview	1
1.3	Structure of this Report	1
2	**The CCAG package and review of evidence**	**2**
2.1	The CCAG Package	2
2.2	Source documents	2
3	**Forecasting Assumptions**	**3**
3.1	Forecast Model	3
3.2	Forecasting Approach Overview	3
3.3	Reference Case Demand	3
3.4	Matrix Segmentation	3
3.5	Demand Adjustment for CCAG Measures	4
3.6	Network Assumptions	8
4	**Do Minimum Results**	**9**
4.1	Introduction	9
4.2	Demand Response	9
4.3	Model Convergence	9
4.4	Highway Network Performance	10
5	**Core Scenario Results**	**11**
5.1	Introduction	11
5.2	Model Convergence	11
5.3	Highway Network Performance	11
6	**Sensitivity Test Forecasts**	**12**
6.1	Introduction	12
6.2	Demand Response	12
6.3	Highway Network Performance	13
7	**Summary**	**14**
7.1	Summary	14

List of Tables

Table 2.1: Evidence of scheme impacts
Table 3.1: scheme costs and population assumptions (2013 prices)
Table 3.2: Mode share proportions (Spend in 2013 prices)
Table 3.3: Core scenario model scheme impacts, vehicle trips removed
Table 3.4: Check of impacts
Table 4.1: Do minimum demand
Table 4.2: Do minimum convergence statistics
Table 4.3: Do minimum highway network statistics
Table 5.1: CCAG core scenario convergence statistics
Table 5.2: CCAG core scenario highway network statistics
Table 6.1: 25% cycle mode shift increase scenario, vehicle trips removed
Table 6.2: 25% cycle mode shift increase scenario highway network statistics

List of Figures

Figure 3.1: Absolute change in vehicle trips 2031 AM destination
Figure 3:2: Absolute change in vehicle trips 2031 PM origin

1 Introduction

1.1 Background

This report sets out the modelling approach and forecasting results to support the Cycle City Ambition Grant (CCAG) appraisal.

The forecasting undertaken for CCAG assessment has used the Greater Bristol area modelling suite (G-BATS) as used for the Major Scheme North Fringe Hengrove Package (NFHP) Best and Final Bid (BAFB) assessment as submitted to the Department for Transport (DfT). The model is DfT approved and WebTAG compliant.

1.2 Modelling Overview

The modelling approach has applied highway trip matrix adjustments in line with published evidence on effects of Smarter Choices schemes, with spatial distribution of adjustments in line with geographical scheme definition.

The total scheme costs have been apportioned, so that appropriate trip matrix adjustments could be implemented in line with evidence for the scheme, within each Unitary Authority (UA).

The resulting adjusted trip matrices were re-assigned to the G-BATS model to identify network impacts and provide inputs to other appraisal tools used, such as TUBA.

The main modelling scenarios are as follows:

- Do Minimum scenario: is as per the Local Sustainable Transport Fund (LSTF) scheme model, based on the NFHP model including all Bristol area major schemes that now have funding approved
- CCAG Core Scenario: developed from the Do Minimum with matrices adjusted to reflect the impacts of the CCAG measures and infrastructure changes at Junction 1 of the M32.

Scheme impacts have only been modelled through the use of the highway model. It is assumed all public transport impacts are neutral.

1.3 Structure of this Report

Following this introductory chapter:

- Chapter 2 provides the scheme description and evidence for;
- Chapter 3 which sets out the forecasting assumptions;
- Chapter 4 sets out the without-intervention case results;
- Chapter 5 sets out the central case results;
- Chapter 6 sets out the sensitivity test results; and
- Chapter 7 provides a summary of the forecasting work

2 The CCAG package and review of evidence

2.1 The CCAG Package

The proposed package is made up of the following main schemes within each of the council areas:

- Provision of sections of a cycle trunk route from Cribbs Causeway to Emersons Green (South Gloucestershire Council); and
- Improved access at 7 Dials in Bath (including contra flow bus lanes) schemes (Bath and North East Somerset Council); and
- Bristol City Centre Chocolate Path and associated footbridge improvements (Bristol City Council).

2.2 Source documents

A number of published documents have been reviewed to examine the evidence for impacts of the types of measures proposed as part of CCAG, as follows:

a) The Effects of Smarter Choices in the Sustainable Travel Towns, Sloman et al, 2010;

b) Greater Bristol Cycling City: End of Project Report, Bristol City and South Gloucestershire Councils 2011;

c) Analysis and synthesis of evidence on the effects of investment in six Cycling Demonstration Towns, Sloman et al 2009;

The evidence considered most appropriate to utilise for the impact of cycle improvements on travel choice is provided in Table 2.1.

Table 2.1: Evidence of scheme impacts

Scheme Impacts	Source document
£10 per person (2008 prices) per year to achieve 4% annual increase in cycling mode share	Cycling demonstration Towns Sloman et al, 2009

It should be noted that this is in general a 'conservative' estimate in the modelling assumptions. For example:

- The Sustainable Travel Towns project indicates a slightly higher annual percentage increase in cycling trips (4.7%) than the value adopted (4%) from the Cycle Demonstration Towns project.
- The Greater Bristol Cycling City End of Project Report indicates a 16.3% annual increase in cycle trips with a spend of £16 per person per year.

3 Forecasting Assumptions

3.1 Forecast Model

There are up to date modelling tools available that will be used for the CCAG assessment. The most appropriate tool was judged to be the G-BATS model used to assess the NFHP submission, which represents AM, inter-peak and PM peaks with forecast years of 2016 and 2031. The model base year is 2009.

Details of the forecasting approach for the NFHP are contained in the scheme's Forecasting Report, Atkins September 2011, as provided to the DfT with the NFHP BAFB submission.

The version of the model used is the latest supplied to the DfT.

3.2 Forecasting Approach Overview

The approach for modelling the effects of the CCAG measures has been through a set of highway matrix adjustments, based on the review of available evidence as described in chapter 2. Hence the mode shift impacts of the CCAG measures have been reflected in the matrix adjustments rather than via the demand model.

Scheme impacts have not been modelled using the PT model and hence benefits to passenger journey times have not been identified.

The main modelling scenarios are as follows:

- Do Minimum scenario: is as per the Local Sustainable Transport Fund (LSTF) scheme model, based on the NFHP model including all Bristol area major schemes that now have funding approved
- CCAG Core Scenario: developed from the Do Minimum with matrices adjusted to reflect the impacts of the CCAG measures and infrastructure changes at Junction 1 of the M32.

Sensitivity scenarios have been undertaken as follows:

- High Impact: assumes schemes have 25% more impact on cycle mode shift than assumed in the Core scenario

For each scenario the CCAG measures have been assessed in relation to the corresponding Do Minimum scenario.

3.3 Reference Case Demand

The demand assumptions for the NFHP Core scenario are as documented in the NFHP Forecasting Report, Atkins September 2011. The development assumptions are contained in the Uncertainty Log.

The Do Minimum demand is as per the LSTF scheme scenario, that includes all local funded major schemes.

3.4 Matrix Segmentation

The highway matrices are segmented as follows:

- UC1: Commute & Other car trips: low income

- UC2: Commute & Other car trips: medium income
- UC3: Commute & Other car trips: high income
- UC4: Employers' business car trips
- UC5: Light goods vehicles
- UC6: Heavy goods vehicles

Matrix adjustments have only been applied to UC1 to UC3 since the modelled measures primarily relate to non-business car trips.

3.5 Demand Adjustment for CCAG Measures

The Do Something scenario matrices have been produced through adjustment of the Do Minimum matrices to reflect the CCAG measures by applying the impacts identified in Table 2.1.

The CCAG impacts have been tested for the Core scenario in 2016 and 2031.

The infrastructure spend has been applied to BCC and SGC only. While Bath is represented in the G-BATS model, only trips interacting with Bristol are included in the highway matrices, therefore outputs from the approach used do not take account of trips from those areas that do not interact with Bristol. Hence the identified CCAG benefits are conservative in this regard as the 7 Dials scheme is not represented in the modelling and the reduced levels of congestion will not be fully reflected in Bath.

Table 3.1: scheme costs and population assumptions (2013 prices)

	BCC	SGC	CCAG
Package Costs (£000s)	£ 7,980	£ 1,630	£ 9,610
2011 census population	428,200	262,800	691,000
2016 forecast population	435,922	270,723	706,645
Spend per person (£)	£ 18.31	£ 6.02	£ 13.60

The % increase in cycle mode share has been identified from available evidence has been translated into % reduction in other mode trips based on current mode share on the basis that trips would transfer to cycle from other modes in proportions consistent with current mode share of other modes. It is assumed that walk mode share is unaffected by the scheme measures.

The do minimum mode share values are derived from the 2004 Greater Bristol Strategic Transport Study and a comparison of the 2001 and 2011 travel to work census data has been used to determine the change over time in each mode.

Table 3.2: Mode share proportions (Spend in 2013 prices)

City of Bristol mode of travel	Do min	*Evidence*	CCAG % change	CCAG
Cycle	13.8%	*4.00%*	4.64%	14.4%
Walking	17.1%	*0.00%*	0.00%	17.1%
Bus	6.3%	*-0.80%*	-0.92%	6.3%
Train	3.2%	*-0.80%*	-0.92%	3.2%
Driving a Car or Van, or Taxi	46.6%	*-0.80%*	-0.92%	46.1%
Car Passenger	13.1%	*-0.80%*	-0.92%	12.9%
Other	0.0%	*0.00%*	-0.92%	0.0%
Total / Spend per person	100%	£ *11.71*	£ 13.60	100%

Using these values, a £10 (£11.71, 2013 prices) spend per person per year on cycling measures results in a 4% increase in cycling, which corresponds to a 0.80% reduction in vehicle trips.

The CCAG package is therefore estimated to result in a 4.6% increase in cycling and corresponding 0.92% reduction in car trips.

The adjustments made to the highway trips matrices, to account for the CCAG measures implemented, are shown in Table 3.3. Around 1000 vehicle trips are expected to be removed during the modelled hours.

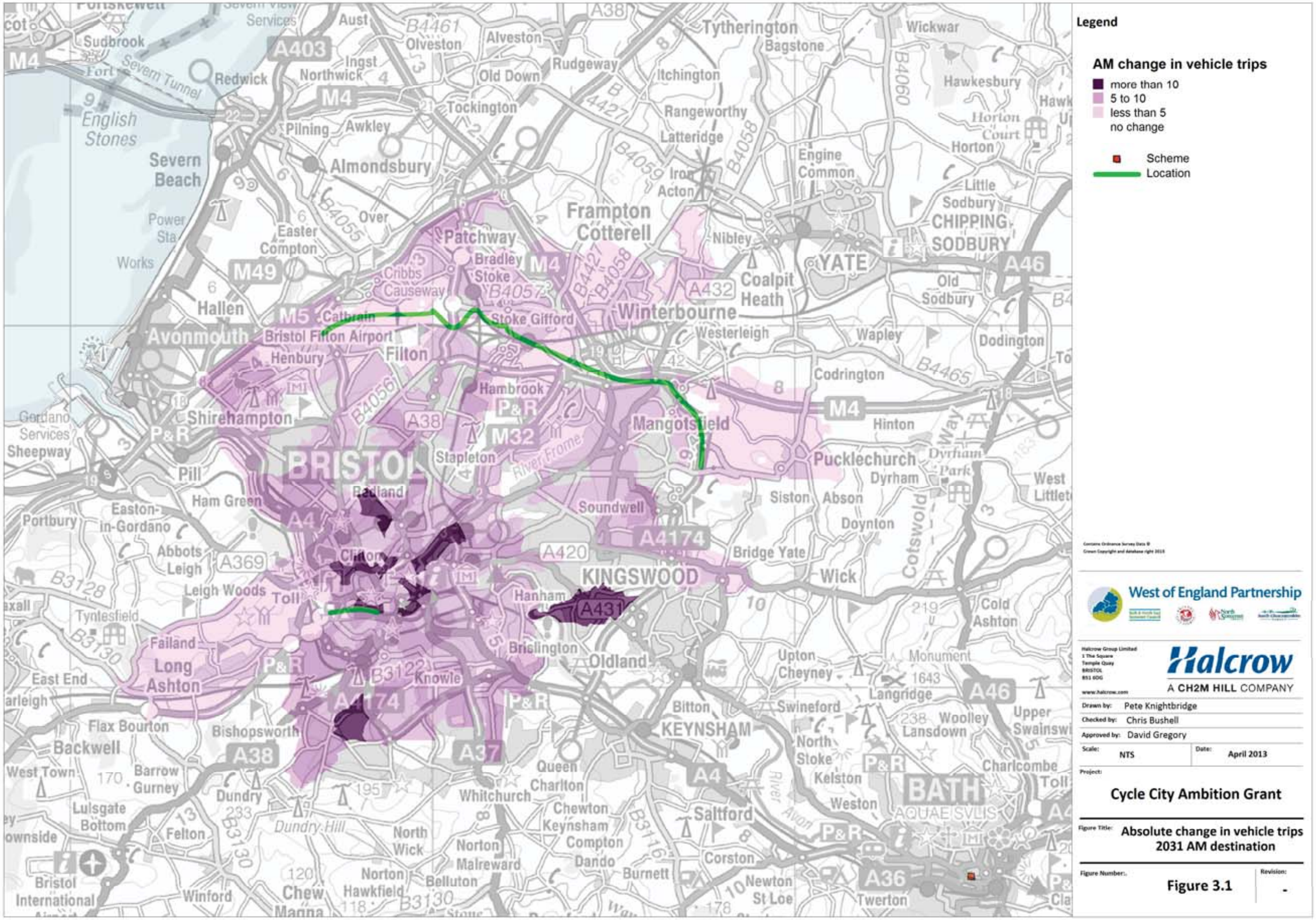
Table 3.3: Core scenario model scheme impacts, vehicle trips removed

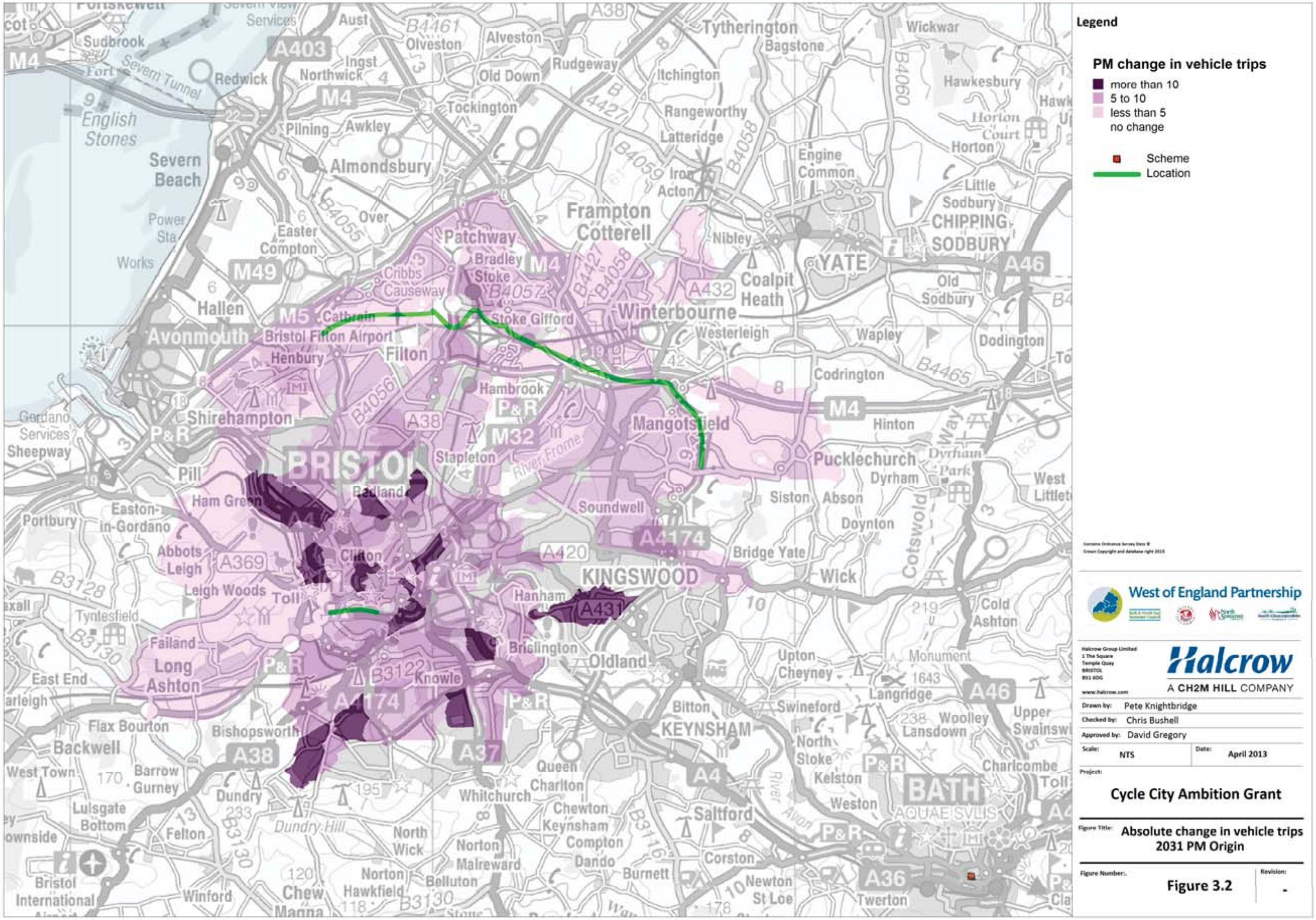
Trips removed		units	B&NES	BCC	NSC	SGC	CCAG
2016	AM	PCUs	0	-811	-5	-145	-961
	IP	PCUs	0	-657	-3	-110	-770
	PM	PCUs	0	-852	-6	-153	-1011
2031	AM	PCUs	0	-943	-7	-169	-1119
	IP	PCUs	0	-805	-5	-140	-951
	PM	PCUs	0	-1004	-7	-176	-1188

The following steps were used to implement the matrix adjustment process are:

- Identify scheme costs by geographic location for CCAG;
- Identify impact of measures based on applying evidence to total spend;
- Identify model zones within 3km of cycle infrastructure measures;
- Apportion scheme costs to model zones for each type of measure;
- Apply trip adjustments for each category of measure, in proportion to the scheme spend per model zone for each UA;
- Only vehicle journeys with a total trip distance under 8km were removed from the matrices;

Figures 3.1 and 3.2 show matrix reductions by zone across the modelled area for the AM and PM peak periods.


Legend
AM change in vehicle trips
more than 10
5 to 10
less than 5
no change
Scheme
Location
West of England Partnership
Halcrow
A CH2M HILL COMPANY
Drawn by: Pete Knightbridge
Checked by: Chris Bushell
Approved by: David Gregory
Scale: NTS
Date: April 2013
Project: Cycle City Ambition Grant
Figure Title: Absolute change in vehicle trips 2031 AM destination
Figure Number: Figure 3.1
Revision: -


Legend
PM change in vehicle trips
more than 10
5 to 10
less than 5
no change
Scheme
Location
West of England Partnership
Halcrow
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Drawn by: Pete Knightbridge
Checked by: Chris Bushell
Approved by: David Gregory
Scale: NTS
Date: April 2013
Project:
Cycle City Ambition Grant
Figure Title: Absolute change in vehicle trips 2031 PM Origin
Figure Number: Figure 3.2
Revision: -

Table 3.4 provides a check against evidence of aggregate impacts.

Table 3.4: Check of impacts

source	Annual spend per person	Annual % reduction in car trips
The Effects of Smarter Choices in the Sustainable Travel Towns, Sloman et al, 2010	£ 12.12	1.55%
WEST LSTF	£ 11.74	0.85%
CCAG	£ 4.53	0.31%

This shows that the matrix adjustments undertaken are less than the impacts achieved in the Sustainable Travel Towns projects and similar to the WEST LSTF package, in terms of equivalent annual vehicle trip reductions relative to scheme cost.

3.6 Network Assumptions

The Do Minimum network is as defined for the NFHP BAFB submission scenario which includes the Ashton-Vale to Temple Meads (AVTM), South Bristol Link (SBL) and North fringe to Hengrove Package (NFHP) Major Schemes. Details of the scheme assumptions in this scenario are documented in Do Minimum MSB Schemes and Sensitivity Tests, Atkins, September 2011.

The with Scheme network includes the changes to westbound A4174 approach to Junction 1 of the M32 and toucan crossing on the southbound entry slip as per the CCAG scheme proposals.

4 Do Minimum Results

4.1 Introduction

This chapter provides the results of the core scenario Do Minimum.

4.2 Demand Response

Table 4.1 shows demand for the Do Minimum scenario

Table 4.1: Do minimum demand

Mode	Units	2009			2016			2031		
		AM	IP	PM	AM	IP	PM	AM	IP	PM
Base / Do Minimum										
Car	pcus	116,035	80,503	126,707	120,335	84,322	131,716	142,017	107,144	157,221
LGV	pcus	14,604	19,089	6,941	15,848	20,994	7,504	17,534	24,306	8,408
HGV	pcus	29,883	29,488	18,478	32,623	31,999	20,353	41,125	39,914	26,051
Total	pcus	160,521	129,081	152,127	168,806	137,315	159,573	200,676	171,364	191,680
% Change from Base										
Car	pcus				3.7%	4.7%	4.0%	22.4%	33.1%	24.1%
LGV	pcus				8.5%	10.0%	8.1%	20.1%	27.3%	21.1%
HGV	pcus				9.2%	8.5%	10.1%	37.6%	35.4%	41.0%
Total	pcus				5.2%	6.4%	4.9%	25.0%	32.8%	26.0%

4.3 Model Convergence

Table 4.2 shows convergence statistics for the Do Minimum scenario.

Table 4.2: Do minimum convergence statistics

Convergence Statistics	Units	2016			2031		
		AM	IP	PM	AM	IP	PM
Do Minimum							
Convergence	no. of loops	12	3	6	25	12	25
% Link Flows differing by < 5%	%	99.0	98.0	98.6	98.8	98.9	98.9
Wardrop Equilibrium % Gap Function	%	0.026	0.029	0.029	0.037	0.028	0.038

4.4 Highway Network Performance

Table 4.3 shows highway network statistics for the Do Minimum scenario.

Table 4.3: Do minimum highway network statistics

Highway Network Statistics	Units	2016			2031		
		AM	IP	PM	AM	IP	PM
Do min							
Total Travel Time	pcu. hrs./hr.	33147	22731	32024	50566	32894	49204
Travel Distance	pcu. kms./hr	1265064	1044028	1239560	1521038	1321211	1499922
Overall Average Speed	kph	38.2	45.9	38.7	30.1	40.2	30.5

5 Core Scenario Results

5.1 Introduction

This chapter provides the results of the CCAG core scenario assessment.

5.2 Model Convergence

Table 5.1 shows convergence statistics for the CCAG core scenario.

Table 5.1: CCAG core scenario convergence statistics

Convergence Statistics	Units	2016			2031		
		AM	IP	PM	AM	IP	PM
CCAG							
Convergence	no. of loops	20	9	20	25	23	25
% Link Flows differing by < 5%	%	98.9	97.1	98.6	97.4	98.3	98.3
Wardrop Equilibrium % Gap Function	%	0.029	0.023	0.025	0.068	0.030	0.096

5.3 Highway Network Performance

Table 5.2 shows highway network statistics for the CCAG core scenario.

Table 5.2: CCAG core scenario highway network statistics

Highway Network Statistics	Units	2016			2031		
		AM	IP	PM	AM	IP	PM
Do min							
Total Travel Time	pcu. hrs./hr.	33147	22731	32024	50566	32894	49204
Travel Distance	pcu. kms./hr	1265064	1044028	1239560	1521038	1321211	1499922
Overall Average Speed	kph	38.2	45.9	38.7	30.1	40.2	30.5
CCAG							
Total Travel Time	pcu. hrs./hr.	32861	22610	31682	49839	32656	48447
Travel Distance	pcu. kms./hr	1261510	1041971	1235837	1517169	1318659	1496106
Overall Average Speed	kph	38.4	46.1	39.0	30.4	40.4	30.9
CCAG vs Do min							
Total Travel Time	pcu. hrs./hr.	-0.9%	-0.5%	-1.1%	-1.4%	-0.7%	-1.5%
Travel Distance	pcu. kms./hr	-0.3%	-0.2%	-0.3%	-0.3%	-0.2%	-0.3%
Overall Average Speed	kph	0.5%	0.4%	0.8%	1.0%	0.5%	1.3%

6 Sensitivity Test Forecasts

6.1 Introduction

A sensitivity test has been undertaken, this assess the affect of:

- Increased impacts: CCAG impacts have been tested in relation to the Core scenario Do Minimum, assuming 25% more cycle mode shift, relative to the core scenario.

6.2 Demand Response

Table 6.1: Sensitivity scenario mode share proportions (Spend in 2013 prices)

City of Bristol mode of travel	Do min	*Evidence (+25%)*	CCAG % change	CCAG
Cycle	13.8%	*5.0%*	5.8%	14.6%
Walking	17.1%	*0.0%*	0.0%	17.1%
Bus	6.3%	*-0.99%*	-1.15%	6.3%
Train	3.2%	*-0.99%*	-1.15%	3.2%
Driving a Car or Van, or Taxi	46.6%	*-0.99%*	-1.15%	46.0%
Car Passenger	13.1%	*-0.99%*	-1.15%	12.9%
Other	0.0%	*0.00%*	-1.15%	0.0%
Total / Spend per person	100%	£ *11.71*	£ 13.60	100%

If a £10 (£11.71, 2013 prices) spend per person per year on cycling measures results in a 5% increase in cycling, this corresponds to a 0.99% reduction in vehicle trips.

The sensitivity CCAG package is therefore estimated to result in a 5.8% increase in cycling and corresponding 1.15% reduction in car trips.

The adjustments made to the highway trips matrices, to account for the CCAG sensitivity test is shown in Table 6.2. Around 250 additional vehicle trips are expected to be removed, relative to the core scenario during the peak periods.

Table 6.2: 25% cycle mode shift increase scenario, vehicle trips removed

Trips removed		units	CCAG core	CCAG +25%
2016	AM	PCUs	-961	-1201
	IP	PCUs	-770	-963
	PM	PCUs	-1011	-1264
2031	AM	PCUs	-1119	-1399
	IP	PCUs	-951	-1189
	PM	PCUs	-1188	-1484

6.3 Highway Network Performance

Table 6.3 shows highway network statistics for the CCAG 25% sensitivity scenario.

Table 6.3: 25% cycle mode shift increase scenario highway network statistics

Highway Network Statistics	Units	2016			2031		
		AM	IP	PM	AM	IP	PM
CCAG core							
Total Travel Time	pcu. hrs./hr.	32861	22610	31682	49839	32656	48447
Travel Distance	pcu. kms./hr	1261510	1041971	1235837	1517169	1318659	1496106
Overall Average Speed	kph	38.40	46.1	39.0	30.4	40.4	30.9
CCAG 25% sensitivity							
Total Travel Time	pcu. hrs./hr.	32803	22575	31626	49773	32593	48355
Travel Distance	pcu. kms./hr	1260753	1041309	1235309	1516703	1317994	1495108
Overall Average Speed	kph	38.40	46.1	39.1	30.5	40.4	30.9
CCAG 25% sensitivity vs CCAG core							
Total Travel Time	pcu. hrs./hr.	-0.18%	-0.16%	-0.18%	-0.13%	-0.19%	-0.19%
Travel Distance	pcu. kms./hr	-0.06%	-0.06%	-0.04%	-0.03%	-0.05%	-0.07%
Overall Average Speed	kph	0.00%	0.00%	0.26%	0.33%	0.00%	0.00%

7 Summary

7.1 Summary

The 2016 Core CCAG Scenario forecast results indicate travel time savings of 0.9% to 1.1% and vehicle distance savings of 0.3% in the peak hours. The 2031 Core CCAG Scenario forecast results indicate travel time savings of 1.4% to 1.5% and vehicle distance savings of 0.3% in the peak hours.

The modelling assessment undertaken has used conservative evidence for cycle mode shift. Sensitivity test results show additional travel time savings of 0.2% against the Core Scenario.