4. Economic Case

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Introduction

4.1.1 Background

The A38 in Bromsgrove is an important corridor on the Major Road Network (MRN). It acts as a key strategic link, providing access to the Strategic Road Network (SRN), as well as offering an important local function as an eastern bypass to Bromsgrove and providing access to housing, services and employment frontages.

This Outline Business Case (OBC) seeks funding to deliver a major upgrade of the A38 corridor, between M5 Junction 4 to the north and the junction of the A38 with B4094 Worcester Road to the south which is approximately 7.5 miles (12 km) long. This corridor forms part of the strategic north south spine through Worcestershire, connecting Worcester, Droitwich, Bromsgrove to Birmingham to the north and Gloucester and Bristol to the south as an alternative to the M5 route. The study area is shown in as shown on Figure 4.1.

The A38 corridor is a multi-functional route serving a range of users which contributes to the problems and issues discussed later in this chapter. The key characteristics are:

- The route performs a range of different functions, acting as a link to the Strategic Road Network, as a bypass to Bromsgrove town centre, a distributor road for journeys that have an origin and/or destination in Bromsgrove and a local access route for residents and businesses that have direct frontages on to the corridor.
- The corridor comprises sections with differing speed limits, levels of frontage and access points in addition to varying levels of pedestrian and cyclist provision. In addition, the driving experience along the route varies due to the differing land uses along sections of the A38 from residential, open field to employment and retail.
- Congested corridor due to high levels of car dependency across Bromsgrove.

The A38 Bromsgrove Route Enhancement Programme (BREP – or 'the scheme') comprises a package of schemes delivering targeted improvements to junctions and significant enhancement of facilities for active modes.

Figure 4.1: Scheme location

This situation is projected to worsen in the future as new housing and employment planned for the local area are delivered. The planned growth in housing will increase the demand for travel. The following points summarise the planned developments in the area:

- The Bromsgrove District Plan (adopted in 2017) includes major residential development sites around the edge of Bromsgrove, with Perryfields Road and Whitford Road being particularly relevant to the A38. Smaller residential allocations are also found in surrounding areas. In total the Local Plan identifies a need for 7,000 dwellings and 28 Hectares of employment land in the period 2011-2030. However, the adopted local plan only allocated land for 4,700 dwellings to 2023, noting that the remaining 2,300 would be subject to a Green Belt review and then allocated within a Local Plan Review. Subject to the ongoing Local Plan review, the scheme may further support delivery of additional homes and employment land. This review is intended to be completed by 2023.

- The Local Plan review also identified development allocations for growth targets beyond 2030 and in its Issues and Options Consultation, which put forward various scenarios. The consultation documents published in September 2019 proposed that the new Plan will have a likely start date of 2023 and an end date of 2040. Over this period the Plan will be required to provide for at least 6,443 dwellings and up to 90 Hectares of employment land.

- Within close proximity of the A38 corridor area there are significant cross-boundary allocations within the adopted Local Plan for Redditch. This includes an additional 3,400 dwellings on the border with Redditch but located within Bromsgrove District, to meet Redditch's housing need, as identified in their own Local Plan. The allocation at Foxlyidate is particularly relevant to the A38.

- In addition, there are further allocations within the Redditch Local Plan (and sited within Redditch itself).

Table 2.29 of the Strategic Case shows key development sites in the vicinity of the A38 identified within the adopted 2017 plans. The quantum of proposed development (housing and employment) within the adopted plans requires enhancements to transport infrastructure, including the A38. Whilst no individual development site currently has obligations that restrict development in advance of delivery of the A38 schemes, there are planning linkages between the A38 BREP and the delivery of allocations identified in existing Local Plans and this is reflected in the requirement for S106 contributions to the BREP scheme. Worcestershire County Council (WCC) has identified that the A38 in its current form is a key constraint to additional future development allocations through the District and Local Plan review process. Therefore, in summary, the A38 BREP supports the delivery of 5310 homes and 13.45 Hectares of employment land based on the current plan. Subject to the ongoing Local Plan review, the scheme may further support delivery of additional homes.

To effectively support the future development of Bromsgrove and to deliver economic growth, significant improvements are required to the corridor itself; supported by targeted improvements for other modes.

The scheme for which funding is sought through this MRN bid is an important part of the overall approach to transport in Bromsgrove. It would support ongoing work that is aiming to enhance both the major and local road network, as well as encouraging walking, cycling and the use of public transport.

4.1.2 Scheme context

The A38 BREP Package is being delivered in three parts as described below:

- Part 1 (funded by WLEP, Greater Birmingham and Solihull Local Economic Partnership (GBSLEP) and National Highway's (previously called Highway England) Growth and Housing Fund (GHF)), provided for capacity upgrades at M5 Junction 4, M42 Junction 1 (completed in 2020/21) and the Barley Mow Lane junction with the A38 (completed in 2019). (Historically, this has been referred to as A38 Package 1, for this OBC submission, this will now be referred to as Part 1).

- Part 2 comprises of the early delivery elements of the BREP Package presented at SOBC stage and submitted in November 2020. The early delivery schemes have been delivered using WLEP local contribution funding, and are referred to as Schemes 2a, 2b and 4. These works are an important part of the overall BREP scheme, contributing to the improvement of active mode facilities on the corridor. They have been delivered early to take advantage of the local funding availability.

    - Scheme 2a was identified in the SOBC as Scheme 2 and provides an active mode corridor between Harvington Road and Charford Road, the new scheme 2a also includes the connecting bridge to Charford Road that in the SOBC was included in Scheme C. Leading to an enhanced scheme 2a at an earlier stage.

    - Scheme 2b is a shared active mode corridor along the northern side of Charford Road, to connect scheme 2a to South Bromsgrove High School. This scheme was added further to public engagement in early 2020, and after the SOBC submission.

    - Scheme 4 is a new toucan crossing as outlined in the SOBC, over the A448 Stratford Road and localised path improvements to facilitate walking and cycling.

  Schemes have been developed as part of the overall strategic active modes upgrade as part of the A38 BREP Package. A copy of the approved WLEP Full Business Case (FBC) is appended (Appendix S.6) to the overall A38 BREP OBC. These schemes form part of the Do Minimum scenarios, and their economic and financial impacts will be informed by their FBC.

- Part 3 includes a number of active modes, local public transport and highways improvement schemes. Which were originally included in the SOBC submission to DfT in 2019, alongside the initial OAR document.

Part 2 and Part 3 form the overall BREP Package, with Part 2 being delivered using local contribution, and Part 3 to be delivered with local and MRN funding contributions. The overall BREP package is broadly the same as the SOBC stage, with improvements to the scheme added following on from discussion with the DfT and public engagement. In brief the A38 BREP Package includes:

- Highways schemes, notated as Schemes A to G, targeting key junctions.
- Sustainable/active mode schemes, notated as Schemes 1 to 6.

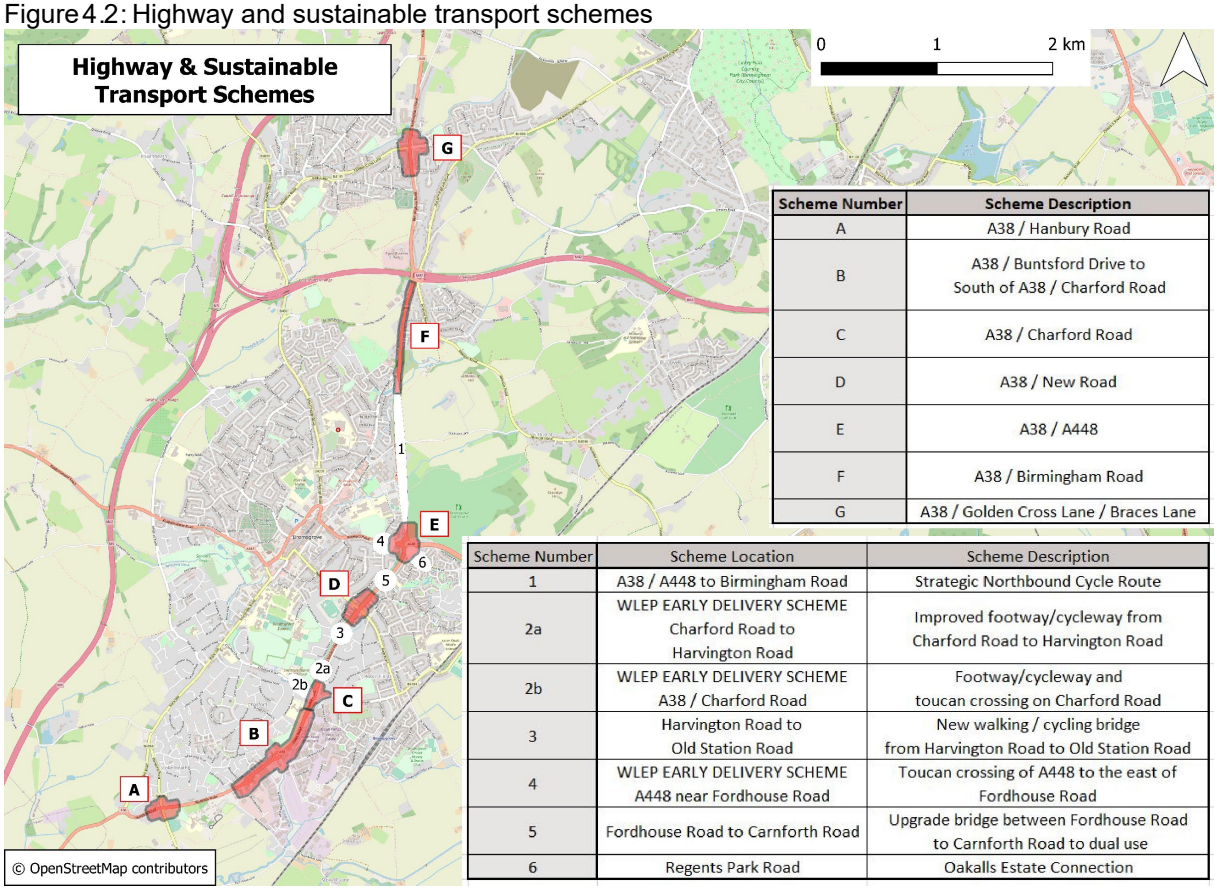
As indicated above, of these, 3 schemes (schemes 2a, 2b and 4) have been taken forward as early delivery schemes, funded by WLEP which has its own FBC that will be used to inform this economic case. Hence, the early delivery schemes are reflected in the do minimum scenario, and their impacts are therefore not assessed as part of the modelling and economic assessment work carried out as part of this OBC (which is considered to be aligned with the TAG requirements).

Construction of these schemes began on site at the end of 2020 and now have been completed. Schemes 1, 3, 5 and 6 are included within this OBC for MRN funding.

- Local public transport improvements, notated as schemes 7 (Real time information (RTI)) and 8 (the provision of select vehicle detection at New Road and Charford Road junctions to support buses in crossing the A38 corridor, on the primary routes between the Town Centre and Railway station). This scheme is accommodated within the works of the highway interventions hence not discussed separately.

Figure 4.2 provides an overview of the highway and sustainable elements of the A38 scheme while Figure 4.3 presents the locations of the RTI interventions included in scheme 7.

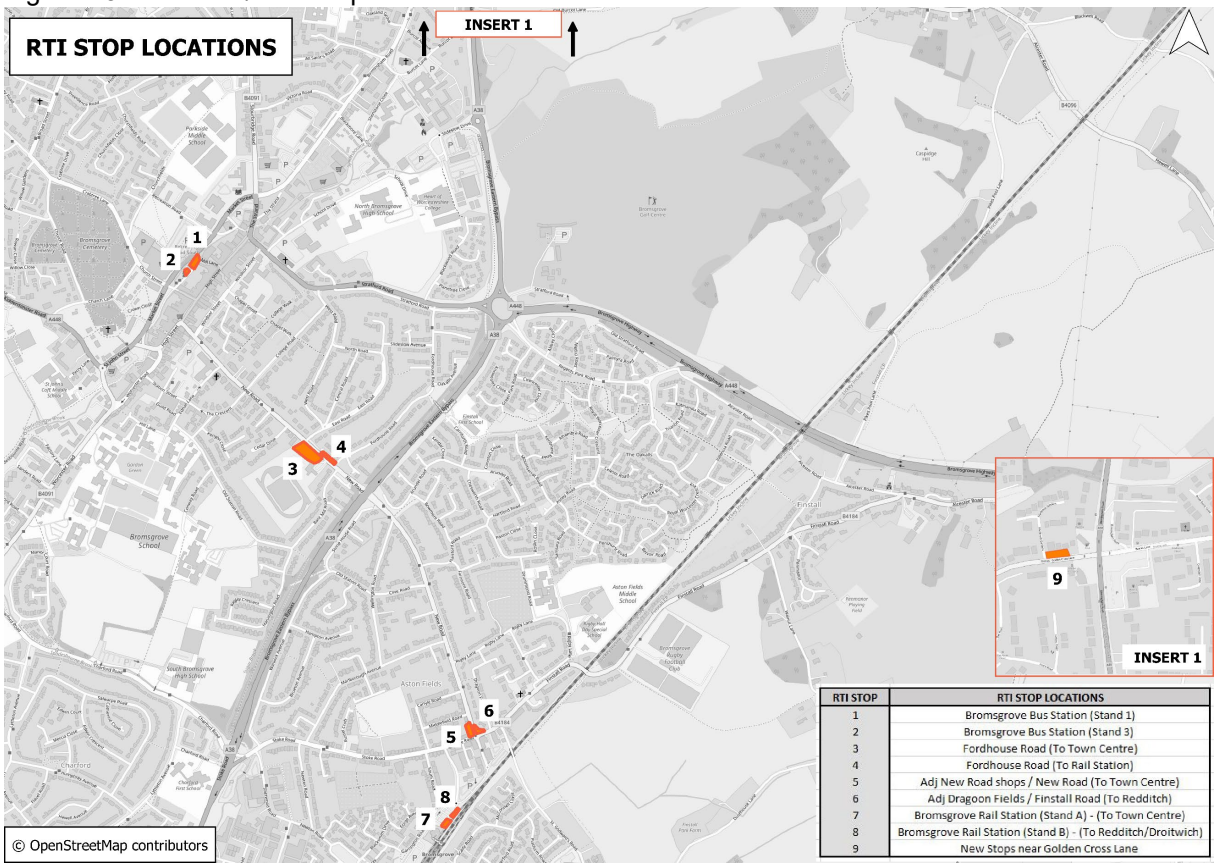
Figure 4.2: Highway and sustainable transport schemes



Scheme Number	Scheme Description
A	A38 / Hanbury Road
B	A38 / Buntsford Drive to South of A38 / Charford Road
C	A38 / Charford Road
D	A38 / New Road
E	A38 / A448
F	A38 / Birmingham Road
G	A38 / Golden Cross Lane / Braces Lane

Scheme Number	Scheme Location	Scheme Description
1	A38 / A448 to Birmingham Road	Strategic Northbound Cycle Route
2a	WLEP EARLY DELIVERY SCHEME Charford Road to Harvington Road	Improved footway/cycleway from Charford Road to Harvington Road
2b	WLEP EARLY DELIVERY SCHEME A38 / Charford Road	Footway/cycleway and toucan crossing on Charford Road
3	Harvington Road to Old Station Road	New walking / cycling bridge from Harvington Road to Old Station Road
4	WLEP EARLY DELIVERY SCHEME A448 near Fordhouse Road	Toucan crossing of A448 to the east of Fordhouse Road
5	Fordhouse Road to Carnforth Road	Upgrade bridge between Fordhouse Road to Carnforth Road to dual use
6	Regents Park Road	Oakalls Estate Connection

Figure 4.3 Scheme 7/ RTIs stop locations



RTI STOP	RTI STOP LOCATIONS
1	Bromsgrove Bus Station (Stand 1)
2	Bromsgrove Bus Station (Stand 3)
3	Fordhouse Road (To Town Centre)
4	Fordhouse Road (To Rail Station)
5	Adj New Road shops / New Road (To Town Centre)
6	Adj Dragoon Fields / Finstall Road (To Redditch)
7	Bromsgrove Rail Station (Stand A) - (To Town Centre)
8	Bromsgrove Rail Station (Stand B) - (To Redditch/Droitwich)
9	New Stops near Golden Cross Lane

The expected scheme outputs, as detailed in the Logic Map set out in the Management Case (Chapter 7), are summarised in Table 4-1. Table 4-1 also provides a summary of how these outputs are assessed within this Economic Case.

Table 4-1 – Assessment methodology of scheme outputs (as per the Logic Map in Chapter 7)

Highways Schemes

Outcome (short-term)	Outcome (medium / long -term)	Assessment Methodology
Decreased congestion on junctions along A38 through Bromsgrove area	Carbon savings Reduction in local greenhouse gas emissions	Quantitative Assessment Emissions of carbon dioxide have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios using the TAG Databook approach (July 2021 v1.15).
	Reduced noise and air pollution Improvements in public health	Quantitative Assessment The damage costs approach has been used to value the impact of the proposed scheme on local air quality, in line with requirements set out in TAG Unit A3. Emissions of oxides of NOx and PM2.5 have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios, using Defra's Emission Factors Toolkit (EFT), version 10.1. A quantitative noise assessment has been undertaken using a noise model. The noise model Study Area has been determined through review of the initial traffic model outputs following the criteria in DMRB LA

		111. The proposed scheme does not result in any obvious bypassed routes; therefore, the Study Area has been taken as a 600m buffer around the proposed scheme and sections of the A38 linking the proposed scheme together. In accordance with Transport Analysis Guidance (TAG) Unit A3, noise modelling has been undertaken to predict noise levels at all noise sensitive receptors within the Study Area.
Improved journey times along the A38	Reduced commute time More time to spend on recreational activities	Quantitative Assessment Travel time reductions form part of the Level 1 Transport User Benefits. This has been quantified through strategic modelling for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios. These impacts have also been monetised for a 60-year appraisal period using DfT's TUBA program (TUBA Version 1.9.15) for Core, High Growth and Low Growth Scenarios, with input matrices provided by the transport models.
	Travel time savings for business users and transport users	
	Cost reductions for transport allowing businesses to operate more efficiently	
Improved accessibility	Facilitates the delivery of local plan allocations	N/A Recognising that all proximate major development sites already have planning permission granted and as agreed with DfT, no formal dependent development assessment was undertaken.
	Easier journey means a greater number of people will be willing to travel to / from this area Businesses have access to a wider range of workers and skills	Quantitative Assessment A Level 2 Wider Impacts Assessment has been completed in line with the guidance set out in TAG. This assessment includes Induced Investment (TAG Unit A2.2), Employment Effects (TAG Unit A2.3) and Productivity Impacts (TAG Unit A2.4). The DfT's Wider Impacts in Transport Appraisal (WITA) V2.0 Beta tool has been used to estimate the wider economic impacts.
	Better access from Bromsgrove to West Midlands major employment areas Businesses have access to a wider range of workers and skills	

Active Mode Schemes

Removal of potential conflicts between pedestrians and cyclists (short-term) Increased in the number of pedestrians	Enhancements for pedestrians and cyclists can promote a long-term shift to active modes	Quantitative/ Qualitative Assessment The DfT's Active Mode Appraisal Toolkit (July 2021) has been used to assess relevant scheme benefits as part of a wider value for money assessment The social impacts assessments have been undertaken in line with TAG Units A4.1 and consider impacts to physical activity, journey quality, collisions, security, accessibility, affordability and severance.

4.1.3 Purpose of Report

This chapter sets out the Economic Case for investment in the A38 BREP. It assesses the options to identify the impacts and resultant value for money, in line with the principles set out in TAG. The scheme has been presented in a Do Something scenario and compared against a Do Minimum scenario which assumes no scheme is implemented. The details of the scheme included in the Do Something scenario are provided as part of the Strategic Case (Chapter 2). In addition, the Transport Modelling Chapter (Chapter 3) and its appendices document the modelling approach and results.

The Economic Case provides information on the:

- Option Appraised;
- Scheme Costs;
- Economic Impacts Assessment Methodology and Outcomes;
- Environmental Impacts Assessment Methodology and Outcomes;
- Social Impacts Assessment Methodology and Outcomes;
- Distributional Impacts Assessment Methodology and Outcomes;
- Economic Tables;
- Sensitivity and Risk Profile;
- Non-Welfare Impacts';
- Value for Money statement;
- Comparison of Value for Money Against Part 2 Early Delivery Schemes and
- Appraisal Summary Table.

The Economic Case is supported by the Traffic Modelling Chapter (Chapter 3), the Environmental Report (Appendix S.3). This OBC is supported by the DfT toolkit.

Option appraised

The proposed programme includes enhancements to a number of key junctions situated along the A38 Corridor in Bromsgrove between M5 Junction 4 to the north and the junction of the A38 Eastern Bypass with the B4094 Worcester Road to the south. The purpose of these options is to address the existing and forecast highway network issues as set out in the Strategic Case and summarised in the logic map in Table 4-1.

The scheme options are summarised in Table 4-2. Full details of the wider option development, assessment and sifting work are set out in the Strategic Case (Chapter 2) and the Options Assessment Report (Appendix S.1).

Table 4-2 - Option Layouts and Referencing

Proposed Highways Schemes

Ref	Scheme location	Description of proposed schemes
A	A38 / Hanbury Road	Provide a longer left turn lane on the Eastern A38 approach. Optimisation of signal timings to provide network control.
B	A38 / Buntsford Drive to south of A38 / Charford Road	Provision of two northbound lanes over approximately 100m on approach to Buntsford Drive roundabout, continuing to A38 / Charford Lane approach. Removal of guard railing at Buntsford Drive roundabout. Reconfigured lane markings on approaches and circulatory at A38 / Sherwood Road / Austin Road junction. New toucan crossings over Sherwood Road and A38 North. Development of Active Travel Corridor Link parallel to A38, providing a 3m wide shared footway/cycleway from Buntsford Drive to Charford Road (Scheme C and Scheme 2), as part of a wider cycle strategy for A38 corridor. Pedestrian / Cyclist linkage to Sherwood Road towards Bromsgrove Railway Station.
C	A38 / Stoke Road / Charford Road	Widening of the existing narrow 60m two lane approach and realignment of Charford Road. Widening of Culvert on Stoke Road to facilitate third lane over structure and realign ahead and right turn movement lane to improve access into the left turn lane to the A38 Southbound. Enhance pedestrian crossing widths across A38 corridor to 5m to support volume of pedestrians crossing over the A38 at grade. Provision of 3m wide footway/cycleway connection to link with Scheme B. Upgrade of uncontrolled crossings of Stoke Road (Upgrade to toucan) and Charford Road (Upgraded to pelican). Widen existing parking bays on Charford Road, to facilitate improved exit lane width from A38. Improved footway connection between A38 North and Warwick Avenue. Provision of on-crossing detection equipment at signals.
D	A38 / New Road	Provision of additional southbound traffic lane on A38. Realign Northbound A38 corridor to accommodate changes in southbound direction. Provision of an additional ahead lane from New Road West approach, with associated widening of A38 East exit. Provide new staggered pedestrian crossing on New Road West approach and exit in vicinity of Fordhouse Road and Bant Mill Road. Provision of wider crossing widths to support any future uplift in pedestrian movements. Provision of on-crossing detection equipment at signals. Reconfiguration of signal timings to accommodate separate phases for New Road East and West.
E	A38 / A448	Provision of two additional flare lanes (30 and 85m) on A38 north approach. Provision of a 61m flare lane on A448 East approach. Provision of longer flare lane (100m) on A38 South approach. Provision of 46m flare on A448 West approach. Provision of toucan crossings on A38 South and A448 Stratford Road approaches. Provision of 2 lane exit on A38 South and A448 West. Provision of Pedestrian crossing facilities across A38 Northand A448 West arms. Signalisation of both A38 and A448 arms. Provision of cycle connection from A448 West to Regents Park Road, to connect to Schemes 4 and 6). Provision of

		cycle route from A448 West toucan crossing to A38 North to link to Scheme 7). Provision of MOVA signal control. Revisions to circulatory markings. New footway connection from Scheme 4 on northern side of A448 West to Toucan Crossing by circulatory.
F	A38 / Birmingham Road to south of M42 Junction 1	Realignment of Birmingham Road junction, to accommodate two southbound lanes through junction, with a 3m wide footway on the eastern side of the A38, narrowing to a minimum of 2m in front of properties in front of dwelling curtilages. Provision of on crossing detection to Birmingham Road signals, and pedestrian crossing near Barnsley Hall Drive. Provision of localised widening of kerb lines to accommodate two lanes southbound from M42 J1 to Birmingham Road. School Lane to be converted to left out only, and car left in only, with associated kerb adjustments. Banning of right turn into School Lane. Consideration of lining and signing scheme on Alcester Road between School Lane and Birmingham Road (Cost excluded for Alcester Road scheme). Conversion of existing 40mph section from south of Birmingham Road to North of M42 J1 to 30mph.
G	A38 / Golden Cross Lane / Braces Lane	Provision of two northbound and two southbound ahead movement lanes on A38 corridor through junction. Improve NB approach to 150m two lane, and southbound to be 125m. Conversion of Lane 2 on SB approach to allow ahead movements from current right turn only, with associated exit widening. Improve controlled A38 north crossing point. Relocate bus stop within A38 North merge area to Golden Cross Lane. Remove bus stop lay-by in A38 south direction, and relocate. Provide new formal crossing provision on A38 south. Provision of on crossing detectors on crossing points.

Proposed Active Mode Schemes

1	Northbound Strategic Cycle Link	Active Travel Corridor Link (Birmingham Road to Bunstsford Business Park) - Widening of existing footway to a 4m wide shared cycleway/footway link between the A38/A448 roundabout and Birmingham Road junctions, incorporating a new section between Birmingham Road and Old Burcot Lane. Scheme to include removal of left turn merge at Slideslow Drive Roundabout, and provision of connections to existing access points.
2a*	Charford Road to Harvington Road	Active Travel Corridor – A38 between Buntsford Business Park to Birmingham Road. Scheme provides a 4m shared footway/cycleway along existing footpath between Charford Road and Harvington Road, provision of connection to Harvington Road. Closure of existing cut through to A38, and links with new pedestrian/cyclist bridge structure included as part of Scheme 2B.
2b*	Charford Road (Connection from Scheme 2a to School)	Active Travel Corridor - Connection between Scheme 2 and South Bromsgrove High School, to provide a 3m wide shared cycle path andfootpath.
3	Harvington Road to Old Station Road	New Walking/Cycling bridge from Harvington Road to Old Station Road, including access ramps and stairs to connect Old Station Road and Harvington Road, to provide missing link in NPIF strategy. Stop up existing at grade crossing point over A38. Reconfigure junction of Old Station Road / Bant Mill Road / Harvington Road, to improve conditions for cyclists and pedestrians to support a north to south parallel route to the A38, and connection to NPIF Route between Town Centre and Station (East to West). Old Station Road/Stonehouse Road/Warwick Avenue junction to be upgraded to provide connection for walking/cycling trips as part of NPIF Route connection.
4*	A448 near Blackwood Road	Signal Toucan Crossing of A448to east of Fordhouse Road, to provide connectivity between Blackwood Road (HOW College) and Regents Park Road and Fordhouse Road up to eastern extent of zig zag markings, and tie into Scheme 6.

5	Fordhouse Road to Carnforth Road	Upgrade bridge between Fordhouse Road to Carnforth Road to facilitate cycling, bridge to be widened and parapet heights to be raised. Stairs also to be added on eastern side of A38.
6	Regents Park Road Connection to Oakalls Loop	Provision of a footway/ cycleway connection between Scheme 4 and the existing cycle provision within the Oakalls Estate of Bromsgrove, to provide further connectivity from the north and west of Bromsgrove to the station.

Proposed Bus Schemes

7	RTI- New Road	Provision of upgrades to bus stops to install additional information on the route between the Town Centre and Railway Station
8	PT Select Vehicle Detection	Provision of select vehicle detection at New Road and Charford Road junctions to support buses in crossing the A38 corridor, on the primary routes between the Town Centre and Railway station

* Scheme 2a, 2b and 4 have been constructed as an early delivery scheme, funded by WLEP. It still forms part of the wider scheme local contribution and is included in the Do Minimum scenario.

4.1.4 Capital Costs

The Finance Case presents an estimate for the implementation of the schemes of £49.8 million (outturn cost) including inflation (the value of inflation excluding risk is £3.63M) and quantified risk (£6.93M, including inflation). In line with TAG, sunk costs are excluded in the economic analysis, hence, a portion of costs on early FBC development (detail design), amounting to £1.3 million, was spent in 2020/21 and therefore has been treated as sunk cost and not included. Total outturn scheme cost used in the Economic Case amounts to £48.5 million. Baseline cost is a combined 2020Q1 and 2021Q1 figure, that is individually calculated with appropriate levels of inflation in a spreadsheet for each individual scheme before being combined. Further details can be found in the Financial Case (Chapter 6).

Applying Optimism Bias as set out in TAG Unit A1.2 requires a 23% uplift for roads applied to all schemes except 3 and 5 and 32% uplift for structures and tunnels applied to schemes 3 and 5 – to be applied to the Baseline outturn cost including inflation, but with quantified risk excluded. The final cost including Optimism Bias becomes £52.76M (these exclude whole life costs which are presented subsequently).

For the economic case, the costs are discounted in TUBA to 2010 prices and GDP deflation factors applied from DfT's TAG Databook v1.15 (updated in July 2021). The resulting value is the 2010 Present Value of Costs, which equates to a Present Value of Costs (PVC) of £25.48M for the scheme excluding maintenance costs.

Cost assumptions are that:

- The appraisal approach identifies cost items that it is considered will change in real terms with respect to the prevailing inflation rate;
- Optimism bias level for capital costs = 23% applied to costs of roads (All schemes except 3 and 5), and 32% applied to costs of bridges and tunnels (Schemes 3 and 5);
- Capital expenditure is assumed to be funded by DfT;
- Values of time model are drawn from the TAG Databook (July 2021); and
- Value of time is assumed to grow in line with GDP.

Further details can be found in the Financial Case (Chapter 6).

4.1.5 Whole Life Costing

A calculation of the whole life costs of the scheme has been carried out and calculated to be £3.19 million. The process has been undertaken in line with TAG Unit A1.2, the key assumptions are that:

- A maintenance regime as detailed in the Financial Case Appendix F.5;
- Inflation based upon the Construction Indices;
- A GDP Deflation value of 125.74 to correct from 2021 values to 2010, as per the TAG Databook (July 2021 v1.15);
- Discounting of 3.5% for the first 30 years from 2021, and 3% thereafter, as per the TAG Databook (July 2021 v1.15); and
- Optimism bias level for capital costs = 23% applied to costs of roads, and 32% applied to costs of bridges and tunnels, as per TAG Unit M4.

The figure includes inflation, discounting and optimism bias in line with TAG guidance. The figure is based on maintenance work including resurfacing, inspections, replacements, antiskid and other necessary work such as bridge maintenance and necessary renewal.

Economic impacts

4.1.6 General economic assumptions

The main non-assessment specific economic appraisal parameters and assumptions are drawn from the requisite units of the DfT's appraisal guidance contained in various TAG guidance units and the TAG databook (July 2021). The relevant discounting parameters and appropriate appraisal period were adopted and used in TUBA to assess the level 1 highway benefits. Key assumptions made for the economic assessment are:

- Opening year 2025, preparation and construction profile from 2020-2025.
- Appraisal period = 60 years
- Appraisal based on model result years 2025 and 2040, and three modelled hours – AM, IP and PM, using annualisation factors.
- Value of Time (VoT), Vehicle Operating Costs (VOC), and other economic parameters are as defined in the most recent version of the TAG Data Book (July 2021), as applicable at the start of the economic appraisal.
- Price base year = 2010
- Current year for discounting = 2021 (Note: Costs are deflated from 2021 to 2010 using the GDP deflator, then both costs and benefits are discounted to the Present Value Year of 2010).
- Discount rate = 3.5% for 30 years from current year then 3% thereafter.
- LGVs are split into Freight and Personal trips in the proportion of 88% and 12% respectively, based upon default TUBA economic parameters.
- HGVs have been split into OGV1 and OGV2 in the proportion 73% and 27% respectively, based upon observed local data.

4.1.7 Transport Modelling to Inform Economic Assessments

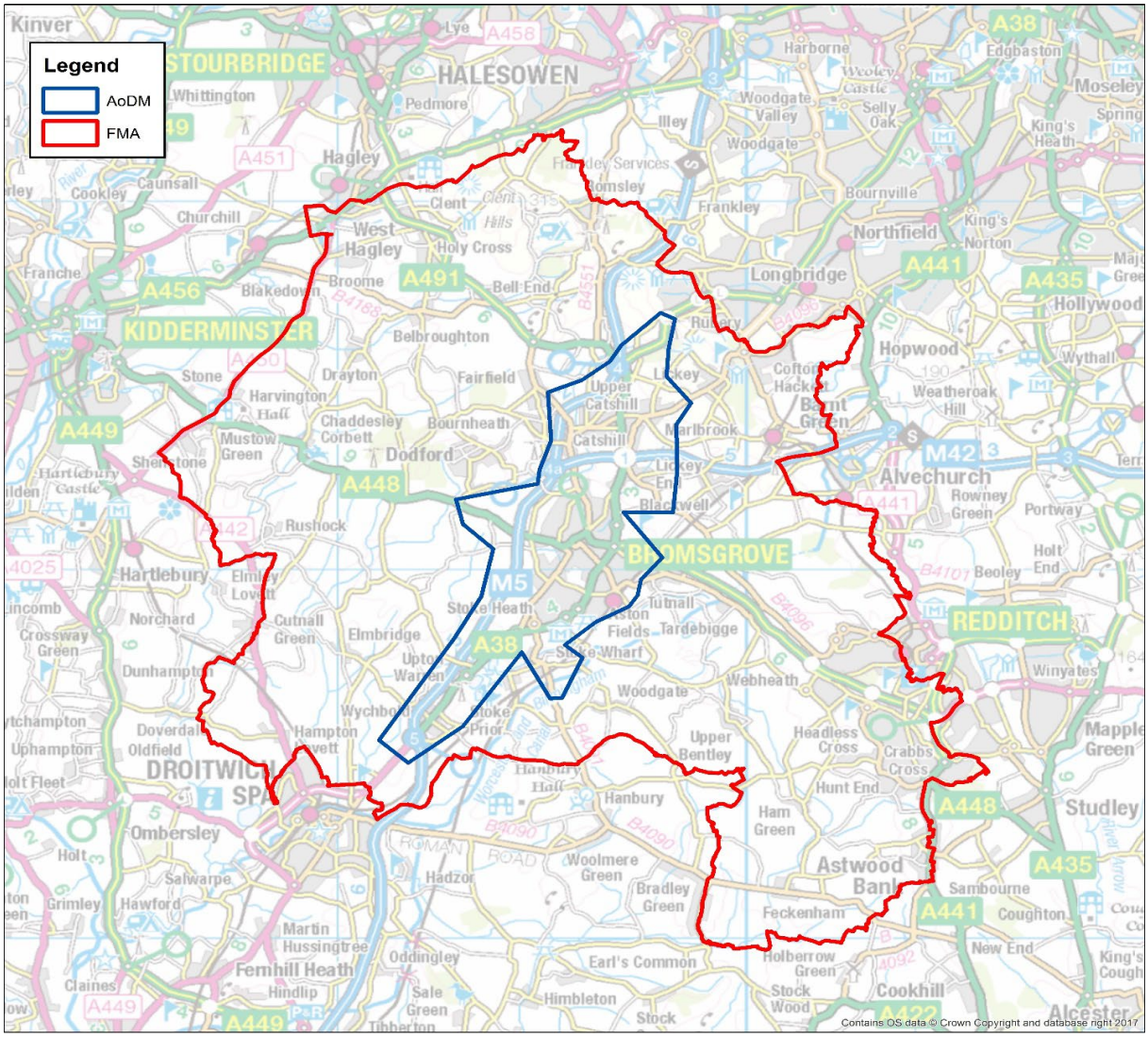
This section details the transport modelling methodology used as an input to the impact assessments of highway user benefits, bus facilities, construction, maintenance greenhouse gasses, air quality and noise.

4.1.7.1 Transport modelling approach

A transport model, known as the A38 BREP SOBC model, was previously developed and used to inform the 2019 SOBC. Based on DfT feedback, updates to the highway and demand model have been undertaken for the OBC submission, the resultant model is referred to as the A38 BREP OBC model.

The A38 BREP OBC model is a variable demand model which, in conjunction with the highway assignment model, has been deemed as a suitable tool for the A38 BREP scheme assessment. The model extent is shown in Figure 4.4 and is comprised of a Fully Modelled Area (FMA) and an External Area. The Fully Modelled Area is an area over which the A38 BREP scheme impacts are significant and certain or more likely. It is further subdivided as an Area of Detailed Modelling (AoDM), where the impacts of the scheme are significant and certain, and the Rest of the Fully Modelled Area (RoFMA) where the impacts of scheme were more likely but weak in magnitude. The area outside of the FMA is designated the External Area (EA). In the External Area impacts of interventions were predicted to be reasonably assumed as negligible.

Figure 4.4: A38 BREP OBC Model Extent



Information o n the model development (including data collection), model validation and forecasting are appended to the Transport Modelling Chapter (Chapter 3), named:

- Traffic Data Collection Report;
- Highway Assignment Model Local Model Validation Report;
- Variable Demand Model Report; and
- Traffic Forecasting Report.

4.1.7.2 Transport modelling scenarios

The modelling framework has been developed to represent a 2017 Base Year to which the model has been calibrated and validated. Forecasts for two future years (2025 and 2040) have been considered for this study. To assess the economic impacts of the proposed A38 BREP, the following modelling scenarios have been included:

- **Opening year (2025)** Do Minimum (Without Scheme)
- **Opening year (2025)** Do Something (With Scheme)

- **Future assessment year (2040)** Do Minimum (Without Scheme)
- **Future assessment year (2040)** Do Something (With Scheme)
- **Modelled year (2050)** Do Minimum (Without Scheme)
- **Modelled year (2050)** Do Something (With Scheme)

In addition to the model scenarios outlined above, the high and low growth sensitivity tests have been undertaken, further info is provided in Section 4.10 (Sensitivity and Risk Profile) and in the Traffic Modelling Chapter (Chapter 3).

The forecast model outputs in terms of skims (demand, time, distance) for all user classes modelled (Car– Home based work, Car– Employers business, Car– Other journey purposes, LGVs and HGVs) have been extracted to feed into the economic appraisal for the calculation of transport user benefits using TUBA. Link flow, congested speeds, travel times, and junction performance data have been used to inform COBALT (COst and Benefit to Accidents – Light Touch) and QUADRO (QUeues And Delays at ROadworks) assessments.

4.1.8 Highway Users

4.1.8.1 Methodology

The assessment of Transport Economic Efficiency benefits and costs has been conducted using DfT's TUBA computer program (TUBA Version 1.9.13) for the Core Scenario (and Sensitivity Tests), with input matrices provided by the transport modelling process.

In the assessment, three standard time periods have been used in TUBA as follows:

- AM Peak (weekday 07:00 to 10:00);
- PM Peak (weekday 16:00 to 19:00); and
- Inter-peak (weekday 10:00 to 16:00).

The traffic model has three weekday time periods; AM peak hour, Average Inter peak hour and PM peak hour. The modelled period benefits calculated by TUBA have been converted into an estimate of annual benefits using annualisation factors – expanding the modelled periods to be used to represent a full year.

The annualisation factors are based on daily flow distribution, plotted based on average flow profiles across 58 automatic traffic counts in both directions, with full validated datasets. Taking flow as a proxy for congestion, the analysis of annualisation factors has been based on the average traffic flow across all surveyed ATC sites. The 2-way ATC data was aggregated into average weekday hourly flow and analysed. For economic modelling purposes, the flow-based approach has been adopted for further estimation of annualisation factors which are summarised in Table 4-3 below. The annualisation factors are derived based on the standard 253 working days per year.

Table 4-3 - Annualised number of hours in each time slice

Time period	Annualised hours
AM	473
PM	491
IP	2047

Further information on the annualisation factors is presented in Appendix E.1 (Economic Impacts Report), and details on the traffic counts can be found in Appendix TM.3 (A38 Bromsgrove – VISUM model Local Model Validation Report).

TUBA output files (.out) produced for each scenario contain a list of errors and warnings during the program execution. Any errors encountered that caused the program to stop have been rectified. Warnings and serious warnings represent possible anomalies in the input data and have been investigated. All TUBA output files are included in Appendix E.1 (Economic Impacts Report).

The study area for the transport economic efficiency elements of the economic assessment is the FMA as shown Figure 4.4. All movements in the skims not interacting with the FMA have been excluded using a masking process.

4.1.8.2 Assessment outcome

The key economic impact included in the present value of benefits is the time saving. The A38 BREP scheme has been shown in the modelling to reduce travel times, especially during peak hours; thus commuters will value the savings derived from this scheme. It is expected that the surrounding network in Bromsgrove will benefit from reduced congestion because of the scheme attracting users toward the improved A38 corridor. The benefit is measured as a change in the road user cost due to the time savings for the users without and with the scheme.

This scheme generates £56.22M of travel time benefits, £2.27M in 2010 Present Value of Benefits (PVB) of fuel VOC benefits, and £-1.14M PVB of non-fuel VOC benefits. This equates to a total user benefit of £57.35M PVB. Further details of the breakdown of these benefits are provided in Table 4-4 to Table 4-7 below prices and values).

The table indicates the AM period accounts for 38% of the benefits and the PM peak period accounts for 47% of the benefits. The interpeak accounts for the remaining 15% of benefits demonstrating the scheme is largely alleviating peak period congestion benefits, linking to the MRN priority and A38 BREP Package objective of reducing congestion.

Table 4-4: Transport user benefits (£000's, discounted 2010 prices and values) by time period

Time Period	Time Benefits	Fuel VOC Benefits	Non- Fuel VOC Benefits	PVB
AM	21618	923	-445	22096
PM	25152	1417	227	26796
IP	9447	-74	-917	8456
Total	**56217**	**2266**	**-1135**	**57348**

Table 4-5: Transport user benefits (£000's, discounted 2010 prices and values) by purpose

Purpose	Time Benefits	Fuel VOC Benefits	Non- Fuel VOC Benefits	PVB
Business	15105	363	784	16252
Commute	24528	1159	-1606	24081
Other	16584	744	-313	17016
Total	**56217**	**2266**	**-1135**	**57348**

Table 4-6: Transport user benefits (£000's, discounted 2010 prices and values) by user class

User Class	Time Benefits	Fuel VOC Benefits	Non- Fuel VOC Benefits	PVB
Car	46056	2088	-1405	46739
LGV personal	384	26	-14	396
LGV freight	6382	191	35	6608
OGV1	2478	-145	146	2479
OGV2	917	107	103	1126
Total	**56217**	**2266**	**-1135**	**57348**

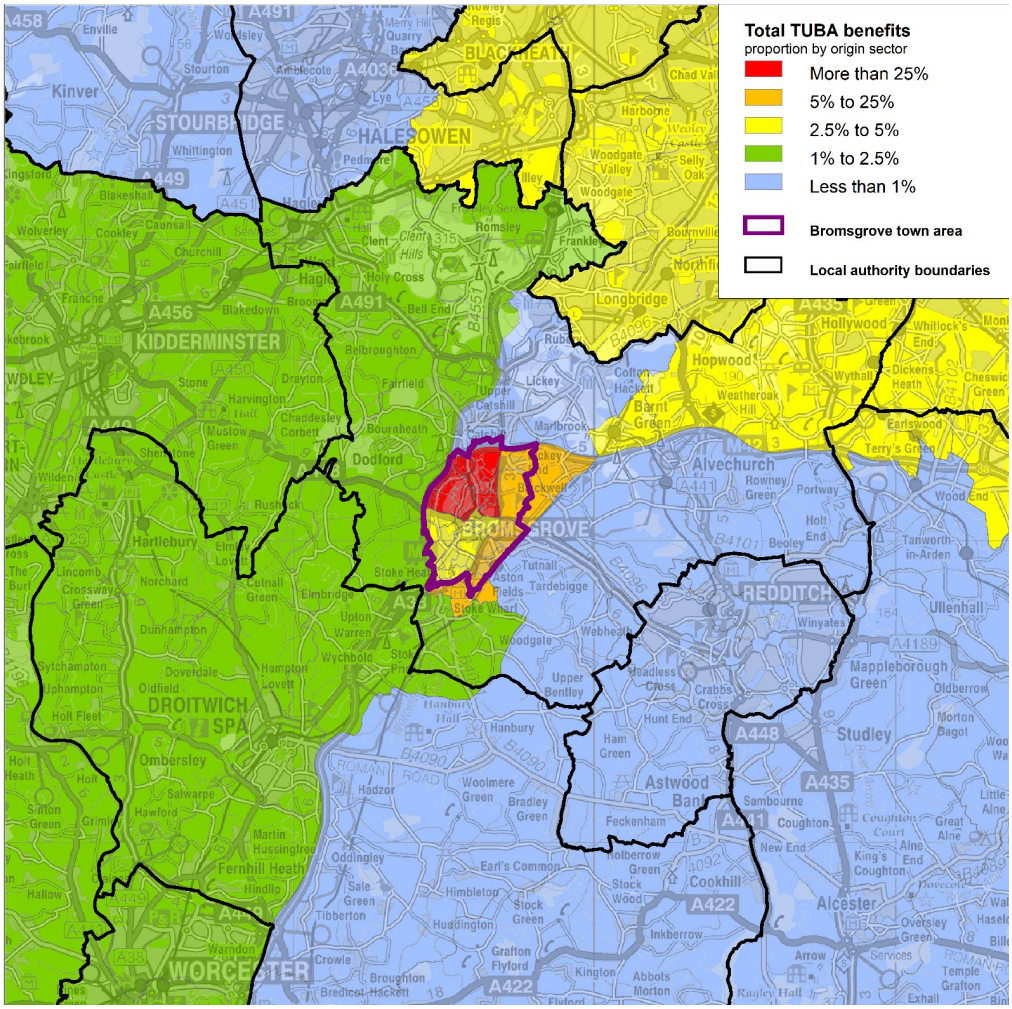
Table 4-7: Transport user benefits (£000's, discounted 2010 prices and values) by year

Year	Time Benefits	Fuel VOC Benefits	Non- Fuel VOC Benefits	PVB
2025	799	94	25	917
2026	843	92	18	953
2027	885	90	12	986
2028	925	88	6	1018
2029	963	86	0	1049
2030	999	82	-5	1077
2031	1034	79	-10	1103
2032	1067	75	-14	1127
2033	1098	72	-18	1151
2034	1127	68	-22	1174
2035	1155	65	-26	1195
2036	1182	62	-29	1215
2037	1207	60	-32	1235
2038	1231	57	-35	1253
2039	1253	55	-38	1270
2040	1274	53	-40	1287
2041	1249	49	-39	1260
2042	1225	47	-37	1235
2043	1201	44	-36	1210
2044	1178	42	-35	1185
2045	1155	40	-34	1162
2046	1133	38	-32	1139
2047	1111	36	-31	1116
2048	1090	34	-30	1094
2049	1069	33	-29	1072

2050	1048	31	-28	1051
2051	1028	30	-27	1031
2052	1013	30	-27	1016
2053	998	29	-26	1001
2054	984	28	-25	987
2055	969	27	-24	972
2056	955	27	-24	958
2057	941	26	-23	944
2058	927	25	-22	931
2059	914	25	-22	917
2060	901	24	-21	904
2061	888	23	-20	891
2062	875	23	-20	878
2063	862	22	-19	865
2064	849	22	-19	852
2065	837	21	-18	840
2066	825	20	-18	828
2067	813	20	-17	816
2068	801	19	-17	804
2069	789	19	-16	792
2070	778	18	-16	781
2071	766	18	-15	769
2072	755	18	-15	758
2073	744	17	-14	747
2074	733	17	-14	736
2075	723	16	-13	725
2076	712	16	-13	715
2077	702	15	-13	705
2078	692	15	-12	694
2079	682	15	-12	684
2080	672	14	-12	674
2081	662	14	-11	664
2082	652	13	-11	655
2083	643	13	-11	645
2084	633	13	-10	636
Total	**56217**	**2266**	**-1135**	**57348**

Figure 4.5 displays the TUBA benefits by origin sector graphically. The figure demonstrates that most benefits originate from sectors within Bromsgrove town centre (north).

Figure 4.5 – Share of TUBA benefits by sector



Full TUBA outputs are included in Appendix E.1 (Economic Impacts Report).

4.1.9 Bus Facilities

4.1.9.1 Methodology

The analysis considered the annualised number of boarders at each bus stop specified, based on data supplied by Worcester County Council (Table 4-8). No change in patronage was assumed across this appraisal period.

Table 4-8 - Bus Boarding Counts

Location	Average Weekday Boarders	Average Saturday Boarders	Average Sunday Boarders	Total Weekly Boarders	Total Annual Value
Bromsgrove Bus Station	112	98	43	699	36,360
Bromsgrove Railway Station	16	14	6	100	5,194
Fordhouse Road vicinity	3	3	1	21	1,094
Golden Cross Lane (near Marlbrook Crossroad)	5	5	2	34	1,777
Aston Fields	1	0	0	3	163

Annualised patronage estimates and generalised journey time savings of 1.47 minutes per boarder unlocked through provision of RTI were applied based on TAG Databook Table M3.2.1. Market price values of time from TAG Databook Table A1.3.2 were then applied for different journey purposes (i.e. commuters, business travellers, other users) to understand the journey time saving enabled by provision of RTI.

No formal analysis of the potential quantified or monetised impact of provision of select vehicle detection at New Road and Charford Road junctions was undertaken. This reflects the view that the system would only apply to late running buses, recognising that use of the system as standard could cause significant delays and disbenefits for other highway users. Hence, the impact of the select vehicle detection intervention is assumed to be neutral.

4.1.9.2 Assessment Outcome

The bus facility interventions are expected to generate some £151,000 PVB of journey time saving benefits. Of this, £48,279 PVB of journey time saving benefits is for commuting users, £5,034 PVB for business users and £98,109 PVB for other purpose users.

Further details on the methodology are provided in Appendix E.1 (Economic Impacts Report).

4.1.10 Construction and Maintenance

4.1.10.1 Methodology

Impacts due to the construction periods were assessed using the QUADRO (QUeues And Delays at ROadworks), software released by the DfT. The impacts were analysed using QUADRO 2020 which was the latest available version at the time of the OBC submission. The methodology followed the guidance set out by the DfT in the QUADRO Manual supplied with the program.

The purpose of the program is to provide a method for assessing the total cost of major road maintenance works and during construction. There are three elements of this user cost; delay (value of time), vehicle operating costs, and accident costs. When assessing maintenance works, the total of the works and road user costs are considered.

In line with QUADRO guidance, count sites near or on the junctions/roads affected were used to inform the input flows. Based on the input flows and count dates (including year) a flow profile for a 7 day week was produced for further analysis.

Information about the roads (including type of road/environment and speed limit) was taken from a combination of google maps and street view which informed the QUADRO road type. Construction information input to QUADRO was based on the planned construction details (supplied by WCC), this included:

- The length of the construction period;
- The start/ end date of construction;
- Type of impact (i.e. lane narrowing / road closure) of the construction; and
- Diversion routes.

The construction details are summarised in Table 4-9 which shows the assumed construction schedule and the type and length of impact for each scheme. Further detail on the construction phase is provided in the Management Case (Chapter 3).

Table 4-9: Construction schemes and their proposed duration, start and end dates

Scheme	Estimated construction duration on site	Proposed construction start date	Proposed construction end date	Type of construction impacts
A	6 Months	Apr-24	Sep-24	Narrow Lanes (6 Months) Overnight Arm closure (3 nights)
B	18 Months	Jul-24	Dec-25	Narrow Lanes (18 Months) Overnight Closure (3 nights)
C	18 Months	Jul-24	Dec-25	Narrow Lanes (18 Months) Overnight Shuttle working (6 nights)
D	12 Months	Jul-23	Jun-24	Narrow Lanes (12 Months) Overnight Closure (6 nights)
E	12 Months	Jul-23	Jun-24	Narrow Lanes (12 Months) Overnight Arm closure (12 nights)
F	12 Months	Dec-24	Nov-25	Narrow Lanes (12 Months) Overnight Shuttle working (3 nights)
G	10 Months	Feb-24	Nov-24	Narrow Lanes (10 Months) Overnight Shuttle working (3 nights)
1	9 Months	Nov-22	Jul-23	Narrow Lanes (9 Months) Overnight Arm closure (3 nights)
3	6 Months	Mar-23	Sep-23	Narrow Lanes (6 Months) Road closure (1 weekend)
5	6 Months	Oct-23	Mar-24	Narrow Lanes (6 Months) Road closure (1 weekend)
6	4 Months	Mar-24	Jun-24	Narrow Lanes (4 Months) Overnight Arm closure (3 nights)

** Only minor localised traffic management is planned for scheme 7 hence is not included in the assessment.*

Similarly, maintenance impacts have been estimated based upon anticipated road traffic disruptions over the 60 -year appraisal period. This assessment is con sistent with the maintenance regime as detailed in the Financial Case Appendix F.5

4.1.10.2 Construction Impacts Outcome

The total impact for all the different schemes/locations was found to be -£3,202,880 PVB. Table 4-10 below presents the construction disbenefits broken down for each specific scheme.

Table 4-10 – Quadro Disbenefit broken down by scheme, by year

Scheme	Disbenefit Year	Disbenefits by year
A	2024	-£26,026
B	2024	-£121,602
	2025	-£258,075
C	2024	-£142,740
	2025	-£295,083
D	2023	-£156,312
	2024	-£164,742
E	2023	-£115,414
	2024	-£122,665
F	2024	-£62,755
	2025	-£686,588
G	2024	-£323,007
1	2022	-£103,424
	2023	-£366,462
3	2023	-£113,294
5	2023	-£33,969
	2024	-£52,495
6	2024	-£58,228
Total		-£3,202,880

4.1.10.3 Maintenance Impacts Outcome

Table 4-11 displays the QUADRO delay during maintenance. The total impact during maintenance was found to be -£298,000 PVB.

Table 4-11 – Quadro Delay DuringMaintenance (£'000)

Impact	Car- Commute	Car- Other	Cars- Business + LGV	HGV
User Impacts	-£52.8	-£86.7	-£39.3	-£34.5

Greenhouse Gases	-£74.8
Accident Benefits	-£14.2
Indirect Tax Revenue	£4.3

4.1.11 Reliability

4.1.11.1 Methodology

Reliability impacts have been assessed in line with section 6.3 of TAG Unit A1.3 User and Provider Impacts using inputs from the A38 BREP OBC model. This approach is based on the forecast changes in the standard deviation of travel time from changes to journey time and distance given by the formula

$$\Delta\sigma_{ij} = 0.0018\left(t_{ij2}^{2.02} - t_{ij1}^{2.02}\right)d_{ij}^{-1.41}$$

Where:

$\Delta\sigma_{ij}$ is the change in standard deviation of journey time from i to j (seconds);

t_{ij2}, t_{ij1} are the DS and DM journey times from i to j (seconds) respectively; and

d_{ij} is the distance from i to j.

TAG A1.3 paragraph 6.3.4 gives the recommended value for the Reliability Ratio as 0.4 for all journey purposes. This is then used along with the $\Delta\sigma_{ij}$ values to determine the Reliability Benefit given by,

$$Reliability\ Benefit\ = -\frac{1}{2}\sum_{ij}\Delta\sigma_{ij}\cdot\left(T_{ij}^{0}+T_{ij}^{1}\right)\cdot VOR.$$

Where:

VOR is the reliability ration

T^0_{ij} and T^1_{ij} are demand in the without scheme and with scheme models.

4.1.11.2 Assessment outcome

The term reliability refers to variation in journey times that individuals are unable to predict. Table 4-12 displays the reliability benefit calculated and shows apositive reliability benefit for the AM and PM peak hours indicating a more reliable journey time is anticipated. In the interpeak hour a more marginal benefit/disbenefit is shown.

Table 4-12: Reliability Benefit

Year	Time Period	Commute	Employers' business	Other purpose
2025	AM	26.85	8.15	15.49
	IP	-0.51	0.00	-1.74
	PM	40.99	14.29	21.86
2040	AM	52.53	11.57	20.02
	IP	2.14	1.69	4.51
	PM	63.19	16.74	33.80

4.1.12 Level 2 - Wider Economic Impacts

4.1.12.1 Methodology

A Wider Impacts assessment has been completed in line with the guidance set out in TAG Unit A2.1. Wider economic impacts occur due to market failures that are prevalent within non-transport markets. Thus, traditional welfare impacts don't wholly reflect the full range of benefits, therein requiring for the quantification of wider impacts separately.

These wider benefits arise as a result of the impact of a reduction in generalised journey times and costs filtering through to non-transport markets, including:

- Induced Investment (TAG Unit A2.2) - Increased or decreased **output in imperfectly competitive markets .** These are typically 10% of the business user benefits.
- Employment Effects (TAG Unit A2.3) - **Labour market impacts** from more/less people working as a result of better accessibility to employment opportunities.
- Productivity Impacts (TAG Unit A2.4) - **Agglomeration impacts** : a reduction in generalised costs will increase the effectivity density of economic activity within the area. Leading to an increase in productivity measured through GDP.

For the purpose of this analysis, the DfT's Wider Impacts in Transport Appraisal (WITA) V2.0 Beta tool has been used to estimate the wider economic impacts.

Additional detail on the assessment methodology is included in the Appendix E.1 - Economic Impacts Report.

4.1.12.2 Assessment outcome

Based on the analysis undertaken in WITA, it is estimated that the wider economics benefits as a result of the scheme are an estimated £14.2M PVB. These benefits correspond to the local authority districts that are captured by the Fully Modelled Areas.

As only static clustering has been modelled, the reduction in generalised travel costs will increase the effective density of economic activity within the area, giving rise to the agglomeration impacts. The agglomeration impacts are primarily concentrated around Bromsgrove/Redditch with a small proportion of the impacts materialising within Wychavon and Wyre Forest. Agglomeration benefits typically are between 10-30% of the TEE user impacts as per DfT guidance, the impacts generated for this study lie within those approximations.

To model the output change in imperfectly competitive markets, as per DfT guidance, 10% of the business user benefits have been adopted. This quantifies the benefits to be £1.2M PVB.

The breakdown of the benefits by impact category can be seen in Table 4-13:

Table 4-13: Wider economic impacts summary

Wider Impact Type	Benefits £ 000's (2010 prices and values)
Imperfect competition impacts	£1,213
Agglomeration impacts	£11,907
Labour supply impacts	£1,069
Total	£14,189

4.1.13 Development Impacts

Recognising that all proximate major development sites already have planning permission granted and as agreed with DfT, no formal dependent development assessment was undertaken. However, given that four proximate development sites are required to make a Section 106 contribution to scheme delivery, a clear planning link between the proposed intervention and key development sites exists. Within this context, the scheme is considered to facilitate and support development rather than fundamentally unlock the following sites:

- Whitford Road;
- Perryfields Road;
- Foxlydiate; and
- Brockhill.

The development impacts facilitated at these sites is outlined in Table 4-14 and Table 4-16 which demonstrate that some 5,310 homes, 1,130 gross FTE jobs and more than £58m in GVA per annum could be realised at sites that the proposed A38 BREP will support.

Table 4-14: Quantum of Development at Facilitated Development Sites

		Floorspace (sq m)					
Site	**Homes**	**Retail (A1-3)**	**B1c**	**B1a**	**Education**	**Care**	**Community (D1)**
Perryfields Road	1,300	*	*	*	*	*	*
Whitford Road	490	400					
Foxlydiate	2,560	900			*	*	900
Brockhill	960	970					
Total	5,310	2,270	0	0	0	0	900

** FTE employment for the Use Classes has been taken from documentation associated with the approved planning applications rather than calculated based on the quantum of development.*

The quantum of development has been used to inform the gross FTE employment at facilitated development sites as displayed in Table 4-15. No development quantum is displayed for Perryfields Road and Foxlydiate (education and care) as figures from the approved planning applications were available for use.

Table 4-15: Gross FTE Employment at Facilitated Development Sites

Site	Full Time Equivalent (FTE) Jobs						Total
	Retail (A1-3)	B1c	B1a	Education	Care	Community (D1)	
Perryfields Road	40	732		33	120		925
Whitford Road	23						23
Foxlydiate	51			50	20	6	127
Brockhill	55						55
Total	170	732		83	140	6	1,131

Table 4-16: Gross GVA per annum at Facilitated Development Sites

Site	GVA p.a. (£, 2019 Prices)
Perryfields Road	52,710,589
Whitford Road	641,006
Foxlydiate	3,489,646
Brockhill	1,554,438
Total	58,395,678

Further detail on derivation of these development-related impacts is provided in Appendix E.1 (Economic Impacts Report).

Environmental impacts

This chapter is supported by the Environmental Report (Appendix S.3) which details the environmental baseline and the assessment whilst a summary (and relevant monetisation) is provided in the TAG worksheets (Appendices E2 to E.8).

4.1.14 Air quality

4.1.14.1 Methodology

In accordance with TAG Unit A3 (Figure 2), as the proposed scheme is unlikely to affect legal pollution limits and air quality impacts are unlikely to have a Net Present Value (NPV) greater than £50M (due to the size and nature of the proposed scheme), then the damage costs approach has been used to value the impact of the proposed scheme on local air quality.

As a result, emissions of oxides of nitrogen (NOx) and particulate matter less than 2.5 μm in diameter ($PM_{2.5}$) have been estimated for the Opening Year (2025) and Future Assessment Year (2040) Do Minimum and Do Something scenarios, using Defra's Emission Factors Toolkit (EFT), version 10.1. Emissions have been estimated for the extent of the Affected Road Network (ARN), defined in accordance with the criteria defined in Design Manual for Roads and Bridges (DMRB) LA 105 Air Quality guidance. These emissions estimates have been entered into the TAG Air Quality Valuation Workbook, as shown in Appendix E.2 (Air Quality Valuation Workbook).

4.1.14.2 Assessment outcome

As a result of the Proposed Scheme reducing congestion and therefore increasing the attractiveness of the network, traffic flows and emissions along the A38 and A448 are anticipated to increase. Therefore, estimated increases in emissions are anticipated by 98 tonnes of NOx and 18 tonnes of $PM_{2.5}$ (over a 60 year appraisal period).

The total value of the change in air quality is estimated to be -£784,381 PVB (-£300,402 PVB for NOx and -£483,979 PVB for $PM_{2.5}$).

A detailed air quality assessment undertaken to support this business case indicates there would be no exceedances of relevant air quality objectives at any modelled human health receptors in the opening year, either with or without the proposed scheme. The assessment also indicates that the proposed scheme is unlikely to have a significant effect on national compliance with the annual mean NO2 air quality Limit Value. As such, and in accordance with DMRB LA 105, the air quality impacts of the Proposed Scheme are considered to be **Neutral**.

It is anticipated that whilst there is an overall increase in emissions of air pollutants, the scheme represents a slight betterment in emissions per vehicle kilometre travelled.

4.1.15 Noise

4.1.15.1 Methodology

A quantitative noise assessment has been undertaken using a noise model. The noise model Study Area has been determined through review of the initial traffic model outputs following the criteria in DMRB LA 111. The proposed scheme does not result in any obvious bypassed routes; therefore, the Study Area has been taken as a 600m buffer around the proposed scheme and sections of the A38 linking the proposed scheme together.

In accordance with TAG Unit A3, noise modelling has been undertaken to predict noise levels at all noise sensitive receptors within the Study Area. Impacts have been estimated for the Opening Year (2025) and Future Assessment Year (2040) Do Minimum and Do Something scenarios.

The latest TAG Noise Workbook at the time of the assessment has been used to undertake the following comparisons for the OBC stage for both daytime and night-time periods.

Night-time noise levels have been derived from the predicted daytime noise levels using the Method 3 conversion technique described within the Transport Research Laboratories report "Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping". The completed Noise Workbook, provided in Appendix E.3 (Noise Workbook), provides the Net Present Value and Net Annoyance which are summarised below and in the reported in the Appraisal Summary Table.

4.1.15.2 Assessment outcome

Day time noise levels have been predicted in accordance with the procedures set out in the "Calculation of Road Traffic Noise" and "Design Manual for Roads and Bridges LA 111 Revision 2". Night-time noise levels have been derived through using TRL report "Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping", Method 3.

Analysis of the predicted daytime noise levels indicates that 197 dwellings would indicatively be expected to meet the noise insulation eligibility criteria contained in the Noise Insulation Regulations 1975 (as amended 1988).

The number of properties predicted to experience 55dB L_{night} or greater in the future assessment year is 1581 with the scheme in place, and 1511 without the scheme in place. Therefore, there are 70 more properties above the night-time SOAEL with the scheme in place.

0 properties are predicted to experience 80dB $L_{Aeq,16h}$ or greater in the future assessment year with the scheme and 0 without the scheme in place

Of the 144 non-residential sensitive receptors assessed in the short term, 21 are expected to experience an adverse impact of minor magnitude or greater, whilst 7 are expected to experience a beneficial impact of minor magnitude or greater. In the long term, there are 0 expected to experience an adverse impact of minor magnitude or greater and 1 expected to experience a beneficial impact of minor magnitude or greater.

The total value of the change in noise quality is estimated to be -£3,754,649 PVB.

4.1.16 Greenhouse gases

4.1.16.1 Methodology

Emissions of carbon dioxide (CO_2) have been estimated for the Opening Year (2025) and Future Assessment Year (2040) Do Minimum and Do Something scenarios using the TAG Databook approach (July 2021 v1.15) for all road links within Traffic Reliability Area. In order to derive CO_2 emissions on an annual basis over the required 60-year appraisal period, estimated CO_2 emissions have been linearly interpolated between the Opening Year and Design Year and assumed to remain constant thereafter. Estimated annual emissions of CO_2 in the Do Minimum and Do Something scenarios have been entered into the TAG Greenhouse Gases Workbook, as shown in Appendix E.4 (Greenhouse Gases Workbook).

The guidance published by DfT in October 2021 titled " *Forthcoming change: interim carbon values for scheme appraisal*" sets out updated evidence on the valuation of greenhouse gas emissions for transport interventions using the latest carbon values for appraisal, published by BEIS in September 2021. A sensitivity test using the October 2021 TAG Workbook has been undertaken and is set out in Section 4.9.2.

4.1.16.2 Assessment outcome

Whilst the proposed scheme is expected to relieve congestion in some locations, and therefore reduce GHG emissions in these areas, the proposed scheme is anticipated to result in an increase in vehicle kilometres travelled on the network and therefore a resultant increase in Greenhouse Gas emissions. In

the Scheme Opening Year the GHG emissions are anticipated to rise by 0.4%, which is therefore considered to be negligible. The 0.4% increase in GHG emission (Opening Year) is compared to an increase of 0.6% in vehicle kilometres travelled, demonstrating that the scheme represents a slight betterment to GHG emission per vehicle kilometre travelled. An estimated increase in emissions (over a 60 year appraisal period) of 81,972 tonnes of CO_2 is anticipated.

The total value of the change is estimated to be -£2,912,478 PVB.

4.1.17 Landscape / Townscape

4.1.17.1 Methodology

A qualitative assessment has been undertaken using the townscape worksheet in line with the guidance set out in TAG Unit A3 section 7.

This TAG assessment has been produced to assess the likely impacts arising from the cumulative scheme (incl. Schemes 3 and 5) on local-level townscape. A detailed assessment of the likely site-level townscape effects arising from Schemes 3 and 5 can be found within the standalone, non-statutory Landscape and Visual Impact Assessment (LVIA) produced by TACP. For the purpose of this assessment, site-level townscape effects have been adapted for the local-level. The assessment considers the impacts on townscape as resource in its own right.

The assessment of local-level townscape impacts has been based on the combined geographical extents of Landscape Description Units (LDUs) MW129 and MW130 identified within the regional and local-level landscape character assessment (Worcestershire Landscape Character Assessment, 2020). Judgement of impact includes townscape effects occurring after all mitigation measures have been considered (i.e. 'residual effects') following an appropriate environmental and landscape design to achieve a 'best fit' within the townscape. An assessment of night-time effects has not been included as part of this assessment.

4.1.17.2 Assessment outcome

The overall impact on the townscape is anticipated to be **Slight Adverse** as the cumulative scheme does not quite fit with the overall character of the townscape. Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.5 (Townscape Worksheet).

4.1.18 Historic Environment

4.1.18.1 Methodology

A qualitative assessment has been undertaken using the historic environment worksheet in line with the guidance set out in TAG Unit A3 section 8. This considers the key historic environmental resources within the vicinity of the scheme.

4.1.18.2 Assessment outcome

A heritage asset is defined by the National Planning Policy Framework (NPPF) as “a building, monument, site, place or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest”.

Heritage assets include designated assets (World Heritage Sites, Scheduled Monuments, Listed Buildings, Conservation Areas, Registered Parks and Gardens, Registered Battlefields and Registered Historic Wrecks) and non-designated assets identified by the Local Planning Authority (for example: locally listed buildings, archaeological sites and monuments and historic landscapes).

Key heritage assets have been identified and all potential impacts are characterised. Where relevant, constraints that could influence design, programme, construction timing, methods and working areas on site are highlighted.

Appropriate mitigation measures are set out to ameliorate and compensate for the likely impacts during construction and operation, where necessary, to address any potentially significant effects and to ensure compliance of the cumulative scheme with relevant legislation and planning policy.

The overall impact on the historic environment is anticipated to be **Neutral** as the assessment has found that there will be no significant impact to existing heritage assets and no further work is required. Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.6 (Historic Environment Worksheet).

4.1.19 Biodiversity

4.1.19.1 Methodology

A qualitative assessment has been undertaken using the biodiversity worksheet in line with the guidance set out in TAG Unit A3 section 9.

4.1.19.2 Assessment outcome

Schemes A, B, C, D, E, F, G, 1 and 6 are all anticipated to have a **Neutral** impact to biodiversity. Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.7 (Biodiversity Worksheet).

4.1.20 Water Environment

4.1.20.1 Methodology

A qualitative assessment has been undertaken using the water environment worksheet in line with the guidance set out in TAG Unit A3 section 10.

4.1.20.2 Assessment outcome

Multiple surface water features have been identified within the study area. Two are classified by the Environment Agency under the Water Environment Regulations (WER) as 'main rivers' - River Salwarpe and Sugar/ Spadesbourne Brook. Both have been assigned as high importance due to their status. All other watercourses have been assigned as a medium importance for surface water quality. For geomorphology impacts, importances for watercourses were assigned within the Environmental Assessment Report (EAR) (Jacobs, 2021). One principal aquifer, one secondary A and one secondary B aquifer have been identified within the study area of the cumulative scheme. These are classified as very high, high and medium importance respectively. The cumulative scheme and wider study area has been described as covering all three flood zones but have been classified as low - medium importance due to assumed limited development and/ or small floodplains associated with the smaller watercourses. Overall impacts are either of low significance or insignificant providing particular standards and guidance is implemented appropriately. The overall score is neutral as the scheme would result in a combination of effects, some positive (such as reduction in spillage risk) and some negative (increased road runoff through additional impermeable areas), with both positive and negative impacts being minimal.

The overall impact on the water environment is anticipated to be **Neutral** as all impacts are minimal with some positive and some negative impacts. Further information on the assessment and outcomes is provided in the Environmental Report (Appendix S.3) and Appendix E.8 (Water Environment Worksheet).

Social Impacts

This chapter is supported byAppendix E.9 (Active Mode Impact Assessment), and Appendix E.10 (Social Impact Assessment).

4.1.21 Physical activity

4.1.21.1 Methodology

The highways schemes are anticipated to have little to no effect upon Physical Activity and therefore the assessment focused on the active mode schemes.

The assessment of physical activity provided at SOBC stage was based on assumptions about levels of walking and cycling. For OBC stage baseline walking and cycling count data has been utilised. Comprehensive pedestrian and cycle surveys were undertaken in February 2020 (pre-Covid Lockdown). Count locations along the A38 stretched from the junction with Four Oaks Drive (to the north) to Buntsford Drive (to the south).

As pedestrian and cyclist improvements to the A38 corridor are comprehensive (new crossings, upgraded crossings, new segregated lane provision etc) it has been assumed that every pedestrian or cyclist interacting with the A38 will incur a benefit.

Analysis of raw count data has been undertaken to identify unique pedestrians and cyclists interacting with the A38 corridor, so that duplicate benefits are not claimed.

The Propensity to Travel Tool has been used to forecast cycle demand once the scheme is implemented. The number of cyclists in the Government Target, near market (govnearmkt_slc) figure has been extracted for the relevant Middle Super Output Area (MSOA)s in Bromsgrove.

The schemes have been assessed using the DfT's Active Mode Appraisal Toolkit (AMAT). Due to the nature of individual location-based interventions, and how they work together to provide an improved overall package on the A38 corridor, schemes have been assessed as two packages of investment:

- Scheme G in isolation, due to its distance from the other schemes.
- Schemes B to F and 1 to 6 have been assessed as one package, to avoid double counting of benefits.

Note that Scheme A is not included as it does not include any active mode elements.

Due to the nature of the scheme to be provided, east-west movements across the A38 (currently a significant barrier to movement) and north-south movements adjacent to the A38 have all been considered. Further information on the approach to physical activity including assumptions and impacts is provided in Appendix E.1 (Economic Impacts Report) and Appendix E.9 (Physical activity AMAT).

4.1.21.2 Assessment outcome

Based on the assessment undertaken and the Active Mode figures, the overall impact of the schemes on Physical Activity is **Moderate Beneficial**.

The estimated impact on increased physical activity levels has been estimated and monetised as part of the economic analysis, using the AMAT and is valued at £24.6M PVB (reduced risk of premature death and absenteeism). Total scheme benefits amount to £28.3M PVB as presented in Table 4-17.

Table 4-17 : Total Economic Impacts– Summary Table (Estimates in £ '000s)

Cost / Benefit Type	Impact Drivers	Estimates (present value in 2010 prices)
Mode shift	Congestion benefit	609.88
	Infrastructure maintenance	3.19
	Accident	98.43
	Local Air Quality	11.13
	Noise	6.56
	Greenhouse Gases	24.98
Health	Reduced risk of premature death	21,273.07
	Absenteeism	3,365.12
Journey Quality	Journey Ambience	2,962.19
Government Impact	Indirect Taxation	-36.5
Present Value of Benefits (PVB)		**28,314.86**

These impacts can be largely attributed to the following economic drivers:

- Reduced risk of premature death due to healthier and more active lifestyles;
- Reduced absenteeism from work due to improved general health;
- Enhanced journey ambience due to provision of grade separated crossing points across the A38; and
- Reduced congestion due to reduced need to make short trips via car.

The AMAT impacts associated with mode shift (congestion, infrastructure maintenance, accident, local air quality, noise, greenhouse gases and indirect taxation) will not be included within the Economic Tables (Section 4.9) to avoid any potential double counting. Therefore, the total AMAT scheme benefits accounted for amount to £27.6M PVB.

4.1.22 Journey Quality

4.1.22.1 Methodology

TAG unit A4.1 identifies three main components of journey quality as follows:

- Traveller Care – This focuses on the general transport environment such as cleanliness, facilities, the provision and quality of information, smoothness of the ride and the extent of overcrowding;
- Travellers View – Largely based on the views of both the townscape and landscape during the journey; and
- Travellers Stress – This is based on the convenience of the journey including the ease of using the route, and levels of congestions.

The guidance suggests that the assessment of Journey Quality Impacts should be considered neutral if most or all of the sub factors are classed as neutral or if the positive aspects of certain subfactors are counteracted by the negative impacts within other sub factors. If the Journey Quality is classed as being beneficial or adverse then the severity of this is assessed against how many travellers are likely to be affected, i.e. a slight adverse classification would be attributed if only a low number of traveller's Journey Quality were impacted by the scheme.

The schemes were assessed against these three main components from both a highway and active mode perspective.

4.1.22.2 Assessment outcome

Based on the analysis, the main benefits of the scheme are from reducing traveller stress by providing a safer and more reliable Highway and Active Mode network, with schemes in place to combat the congestion of future years. There is unlikely to be much impact on traveller views. Both sets of schemes will be designed to the latest standards and guidance making sure that traveller care is at the forefront of each design.

The overall impact of the Highway and Active Mode schemes on journey quality is anticipated to be **Moderate Beneficial**.

4.1.23 Collisions

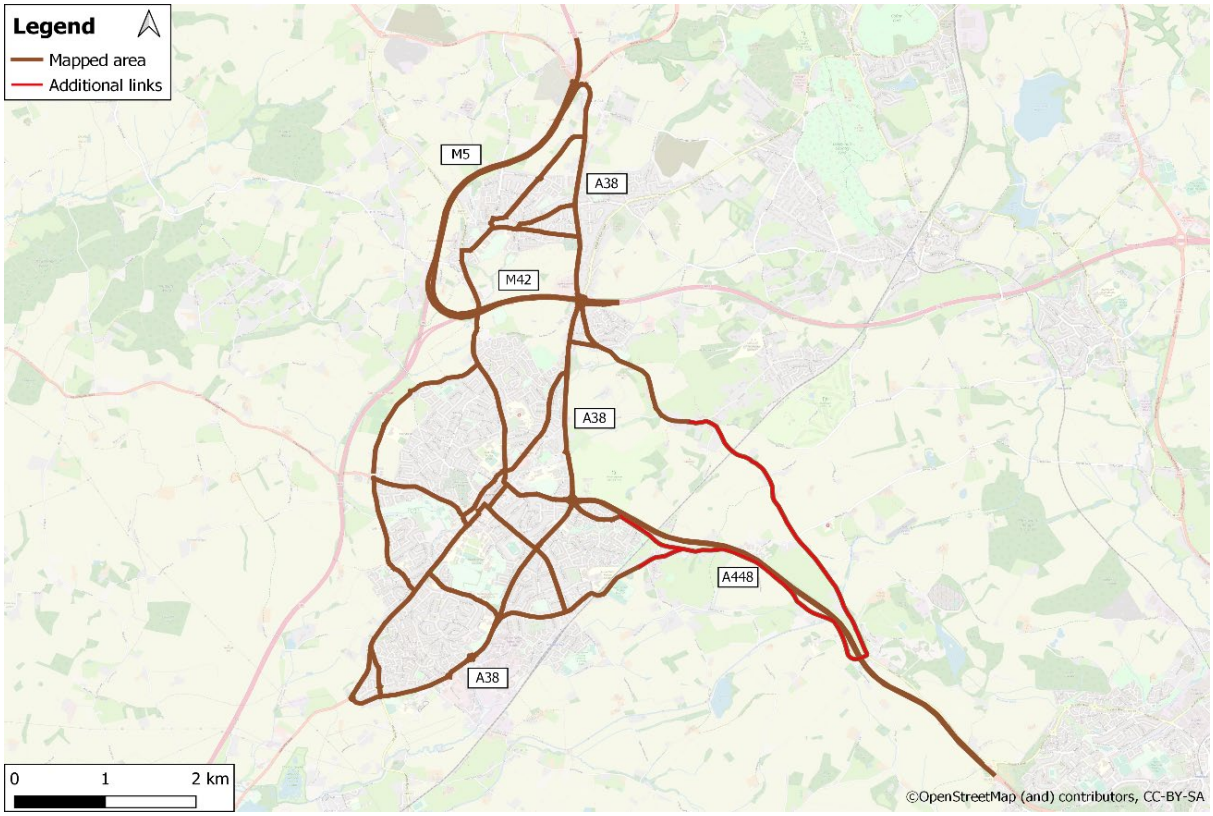
4.1.23.1 Methodology

The impact of accidents assessed using COBALT (COst and Benefit to Accidents – Light Touch) version 2.1. COBALT is the Department for Transport's (DfT) software for assessing the impact of a scheme on accidents.

Default COBALT parameters were used to estimate a monetary value for the prevention of these collisions. The modelled forecast years 2025 and 2040 were used and the results extrapolated to cover a full 60-year appraisal period.

The COBALT study area, shown in Figure 4.6 below, was defined by selecting links with a two-way Annual Average Daily Traffic (AADT) flow difference between DM and DS of more than 1,000 veh/day. Three additional links to the east of the mapped area were included in order to capture both the negative and positive re-routing.

Figure 4.6: COBALT mapped area



Observed collision data, covering the mapped area, were obtained from the DfT STATS19 database. The data provides information on location, date and severity of each collision. It was mapped onto the network to provide the number of accidents on each COBALT link, by year, for the five years from February 2015 to January 2020, inclusive. This assessment utilised pre COVID-19 pandemic safety data, as more recent data might not show accurate levels of collisions on the network due to the numerous lockdowns on the highway network's traffic levels.

Across the COBALT network a total of 215 accidents were observed between February 2015 and January 2020. Of the 215 accidents observed across the COBALT network, 2% (4 accidents) were fatal, 18% (39 accidents) were serious and 80% (172 accidents) were slight. Whilst 215 accidents were observed across the COBALT network, 79 were observed along A38 study area (this includes the junction approaches). Further information on the collisions along the A38 study area is provided in the Strategic Case (Chapter 2).

4.1.23.2 Assessment outcome

Table 4-18 sets out the results from the economic appraisal run in COBALT software. Detailed analysis and assumptions can be found in Appendix E.1 - Economic Impacts Report.

Table 4-18: COBALT results over a 60-year appraisal period

COBALT Economic Summary

Costs and benefits discounted to 2010 £'000s.

Total Without-Scheme Accident Costs (£'000s)	133,569.7
Total With-Scheme Accident Costs (£'000s)	128,070.9
Total Accident Benefits Saved by Scheme (£'000s)	5,498.8

Accident Summary

Total Without-Scheme Accidents	3,177.4
Total With-Scheme Accidents	3,020.2
Total Accidents Saved by Scheme	157.2

Casualty Summary

Total Without-Scheme Casualties	Fatal	30.2
	Serious	395.5
	Slight	3,903.9
Total With-Scheme Casualties	Fatal	29.4
	Serious	383.0
	Slight	3,712.1
Total Casualties Saved by Scheme	Fatal	0.7
	Serious	12.5
	Slight	191.8

Fatal, slight and serious accidents are all predicted to decrease. The proposed scheme provides a benefit of £5.5M PVB and a total accidents savings of 157.2 over 60 years. The accident impacts are considered to be **Moderate Beneficial**.

It should be noted though that, although implicit in the assessment using COBALT as it considers historic accident records and forecasts changes to rates with a scheme in place, it will not explicitly take into account that the scheme includes specific provision of improved facilities that will assist people in crossing the A38, and in particular the most vulnerable road users. This is recorded in assessments of severance, but also provide some mitigation to the distribution of accident impacts.

4.1.24 Security

4.1.24.1 Methodology

The security assessment has been undertaken in accordance with Chapter 4 of TAG Unit A4.1 guidance and assesses how the schemes will impact the level of security for transport users.

The TAG chapter sets out six indicators for security impacts:

- Site perimeters, entrances and exits - Schemes consists of highway, walking & cycling proposals to which this indicator is not relevant.
- Formal surveillance - Schemes consists of highway, walking & cycling proposals to which this indicator is not relevant.

- Informal surveillance - The proximity to human activity will not be changed.

- Landscaping - Landscaping elements will be considered as part of the scheme but will only be a very small consideration.

- Lighting and visibility - Lighting has been a consideration of the scheme and will be improved in some instances.

- Emergency call - Schemes consists of highway, walking & cycling proposals to which this indicator is not relevant.

Based on the above, 'Informal Surveillance', 'Landscaping' and 'Lighting and Visibility' are considered within the Security assessment for the A38 BREP. As 'Site perimeters. Entrances and exits', 'Formal surveillance', and 'Emergency call' are predominantly to do with public transport schemes they have not been considered further.

4.1.24.2 Assessment outcome

The designs for the Highways and Active Mode schemes have been designed to the relevant standards and guidance. It is expected that these will maintain the existing levels of Security at each of the scheme locations, potentially with some improvements in certain areas.

The overall impact of the Highway and Active Mode schemeson security is anticipated to be **Neutral**.

4.1.25 Access to services

4.1.25.1 Methodology

Within the Accessibility chapter of TAG Unit A4.1, it specifies the five key barriers impacting on accessibility in 'Making the Connections' (Social Exclusion Unit, 2003):

- **The availability and physical accessibility of transport** : For some people in isolated urban and rural areas there are limited or no public transport services or the services are unreliable, or do not go to the right places or at the right times;

- **Cost of transport** : Some people find the costs of personal or public transport very high or unaffordable;

- **Services and activities located in inaccessible places**: Developments including housing, hospitals, business and retail are often located in areas not easily accessible to people without a car;

- **Safety and security**: Some people will not use public transport or walk to key services because of the fear of crime or anti-social behaviour; and

- **Travel horizons**: Some people are unwilling to travel long journey times or distances or may not know about or trust transport services.

Building on this, accessibility may be presented as reflecting the range of opportunities and choices people have in connecting with jobs, services and friends and families. The level of access will depend on where people choose to live, where services are located, and the availability of 'home delivery' of goods or services. It is also about the availability and affordability of transport; providing journeys that are appropriate in terms of time and cost. Improving accessibility can be achieved through one or a combination of these elements.

The Highway schemes associated with this programme will not be investigated as 'Accessibility' focused on individuals without access to a car.

4.1.25.2 Assessment outcome

Based on the five key barriers set out in Accessibility chapter of TAG Unit A4.1, the Active Mode schemes are anticipated to have a slight beneficial impact upon availability and access to transport, as well as access to services and activities.

Regarding access to transport, Schemes 1, 3 and 6 are making connections to the railway station easier for those not using a private vehicle. This then allows access to cities such as Birmingham and Worcester. All of the schemes are also linking residential areas to the town centre and employment areas, which prior to their implementation have been more difficult to access.

As scheme 3 is a 'new' connection then this will provide an accessibility benefit to those residents living nearby.

With regards to safety and security, there will be a slight beneficial impact as the new schemes will not make the existing situation worse but provide an improvement.

As these Active Mode schemes do not involve public transport measures, the cost of transport and travel horizons has not been assessed.

The Active Mode schemes of the A38 BREP are expected to improve access across the A38 and provide links to facilities and services. Therefore, the overall impact of the Active Mode schemes on accessibility is anticipated to be **Slight Beneficial**.

4.1.26 Affordability

4.1.26.1 Methodology

One of the recommended approaches to measure relative affordability is to use the Index of Multiple Deprivation (IMD). The most recent measure of IMD across England was undertaken in 2015 and are based on LSOAs (Lower-layer Super Output Areas). These are small areas with a similar population size and approximately 1,500 residents or 650 households. The IMD itself is based on seven domains of deprivation as follows:

- Income Deprivation (22.5%);
- Employment Deprivation (22.5%);
- Education, Skills and Training Deprivation (13.5%);
- Health Deprivation and Disability (13.5%);
- Crime (9.3%);
- Barriers to Housing and Services (9.3%); and
- Living Environment Deprivation (9.3%).

Each LSOA is ranked – with 1 being the most deprived across England with the 32,844 being the least deprived. The LSOAs are divided into 10 equal groups with LSOAs in decile 1 fall within the most deprived 10% of LSOAs nationally and LSOAs in decile 10 fall within the least deprived 10% of LSOAs nationally.

4.1.26.2 Assessment outcome

This analysis demonstrates that there will be no change in costs to users with regards to the Highway schemes. Charges such as car fuel/ non-fuel costs, public transport fares, and walking and cycling fares not expected to change.

For the active mode schemes, those who have been attracted to travel by more sustainable methods rather than via private vehicle will see a reduction in their car fuel and non-fuels costs. Bus and Rail fares are not expected to be affected by the schemes.

The assessment against several factors indicates there will be beneficial affordability impacts from car fuel and non-fuel costs, and with regards to active travel modes. Existing public transport fares will not be affected by the schemes. As 2,000 additional daily walking and cycling trips (on an average weekday) are being positively affected in respect of personal affordability, the overall impact of the schemes on personal affordability is anticipated to be **Slight Beneficial**.

4.1.27 Severance

4.1.27.1 Methodology

Severance is defined as the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows.

Severance primarily concerns pedestrians, cyclists and horse riders. To ensure a consistent approach, classification should be based on pedestrians only. The impact of Severance on cyclists will differ for two reasons: they travel more quickly; and crossing facilities may not be available to them.

Severance is only considered to be an issue where either vehicle flows are significant enough to impede pedestrian movement or where infrastructure presents a physical barrier to movement. In this case, the infrastructure implemented as a part of the A38 BREP (specifically the Active Mode Schemes) will reduce severance along the A38 corridor.

4.1.27.2 Assessment outcome

Table 4-19 sets out the assessment of the Active Mode Schemes with regards to Severance. Whilst some of the schemes have been classed as 'neutral' as they are replacing an existing arrangement on site, there are new schemes which would relieve existing severance issues. With the combined number of additional walking and cycling trips (over 2,000 daily) provision of these elements scheme is expected to have a **Large Beneficial** impact on severance, relative to existing conditions

Highway Schemes have not been assessed for their impact on Severance as the impact is considered to be neutral. No additional physical barriers to movement will be provided and the increase in vehicle flows will be negligible, therefore there will not be an additional impediment to pedestrian movement. In the 2040 AM period modelled scenario, the flows along the A38 are anticipated to increase by up to 450 vehicles in the southbound direction. There are appreciable increases in flow of up to 500 vehicles along the A448 between the A38 and Redditch due to the scheme. These increases are due primarily to traffic re-routeing from alternative routes (B4096, B4184) that experience a reduction in flows and using the A448 to access the A38.

Table 4-19 – A38 BREP Severance Impacts and Mitigation (Active Mode schemes)

Scheme	Location	Description	Severance Impact	Notes
1	Northbound Strategic Cycle Link	Active Travel Corridor Link (Birmingham Road to Buntsford Business Park)	Slight Beneficial	As this infrastructure is new, it is reducing an existing Severance issue.
3	Harvington Road to Old Station Road	New connection from Harvington Road to Old Station Road	Moderate Beneficial	As this infrastructure is new, it is reducing an existing Severance issue.

Scheme	Location	Description	Severance Impact	Notes
5	Fordhouse Road to Carnforth Road	Upgrade bridge between Fordhouse Road to Carnforth Road to dual use	Neutral	As a bridge already exists at this location, no new Severance will be created.
6	Regents Park Road Connection to Oakalls Loop	Provision of a footway/cycleway connection between Scheme 4 and the existing cycle provision within the Oakalls Estate of Bromsgrove	Slight Beneficial	As this infrastructure is new, it is reducing an existing Severance issue.

Scheme 5 is expected to have a 'neutral' impact on severance as it is taking place where a similar scheme is in place already. Schemes 1 and 6 have been rated as 'slight beneficial' as no such crossing infrastructure exists at this location, but the intervention is minor. Scheme 3 has been rated as 'moderate beneficial' as the intervention involves provision of significant new pedestrian and cycle infrastructure which will benefit residents crossing the A38 corridor.

The A38 MRN Active Mode Impact Assessment also recognises that the A38 is a cause of Severance in Bromsgrove. Implementing these schemes will have a positive effect on Severance within the town to cross this route. In total, over 2,000 new pedestrian and cycle trips (on an average weekday) will benefit from reduced severance, in addition to all existing pedestrians and cyclists.

With regards to the Active Mode schemes, some of the schemes have been classed as 'neutral' as they are replacing an existing arrangement on site. However, there are new schemes which would relieve existing severance issues, thus being 'slightly' or 'moderate beneficial' in isolation. With the combined number of additional walking and cycling trips at over 2,000 daily, provision of these elements as part of a wider scheme is expected to have a **Large Beneficial** impact on severance, relative to existing conditions. The existing PRoW and NCN cycle networks will not be affected.

4.1.28 Option and non-use values

Option and Non-Use Values have not been assessed as a part of A38 BREP Social Impact Appraisal. Chapter 7 of TAG Unit 4.1 states that Option and Non-Use Values should be assessed if the scheme being appraised includes measures that will substantially change the availability of transport services within the study area.

As the schemes that form the A38 BREP will not substantially change the availability of transport services within the study area these values shall not be assessed.

4.1.29 Social impacts – Summary

Table 4-20 shows an overview of the outcomes of the social impact assessments. Further details are provided in Appendix E.10 (Social Impacts Assessment).

Table 4-20 – Social impacts summary

Indicator	Rating	Reasoning
Collisions	Moderate Beneficial Impact	• The proposed scheme provides a slight benefit of £5.5M and 157.2 accidents saved overall.
Physical Activity	Moderate Beneficial Impact	• Monetised AMAT Benefit of £28.3m (2010 Prices and Values) • Active Mode schemes are expected to generate an estimated 2,000 additional walking and cycling trips(on an average weekday); and • Moderate changes in journey time.
Security	Neutral	• The Highways and Active Mode schemes have been designed to the relevant standards and guidance. • Schemes expected to maintain the existing levels of Security potentially with some improvements in certain areas.
Severance	Large Beneficial Impact	• Some schemes are replacing existing schemes therefore there will be no change; • New schemes relieve existing Severance issues; • Schemes will be beneficial to existing and new walkers/ cyclists; and • An estimated additional 2,000 (on an average weekday) pedestrian and cycle trips.
Journey Quality	Moderate Beneficial Impact	• Improved smoothness of ride for travellers (particularly cyclists) and reduced overcrowding. • Reduced Traveller Stress via congestion and journey times being reduced by Highway schemes; and • Little/ no impact on Traveller Views.
Options and Non-Use Values	Not Assessed	• The schemes will not substantially change the availability of transport services within the study area these values shall not be assessed.
Accessibility	Slight Beneficial Impact	• Active Mode schemes are expected to improve access across the A38 and provide links to facilities and services.
Personal Affordability	Slight Beneficial Impact	• There will be beneficial affordability impacts from car fuel and non-fuel costs, and with regards to active travel modes. Existing public transport fares will not be affected by the schemes.

Distributional Impacts

The evidence base for distributional impacts associated with the A38 Bromsgrove Route Enhancement Programme has been accumulated through research originally part of the scheme development process. A proportionate approach has been followed throughout the process, based on consideration of a combination of the size of the scheme, scale of its impacts and the analysis required to achieve levels of detail. The ethos of proportionality of approach is enshrined in the overall approach of Transport Analysis Guidance (TAG).

Analyses have been prepared in accordance with TAG Unit A4.2: Distributional Impact Appraisal, which sets out a three-step approach, as follows:

- Step One – Screening: At this stage, the variety of impacts that the scheme might have has been considered and particular impacts are prioritised for further analysis. In the first instance this is to ensure that only the most relevant indicators for the scheme are appraised.

- Step Two – Assessment: Information is collected on the geographical area likely to be affected and how different social and business groups are distributed within that geographical area. This step provides a comprehensive picture of the scheme and its influence areas; and

- Step Three – Appraisal: The extent of the impact on social groups is identified, as far as practical and appropriate, taking a proportionate approach to the analysis carried out for each impact.

Full details of the distributional analysis are provided in Appendix E.11 (Distributional Impact Assessment).

4.1.30 Distributional Impacts – Screening

The first step in the assessment process involves undertaking an initial screening of the key impacts. These are specified in TAG Unit A4.2. This is in order to identify those impacts that could potentially be affected by the proposals and any that are unlikely to be affected. Key outcomes and conclusions of the initial screening are summarised in Table 4-21.

Table 4-21: Distributional Impact Assessment – Initial Screening

Impact Area	Initial Screening Outcome	Next Step
User Benefits	Impacts relating to user benefits have been formally modelled and assessed using TUBA. Benefits derived from TUBA can be assessed for distributional impact. Beneficial impact overall.	Progress to Step 2
Noise	Impacts have been modelled for receptors around the scheme, in a study are covering most of Bromsgrove and slightly beyond. Slight Adverse impact overall.	Progress to Step 2
Air Quality	Any change in alignment of transport corridor or any links with significant changes in vehicle flow, speed or %HDV content: Modelling carried out indicates a slight adverse impact overall, but with small changes it is not significant.	Progress to Step 2
Accidents	Any change in alignment or road layout that may have positive or negative safety impacts, or any links with significant changes in vehicle flow, speed, %HGV content or any significant change (>10%) in the number of pedestrians, cyclists or motorcyclists using network. Slight Beneficial impact overall.	Progress to Step 2
Security	Any change in public transport waiting/interchange facilities including pedestrian access expected to affect user perceptions of personal security.	Progress to Step 2

Impact Area	Initial Screening Outcome	Next Step
	Schemes have been designed to the relevant standards and guidance and are expected to maintain the existing levels of security potentially with some improvements in certain areas. Neutral impact overall.	
Severance	Active travel elements include improvements to footways and highway crossings, and as such are potentially relieving existing severance issues. Scheme is considered to be beneficial to existing and new walkers and cyclists. Slight Beneficial impact overall.	Progress to Step 2
Accessibility	The scheme is expected to have some limited impact upon accessibility as a result of active mode elements, which are expected to improve access across the A38. TAG Unit A4.2 notes that the assessment of accessibility in distributional impact should cover public transport accessibility. As such, impacts on walking and cycling accessibility are incorporated in the assessment of severance. No further assessment required.	AST distributional assessment: Neutral: No further analysis required
Affordability	The existing analysis available suggests that overall there will be little impact in terms of affordability, though is a potential very slight benefit from car operating costs; public transport fares unaffected. Conducting further analysis was considered to be disproportionate.	AST distributional assessment: Neutral: No further analysis required

4.1.31 Distributional Impacts – Appraisal

Following the screening exercise and assessments, the Proposed Scheme is anticipated to have the following distributional impacts:

- **User benefits**: the scheme will result in a **Slight Beneficial** overall distributional impact;
- **Noise**: the scheme will result in a **Slight Adverse** overall distributional impact;
- **Air Quality**: the scheme will result in a **Neutral** overall distributional impact;
- **Accidents**: the scheme will result in a **Neutral** overall distributional impact
- **Security**: the scheme will result in a **Neutral** overall distributional impact; and
- **Severance**: the scheme will result in **Neutral** to **Slight Adverse** overall distributional impact.

A matrix of distributional impact assessment is presented in Table 4-22 and 4-23 (note these differ from Table 4-21 which summarises the initial screening).

Table 4-22: Distributional Impact – appraisal matrix

	Distributional impact of income deprivation						
	1 (most deprived)	**2**	**3**	**4**	**5 (least deprived)**	**Are impacts distributed evenly?**	**Key impacts Qualitative statements**
User benefits	✓	✓✓	✓✓	✓✓✓	✓✓✓	✓	There is a high level of user benefit, though they are distributed relatively unevenly between income groups, with the least deprived areas having proportionally more benefit than population shares.
Noise day Noise night	× ×	× ✓	××× ×××	××× ××	××× ×××	×	Uneven impacts, but the actual impacts are small, and the area in the immediate vicinity of scheme which will see increases in noise does not contain any income deprived communities.
Air quality	×	×	×××	×	××	×	Impacts are small, with a net increase in emissions, but no impacts are considered significant. Impacts are uneven, but lower income groups are disproportionally less impacted than middle/higher income groups.

Table 4-23: Distributional Impact – appraisal matrix

AST entry	Social groups						User groups				
Impact	**Children & young**	**Older people**	**Carers**	**Women**	**Disabled**	**BME**	**Peds**	**Cyclists**	**Motor-cyclists**	**Young male drivers**	**Qualitative statement (including impact on residential population and amenities)**
Noise	×	××									Some adverse impacts near the scheme, but very limited, and no significant concentrations of children in areas affected; there is a slightly higher proportion of older people than county average.
Air Quality	-										Air quality impacts are very small, and not considered significant, mostly being negligible. There are no significant concentrations of children or young people in the areas affected.
Accidents	✓	✓					✓	✓	✓	✓	Slight overall decrease in accidents is spread across the network. Specific consideration of user groups is not-conclusive at this stage, but overall improvements in traffic flow expected to provide limited benefit across all road users.
Security	-	-		-		-					Existing levels of security are maintained, with some minor potential for improvements. No unusually high concentrations of children, older people, those with disabilities, or minority ethnic populations near the scheme. The overall distributional assessment on security is neutral.
Severance	✓	✓	✓		✓						Assessment of the scheme is a 'large beneficial impact', but this relates to new users opportunities; older people, those with disabilities and non-car access households have no unusually high concentrations within the vicinity of the scheme so it has a neutral overall distributional impact.

Note: Accessibility and affordability are not shown; distributional impacts not assessed

4.1.32 Level 1 Impacts

The overall level 1 impacts for the core scenario are summarised in the TEE, PA and AMCB – Presented in Table 4-24, Table 4-25 and Table 4-26 below. These summarise the impacts of the Highway Schemes and Active Mode Schemes.

Note, the AMAT benefits are displayed previously in Table 4-17. The AMAT impacts associated with mode shift (congestion, infrastructure maintenance, accident, local air quality, noise, greenhouse gases and indirect taxation) are not be included within the Economic Tables (Section 4.9) to avoid any potential double counting. Therefore, the total AMAT scheme benefits accounted for amount to **£27.6M PVB**.

Table 4-24: Transport Economic Efficiency Table (TEE) Values in £'000s

Non-business: Commuting	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	24,576		24,528	
Vehicle operating costs	-447		-447	
User charges	0		0	
During Construction & Maintenance	-790		-790	
NET NON-BUSINESS BENEFITS: COMMUTING	23,339	*(1a)*	23,291	
Non-business: Other	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	16,687		16584	
Vehicle operating costs	431		431	
User charges	0		0	
During Construction & Maintenance	-1,298		-1,298	
NET NON-BUSINESS BENEFITS: OTHER	15,820	*(1b)*	15,717	
Business				
User benefits			**Road Personal**	**Road Freight**
Travel time	15,105		5,328	9,777
Vehicle operating costs	1,147		711	436
User charges	0		0	0
During Construction & Maintenance	-902		-902	0
Subtotal	15,350	*(2)*	5,137	10,213
Private sector provider impacts				
			Road	Bus
Revenue	0		0	0
Operating costs	0		0	0
Investment costs	0		0	0
Grant/subsidy	0		0	0
Subtotal	0	*(3)*	0	0
Other business impacts				
			Road	Bus
Developer contributions	-3,223	*(4)*	-3223	0
NET BUSINESS IMPACT	12,127	*(5) = (2) + (3) + (4)*		

TOTAL			
Present Value of Transport Economic Efficiency Benefits (TEE)	51,286	*(6) = (1a) + (1b) + (5)*	
Notes: Benefits appear as positive numbers, while costs appear as negative numbers.			
All entries are discounted present values, in 2010 prices and values			

Table 4-25: Public Accounts Table (PA) – Values in £'000s

	ALL MODES		**ROAD**
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**
Revenue	0		0
Operating Costs*	3,366		3,366
Investment Costs	431		431
Developer and Other Contributions	-3,223		-3,223
Grant/Subsidy Payments	0		0
NET IMPACT	574	*(7)*	574
Central Government Funding: Transport			
Revenue	0		0
Operating costs	0		0
Investment Costs	28,095		28,095
Developer and Other Contributions	0		0
Grant/Subsidy Payments	0		0
NET IMPACT	28,095	*(8)*	28,095
Central Government Funding: Non-Transport			
Indirect Tax Revenues	-357	*(9)*	-357
TOTALS			
Broad Transport Budget	28,669	*(10) = (7) + (8)*	
Wider Public Finances	-357	*(11) = (9)*	
Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.			
All entries are discounted present values in 2010 prices and values.			

* *Includes whole life scheme costs of 3.19 million as discussed in section 4.1.5*

Table 4-26: Analysis of Monetised Costs and Benefits (AMCB) – Values in £'000s

Noise	-3,755	*(12)*
Local Air Quality	-784	*(13)*
Greenhouse Gases	-2,921	*(14)*
Journey Quality	2,962	*(15)*
Physical Activity	24,638	*(16)*
Accidents	5,487	*(17)*
Economic Efficiency: Consumer Users (Commuting)	23,339	*(1a)*
Economic Efficiency: Consumer Users (Other)	15,820	*(1b)*
Economic Efficiency: Business Users and Providers	12,127	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	357	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	77,270	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,669	*(10)*
Present Value of Costs (see notes) (PVC)	28,669	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	48,601	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.695	BCR=PVB/PVC
Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.		

** A portion of costs on early FBC development on detail design amounting to £1.3 million was spent in 2020/21. This cost has been treated as sunk cost and therefore not included in the above results. If this cost was considered as part of the economic analysis, the PVC would amount to £29.7million resulting in a BCR of 2.6*

4.1.33 Level 2 Impacts

The breakdown of the benefits by impact category can be seen in Table 4-27 below.

Table 4-27: Wider economic impacts summary

Wider Impact Type	Benefits £ 000's (2010 prices and values)
Imperfect competition impacts	£1,213
Agglomeration impacts	£11,907
Labour supply impacts	£1,069
Total	£14,189

The adjusted BCR, as a result of the wider economic impacts, is presented in Table 4-28.

Table 4-28: Wider economic impacts– adjusted BCR

Scenario	Core Scenario £000's
Present Value of Benefits (PVB)	77,270
Wider Benefits	14,189
Adjusted PVB	91,459
Present Value of Costs (PVC)	28,669
Adjusted Net Present Value (NPV)	62,790
Adjusted Benefit to Cost Ratio (BCR)	3.19
VfM Category	**High**

Sensitivity and risk profile

4.1.34 High and Low Growth Sensitivity

The core scenario presented within this business case is based upon central assumptions of forecast economic conditions. TAG Unit A1.3 requires sensitivity analysis to be undertaken to provide confidence that the proposed schemes will still result in suitable value for money under various alternative assumptions. In the case of this scheme, it was considered appropriate and proportionate to undertake sensitivity analysis under high and low forecast demand growth scenarios.

High and low traffic growth model scenarios were developed. For each modelled scenario, local development is allocated first – then the overall demand is adjusted as per the national growth assumptions. The assumptions are set out in Table 4-29. The calculations are as required by TAG Unit M4.

Table 4-29: Growth assumptions

Growth Type	Low	Core	High
Local Developments	All Near Certain and More than Likely	All Near Certain and More than Likely	All Near Certain, More than Likely, and Reasonably Foreseeable
National Growth Assumptions	As Core – but with total demand reduced by 6.1% in 2025 and 11.5% of the base in 2040.	Constrained to TEMPro central growth	As Core – but with total demand increased by 6.1% in 2025 and 11.5% of the base in 2040.

The high and low traffic growth outcomes fed into further TUBA, COBALT, Noise, Air Quality and Greenhouse Gasses assessments (using similar methodologies as outlined in previous sections).

High and low growth AMAT scenarios have also been developed. For the low growth scenario, no seasonality adjustments were applied. For the high growth scenario, the following assumptions were followed:

- Includes pedestrians and cyclists using Scheme 2a (Charford Road to Harvington Road link).
- Scheme 2a has been constructed as an early delivery scheme and in order to be robust and to avoid double counting of benefits, baseline pedestrian and cycle flows for this link have been excluded from the core scenario. However, for the high growth scenario, baseline Scheme 2a pedestrian and cyclists have been included, as users of this recently delivered scheme will also benefit from the additional new BREP provision. The number of baseline users of Scheme 2a is relatively low when considered as part of the overall scheme (6 cyclists and 114 pedestrians) and therefore the impact of their inclusion is found to be minor.
- Background growth assumed to occur for 40 years (AMAT default is 20 years).

- All other assumptions remain the same as previous chapters.

As per the core assessment, for the high and low growth assessments the AMAT impacts associated with mode shift (congestion, infrastructure maintenance, accident, local air quality, noise, greenhouse gases and indirect taxation) are not be included within the Economic Tables to avoid any potential double counting. Table 4-30 presents a comparison of the benefits of the core scenario with the high and low growth scenarios for the combined Highways and Active Mode Schemes. A full breakdown of the analysis is then provided in subsequently.

Table 4-30: Sensitivity comparison (£000's)

Scenario	Core Scenario	Low Growth Scenario	High Growth Scenario
Present Value of Benefits (PVB)	77,270	56,736	87,478
Present Value of Costs (PVC)	28,669	28,669	28,669
Net Present Value (NPV)	48,601	28,067	58,809
Benefit to Cost Ratio (BCR)	2.70	1.98	3.05
VfM Category	High	Medium	High
With Adjusted Benefits (Level 2)			
Level 2 Wider Impacts	14,189	9,604	16,608
Adjusted PVB	91,459	66,340	104,086
Adjusted BCR	3.19	2.31	3.63
VfM Category	High	High	High

4.1.34.1 Sensitivity Analysis (Low Growth)

The overall level 1 impacts in a low growth scenario are summarised below in the TEE, PA and AMCB. Presented in Table 4-31, Table 4-32 and Table 4-33 below.

Table 4-31: Low Growth- Transport Economic Efficiency Table (TEE)

Non-business: Commuting	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	17,288		17,240	
Vehicle operating costs	-472		-472	
User charges	0		0	
During Construction & Maintenance	-790		-790	
NET NON-BUSINESS BENEFITS: COMMUTING	16,026	*(1a)*	15,978	
Non-business: Other	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	9,758		9655	
Vehicle operating costs	301		301	
User charges	0		0	
During Construction & Maintenance	-1,298		-1,298	
NET NON-BUSINESS BENEFITS: OTHER	8,761	*(1b)*	8,658	
Business				
User benefits			**Road Personal**	**Road Freight**
Travel time	7,484		4,015	3,469
Vehicle operating costs	446		178	268
User charges	0		0	0
During Construction & Maintenance	-902		-902	0
Subtotal	7,028	*(2)*	3,291	3,737
Private sector provider impacts				
			Road	Bus
Revenue	0		0	0
Operating costs	0		0	0
Investment costs	0		0	0
Grant/subsidy	0		0	0
Subtotal	0	*(3)*	0	0
Other business impacts				
			Road	Bus
Developer contributions	-3,223	*(4)*	-3223	0
NET BUSINESS IMPACT	3,805	*(5) = (2) + (3) + (4)*		
TOTAL				
Present Value of Transport Economic Efficiency Benefits (TEE)	28,592	*(6) = (1a) + (1b) + (5)*		
Notes: Benefits appear as positive numbers, while costs appear as negative numbers.				
All entries are discounted present values, in 2010 prices and values				

Table 4-32: Low Growth- Public Accounts Table (PA)

	ALL MODES		ROAD
Local Government Funding	**TOTAL**		**INFRASTRUCTURE**
Revenue	0		0
Operating Costs	3,366		3,366
Investment Costs	431		431
Developer and Other Contributions	-3,223		-3,223
Grant/Subsidy Payments	0		0
NET IMPACT	574	*(7)*	574
Central Government Funding: Transport			
Revenue	0		0
Operating costs	0		0
Investment Costs	28,095		28,095
Developer and Other Contributions	0		0
Grant/Subsidy Payments	0		0
NET IMPACT	28,095	*(8)*	28,095
Central Government Funding: Non-Transport			
Indirect Tax Revenues	-508	*(9)*	-508
TOTALS			
Broad Transport Budget	28,669	*(10) = (7) + (8)*	
Wider Public Finances	-508	*(11) = (9)*	
Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.			
All entries are discounted present values in 2010 prices and values.			

Table 4-33: Low Growth- Analysis of Monetised Costs and Benefits (AMCB)

Noise	-1,446	*(12)*
Local Air Quality	-586	*(13)*
Greenhouse Gases	-2,151	*(14)*
Journey Quality	2,528	*(15)*
Physical Activity	23,433	*(16)*
Accidents	5,858	*(17)*
Economic Efficiency: Consumer Users (Commuting)	16,026	*(1a)*
Economic Efficiency: Consumer Users (Other)	8,761	*(1b)*
Economic Efficiency: Business Users and Providers	3,805	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	508	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	56,736	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,669	*(10)*
Present Value of Costs (see notes) (PVC)	28,669	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	28,067	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.979	BCR=PVB/PVC

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

4.1.34.2 Sensitivity Analysis (High Growth)

The overall level 1 impacts in a high growth scenario are summarised below in the TEE, PA and AMCB Presented in Table 4-34, Table 4-35 and Table 4-36 below.

Table 4-34: High Growth - Transport Economic Efficiency Table (TEE)

Non-business: Commuting	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	27,473		27,425	
Vehicle operating costs	-1,042		-1,042	
User charges	0		0	
During Construction & Maintenance	-790		-790	
NET NON-BUSINESS BENEFITS: COMMUTING	25,641	*(1a)*	25,593	
Non-business: Other	**ALL MODES**		**ROAD**	
User benefits	**TOTAL**		**Private Cars and LGVs**	
Travel time	22,296		22193	
Vehicle operating costs	-461		-461	
User charges	0		0	
During Construction & Maintenance	-1,298		-1,298	
NET NON-BUSINESS BENEFITS: OTHER	20,537	*(1b)*	20,434	
Business				
User benefits			**Road Personal**	**Road Freight**
Travel time	19,003		7,317	11,686
Vehicle operating costs	1,580		796	784
User charges	0		0	0
During Construction & Maintenance	-902		-902	0
Subtotal	19,681	*(2)*	7,211	12,470
Private sector provider impacts				
			Road	Bus
Revenue	0		0	0
Operating costs	0		0	0
Investment costs	0		0	0
Grant/subsidy	0		0	0
Subtotal	0	*(3)*	0	0
Other business impacts				
			Road	Bus
Developer contributions	-3,223	*(4)*	-3223	0
NET BUSINESS IMPACT	16,458	*(5) = (2) + (3) + (4)*		
TOTAL				
Present Value of Transport Economic Efficiency Benefits (TEE)	62,636	*(6) = (1a) + (1b) + (5)*		
Notes: Benefits appear as positive numbers, while costs appear as negative numbers.				
All entries are discounted present values, in 2010 prices and values				

Table 4-35: High Growth - Public Accounts Table (PA)

	ALL MODES		**ROAD**

Local Government Funding	**TOTAL**		**INFRASTRUCTURE**
Revenue	0		0
Operating Costs	3,366		3,366
Investment Costs	431		431
Developer and Other Contributions	-3,223		-3,223
Grant/Subsidy Payments	0		0
NET IMPACT	574	*(7)*	574
Central Government Funding: Transport			
Revenue	0		0
Operating costs	0		0
Investment Costs	28,095		28,095
Developer and Other Contributions	0		0
Grant/Subsidy Payments	0		0
NET IMPACT	28,095	*(8)*	28,095
Central Government Funding: Non-Transport			
Indirect Tax Revenues	-718	*(9)*	-718
TOTALS			
Broad Transport Budget	28,669	*(10) = (7) + (8)*	
Wider Public Finances	-718	*(11) = (9)*	
Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.			
All entries are discounted present values in 2010 prices and values.			

Table 4-36: High Growth - Analysis of Monetised Costs and Benefits (AMCB)

Noise	-4,065	*(12)*
Local Air Quality	-999	*(13)*
Greenhouse Gases	-3,487	*(14)*
Journey Quality	2,849	*(15)*
Physical Activity	25,438	*(16)*
Accidents	4,389	*(17)*
Economic Efficiency: Consumer Users (Commuting)	25,641	*(1a)*
Economic Efficiency: Consumer Users (Other)	20,537	*(1b)*
Economic Efficiency: Business Users and Providers	16,458	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	718	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	87,478	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,669	*(10)*
Present Value of Costs (see notes) (PVC)	28,669	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	58,809	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	3.051	BCR=PVB/PVC

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

4.1.35 Updated Carbon Values Sensitivity

The guidance published by DfT in October 2021 titled " *Forthcoming change: interim carbon values for scheme appraisal*" sets out updated evidence on the valuation of greenhouse gas emissions for transport interventions using the latest carbon values for appraisal, published by BEIS in September 2021.

New versions of the TAG data book, greenhouse gases workbook, and Active mode appraisal toolkit have been made available to support the use of the new values. An updated version of TUBA will be made available as soon as possible. All relevant workbook and guidance updates will become definitive in November 2021. As such, a sensitivity test utilising the updated carbon value has been undertaken, with the updated AMCB shown in Table 4-37 below.

An estimated increase in emissions (over a 60 year appraisal period) of 81,972 tonnes of CO_2 is anticipated. **The total value of the change is estimated to be -£2,912,478 based on the July 2021 TAG Workbook and -£4,945,807.73 based on the October 2021 TAG Workbook.**

Table 4-37: Updated Carbon Values - Analysis of Monetised Costs and Benefits (AMCB)

Noise	-3,755	*(12)*
Local Air Quality	-784	*(13)*
Greenhouse Gases	-4,954	*(14)*
Journey Quality	2,962	*(15)*
Physical Activity	24,638	*(16)*
Accidents	5,487	*(17)*
Economic Efficiency: Consumer Users (Commuting)	23,339	*(1a)*
Economic Efficiency: Consumer Users (Other)	15,820	*(1b)*
Economic Efficiency: Business Users and Providers	12,127	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	357	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	75,237	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	28,669	*(10)*
Present Value of Costs (see notes) (PVC)	28,669	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	46,568	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	2.624	BCR=PVB/PVC
Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.		

4.1.36 Risk Profile

An assessment has been undertaken in order to determine the sensitivity of the benefit cost ratio with respect to change in cost. This assessment considers key levels of Benefit Cost Ratio against the risk profile set out in the Quantitative Risk Assessment (detailed in the Financial Case, Appendix F.4). Table 4-38 details the risk profile used for this comparison. Prices are converted to 2010 values for consistency with the rest of the economic case.

Table 4-38: Risk Profile - in 2021 and 2010 prices

Percentile	Risk £M (2021)	Risk £M (2010)

Mean	£6.93	£3.41
50%	£5.88	£2.89
75%	£9.28	£4.57
80%	£10.21	£5.02
90%	£13.64	£6.71
95%	£17.84	£8.78
97.5%	£19.84	£9.76
99%	£22.02	£10.83

A scenario test has been undertaken to demonstrate the impact to the BCR with 80th and 90th percentile costs as well as determining the level of cost change which would be required to move to the next lowest value for money band. As can be seen by the results in Table 4-39, for example, the cost would need to be above the 99th percentile in order for the core scenario BCR to reduce below 2.0. The 80th and 90th percentile risk costs make marginal impacts to the BCR.

Table 4-39: Risk Profile Scenario Test Outcome

PVB (2010 £M) - Core Scenario	**£77.3**	**Scenario Tests**				
BCR Scenario	2.70	2.51	2.38	**2.0**	**1.5**	**1.0**
PVC (2010 £M)	£28.7	£30.8	£32.5	£38.6	£51.5	£77.3
Scenario NPV (2010 £M)	£48.6	£46.5	£44.8	£38.6	£25.8	£0.0
Risk Overspend (2010 £M)	£3.4	£5.5	£7.2	£13.4	£26.3	£52.0
Risk Likelihood Percentile	Mean	**80%**	**90%**	>99%	>99%	>99%
PVB- Low Growth Scenario	**£56.7**	**Scenario Tests**				
BCR	1.98	1.84	1.75		**1.5**	**1.0**
PVC (2010 £M)	£28.7	£30.8	£32.5		£37.8	£56.7
Scenario NPV (2010 £M)	£28.1	£25.9	£24.3		£18.9	£0.0
Risk Overspend (2010 £M)	£3.4	£5.5	£7.2		£12.6	£31.5
Risk Cost Percentile	Mean	**80%**	**90%**		>99%	>99%
PVB- High Growth Scenario	**£87.5**	**Scenario Tests**				
BCR	3.05	2.84	2.69	**2.0**	**1.5**	**1.0**
PVC (2010 £M)	£28.7	£30.8	£32.5	£43.7	£58.3	£87.5
Scenario NPV (2010 £M)	£58.8	£56.7	£55.0	£43.7	£29.2	£0.0
Risk Overspend (2010 £M)	£3.4	£5.5	£7.2	£18.5	£33.1	£62.2
Risk Cost Percentile	Mean	**80%**	**90%**	>99%	>99%	>99%

The outcome of this analysis has been summarised as per the requirements of the DfT Value for Money Framework, on a scale as shown in Figure 4.7. The outcome, summarised in Table 4-40, indicates that a **High** value for money is very likely, and there is only just a possible likelihood that the BCR may drop below 2 into the Medium value for money category. However, the value for money is largely stable.

Figure 4.7: Likelihood Scale for VfM Categories (Box 6.1 of VfM Framework)

Table 4-40: Summary of Confidence in the VfM Category

VfM Category	Low	Medium	High	Very High
Likelihood	Very Unlikely	Possible	Very Likely	Unlikely
Justification	This would require low traffic growth, and a cost overspend greater than the 99th percentile.	In the core demand scenario, the risk profile would need to be greater than the 99th Percentile. However, the low growth scenario could result in a BCR <2	It is very likely that there will be a high value for money in the core scenario and in the high growth scenario.	None of the scenarios indicates a very high value for money category.

Non-Welfare Impacts

Whilst no specific development is dependent on the scheme, S106 contributions have been requested from key developers due to the potential for these developments to put pressure on the existing network. As a result of this link, it is possible to infer some impacts to Gross Value Added (GVA).

The analysis demonstrates that at the larger proposed sites, 5,310 homes, 1,130 gross FTE jobs could lead to an increase in gross GVA per annum which the A38 BREP will support.

A total uplift in GVA is estimated at £58.4M in 2019 prices.

It is acknowledged that there is no formal dependency demonstrated between the sites and the proposed A38 BREP in transport modelling terms. Further, the various sites have planning permission prior to delivery of the scheme. As a result, these outputs and outcomes are not included in any BCR calculation. However, given the Section 106 contribution the various developments are required to make to support scheme delivery, it is important to recognise that the scheme has a facilitatory role in realising development. Hence, the analysis above is prepared for indicative purposes, rather than to inform any formal value for money metric.

Value for Money statement

Economic appraisal involves the determination of costs and benefits of a scheme using travel demand, traffic flows, journey times and other inputs from a traffic model. By comparing the costs with the benefits of a scheme over a 60-year assessment period, a Benefit Cost Ratio (BCR) has been calculated, which represents the value for money of the scheme. In line with HM Treasury's appraisal requirements, non-monetised impacts of the scheme have also been considered as part of the Value for Money assessment.

Table 4-41: Summary of Elements Included in Assessment

Impacts	Assessment Methodology	Initial BCR	Adjusted BCR
TEE - Travel Times, VOC, and bus facility improvements	TUBA assessment and bus facility improvement assessment	✓	✓
TEE - Travel Times and VOC (during construction and maintenance activities)	QUADRO assessment	✓	✓
Journey Time Reliability	Reliability assessment (section 6.3 of TAG unit A1.3)	Included in AST only	Included in AST only
Wider Impacts	Level 2 and 3 benefits	-	✓
Noise	Noise TAG modelling	✓	✓
Air Quality	Local AQ TAG modelling	✓	✓
Greenhouse Gases	Greenhouse Gases TAG spreadsheet	✓	✓
Accidents	COBALT assessment	✓	✓
Physical Activity	Active Modes Toolkit	✓	✓
Scheme costs	Scheme costs developed for OBC stage These will be converted for use in the economic appraisal using a GDP deflator and converted to market prices where required. Optimism bias and risk adjustments have been applied, and operational and maintenance costs added.	✓	✓
Operation and Maintenance costs	Based on costs developed for OBC stage	✓	✓

4.1.37 Value for money category

Analysis has been undertaken on this study to identify suitable solutions to the problems on the A38. The final solution included a set of highway and active travel improvements.

Potential risks may be associated with the delivery of scheme. Higher proportion of risk may arise from delay in award and funding as well as procurement delays.

The assessment work presented in the economic case shows that there is a case for the A38 scheme. The PVB equals to £77.3M and when compared against a PVC of £28.7M, the scheme demonstrates an initial BCR of 2.70 demonstrating the scheme provides a 'High Value for Money'.

4.1.38 Key impacts on the public finances

The broad transport budget excluding maintenance is £25.48M (2010 present value), based upon an assumed 2021 cost of £52.76M (Including Inflation and Optimism Bias) or £48.5M (including Inflation and Risk). An additional local contribution will be required for maintenance, to a value of £3.19M in (2010 present value) resulting in the broad transport budget to be £28.67M.

The scheme improvements will reduce congestion and journey times on the junctions along A38 through Bromsgrove area. The main benefits result from a reduced journey time for commuters and other users, resulting

in journey time benefits of £ 41.3M. Similarly, business user classes and transport providers time savings benefits are £15.1M. The greatest proportion of journey time savings across all purposes are in the magnitude of 5 minutes or less per trip.

The economic assessment demonstrates how the scheme will meet the objectives defined in the strategic case, as set out below:

- Support the delivery of housing and employment growth – The modelling work shows that with the scheme in place, the congestion issues associated with future growth are reduced;
- Reduce congestion and transport costs – The scheme provides journey time and cost benefits, resulting in a highway only PVB of £54.1M;
- Maximise the efficiency of the road network – The scheme proposed makes good use of the existing infrastructure and the scheme components are targeted at most significant issues on the corridor;
- Increased journey time reliability – The reduction in congestion will improve journey time reliability;
- Improve conditions for pedestrians and cyclists - The scheme provides five components improving conditions for pedestrians and cyclists. The schemes result in total AMAT benefits of £28.3M (of which £24.6M are associated with physical activity).

4.1.39 Drivers for value for money category

The key driver for this value for money category is the relatively high transport user benefits experienced through a significant reduction in congestion, significant benefits for pedestrians and cyclists, as well as wider impacts.

4.1.40 Confidence in value for money

The sensitivity testing demonstrated in Section 0 of this document indicates high confidence in the monetised aspects of the value for money. In summary:

- The PVB from the level 1 travel time, vehicle operating costs and associated indirect tax revenue impacts were notable, with the potential to reduce the PVB by approximately £25M in a low growth scenario.
- The PVB from the active mode assessment indicated that the core scenario was very close, within £2M of the high and low impact scenarios.
- Changes in the value for money category linked to increased scheme costs are very low. Even with 90th Percentile costs, the value for money category remains the same.

The confidence in the scheme value for money is summarised in Table 4-43 below.

Table 4-42: Summary of Confidence in the VfM Category

VfM Category	Low	Medium	High	Very High
Likelihood	Very Unlikely	Possible	Very Likely	Unlikely

Part 2 (Schemes 2a, 2b and 4) Economic Impacts

As set out previously and below, the A38 BREP Package is being delivered in three parts:

- Part 1 (funded by WLEP, GBSLEP and National Highways' Growth and Housing Fund (GHF)), provided for capacity upgrades at M5 Junction 4, M42 Junction 1 and the Barley Mow Lane junction with the A38. The works are included in the Do Minimum scenario for A38 BREP, as these have now been completed on site.

- Part 2 comprises of the early delivery elements of the A38 BREP Package presented at SOBC stage and submitted in November 2020. The early delivery schemes have been delivered using WLEP local contribution funding, and are referred to as Schemes 2a, 2b and 4:
    - Scheme 2a was identified in the SOBC as Scheme 2 and provides an active mode corridor between Harvington Road and Charford Road, the new scheme 2a also includes the connecting bridge to Charford Road that in the SOBC was included in Scheme C. Leading to an enhanced scheme 2a at an earlier stage.
    - Scheme 2b is a shared active mode corridor along the northern side of Charford Road, to connect scheme 2a to South Bromsgrove High School. This scheme was added further to public engagement in early 2020, and after the SOBC submission.
    - Scheme 4 is a new toucan crossing as outlined in the SOBC, over the A448 Stratford Road and localised path improvements to facilitate walking and cycling.

  Schemes have been developed as part of the overall strategic active modes upgrade as part of the A38 BREP Package. A copy of the approved WLEP FBC is appended to the Strategic Case (Appendix S.6).

- Part 3 includes a number of active modes, local public transport and highways improvement schemes. These were originally included in the SOBC submission to DfT in 2019, alongside the initial OAR document. The overall Level 1 impacts for the Part 3 schemes (core scenario of this OBC, with Part 1 and 2 included in the Do Minimum Scenario) are summarised in the TEE, PA and AMCB – presented in Table 4-24, Table 4-25 and Table 4-26 previously.

It is considered that the Part 2 early delivery schemes are reflected in the Do Minimum scenario of this OBC, and their impacts are therefore not assessed as part of the modelling and economic assessment work - which is considered to be aligned with the TAG requirements. However, for completeness this section provides:

- The PVB, PVC and BCR for the Part 2 early delivery schemes (based on the May 2020 AMAT) as provided in the approved WLEP FBC;

- The PVB, PVC and BCR for the Part 2 early delivery schemes (based on the July 2021 AMAT and 15% Optimism Bias); and

- The PVB, PVC and BCR for the Part 2 early delivery schemes (based on the July 2021 AMAT and 23% Optimism Bias for consistency with the approach in this OBC).

4.1.41 Part 2 Schemes Economic Impacts

4.1.41.1 PVB

The FBC for the early delivery schemes (Schemes 2a, 2b and 4) established the PVB, PVC and BCR utilising DfT's AMAT (May 2020). The outcomes from this toolkit, as set out in the FBC, are summarised in Table 4-43.

Table 4-43: Early Delivery Schemes (AMAT May 2020 version)

Impact Drivers	Estimates (present value in 2010 prices, in £'000s)
Congestion benefit	141.04
Infrastructure maintenance	0.77
Accident	23.28

Local Air Quality	3.23
Noise	1.54
Greenhouse Gases	5.38
Reduced risk of premature death	4196.19
Absenteeism	536.22
Journey Ambience	143.03
Indirect Taxation	-10.05
Present Value of Benefits (PVB)	**5039.86**

As presented in Table 4-43 the early delivery schemes present as PVB of £5.04 M (AMAT May 2020).

Since the submission of the FBC for the early delivery schemes, a DfT have published a new version of the AMAT (July 2021) . For completeness, the early delivery schemes have been input to the July 2021 toolkit and the outcomes are presented in Table 4-44 .

Table 4-44: Early Delivery Schemes AMAT July 2021 version)

Impact Drivers	**Estimates (present value in 2010 prices, in £'000s)**
Congestion benefit	164.07
Infrastructure maintenance	0.76
Accident	23.89
Local Air Quality	2.98
Noise	1.59
Greenhouse Gases	6.16
Reduced risk of premature death	4607.34
Absenteeism	706.33
Journey Ambience	156.4
Indirect Taxation	-10.96
Present Value of Benefits (PVB)	**5657.79**

As presented in Table 4-44 the early delivery schemes increase to a PVB of £5.66 M (AMAT July 2021) under the latest guidance.

4.1.41.2 PVC

Estimation of early delivery scheme's PVC was also based on DfT's AMAT (May 2020), and included the following assumptions:

- Scheme capital costs, including risk allowance, in Q1 2020 prices;
- Estimated maintenance costs in Q1 2020 prices over the appraisal period;
- Optimism Bias at 15%, given the stage of scheme design;
- Discount rates over the appraisal period;
- GDP deflators for adjusting the costs; and
- Market price adjustment factor.

The combined PVC of the early delivery schemes, based on the May 2020 AMAT, was estimated at £1.91M (in 2010 prices and values). Consistent with economic appraisal guidance, sunk costs are excluded from estimation of this PVC.

Due to the update of the AMAT, the scheme costs have also been recalculated in the July 2021 version using the same assumptions. The combined PVC of the early delivery schemes, based on the July 2021 AMAT, was estimated at £1.85M (in 2010 prices and values).

Further analysis has been undertaken on the Optimism Bias. When the FBC was submitted, Optimism Bias at 15% was considered to be appropriate based on the stage of scheme design and the latest TAG Unit A1.2 guidance (July 2017) at the stage of submission. TAG Unit A1.2 guidance has been updated in July 2021 following

submission, which suggests Optimism Bias at 23% may be more appropriate. Therefore, combined PVC of the early delivery schemes, based on the July 2021 AMAT and applying Optimism Bias at a level of 23%, was estimated at £1.98M (in 2010 prices and values).

4.1.41.3 BCR

Table 4-45 presents a summary of various PVBs, PVCs and BCRs for the early delivery schemes (Schemes 2a, 2b and 4) based on the tests set out above.

Table 4-45: Early Delivery Schemes PVB, PVC and BCR

	DfT AMAT May 2020 (Optimism Bias 15%)	DfT AMAT July 2021 (Optimism Bias 15%)	DfT AMAT July 2021 (Optimism Bias 23%)
PVB (£m)	5.04	5.66	5.66
PVC (£m)	1.91	1.85	1.98
BCR	**2.6**	**3.1**	**2.9**

The PVB, PVC and BCR based on the DfT's AMAT (July 2021) with an applied Optimism Bias of 23% have been used to present a combined Part 2 and Part 3 economic table subsequently.

4.1.42 Part 2 + Part 3 Schemes Economic Impacts

Table 4-46 presents a summary of the Part 3 Schemes plus the early delivery schemes and presents a combined BCR of 2.6.

Table 4-46: A38 BREP Part 3 + Early Delivery Schemes PVB, PVC and BCR

	Part 3 Schemes (this OBC)	Part 2 Schemes (Early delivery schemes)	Part 2 and Part 3 Combined
PVB (£m)	77.27	5.66	82.93
PVC (£m)	28.67	1.98	30.65
BCR	**2.7**	**2.9**	**2.7**

4.1.43 Part 2 + Part 3 Value for Money

It can be seen that independently Part 2 and Part 3 schemes offer high value for money based upon the monetised benefits alone because they both have a BCR between 2 and 3. The same is also true for the combined assessment of the combined schemes which have a BCR of 2.7.

Summary

Overall, the A38 BREP is anticipated to have a beneficial impact on transport users and the surrounding area through meeting the scheme objectives. The scheme will:

- Reduce congestion and transport costs;
- Maximise the efficiency of the road network;
- Increased journey time reliability;
- Support the delivery of housing and employment growth as outlined in the Bromsgrove District Plan and the Redditch Local Plan; and
- Improve connectivity for pedestrians and cyclists on and across the A38 corridor, including to the rail station.

The expected scheme outputs, as detailed in the Logic Map set out in the Management Case (Chapter 7), are summarised in Table 4-47 alongside the quantified outcomes.

Table 4-47 – Assessment summary of scheme outputs (as per the Logic Map in Chapter 7)

Highways Schemes

Outcome (short-term)	Outcome (medium / long-term)	Assessment Methodology	Assessment Summary
Decreased congestion on junctions along A38 through Bromsgrove area	Carbon savings Reduction in local greenhouse gas emissions	Quantitative Assessment Emissions of carbon dioxide have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios using the TAG Databook approach (July 2021 v1.15).	-£2,912,478 (GHG over a 60 year appraisal period) Whilst the proposed scheme is expected to relieve congestion in some locations, and therefore reduce GHG emissions in these areas, the proposed scheme is anticipated to result in an increase in vehicle kilometres travelled on the network and therefore a resultant increase in Greenhouse Gas emissions. In the Scheme Opening Year the GHG emissions are anticipated to rise by 0.4%, which is therefore considered to be negligible. The 0.4% increase in GHG emission (Opening Year) is compared to an increase of 0.9% in vehicle kilometres travelled, demonstrating that the scheme represents a betterment to GHG emission per kilometre travelled.
	Reduced noise and air pollution Improvements in public health	Quantitative Assessment The damage costs approach has been used to value the impact of the proposed scheme on local air quality, in line with requirements set out in TAG Unit A3. Emissions of oxides of NOx and PM2.5 have been estimated for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios, using Defra's Emission Factors Toolkit (EFT), version 10.1. A quantitative noise assessment has been undertaken using a noise model. The noise model Study Area has been determined through review of the initial traffic model outputs following the criteria in DMRB LA 111. The proposed scheme does not result in any obvious bypassed routes; therefore, the Study Area has been taken as a 600m buffer around the proposed scheme and sections of the A38 linking the proposed scheme together. In accordance with Transport Analysis Guidance (TAG) Unit A3, noise modelling has been undertaken to predict noise levels at all noise sensitive receptors within the Study Area.	-£784,381 (Air Quality over a 60 year appraisal period) Whilst the scheme is estimated to result in an overall increase in emissions of air pollutants, reductions in emissions are expected to occur in some areas (e.g. at approaches to junctions as a result of reduced congestion). Furthermore, a detailed air quality assessment undertaken to support this business case indicates there would be no exceedances of relevant air quality objectives at any modelled human health receptors in the opening year, either with or without the proposed scheme. The assessment also indicates that the proposed scheme is unlikely to have a significant effect on national compliance with the annual mean NO2 air quality Limit Value. As such, and in accordance with DMRB LA 105, the air quality impacts of the proposed scheme are considered to be not significant. -£3,754,649 (Noise over a 60 year appraisal period) Of the 144 non-residential sensitive receptors assessed in the short term, 21 are expected to experience an adverse impact of minor magnitude or greater, whilst 7 are expected to experience a beneficial impact of minor magnitude or greater. In the long term, there are 0 expected to experience an adverse impact of minor magnitude or greater and 1 expected to experience a beneficial impact of minor magnitude or greater.
Improved journey times along the A38	Reduced commute time More time to spend on recreational activities	Quantitative Assessment Travel time reductions form part of the Level 1 Transport User Benefits. This has been quantified through strategic modelling for the Opening Year (2025) and Future Assessment Year (2040) in the Do Minimum and Do Something scenarios. These impacts have also been monetised for a 60-year appraisal period using DfT's TUBA program (TUBA Version 1.9.15) for Core, High Growth and Low Growth Scenarios, with input matrices provided by the transport models.	Total user benefit of £57.34m. The Proposed Scheme is anticipated to have a positive impact to journey times. User benefits include £56.37m of travel time benefits (including bus users) and £2.27m of fuel VOC benefits and £-1.14m of non-fuel VOC benefits. As detailed in the Chapter 3 (Traffic Modelling), the scheme results in savings of up to 3.6 minutes in the peak hours with the AM peak hour showing greater savings than the PM peak.
	Travel time savings for business users and transport users		
	Cost reductions for transport allowing businesses to		

	operate more efficiently		
Improved accessibility	Facilitates the delivery of local plan allocations	N/A Recognising that all proximate major development sites already have planning permission granted and as agreed with DfT, no formal dependent development assessment was undertaken.	No qualitative assessment. Given that four proximate development sites are required to make a Section 106 contribution to scheme delivery, a clear planning link between the proposed intervention and key development sites exists.
	Easier journey means a greater number of people will be willing to travel to / from this area Businesses have access to a wider range of workers and skills	Quantitative Assessment A Level 2 Wider Impacts Assessment has been completed in line with the guidance set out in TAG.This assessment includesInduced Investment (TAG Unit A2.2), Employment Effects (TAG Unit A2.3) and Productivity Impacts (TAG Unit A2.4). The DfT's Wider Impacts in Transport Appraisal (WITA) V2.0 Beta tool has been used to estimate the wider economic impacts.	Wider economics benefits are an estimated £142m. The reduction in generalised travel costs will increase the effective density of economic activity within the area, giving rise to the agglomeration impacts. The agglomeration impacts are primarily concentrated around Bromsgrove/Redditch with a small proportion of the impacts materialising within Wychavon and Wyre Forest
	Better access from Bromsgrove to West Midlands major employment areas Businesses have access to a wider range of workers and skills		

Active Mode Schemes

Removal of potential conflicts between pedestrians and cyclists (short-term)	Enhancements for pedestrians and cyclists can promote a long-term shift to active modes	Quantitative/ Qualitative Assessment The DfT's Active Mode Appraisal Toolkit (July 2021) has been used to assess relevant scheme benefits as part of a wider value for money assessment The social impacts assessments have been undertaken in line with TAG Units A4.1 and consider impacts to physical activity, journey quality, collisions, security, accessibility, affordability and severance.	£28.3m - Monetised AMAT benefit based on increased physical activity levels Active Mode schemes are expected to generate an estimated 2,000 additional walking and cycling trips on an average weekday
Increased in the number of pedestrians			

Whilst Table 4-47 provides a summary of the anticipated scheme impacts against the logic model outputs, additional impacts are anticipated which are not included in the table above including:

- Construction and maintenance impacts (Travel Times and VOC);
- Wider Impacts (Level 2 and 3 (GVA) benefits);
- Journey Time Reliability impacts;
- Accidents (based on COBALT assessment); and
- Scheme costs including operation and maintenance costs.

These additional impacts are included within the Value for Money Statement and Appraisal Summary Table; together demonstrating that the scheme has an overall positive impact and is a strong value for money proposition.

The assessment work presented in the economic case shows that there is a strong case for the A38 scheme. The scheme demonstrates an initial (level 1) **BCR of 2.69** hence the scheme provides a **High Value for Money (VfM)'** (between 2 and 4) to taxpayers. The likelihood of achieving this VfM is very likely. The PVB is equal to £77.3M and compared against the PVC of £28.7M.

With the inclusion of the wider economic benefits (level 2) a BCR of scheme demonstrates an adjusted BCR of 3.1 is calculated which implies a High VfM. Low and high growth sensitivity tests have been undertaken. The low growth scenario demonstrated a BCR of 1.98 implying a medium value for money whilst the high growth scenario demonstrated a BCR of 3.05 implying a high value for money.

Analysis of the combined Part 2 (early delivery schemes 2a, 2b and 4) and Part 3 schemes (this OBC) has been undertaken. As a standalone package, the Part 2 schemes offered a High VfM to taxpayers. When combined with the rest of the A38 BREP Package (Part 3) a High VfM to taxpayers is anticipated with a BCR estimated at 2.70.

Appraisal Summary Table

			Date produced:		16/12/2021					**Contact:**	
Name of scheme:		A38 Bromsgrove Route Enhancement Programme								**Name**	Abhi Bhasin
Description of scheme:		This Outline Business Case (OBC) seeks funding to deliver a major upgrade of the A38 corridor, between M5 Junction 4 to the north and the junction of the A38 with B4094 Worcester Road to the south which is approximately 7.5 miles (12 km) long. This corridor forms part of the strategic north south spine through Worcestershire, connecting Worcester, Droitwich, Bromsgrove to Birmingham to the North and Gloucester and Bristol to the south as an alternative to the M5 route.								**Organisation**	WCC
										Role	Promoter/Official
Impacts		**Summary of key impacts**	**Assessment**								
			Quantitative						**Qualitative**	**Monetary**	**Distributional**
										£(NPV)	**7-pt scale/ vulnerable grp**
Economy	Business users & transport providers	TUBA has been used to assess the scheme, masking has been applied to mask journeys where impacts are not considered attributable to the proposed scheme. The scheme reduces travel time for journeys providing overall benefits of £15.350m, split as follows: reduction of £15.105m for travel time, reductions of £1.147m for VOC and of £3.2M for Developer contributions . During Construction of the proposed scheme there will be additional delays to road users resulting in disbenefits of -£0.902m.	**Value of journey time changes(£)**		15.105m				N/A	£12,127,000	
			Net journey time changes (£)								
			0 to 2min		2 to 5min		> 5min				
			10.631m		3.190m		1.283m				
	Reliability impact on Business users	The reliability benefit calculated shows a positive reliability benefit for the AM and PM peak hours indicating a more reliable journey time is anticipated. In the interpeak hour a marginal benefit/disbenefit is shown.	N/A						Beneficial	N/A	
	Regeneration	N/A - No assessment undertaken	N/A						N/A	N/A	
	Wider Impacts	N/A - No assessment undertaken Based on the analysis undertaken in WITA, over a 60 year appraisal period, it is estimated that the wider economics benefits as a result of the scheme are an estimated £14.2m (2010 prices and values). These benefits correspond to the local authority districts that are captured by the Fully Modelled Area. The agglomeration impacts are primarily concentrated around Bromsgrove/Redditch with a small proportion of the impacts materialising within Wychavon and Wyre Forest.	Imperfect competition impacts £1,213,000 Agglomeration impacts £11,907,000 Labour supply impacts £1,069,000 Total £14,189,000						N/A	£14,190,000	
Environmental	Noise	Analysis of the predicted daytime noise levels indicates that 197 dwellings would indicatively be expected to meet the noise insulation eligibility criteria contained in the Noise Insulation Regulations 1975 (as amended 1988). The number of properties predicted to experience 55dB L,night or greater in the future assessment year is 1581 with the scheme in place, and 1511 without the scheme in place. Therefore, there are 70 more properties above the night-time SOAEL with the scheme in place. 0 properties are predicted to experience 80dB LAeq,16h or greater in the future assessment year with the scheme and 0 without the scheme in place Of the 144 non-residential sensitive receptors assessed in the short term, 21 are expected to experience an adverse impact of minor magnitude or greater, whilst 7 are expected to experience a beneficial impact of minor magnitude or greater. In the long term, there are 0 expected to experience an adverse impact of minor magnitude or greater and 1 expected to experience a beneficial impact of minor magnitude or greater.	Households experiencing increased daytime noise in forecast year: 1386 Households experiencing reduced daytime noise in forecast year: 394 Households experiencing increased night time noise in forecast year: 980 Households experiencing reduced night time noise in forecast year: 312						N/A	-£3,755,000	Slight increases in noise, but area in the immediate vicinity of scheme which will see increases in noise does not contain any income deprived communities; generally uneven distribution across all groups though; slight adverse distributional impact overall
	Air Quality	Estimated to result in an overall increase in NOx and PM2.5 emissions and a net disbenefit in monetary terms (with an upper and lower estimate of NPV ranging from -£2,638,794 to -£133,002). The scheme aims to improve congestion along the A38 and is predicted to result in increased emissions due to an attraction of traffic onto this part of the network and the nearby A448. The proposed scheme is located within the Bromsgrove administrative area and no exceedances of air quality objectives are modelled to occur at any sensitive receptors in the scheme opening year, either with or without the scheme. Emissions have been calculated for the affected road network in 2025 and 2040, both with and without the proposed scheme, using Defra's Emission Factors Toolkit (EFT v10.1). The emission factors post 2030 therefore assume the same emissions per vehicle as in 2030 (as per Defra's EFT) and therefore represent a worst-case - this is in line with TAG guidance.	Change in $PM_{2.5}$ emissions over 60 year appraisal period (tonnes) = +18 Change in NO_X emissions over 60 year appraisal period (tonnes) = +98 PM2.5 = - £483,979 NOX = - £300,402 Total = - £784,381						N/A	-£784,000	Impacts are small, with a net increase in emissions, but no impacts are considered significant; impacts are uneven, but lower income groups are disproportionally less impacted than middle/higher income groups; neutral to slight adverse distributional impact overall.
	Greenhouse gases	Estimated to result in an overall increase in non-traded and traded (i.e. electric vehicle) GHG emissions as a result of an increase in vehicle kilometres travelled and a net disbenefit in monetary terms (with an upper and	Change in non-traded carbon over 60y (CO_2e)		66,557				N/A	-£2,921,000	

		lower estimate of NPV ranging from -£4,505,087 to -£1,321,486). Emissions have been calculated for the entirety of the Traffic Reliability Area using the methodology set out in the TAG Databook (July 2021 v1.15). Whilst the proposed scheme is expected to relieve congestion in some locations, and therefore reduce GHG emissions in these areas, the proposed scheme is anticipated to result in an increase in vehicle kilometres travelled on the network and therefore a resultant increase in Greenhouse Gas emissions. In the Scheme Opening Year the GHG emissions are anticipated to rise by 0.4%, which is therefore considered to be negligible. The 0.4% increase in GHG emission (Opening Year) is compared to an increase of 0.9% in vehicle kilometres travelled, demonstrating that the scheme represents a betterment to GHG emission per kilometre travelled.	Change in non-traded carbon over the five-year budget period 2023-2027 (CO2e)	2,033			
			Change in non-traded carbon over the five-year budget period 2028-2032 (CO2e)	4,108			
			Change in non-traded carbon over the five-year budget period 2033-2037 (CO2e)	5,007			
			Change in traded carbon over 60y (CO2e)	15,415			
			Change in traded carbon over the five-year budget period 2023-2027 (CO2e)	474			
			Change in non-traded carbon over the five-year budget period 2028-2032 (CO2e)	955			
			Change in non-traded carbon over the five-year budget period 2033-2037 (CO2e)	1,161			
	Landscape	No assessment required due to the location of the scheme.	N/A		N/A	N/A	
	Townscape	The assessment of local-level townscape impacts has been based on the combined geographical extents of Landscape Description Units (LDUs) MW129 and MW130 identified within the regional and local-level landscape character assessment (Worcestershire Landscape Character Assessment, 2020). Judgement of impact includes townscape effects occurring after all mitigation measures have been considered (i.e. 'residual effects') following an appropriate environmental and landscape design to achieve a 'best fit' within the townscape. An assessment of night-time effects has not been included as part of this assessment.	N/A		Slight Adverse	N/A	
	Historic Environment	The overall impact on the historic environment is anticipated to be Neutral as the assessment has found that there will be no significant impact to existing heritage assets and no further work is required.	N/A		Neutral	N/A	
	Biodiversity	Schemes A, B, C, D, E, F, G, 1 and 6 are all anticipated to have a natural impact to biodiversity.	N/A		Neutral	N/A	
	Water Environment	Multiple surface water features have been identified within the study area. Two are classified by the Environment Agency under the Water Environment Regulations (WER) as 'main rivers' - River Salwarpe and Sugar/Spadesbourne Brook. Both have been assigned as high importance due to their status. All other watercourses have been assigned as a medium importance for surface water quality. For geomorphology impacts, importance's for watercourses were assigned within the Environmental Assessment Report (EAR) (Jacobs, 2021). One principal aquifer, one secondary A and one secondary B aquifer have been identified within the study area of the cumulative scheme. These are classified as very high, high and medium importance respectively. The cumulative scheme and wider study area have been described as covering all three flood zones but have been classified as low - medium importance due to assumed limited development and/or small floodplains associated with the smaller watercourses. Overall impacts are either of low significance or insignificant providing particular standards and guidance is implemented appropriately. The overall score is neutral as the scheme would result in a combination of effects, some positive (such as reduction in spillage risk) and some negative (increased road runoff through additional impermeable areas), with both positive and negative impacts being minimal.	N/A		Neutral	N/A	
Social	Commuting and Other users	The TUBA outputs have been utilised to provide these results. The scheme attracts additional vehicle trips, results in a re-distribution of trips compared to the without scheme scenario, drawing traffic away from more congested part of Bromsgrove. Additional travel time savings associated with the bus facility measures have been included. The scheme reduces travel time for journeys providing overall benefits of £39.16m, split as follows: reduction of £41.263m for travel time, increase of £0.016m for VOC. During Construction of the proposed Scheme there will be additional delays to road users resulting in disbenefits of -£2.088m	**Value of journey time changes(£)**	41.263m (highways + bus)		£39,159,000	High user benefit, distributed relatively unevenly between income groups; least deprived areas having proportionally more benefit than population share; slight beneficial distributional impact overall
			Net journey time changes (£)				
			0 to 2min	2 to 5min	> 5min		
			24.802m (highways only)	16.296m (highways only)	0.013m (highways only)		
	Reliability impact on Commuting and Other users	The reliability benefit calculated shows a positive reliability benefit for the AM and PM peak hours indicating a more reliable journey time is anticipated. In the interpeak hour a more marginal benefit/disbenefit is shown.	N/A		Beneficial	N/A	
	Physical activity	Based on the assessment undertaken and the Active Mode figures, the overall impact of the schemes on Physical Activity is considered to be a 'beneficial impact. These impacts can be largely attributed to the following economic drivers: - Reduced risk of premature death due to healthier and more active lifestyles. - Reduced absenteeism from work due to improved general health.	The schemes result in total AMAT benefits of £28.3M, of which £24.6M are associated with physical activity.		Beneficial	£24,638,000	

	Journey quality	The main benefits of the scheme are from reducing traveller stress by providing a safer and more reliable Highway and Active Mode network, with schemes in place to combat the congestion of future years. There is unlikely to be much impact on traveller views. Both sets of schemes will be designed to the latest standards and guidance making sure that traveller care is at the forefront of each design.	£3.0 million (2010 prices and values) based on AMAT	Moderate beneficial	£2,962,000	
	Accidents	Fatal, slight and serious accidents are all predicted to decrease. The proposed scheme provides a benefit of £5.5M PVB and a total accidents savings of 205 over 60 years..	The proposed scheme provides a slight benefit of £5.5M	Moderate beneficial	£5,487,000	Slight overall decrease in accidents is widespread across the network; no specific issues in accident record according to vulnerable groups; neutral distributional impact overall
	Security	The designs for the Highways and Active Mode schemes have been designed to the relevant standards and guidance. It is expected that these will maintain the existing levels of Security at each of the scheme locations, potentially with some improvements in certain areas.	N/A	Neutral	N/A	Impact on security is small; no vulnerable groups impacted; distributional impact is neutral overall
	Access to services	The Active Mode schemes are anticipated to have a slight beneficial impact upon availability and access to transport, as well as access to services and activities. The Highways schemes improve connectivity to the railway station easier for those not using a private vehicle. Scheme 3 will provide an accessibility benefit to those residents living nearby. With regards to safety and security, there will be a slight beneficial impact as the new schemes will not be make the existing situation worse but provide an improvement.	N/A	Slight beneficial	N/A	N/A
	Affordability	The assessment against several factors indicates there will be beneficial affordability impacts from car fuel and non-fuel costs, and with regards to active travel modes. Existing public transport fares will not be affected by the schemes. An additional 2,000 daily walking and cycling trips are anticipated to positively impact personal affordability.	N/A	Slight beneficial	N/A	N/A
	Severance	Highway Schemes have not been assessed for their impact on Severance as all elements involve improving existing provision. No additional physical barriers to movement will be provided and the increase in vehicle flows will be negligible, therefore there will not be an additional impediment to pedestrian movement. Some active mode schemes have been classed as 'neutral' as they are replacing an existing arrangement on site. However, there are new schemes which would relieve existing severance issues, thus being 'slightly' or 'moderate beneficial' in isolation. An additional 2,000 daily walking and cycling trips are anticipated to positively impact personal affordability.	N/A	Large beneficial	N/A	No concentrations of vulnerable groups and impact on severance is beneficial; neutral distributional impact overall
	Option and non-use values	Option and Non-Use Values have not been assessed as the schemes will not substantially change the availability of transport services within the study area these values shall not be assessed.	N/A	N/A	N/A	
Public Accounts	Cost to Broad Transport Budget	Costs include Whole Life Costs risks (QRA) and optimism bias at 23% for roads and 32% for structures. The contribution of the Local government to the scheme is £3.8M, contribution from the Central government is £28M and Developer contributions amout to £3.2M.	N/A	N/A	-£28,670,000	
	Indirect Tax Revenues	Based on an increase in vehicle km and increase in fuel consumption, resulting in a marginal gain in tax	N/A	N/A	£357,000	