ATKINS

Member of the SNC-Lavalin Group

# West Cheltenham Transport Improvements Scheme – UK Cyber Business Park
# Phase 1 Arle Court Roundabout

## Full Business Case

Gloucestershire County Council

16th October 2019

# Notice

This document and its contents have been prepared and are intended solely as information for Gloucestershire County Council and use in relation to Business Case submission

Atkins Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 101 pages including the cover.

## Document history

| Revision | Purpose description | Origin-ated | Checked | Reviewed | Authorised | Date |
|---|---|---|---|---|---|---|
| Rev 1.0 | First draft | MH | IS | <initials> | <initials> | 25/06/2019 |
| Rev 1.8 | Draft for issue to Aecom | MH | IS | CW | RSS | 03/09/2019 |
| Rev 2.0 | Final | MH | IS | CW | RSS | 04/10/2019 |
| Rev 3.0 | Final | MH | IS | AB | RSS | 16/10/2019 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## Client signoff

| | |
|---|---|
| Client | Gloucestershire County Council |
| Project | West Cheltenham Transport Improvements Scheme UK Cyber Business Park - Phase 1 Arle Court Roundabout |
| Job number | 5188734 |
| Client signature / date | |

# Contents

## Tables

## Figures

# 1. Introduction

## 1.1. Background to the Business Case

The A40 Corridor is a key strategic route for both local and national traffic entering from the M5 (Junction 11). It is currently the primary link for commuters travelling between Gloucester and Cheltenham. The Arle Court roundabout acts as conduit for road users into Cheltenham. The land adjacent to the scheme and immediate surroundings consists of residential developments, businesses and a park and ride.

The County Council is highly supportive of the Cyber Park proposals, including 45 hectares of much needed employment land. The proposal will be focussed on cyber industries generating new highly skilled jobs. The site is important to the economic prosperity of the county and the aspiration for Gloucestershire to become a magnet county attracting young professionals. The proposed Cyber Park will be served by the currently highly congested A40 corridor from the M5 J11 to Cheltenham Spa Rail Station.

The corridor currently experiences significant congestion and delays, particularly during peak hours. A package of schemes has been identified to improve key areas, aiming to increase capacity, optimise the efficiency of the infrastructure and reduce journey time delays for all traffic using the A40, whilst also maintaining and improving access for businesses, and facilities for pedestrians and cyclists.

The West of Cheltenham Transport Improvement Scheme – UK Cyber Business Park (WCTIS) is a series of highway improvements along the A40 corridor in Cheltenham from the M5 Junction 11 to Griffiths Avenue, the scheme will be split into four distinct phases, of which phase 1 will include capacity improvements at Arle Court Roundabout.

Arle Court Roundabout is a large roundabout on the A40 between Junction 11 of the M5 and Cheltenham. It has five arms as follows:

- Fiddler's Green Lane – providing access to the Jurys Inn and other businesses and residential areas to the north;
- A40 East – towards Cheltenham and major employment land including GCHQ and the access to the proposed 45ha Cyber Park site;
- Hatherley Lane – providing access to both buses and users to the Arle Court Park and Ride, as well as businesses and residential areas to the south;
- A40 West – towards the M5 Junction 11 and Gloucester; and
- B4063 – towards Churchdown via Staverton Bridge.

The roundabout acts as a significant pinch point in both the AM and PM peak periods, with the current demand exceeding the existing capacity of the junction. With the level of both housing and employment growth that is planned for Cheltenham and Gloucestershire as a whole, the existing situation is predicted to get worse, and will ultimately represent a constraint to growth in the county. In particular, the Joint Core Strategy (JCS) for Cheltenham, Gloucester and Tewkesbury, which was adopted in 2017, identified a number of strategic land allocations. These include West Cheltenham, an urban extension comprising 1,100 houses and 45 hectares of employment land[1] that will lie on land between GCHQ and the B4634 (Old Gloucester Road). This development includes the nationally-important Cyber Park and Innovation Centre, which will require access to Cheltenham and the Strategic Road Network adjacent to Arle Court Roundabout.

GFirst Local Enterprise Partnership (LEP) has provisionally allocated a total of £22m funding from Growth Deal 3 to the West of Cheltenham Transport Improvement Scheme, subject to business case approvals. This is a wider programme of investments on the A40 in Cheltenham comprising of four phases, of which improvements to Arle Court Roundabout comprise the first phase.

The scheme and wider programme have been designed to be deliverable by 2021, the point at which the LEP funding must be committed.

This document is the Full Business Case (FBC) for the Arle Court Roundabout scheme, also known as Phase 1. The FBC is a requirement of GFirst LEP and includes fully developed Strategic and Economic Cases based

[1] Policy A7 in the adopted Joint Core Strategy

on transport modelling, along with detailed cost estimates (Financial Case), a clear procurement strategy (Commercial Case) and delivery arrangements (Management Case).

## 1.2. The Arle Court Roundabout Scheme

The proposed scheme aims to increase the capacity of the roundabout to alleviate the existing issues at the junction and go some way to mitigate the impact of the expected increase in demand which will be caused by development directly relying on this network, not least the Cyber Business Park. Figure 1-1 shows the geographical context of the scheme, including the location of the proposed Cyber Business Park.

**Figure 1-1 - Existing network and location of Arle Court Roundabout**


The scheme is the first, and most significant phase of a wider programme of investments along the A40 corridor in Cheltenham called the West of Cheltenham Transport Improvements Scheme (WCTIS). Without addressing the congestion at Arle Court Roundabout, the full benefit of the other phases and transport schemes as well as planned strategic development cannot be realised; It is deemed essential that the Arle Court Roundabout is improved first to remove the existing pinch point and enable the subsequent phases.

WCTIS will progress in phases, with each phase needing to stand on its own merits, in terms of aligning to and delivering the objectives as set out in Section 1.3 and proving sound value for money and use of public funds. The number of phases will determined on the most cost effective scope for buildability; it is currently proposed that the phasing be as summarised in Table 1-1 below and illustrated in Figure 1-2:

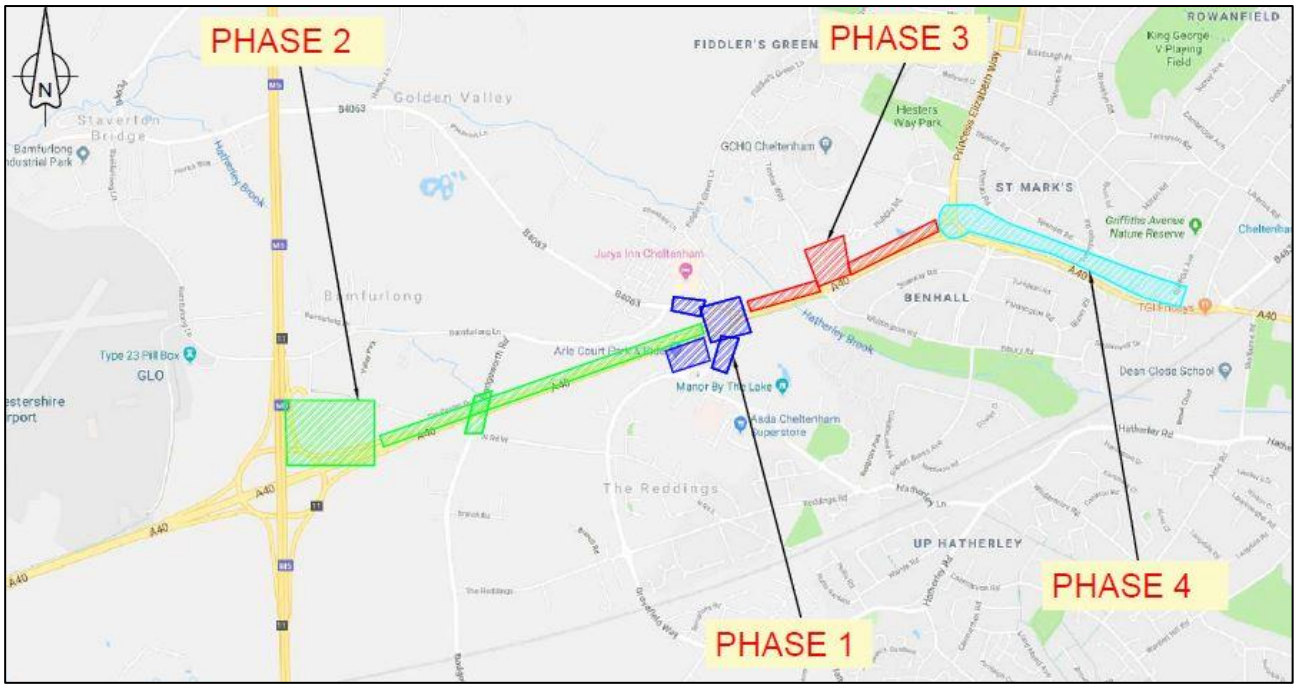
**Table 1-1 - West of Cheltenham Transport Improvement Scheme – Current proposed Phasing**

| Phase | Scope |
|---|---|
| 1 | Capacity improvements to the Arle Court Roundabout |
| 2 | Widening of the existing A40 carriageway eastbound from M5 J11 to Arle Court Roundabout |
| 3 | Capacity and cycleway improvements from Arle Court Roundabout to Benhall Roundabout |
| 4 | Benhall Roundabout remodelling, and cycle/pedestrian infrastructure improvements from Benhall Roundabout towards Cheltenham Railway Station.<br>A40 eastbound widening from Benhall Roundabout towards Griffiths Avenue |

The capacity improvements in the Arle Court Roundabout Scheme, comprise:

- The provision of an additional lane to the circulatory of the signalised roundabout;
- Corresponding additional lanes to the A40 on the approaches and exits to and from the junction;
- Providing a new bus lane on the B4063 Staverton approach to the roundabout, also improving facilities for cyclists;
- Bus lane modifications to improve journey times for public transport
- Widening the Hatherley Lane arm to the south-side of the roundabout, improving access to the Arle Court Park and Ride (P&R);
- Investigating other cycling improvements as part of this phase
- Proposal to improve cyclist access at specific junctions, such as Fiddlers Green Lane
- Park and Ride Entrance/Exit westbound (towards Gloucester) from Arle Court Roundabout; and
- Relocating the bus stop at the P&R and building a new one on the other side of the road to take advantage of the bus only slip.

**Figure 1-2 - Phase plan map**




## 1.3. Objectives of the scheme

The key objectives which have been agreed by GCC and GFirst LEP have been detailed below. These objectives also led to the provisional allocations of the funds and are as follows:

- Contribute to accelerating the release of the employment land associated with the 'West Cheltenham' Strategic Allocation along with the other strategic allocations in the JCS adjacent to GCHQ, which includes the proposed Cyber Park and Cyber Innovation Centre;
- Deliver transport benefits to people living and working in Gloucestershire by improving traffic flows on the A40, one of the most important and busiest sections of Gloucestershire's road network;
- Aim to have an overall neutral impact on the Cheltenham Air Quality Management Area (AQMA);
- Maintain and improve the options for sustainable travel modes through the junction and on the approaches; walking, cycling, and where feasible providing for enhanced public transport facilities.

## 1.4. Structure of the document

This document is structured around the DfT's recommended five-case model for a transport business case:

- Strategic Case (Section 2), setting out a rationale for the scheme, the need for investment in this location, options considered and anticipated benefits of the scheme;
- Economic Case (Section 3), identifying the key economic, environmental and social impacts of the scheme and its overall value for money;
- Financial Case (Section 4), presenting evidence of the scheme's affordability both initially (for the construction phase) and in terms of ongoing operations, maintenance and renewal;
- Commercial Case (Section 5), summarising the approach to scheme procurement and justifying the commercial and legal viability of the approach; and
- Management Case (Section 6), setting out how GCC will ensure that the scheme is delivered successfully – on time and to budget, with suitable governance and risk management processes in place.

# 2. Strategic Case

## 2.1. Introduction

This Full Business Case is specifically for WCTIS Phase 1 Arle Court Roundabout Capacity Improvements. Arle Court Roundabout is considered to be the key pinch point and critical to any overall improvement for traffic in the area.

Arle Court Roundabout currently creates significant delays and congestion for traffic travelling on the A40 into and out of Cheltenham, particularly in the peak morning and evening periods. This congestion would be increased with additional development planned for the area, and subject to ongoing planning discussions with the County Council. It is therefore considered essential that a scheme to improve congestion at the junction is progressed as a priority, and accordingly the scheme has been identified as the highest priority in the area.

The issues at Arle Court roundabout have previously called into question the value of implementing other schemes; without addressing Arle Court congestion, the full benefit of other schemes would not be realised. The Arle Court scheme in isolation is not expected to mitigate the full impact of the expected development in the area but will contribute to the early phases of development and the delivery of subsequent enabling schemes.

This scheme comprises the following elements:

**Phase 1 – Arle Court Improvements**

- The provision of an additional lane to the circulatory of the signalised roundabout;
- Corresponding additional lanes to the A40 on the approaches and exits to and from the junction;
- Providing a new bus lane on the B4063 Staverton approach to the roundabout, also improving facilities for cyclists;
- Bus lane modifications to improve journey times for public transport
- Widening the Hatherley Lane arm to the south-side of the roundabout, improving access to the Arle Court Park and Ride (P&R);
- Investigating other cycling improvements as part of this phase
- Proposal to improve cyclist access at specific junctions, such as Fiddlers Green Lane
- Park and Ride Entrance/Exit westbound (towards Gloucester) from Arle Court Roundabout; and
- Relocating the bus stop at the P&R and building a new one on the other side of the road to take advantage of the bus only slip.

## 2.2. Local policy context

### 2.2.1. Joint Core Strategy (JCS) – Adopted Dec 2017

The JCS Transport Strategy Evidence Base was revised in May 2017 and took account of the transport impact of the Strategic Allocation sites for the JCS areas, of which West of Cheltenham is included (A7). The evidence base concludes that M5 J10 is a priority for the County, which is currently subject to an application for funding by GCC to the Housing Infrastructure Fund (HIF). In addition, the Transport Mitigation Considerations include improved access to M5 and Junction improvements at Arle Court Roundabout and /or M5 Junction 10.

### 2.2.2. M5 J10 HIF Bid

The JCS Transport Evidence Base and other GCC policy focuses on the need for an all movements junction at M5 J10. A comprehensive bid has been submitted by the County Council and their partners to the Housing Infrastructure Bid (HIF). The bid links the need for an all-movements M5 J10 to the delivery of housing both at a higher level and earlier than would otherwise be possible without M5 J10. While no funding was sought in the HIF bid for the improvements along the A40 as proposed for the LEP (Phases 1 to 4), these improvements were an integral part of the bid for M5 J10. The County Council will be informed of the decision on allocation of HIF funds by the end of the year, as the scheme is currently at technical checking and verification and being judged competitively against other schemes across the Country.

### 2.2.3. GFirst LEP Strategic Economic Plan (SEP)

GFirst LEP has the aim to help Gloucestershire realise its economic potential and promote developments and business growth across the County. The SEP for Gloucestershire, submitted to the government in March 2014 in order to obtain Growth Deal funding, outlines how the LEP aims to achieve average economic growth of 4.8% GVA per annum by 2022. It enables the LEP to support local businesses, develop the skills of workers in high-growth sectors, and maximise the connections and opportunities of the M5 corridor. From this Growth Deal funding, £22m has been provisionally allocated to Gloucestershire County Council for the four phases of the West of Cheltenham Transport Improvement Scheme.

The SEP was recently refreshed in 2018, and restated 'Connectivity' as a strategic priority to improve and integrate transport in the county to stimulate business growth. The SEP defines four 'Enablers for growth' under the Connectivity strategic priority: housing, regeneration, transport infrastructure and collaboration. The SEP further identifies that unlocking employment land in a growth zone with good access to the M5 is especially important. The scheme will contribute to the aims of the SEP by reducing congestion; improving connectivity between the M5 and west Gloucestershire, including key regeneration areas such as the Forest of Dean.

### 2.2.4. Gloucestershire Local Transport Plan (LTP) – Adopted June 2016.

The LTP sets out the long-term transport strategy for Gloucestershire up to 2031[2]. The revised "emerging" LTP (which takes the horizon year to 2041) is currently under review, and will have formal consultation in 2020. All stakeholders will have an opportunity to provide feedback on the reviewed plan before adoption by the full Council.

The aim for GCC is to influence how and when people choose to travel so that individual travel decisions do not cumulatively impact on the attractiveness of Gloucestershire as a place to live, work and invest. The LTP outlines a number of relevant transport objectives, including:

- **Support sustainable economic growth**

  The scheme will increase capacity and improve journey times and reliability on the A40 between Cheltenham (from the M5) and the wider Strategic Road Network. The attraction of the West of Cheltenham area as a place to live, work and invest is therefore enhanced, with the capacity for greater economic activity in the county.

- **Enable community connectivity**

  Improved journey times and reliability along with the new slip from the Park & Ride will enhance the Public Transport provision in the area, providing an attractive alternative to the private car and genuine transport choices.

[2] https://www.gloucestershire.gov.uk/transport/gloucestershires-local-transport-plan-2015-2031/

## 2.3. Existing travel demand and level of service

### 2.3.1. Current road network

Arle Court Roundabout is a large junction on the A40, approximately one mile east of Junction 11 of the M5 motorway heading towards Cheltenham (Figure 2-1). J10 of the M5 only has north-facing slip roads, meaning that the A40 to J11 represents the only direct route from Cheltenham to destinations to the south via the M5, as well as the main route to Gloucester. The A40 is therefore critical to the economy of Cheltenham, connecting the Borough to the wider region and Strategic Road Network. The roundabout has five arms and is already partially signalised, linking the A40 to:

- The B4063, which passes beneath the M5 into Churchdown;
- Fiddler's Green Lane; and
- Hatherley Lane to the south, providing access to Arle Court Park and Ride (P&R).

**Figure 2-1 - Arle Court Roundabout - Geographical context**


### 2.3.2. Traffic flows and network performance

The A40 from J11 of the M5 into Cheltenham carries a significant volume of daily traffic, with large flows in both directions and both the AM and PM peak periods. Table 2-1 summarises the Annual Average Daily Traffic (AADT) observed at a DfT count site between M5 J11 and Arle Court Roundabout from 2014 to 2017. The amount of traffic increased across the period, with the two-way AADT increasing from 42,511 in 2014 to 46,686 in 2017.

**Table 2-1 - 24hr AADT flows on the A40 between M5 J11 and Arle Court Roundabout**

| Direction | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|
| Eastbound | 20,713 | 23,786 | 23,348 | 22,377 |
| Westbound | 21,798 | 24,983 | 25,475 | 24,309 |

| | | | | |
|---|---|---|---|---|
| **Combined** | **42,511** | **48,769** | **48,823** | **46,686** |

Source: DfT manual counts (Site ID 16412)

Table 2-2, meanwhile, shows the peak hour flows approaching Arle Court Roundabout, both the total of all the arms of the junction and in each direction of the A40. This shows that the A40 accounts for about half of the demand at the roundabout.

**Table 2-2 - A40 weekday traffic flows approaching Arle Court Roundabout**

| Direction | AM Peak hour (8-9 AM) | PM Peak hour (5-6 PM) |
|---|---|---|
| Eastbound | 1,527 | 1,267 |
| Westbound | 1,393 | 1,408 |
| Total flow through the roundabout | 6,196 | 5,649 |

All vehicles, surveyed over two weeks in late November and early December 2017

Increases in traffic along the A40 corridor have therefore only served to exacerbate congestion issues at Arle Court Roundabout. These issues can be summarised by the following:

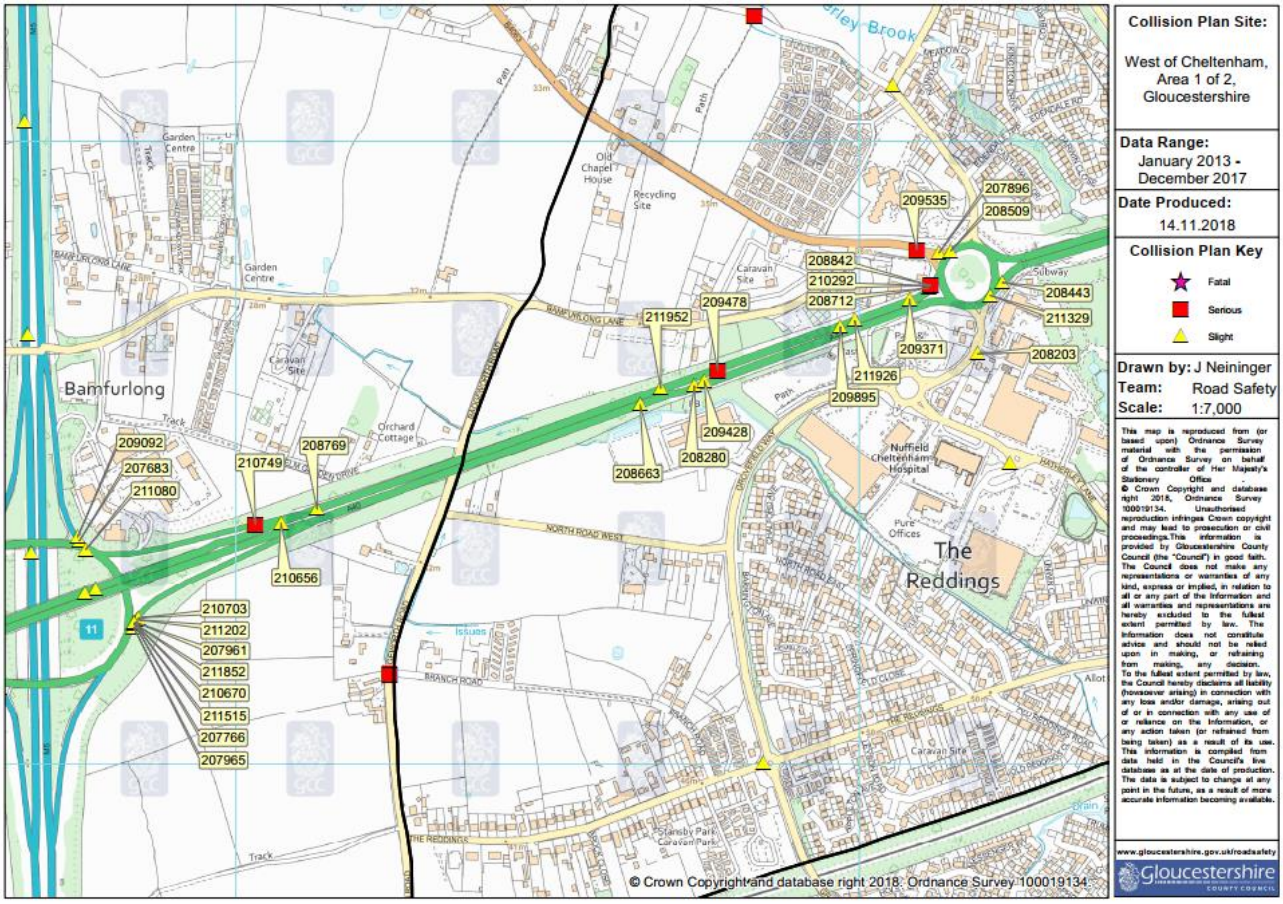
- Queues in the AM peak from the A40 West, from Gloucester/M5 J11 towards Cheltenham;
- Queues in the PM peak from Cheltenham, from the A40 Eastern arm;
- Slow journey times (PM) from Cheltenham town centre along the length of the A40 to the Arle Court Roundabout;
- Difficulties for buses in travelling through the traffic, resulting in unreliable journey times and costs to operators.
- Difficulties for commuters accessing/egressing key employment sites.

### 2.3.3. Accidents

Accident data has been assessed around Arle Court Roundabout, along with the immediately surrounding road network including the A40 to the motorway. The data is for the 5-year period from January 2013 to December 2017, and the summary map is shown in Figure 2-2 below. There are no fatal accidents for the period covered, with a significant cluster of collisions on the approach to the M5 J11 grade-separated roundabout and a smaller cluster on the eastbound approach to Arle Court Roundabout.

The location and severity of the accidents is not considered disproportionate for the traffic volumes on the link and especially given the location of the roundabout. It is also to be noted that the plot only shows reported accidents, and minor rear shunts and other collisions not recorded will be occurring at the roundabout. The scheme is not intended to resolve a significant accident issue, and as reported in the economic case, statistically accidents may be slightly more likely to occur with increased speeds through the roundabout. However, best practice and consideration of all users (pedestrians and cyclists) has been integral to the final design. The Safety Audit has also highlighted safety issues for the designers.

**Figure 2-2 - 5-year plot for Personal Injury Accidents, January 2013 – December 2017**




## 2.3.4. Public Transport Provision

Stagecoach West provides the main local bus services within Cheltenham and connecting Cheltenham to the wider Gloucestershire area. The routes which the company operates in Cheltenham are shown in Figure 2-3. Of these, the 93, 94 and 94 Gold services provide frequent and strategically important connections between Cheltenham and Gloucester, using the A40 via Arle Court Roundabout. These routes are the most-used in the county, with around 2.5 million passenger journeys per year. The 93 and 94 also stop at Arle Court Park and Ride (P&R), providing an alternative for private car users to reach the centre of Cheltenham. In addition to Stagecoach, a number of other local bus service and school bus operators also use the roundabout.

Service 99 (run by Pulhams Coaches) is a Hospitals circular between Gloucester and Cheltenham linking Cheltenham A&E, Gloucestershire Royal Hospital (Gloucester) and Arle Court Park & Ride. There are also intercity services run by National Express and Megabus that stop on the A40 just to the east of Arle Court Roundabout opposite GCHQ. The most frequent services among these connect Cheltenham to Gloucester and Hereford to the north and London to the east.

Along with the other users of Arle Court Roundabout, bus service operators and passengers suffer frequent delays from congestion at peak times the junction, reducing the reliability and attractiveness of the service. The Managing Director of Stagecoach West confirmed these issues, stating:

*"The major roads around Arle Court, including the A40 and B4063 are heavily congested in peak periods and traffic congestion causes significant delays for buses travelling in the area, as reflected within the existing timetabling of the 94 service and other services utilising this route. Journey time variability is also an issue limiting the take up of public transport on this corridor. Without intervention these issues are likely to get worse in the future due to significant expansion in housing and employment planned for the A40 corridor as part of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy (JCS). The more recently announced Cyber Park will also impact adversely on traffic congestion and the ability for bus operators to provide a punctual and reliable service."*

The Arle Court Roundabout scheme will therefore represent much-needed investment to enhance bus connectivity between Cheltenham and Gloucester: improving access to jobs, reducing congestion and making the most of existing investments and assets such as the P&R and Gloucester Transport Hub.

**Figure 2-3 - Stagecoach West route map, Cheltenham**


## 2.4. Future challenges

### 2.4.1. Population and employment growth

As of mid-2017, the population of Cheltenham was estimated to be 117,128[3]. The population is expected to grow and is projected to reach 121,600 by 2026 and 128,000 by 2041, representing population growth of 9.3%

[3] https://inform.gloucestershire.gov.uk/media/2082290/current-population-of-gloucestershire-overview-2017.pdf

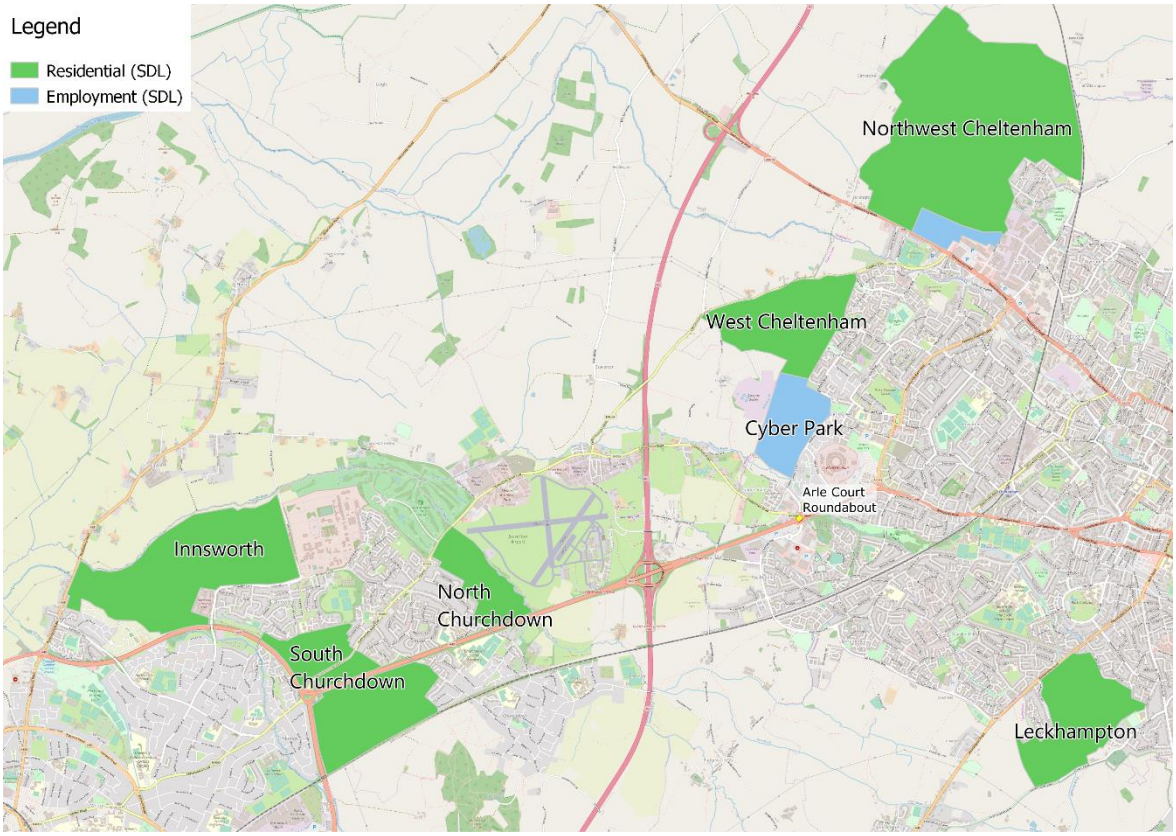
over 25 years[4]. While the population in Gloucestershire is forecast to increase in all age groups, the largest increases are expected among those aged at least 65, reflecting an ageing population. Indeed, those aged 65+ accounted for 20.8% of the population in 2016 yet they are expected to reach 28.9% by 2040. An ageing population will present financial and resource implications for Gloucestershire in the future. By investing in infrastructure that can contribute to enabling a growth zone in the M5 corridor, Gloucestershire can mitigate these challenges by attracting the businesses; jobs and working age population that it needs to prosper.

In 2018, 82.7% of working-age residents in Cheltenham were in employment, compared to 78.5% in Great Britain as a whole[5]. In the 2011 census, 29,462 residents of Cheltenham commuted to work within Cheltenham itself and 14,037 commuted to the wider Gloucestershire area, predominantly Tewkesbury and Gloucester[6]. To meet the needs of this growing population, the adopted Joint Core Strategy identifies the need for 35,175 houses across Cheltenham, Gloucester and Tewkesbury between 2011 and 2031. GFirst's Strategic Economic Plan also states that over the period 2014-2022, they aim to create 33,909 jobs in Gloucestershire. With an already congested road network, it is therefore clear that in order to deliver the aims of the Joint Core Strategy and Strategic Economic Plan, investment to increase the capacity for growth is required.

### 2.4.2. Known development sites

The JCS Housing Strategy (2011 – 2031) has a number of Strategic Allocations that are located close to the Arle Court Roundabout, A40 Corridor and the links to the motorway junctions (J10 and J11). The locations of these sites are shown in Figure 2-4 below.

**Figure 2-4 - JCS Strategic Land Allocations near to Arle Court Roundabout**




In particular, within the Strategic Allocation Sites are two key sites:

- North West Cheltenham (also known as Elms Park) – allocated for 4,285 houses and 23.4 hectares of Employment Land; and

[4] https://inform.gloucestershire.gov.uk/media/2082298/overview_-_population_projections_for_gloucestershire_2016-41-2.pdf
[5] https://www.nomisweb.co.uk/reports/lmp/la/1946157372/report.aspx
[6] https://inform.gloucestershire.gov.uk/media/1520759/economy_of_gloucestershire_2017-35.pdf

- West Cheltenham – allocated for 1,100 houses and the Cyber Park, comprising 45 hectares of Employment Land.

It is important to note that the scheme **is not** solely for the enabling of the North West Cheltenham and West Cheltenham developments and is not specifically for their benefit. This is due to a number of factors:

- Existing Traffic Congestion – there is existing congestion in the area, of which Arle Court Roundabout is considered to be the key to unlocking greater capacity of the network. Therefore, the improvements are at present for the local community, both residents and local businesses to reduce the level of delay and enable developments to be brought forward quicker;
- Planning Status – although within the JCS Strategic Allocations, neither site has full planning permission, and both developers need to submit a full Transport Assessment to determine the impacts on the network and levels of traffic that are generated. Therefore, the results of this work and negotiations with the County Council cannot be anticipated or predicted.
- Timescales – the LEP funding is time limited and needs to be committed before the end of 2021. Therefore, the Strategic Allocations will only be at an early stage by 2021 and will only be approaching full build-out towards the end of the JCS period (2031). As a result, the Arle Court Roundabout Improvement Scheme needs to address the existing issues and growth over the next few years as a priority, and at the same time enabling and encouraging early development of the first phases of the Strategic Allocations.

For the West of Cheltenham development, Gloucestershire County Council's Highways Development Management (HDM) team have contributed the following view:

*The developers of the Cyber Park (West of Cheltenham Strategic Site) are currently undertaking traffic modelling, which will include the planned build out programmes. The outputs are not available at the time of submission of this Full Business Case and should be available later this year. However, due to the quantum of development proposed it is highly likely that planning conditions will be necessary for the advance construction of some or all of the West Cheltenham Transport Improvements Scheme – UK Cyber Business Park Schemes in order to appropriately mitigate impact and create capacity on the A40 corridor to enable the development of the JCS strategic site.*

Therefore, an approach to the assessing the levels of traffic in the local area have been agreed with the Independent Assessors acting for the LEP and explained in the modelling assessment within this report.

### 2.4.3. Future travel demand

TEMPro forecasts for the AM Peak in the Cheltenham area indicate greater growth in car trips originating in Gloucester than trips ending there, as shown in Table 2-3. This suggests that there will be a greater growth in housing and residents in Cheltenham than there is of jobs, reflecting the ageing population but also leading to out-commuting, and making strategic connections such as the A40 and M5 via Arle Court Roundabout critical for connecting people to jobs.

**Table 2-3 - TEMPro trip end forecasts and growth factors for Cheltenham 2017-31 (AM peak)**

| | | 2017 | 2021 | 2031 |
|---|---|---|---|---|
| Growth Factor | Origins | - | 1.0278 | 1.0823 |
| | Destinations | - | 1.0183 | 1.0635 |
| Trip Ends | Origins | 69,403 | 71,333 | 75,118 |
| | Destinations | 76,562 | 77,961 | 81,426 |

Source: TEMPro (7.2) – all modes and purposes

### 2.4.4. Planned changes in the transport network

Apart from the West of Cheltenham Transport Improvement Scheme, a number of changes and highway improvements in the area are at various stages of planning. These include:

- Improvements to the A40/Telstar Way/Whittington Road signals to the east of Arle Court Roundabout;

- Converting M5 J10 to an all-movements junction;
- Innsworth Gateway, a new roundabout to the west on the A40 (Gloucester Northern Bypass) providing access to the Innsworth development, another strategic allocation in the JCS; and
- Capacity improvements at Longford (A40/A38) roundabout.

The Arle Court Roundabout scheme has the potential to complement these other schemes along the A40, contributing to improved journey times and reliability, and therefore the capacity for growth, in the corridor between the Forest of Dean, Gloucester and the M5 and Cheltenham.

### 2.4.5. Future traffic flows and network performance

The following section presents outputs from the A40 Paramics microsimulation traffic model developed to appraise the scheme for the Do-Minimum scenario, and therefore provides a calculated estimate and prediction of likely changes in traffic flows and behaviour. Traffic demand growth is constrained to TEMPro (7.2) forecasts.

Figure 2-5 and Figure 2-6 show the forecast changes in vehicle flows on the modelled road network for the AM and PM Peak hours from the 2017 base model to the 2021 Do-Minimum forecast. In both time periods, the increase in demand in the region leads to increases in flow on the A40 between the motorway and the centre of Cheltenham.

At Arle Court Roundabout, there is an increase of 141 vehicles eastbound and 39 vehicles westbound on the A40 approaches in the AM peak hour. In the PM peak hour, the flow increases by 91 vehicles eastbound while the westbound flow on the A40 approaching the roundabout increases by 143 vehicles. These increases, at a junction that is already close to capacity, will only serve to worsen congestion on the corridor, limiting the potential for growth in the area.

On the other arms of Arle Court Roundabout:

- Flow on the Hatherley Lane approach increases, by 64 vehicles in the AM peak hour and 87 vehicles in the PM peak hour. This reflects expected background traffic growth in the west Cheltenham area.
- In the AM peak hour there is no significant change on either the B4063 approach or Fiddler's Green Lane. However, the flow on the Fiddler's Green Lane approach decreases slightly by 26 vehicles in the PM peak hour, indicating limited rerouting to Telstar Way.

**Figure 2-5 - Change in traffic flows, in vehicles – 2017 to 2021 AM (08:00-09:00)**

**Figure 2-6 - Change in traffic flows, in vehicles – 2017 to 2021 PM (17:00-18:00)**

Average and maximum queue lengths were also extracted from the base and Do-Minimum models with the changes summarised in Table 2-4 and Table 2-5 below. The base signal timings – although calibrated – are not

well optimised for the traffic conditions. For this reason, the impact of changing the signal timings to the 2021 values is presented before showing the impact of increasing the demand. In the AM peak hour, the increased demand results in comparatively little change to queue lengths on most arms, although the average queues on the Fiddler's Green Lane approach increase by 37m and on the A40 west approach by 26m.

Without intervention, the growth in traffic along the A40 in the PM peak hour lengthens the average queue length on the A40 west approach by an even greater amount, by 110m. It also makes it harder for traffic using the unsignalised B4063 and Fiddler's Green Lane approaches to the roundabout to find gaps and enter the junction. The result is that queue lengths on these two arms increase, by an average of 91m and 56m respectively. The A40 West approach also suffers from increased maximum queue length, at an additional 386m, indicating that the operation of the junction is less reliable.

**Table 2-4 - Change in queue lengths – 2017 to 2021 AM (08:00-09:00)**

| Approach | 2017 Base | | 2021 Do-Minimum (Base demand) | | 2021 Do-Minimum | | Difference (Do-Minimum 2021 vs Base demand) | |
|---|---|---|---|---|---|---|---|---|
| | Average | Maximum | Average | Maximum | Average | Maximum | Average | Maximum |
| Fiddler's Green Lane | 48 | 119 | 55 | 135 | 92 | 194 | 37 | 59 |
| A40 East | 110 | 337 | 111 | 326 | 121 | 355 | 10 | 29 |
| Hatherley Lane | 55 | 182 | 50 | 191 | 63 | 266 | 13 | 75 |
| A40 West | 354 | 1084 | 71 | 321 | 97 | 396 | 26 | 75 |
| B4063 | 54 | 120 | 40 | 101 | 53 | 152 | 13 | 51 |

All queue lengths are given in metres

**Table 2-5 - Change in queue lengths – 2017 to 2021 PM (17:00-18:00)**

| Approach | 2017 Base | | 2021 Do-Minimum (Base demand) | | 2021 Do-Minimum | | Difference (Do-Minimum 2021 vs Base demand) | |
|---|---|---|---|---|---|---|---|---|
| | Average | Maximum | Average | Maximum | Average | Maximum | Average | Maximum |
| Fiddler's Green Lane | 88 | 151 | 66 | 136 | 122 | 215 | 56 | 79 |
| A40 East | 123 | 326 | 99 | 273 | 110 | 336 | 11 | 63 |
| Hatherley Lane | 85 | 191 | 74 | 254 | 91 | 300 | 17 | 46 |
| A40 West | 234 | 496 | 78 | 290 | 188 | 676 | 110 | 386 |
| B4063 | 146 | 249 | 87 | 190 | 178 | 405 | 91 | 215 |

All queue lengths are given in metres

Finally, modelled journey times were calculated. As shown in Figure 2-7, these cover the M5 between J10 and J11 and the A40 from Benhall Roundabout to M5 J11, with the journey times, in seconds, summarised in Table 2-6 and Table 2-7. Again, the base signal timings are not well optimised for the traffic conditions. For this reason, the impact of changing the signal timings to the 2021 values is presented before showing the impact of increasing the demand.

Without intervention, the additional demand on the A40 has an adverse impact on journey times in both directions and both peak hours. In the AM peak hour both directions increase by around 50 seconds, while the largest journey time increase is in the eastbound direction in the PM hour, at some 205 seconds.

**Figure 2-7 - Journey time route**

**Table 2-6 - Change in journey time along the A40 – AM peak hour 2017 to 2021**

| Section | | 2017 Base | 2021 Do-Minimum (Base demand) | 2021 Do-Minimum | Difference (Do-Minimum 2021 vs Base demand) |
|---|---|---|---|---|---|
| 1 | SB | 181 | 180 | 175 | -5 |
| | NB | 219 | 209 | 211 | 2 |
| 2 | EB | 362 | 91 | 114 | 23 |
| | WB | 56 | 56 | 56 | 0 |
| 3 | EB | 124 | 115 | 139 | 24 |
| | WB | 162 | 149 | 204 | 55 |
| A40 (2&3) | EB | 486 | 206 | 253 | 47 |
| | WB | 218 | 205 | 260 | 55 |
| **Full route** | **SB** | **668** | **386** | **427** | **41** |
| | **NB** | **437** | **414** | **471** | **57** |

Times are in seconds

**Table 2-7 - Change in journey time along the A40 – PM peak hour 2017 to 2021**

| Section | | 2017 Base | 2021 Do-Minimum (Base demand) | 2021 Do-Minimum | Difference (Do-Minimum 2021 vs Base demand) |
|---|---|---|---|---|---|
| 1 | SB | 177 | 172 | 238 | 66 |
| | NB | 214 | 214 | 215 | 1 |
| 2 | EB | 129 | 97 | 202 | 105 |
| | WB | 56 | 56 | 56 | 0 |
| 3 | EB | 230 | 212 | 312 | 100 |
| | WB | 206 | 113 | 143 | 30 |
| A40 (2&3) | EB | 359 | 309 | 514 | 205 |
| | WB | 262 | 169 | 199 | 30 |
| **Full route** | **SB** | **535** | **481** | **753** | **272** |
| | **NB** | **476** | **383** | **414** | **31** |

Times are in seconds

## 2.5. Summary of identified problems and impact of no intervention

**Table 2-8 - Summary of identified problems and impact of no intervention**

| Challenge | Impact identified |
|---|---|
| Increased journey times on the A40 | Journey times on the A40 are adversely impacted by the increase in demand. In the AM peak hour both directions increase by around 50 seconds, while the largest journey time increase is in the eastbound direction in the PM hour, at some 205 seconds. |
| Population and employment growth | The population of Cheltenham is expected to grow by 9.3% from 2017 to 2041. It is also ageing, with 28.9% of the population expected to be in the 65+ age group by 2040.<br>More housing and jobs will be needed to support this increased population, and the JCS identifies land for an additional 35,175 houses across |

| | |
|---|---|
| | Cheltenham, Gloucester and Tewkesbury. GFirst's SEP identifies a need for nearly 34,000 jobs in Gloucestershire in the period 2014-2022. This development will add to the strain on what is an already-congested road network. |
| Strategic land allocations in the JCS are near the A40 | Most notably the 'West Cheltenham' strategic allocation lies just off the A40 next to GCHQ and a proportion of the traffic from this site would pass through Arle Court Roundabout. While West Cheltenham is not considered to be dependent on the scheme, without intervention this development would only add to the pressure at the junction. |

## 2.6. Objectives of the scheme

In response to these future challenges, GCC has developed a set of key objectives for the Arle Court Roundabout scheme which were reviewed and agreed by GFirst LEP. These objectives also led to the provisional allocations of the funds and are as follows:

- Contribute to accelerating the release of the employment land associated with the 'West Cheltenham' Strategic Allocation along with the other strategic allocations in the JCS adjacent to GCHQ, which includes the proposed Cyber Park and Cyber Innovation Centre;
- Deliver transport benefits to people living and working in Gloucestershire by improving traffic flows on the A40, one of the most important and busiest sections of Gloucestershire's road network;
- Aim to have an overall neutral impact on the Cheltenham Air Quality Management Area (AQMA);
- Maintain and improve the options for sustainable travel modes through the junction and on the approaches; walking, cycling, and where feasible providing for enhanced public transport facilities.

## 2.7. Scheme constraints and dependencies

There are a number of critical scheme design constraints and dependencies for the project, of which the constraints are predominately physical, and the dependencies related to the planning programme and phasing of schemes being implemented.

### 2.7.1. Design constraints

- Maintaining Traffic flow capacity on approaches and around roundabout during works – Requires some restricted hours working with occasional night time working;
- Extensive highly sensitive fibre optic communication services running the full length of A40 and across roundabout serving GCHQ and rapid response police depot;
- Encroachment into A40 Eastbound embankment impacting on slope stability and Comms services (as above);
- Existing sub-standard surface water drainage requiring upgrade for new scheme;
- Interaction with current and ongoing works planned by Highways England using Arle Court roundabout and approach roads as primary diversion route for their works
- Maintaining safe pedestrian access around works – Especially given need to close subway under A40 for structural works
- Maintaining access off Hatherley road to Hotel and food outlets

### 2.7.2. Planning dependencies

Improvements to the operation of the A40 inbound and outbound from Cheltenham are essential to realise the full benefits of the planned Strategic Allocations Sites (West of Cheltenham and NW Cheltenham). At the time of submission, no Strategic Sites have planning permission, and therefore schemes are not directly linked to WCTIS. It is however likely that without the scheme, the scale of development that can be approved would be constrained and the efficacy of any other mitigation measures reduced. There are also Local Planning Applications for smaller development sites in the area. In addition, Highways England has a programme of highways and bridge improvements for the M5, and the scheme at Arle Court Roundabout will have to be sensitive to these changes and the impacts of construction.

It should be noted that the scheme  will be subject to a successful Planning Application.

## 2.8. Scheme selection and option identification

### 2.8.1. Outline Business Case – scheme selection

All phases of the scheme have been evaluated and prioritised through a comprehensive appraisal process, described in the Outline Business Case. This started with an initial assessment of 23 combined options on the corridor to identify those schemes that would be taken forward to the next stage of evaluation. This is summarised in the Outline Business Case. Consideration was given to whether each scheme had the potential to meet the objectives and was deliverable. The criteria used in the assessment is listed below, only those schemes meeting this criterion were taken forward to the next stage of evaluation.

#### Transport Objectives

- Deliver transport benefits to people living and working in Gloucestershire by improving traffic flows on one of the most important and busiest sections of Gloucestershire's road network;
- Neutral impact on the Cheltenham Air Quality Management Area (AQMA); and
- Maintain or improve the options for sustainable travel modes through the junction and on the approaches. Walking, cycling and where feasible providing for enhanced public transport facilities.

#### Deliverability Objectives

- Most suitable for the funding source (LEP);
- Deliverability; and
- Ensuring additional land was not required to avoid extended purchase negotiations.

A priority status was attached to each scheme on the basis of the above criteria for the assessment. This led to the allocation of schemes to be discounted, low, medium or high priority. Only schemes that were identified as high and medium priority – a total of 11 scheme combinations – were taken forward to further detailed assessment.

A detailed assessment was then carried out for these 11 options, assessing them against the core business case criteria listed below:

- Economy;
- Social;
- Environmental impact;
- Verify Deliverability (within LEP time scale of 2021); and
- Indicative Cost.

The scoring is summarised below and Arle Court roundabout was assessed as the highest priority.

**Table 2-9 - Scheme priority assessment**

| | Project | Assessment Cumulative Score |
|---|---|---|
| 1 | Arle Court Roundabout Capacity Improvements | 70.0 |
| 2 | Benhall Roundabout Capacity Improvements | 65.5 |
| 3 | *Staverton Crossroads Capacity Improvements | 65.5 |
| 4 | **M5 Jct 11 South Bound Off Slip Capacity Improvements (May be part funded by HE) | 64.5 |
| 5 | Telstar Way Junction to A40 Improvements | 63.5 |
| 6 | A40 Eastbound - Widening M5 J11 to Arle Court, upgrade Westbound access to Park & Ride | 61.0 |
| 7 | Telstar Way Capacity Improvements | 60.5 |
| 8 | A40 Eastbound Telstar Way Junction to Benhall Roundabout Capacity Improvements | 59.0 |
| 9 | A40 Eastbound Benhall Roundabout to Esso Garage Capacity Improvements | 57.5 |
| 10 | *** Tewkesbury Road (A4019) Capacity Improvements (May be funded by Developers) | 56.5 |
| 11 | A40 Eastbound Arle Court Junction to Telstar Way Junction Capacity Improvements | 52.5 |

* Staverton Crossroads Capacity Improvements could be subject on another LEP funding stream and is affected by a Highways England cycleway scheme which runs through this junction.

** Highway England are developing a scheme through their VM process but decisions on preferred options will not be available in time for the proposed package.

*** The Tewkesbury Road scheme could be developer funded.

The process above therefore fully justifies Arle Court Roundabout as being central to any highway improvements in the area and led to this scheme being taken forward to more detailed option testing through a highways traffic model (PARAMICS). A modelling technical note and validation report (Appendix A and Appendix C) was produced to document the audit and review carried out on the of M5 Junction 11 and 12 Paramics Discovery Model developed by Amey/Jacobs. The purpose of the Paramics model review is to ensure that the model had been coded and developed to an acceptable standard prior to further modelling of the proposed schemes on the A40 and M5 in Gloucester. Further network modelling sensitivity testing was carried out to understand how the proposed changes to Arle Court Roundabout in Phase 1 of the scheme may be improved, and to test two alternative options to the existing Do Something model coded by Amey/Jacobs.

Each phase of the WCTIS Package will be modelled cumulatively, whereby the model viewed the Arle Court roundabout in isolation.

As described in the Forecasting Report produced by Jacobs (Appendix B), the Paramics model was developed on behalf of Highways England to test development impact and to undertake a scheme testing on the strategic road network. The model covers the West of Cheltenham and North of Gloucester.

The modelled area covers motorway sections including M5 Junction 10 and Junction 11, the A40 from Gloucester to Cheltenham, a section of the A38 (between the A40 and A4019) and the west of Cheltenham town centre (west of the rail line). The model has been developed using Version 19 of the Paramics Discovery software; and the model represents 2017 for the Base Year, as detailed in the Jacobs Paramics Validation Report (Appendix C). The modelled years are 2021 and 2031. Jacobs decided to use the NTEM growth factors for forecasting the future car demands from 2017 base demand.[7]
District level factor was applied to the relevant zones. However, National traffic model (NTM) forecast growth

[7] On chapter 7, section 7.1. an evaluation of the use of NTEM district level growth factors is presented. This resulted in defining a new approach to representing the forecast demand utilised in the forecast modelled years.

was used for LGV and HGV. It should be noted the NTEM factors were adjusted with income and fuel factors as per WebTAG unit M4 7.4.13

The modelled periods cover the peaks in traffic flows observed on site;

- AM Weekday Peak Period: 07:00-10:00
- PM Weekday Peak Period: 16:00-19:00

### 2.8.2. Traffic modelling – option identification

A number of different designs have been tested in the model, before arriving at the design being taken forward in this FBC. The original scheme tested is known as Do Something 1 (DS1), with additional lanes on the A40 approaches and a new bus only slip road providing access/egress directly between the Park and Ride site and the A40 westbound. While successful at addressing the issues on the A40, it was found to experience severe congestion on the Hatherley Lane northbound approach to the Arle Court Roundabout. This resulted in a high number of unreleased vehicles in both the AM and PM peaks from nearby zones, including the P&R users and Golden Valley Retail Park, shown in Figure 2-8 below. Opening the new westbound slip at the P&R site to all traffic would not be straightforward due to a need to prevent non-P&R traffic from using the site as a main route to the M5. Therefore, two additional options were assessed to investigate whether these could further improve queueing and journey times at Arle Court Roundabout. The DS1 layout at Arle Court Roundabout is shown in Figure 2-9, but with the addition of the second lane on Hatherley Lane southbound.

**Figure 2-8 - DS1 2031 PM Peak (18:00)**

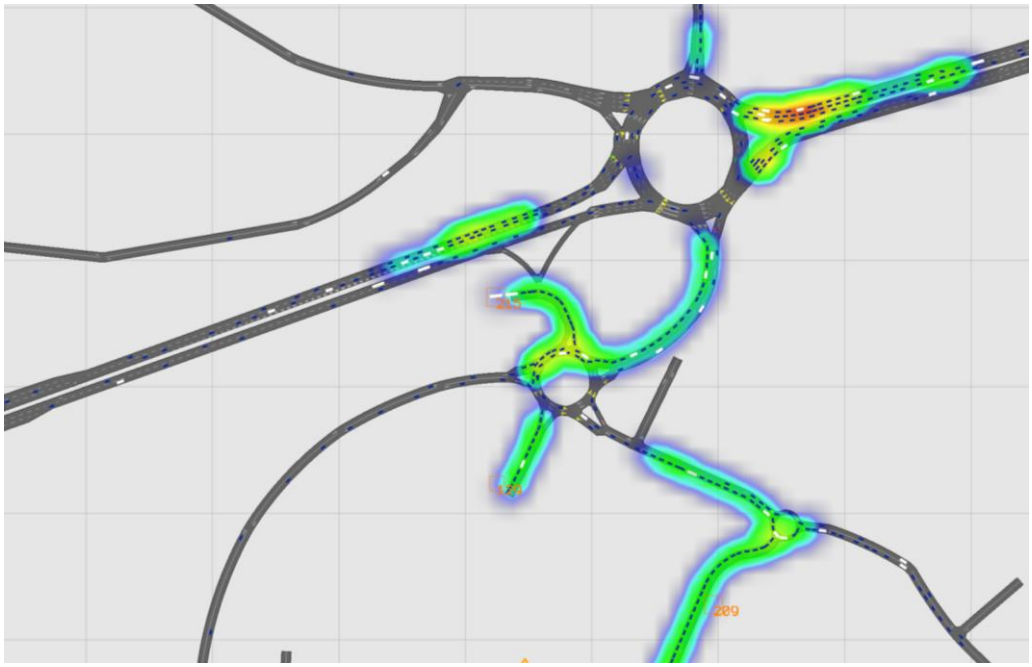
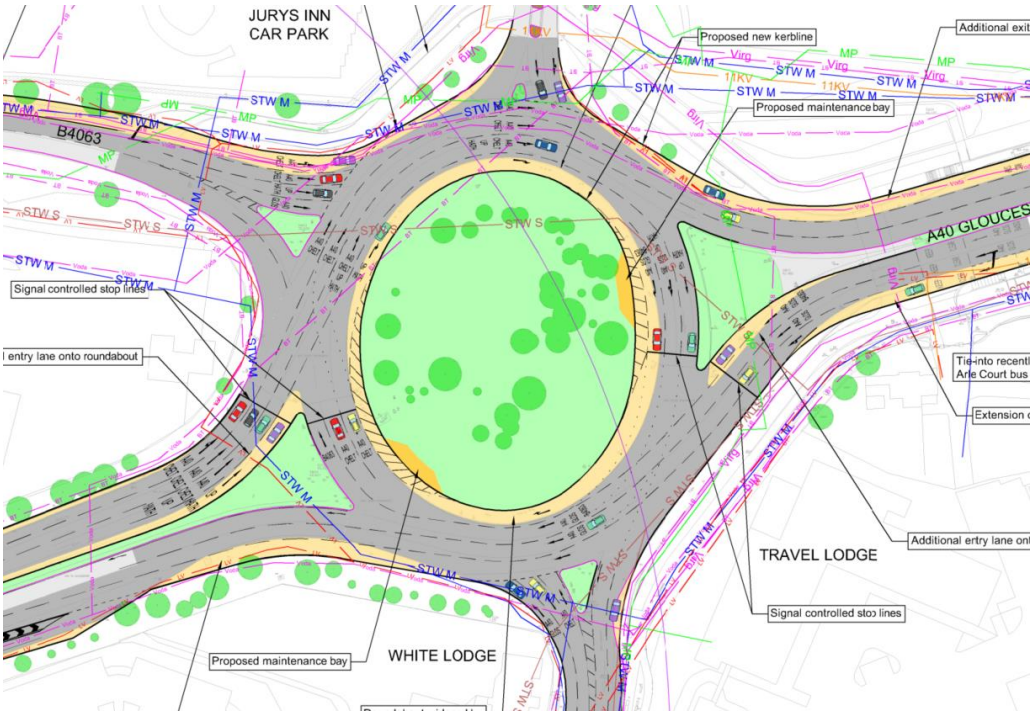


**Figure 2-9 - DS1 Arle Court Roundabout Layout**




The two additional options were:

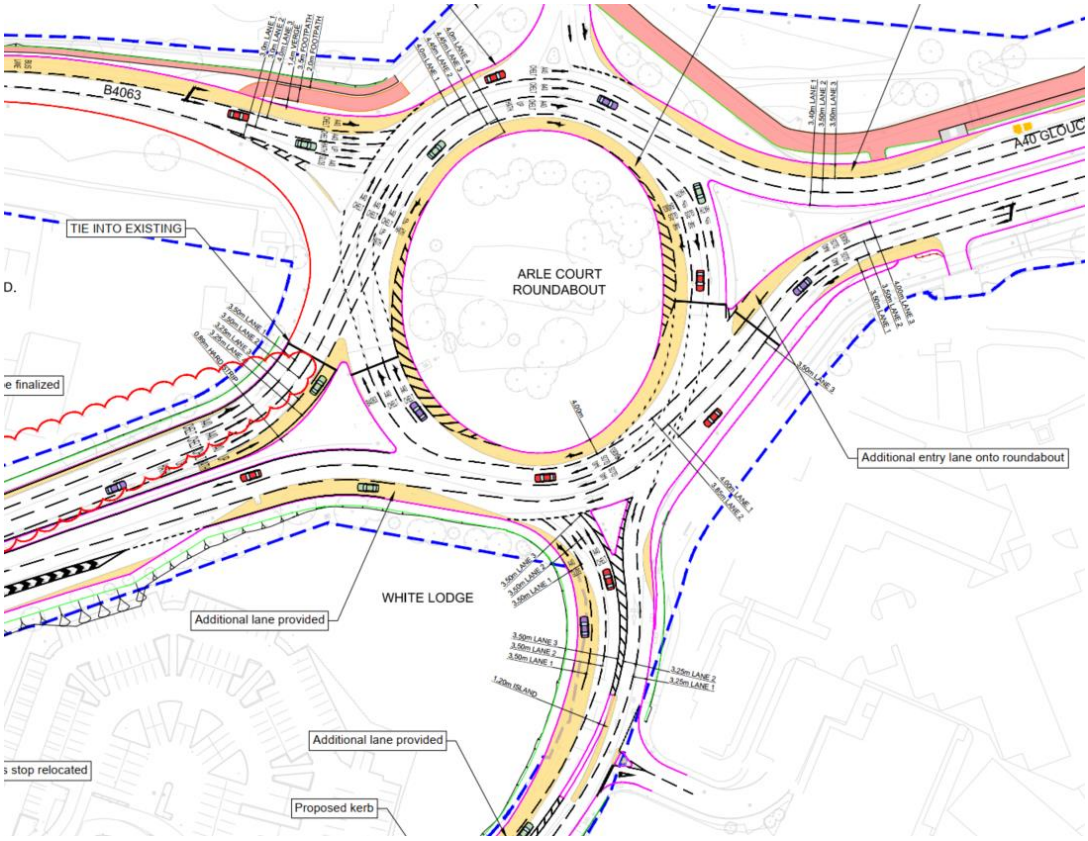
- Do Something 2 (DS2) – an identical network to the DS1 model, with changes only to the lane allocations of the Hatherley Lane approach arm to the Arle Court Roundabout, allowing the left turn from the middle lane towards the A40 westbound, shown in Figure 2-10 below.

**Figure 2-10 - Changes to DS2 Hatherley Lane approach allocations**


- Do Something 3 (DS3) – the DS2 Hatherley Lane option shown in Figure 2-10, but with the third rightmost lane on the Hatherley Lane approach arm extended back to allow further queueing capacity, shown in Figure 2-11. This may help to alleviate traffic and queueing at Arle Court, particularly in the PM peak.

The option also means that land will have to be bought to facilitate this extension of Hatherley Lane, which opens the opportunity to use this land for the site compound during construction and could be used to extend the P&R site in the future, to mitigate air quality impacts.

**Figure 2-11 - DS3 Option for the Arle Court Roundabout**




DS3 was found to dramatically reduce queueing on the Hatherley Lane arm of the roundabout, with minimal adverse impacts on the other arms. Moreover, the fact that it included land for a site compound meant that it was more easily deliverable than the alternatives. It was therefore taken forwards as the preferred option for the scheme.

## 2.9. Scheme impacts and outcomes

### 2.9.1. Journey times

Modelled journey times along the A40 were calculated for both the Do-Minimum and Do-Something 3 forecast models. As shown in Figure 2-7, these cover the M5 between J10 and J11 and the A40 from Benhall Roundabout to M5 J11, with the journey times, in seconds, summarised in Table 2-10 and Table 2-11. With the scheme, there are reductions in journey times in both directions and both time periods on the A40. The largest improvement is in the westbound direction in the AM peak hour, at 95 seconds, and in the eastbound direction in the PM peak hour, at 198 seconds.

**Table 2-10 - Scheme impact on journey time along the M5 and A40 – AM peak hour 2021**

| Section | | 2021 Do-Minimum | 2021 Do-Something 3 | Difference |
|---|---|---|---|---|
| 1 | SB | 175 | 177 | 2 |
| | NB | 211 | 210 | -1 |
| 2 | EB | 114 | 91 | -23 |
| | WB | 56 | 61 | 5 |
| 3 | EB | 139 | 135 | -4 |
| | WB | 204 | 104 | -100 |
| A40 (2&3) | EB | 253 | 226 | -27 |
| | WB | 260 | 165 | -95 |
| **Full route** | **SB** | **427** | **403** | **-24** |
| | **NB** | **471** | **374** | **-97** |

Times are in seconds

**Table 2-11 - Scheme impact on journey time along the M5 and A40 – PM peak hour 2021**

| Section | | 2021 Do-Minimum | 2021 Do-Something 3 | Difference |
|---|---|---|---|---|
| 1 | SB | 238 | 181 | -57 |
| | NB | 215 | 215 | - |
| 2 | EB | 202 | 124 | -78 |
| | WB | 56 | 61 | 5 |
| 3 | EB | 312 | 192 | -120 |
| | WB | 143 | 95 | -48 |
| A40 (2&3) | EB | 514 | 316 | -198 |
| | WB | 199 | 156 | -43 |
| **Full route** | **SB** | **753** | **497** | **-256** |
| | **NB** | **414** | **371** | **-43** |

Times are in seconds

### 2.9.2. Queue lengths

The scheme is forecast to reduce queue lengths on all arms of Arle Court Roundabout, with the impact modelled in 2021 summarised in Table 2-12 and Table 2-13. In the AM peak hour, average queue lengths on both A40 approaches reduce by more than 40m, while in the PM peak hour, the average queue length on the A40 west approach reduces by 101m. These reductions offset the forecast issues on the approach without intervention (Table 2-4 and Table 2-5). The average queue lengths on the B4063 and Fiddler's Green Lane approaches also reduce substantially, with the largest decrease of all being on the B4063 in PM at 134m, indicating that improvements in the operation of the A40 approaches do not come at the expense of the other, unsignalised arms of the roundabout. Maximum queue lengths also decrease, with the maximum queue length on the A40 West arm reducing by some 362m in PM. This suggests that the operation of the junction is more reliable with the scheme.

**Table 2-12 - Scheme impact on queue lengths - 2021 AM (08:00-09:00)**

| Approach | Do-Minimum | | Do-Something 3 | | Difference | |
|---|---|---|---|---|---|---|
| | Average | Maximum | Average | Maximum | Average | Maximum |
| Fiddler's Green Lane | 92 | 194 | 32 | 56 | -59 | -137 |
| A40 East | 121 | 355 | 72 | 217 | -49 | -138 |
| Hatherley Lane | 63 | 266 | 46 | 131 | -17 | -136 |
| A40 West | 97 | 396 | 55 | 209 | -42 | -187 |
| B4063 | 53 | 152 | 42 | 86 | -11 | -66 |

All queue lengths are given in metres

**Table 2-13 - Scheme impact on queue lengths - 2021 PM (17:00-18:00)**

| Approach | Do-Minimum | | Do-Something 3 | | Difference | |
|---|---|---|---|---|---|---|
| | Average | Maximum | Average | Maximum | Average | Maximum |
| Fiddler's Green Lane | 122 | 215 | 45 | 76 | -77 | -139 |
| A40 East | 110 | 336 | 71 | 221 | -39 | -115 |
| Hatherley Lane | 91 | 300 | 45 | 120 | -46 | -180 |
| A40 West | 188 | 676 | 85 | 314 | -103 | -362 |
| B4063 | 178 | 405 | 44 | 78 | -134 | -327 |

All queue lengths are given in metres

### 2.9.3. Traffic flows

The impact of the scheme on traffic flows in the AM peak hour in 2021 is shown in Figure 2-12. The most significant change is an increase in flow along the A40 through the junction westbound with an additional 85 vehicles on the approach.

In the PM peak hour (Figure 2-13), there are increases on all of the approaches to the roundabout, totalling around 250 additional vehicles. This reflects the fact that more traffic is able to pass through the junction with the increased capacity. The biggest increase is on the eastbound approach, at 107 vehicles, providing further evidence of the tidal impact of the scheme. There are also increases on the B4063 and Fiddler's Green Lane approaches of 79 and 48 vehicles respectively, showing that the increased flow in the junction is not to the detriment of the unsignalised arms. Finally, the two-way flow on Hatherley Lane, which benefits from an additional lane with the scheme, increases by 80 vehicles.

**Figure 2-12 - Scheme impact on traffic flows, in vehicles - 2021 AM (08:00-09:00)**

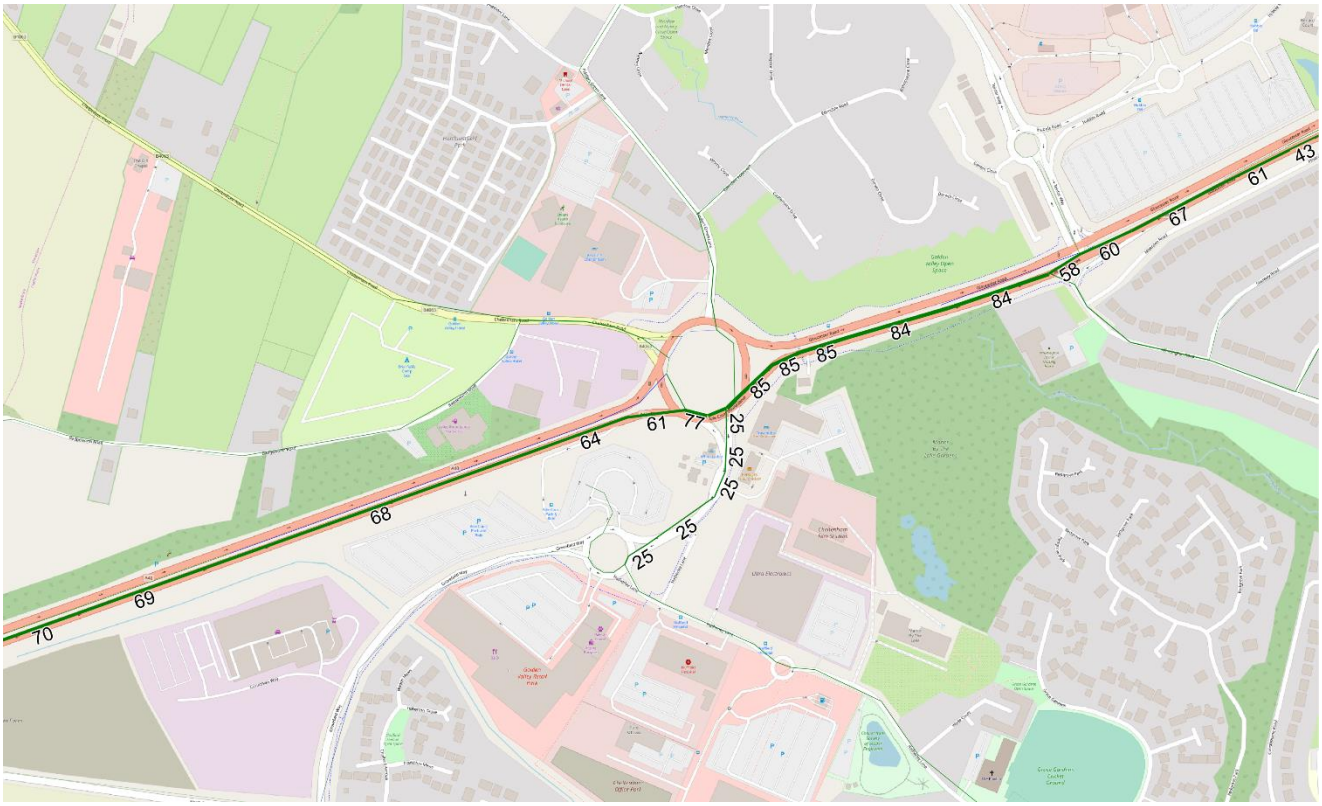
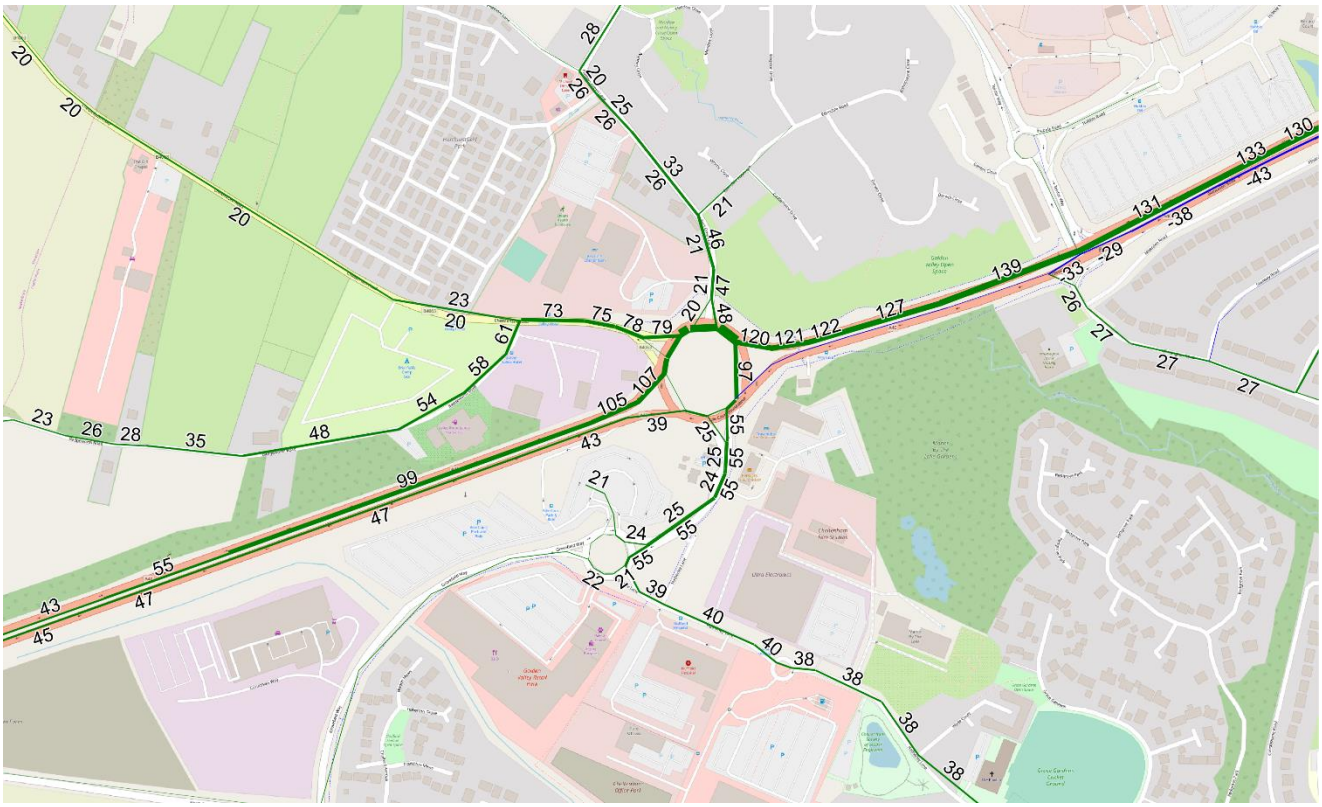



**Figure 2-13 - Scheme impact on traffic flows, in vehicles - 2021 PM (17:00-18:00)**



### 2.9.4. Summary of scheme impacts and outcomes

A summary of scheme impacts is presented in Table 2-14, which demonstrates that the scheme will achieve all the scheme objectives.

**Table 2-14 - Summary of scheme impacts on transport objectives**

| Transport objectives | Summary of forecast scheme impacts |
|---|---|
| Contribute to accelerating the release of the employment land associated with the 'West Cheltenham' Strategic Allocation along with the other strategic allocations in the JCS adjacent to GCHQ, which includes the proposed Cyber Park and Cyber Innovation Centre | Improving connectivity between west Cheltenham and the SRN makes the area a more attractive place to invest and will increase demands to accelerate the release of employment land. The scheme will improve connectivity through reduced queue lengths and journey times, and increased traffic flow enabled by an increase to capacity.<br>• Queue lengths reduce on all arms of Arle Court Roundabout, and in both of the modelled hours.<br>• Journey times improve in both directions on the A40. The largest improvement is in the westbound direction in the AM peak hour, at 95 seconds, and in the eastbound direction in the PM peak hour, at 198 seconds.<br>• Traffic flows increase on all arms of the junction, especially the A40, reflecting the fact that more traffic is able to pass through with the increased capacity. |
| Deliver transport benefits to people living and working in Gloucestershire by improving traffic flows on one of the most important and busiest sections of Gloucestershire's road network | Monetised Transport Economic Efficiency of £105.0m in 2010 prices and values (Table 3-9in the Economics chapter). |
| Aim to have an overall neutral impact on the Cheltenham Air Quality Management Area (AQMA) | The air quality assessment indicates that the scheme would not result in any new exceedances of AQS objectives or worsening of existing exceedances. No additional air quality mitigation for the operational phase of the scheme is therefore required (see section 3.3.6). |
| Maintain and improve the options for sustainable travel modes through the junction and on the approaches; walking, cycling, and where feasible providing for enhanced public transport facilities. | The scheme provides for enhanced public transport facilities, including:<br>• a bus lane on the B4063 approach, improving the reliability of journey times for bus services using this road;<br>• an additional lane on the Hatherley Lane approach, improving egress from the P&R site for users and encouraging increased take-up of the service; and<br>• a bus-only slip road from the P&R site to the A40 westbound, bypassing Arle Court Roundabout. This provides a more direct – and uncongested – route for buses to leave the site.<br>• Incorporating improved cycle facilities on the B4063 and Hatherley Lane with a shared footway/cycleway to be provided alongside improved cycle crossing improvements |

The scheme will also contribute towards a selection of the "Enablers for Growth" from the SEP, as detailed in Table 2-15.

**Table 2-15 - Summary of scheme contribution to SEP Enablers for Growth**

| Enabler for Growth | Summary of forecast scheme impacts |
|---|---|

| | |
|---|---|
| Transport Projects – reducing congestion pinch points including the A40 from west of Gloucester through to Cheltenham town centre | The scheme is forecast to reduce queue lengths and increase flow on all arms of Arle Court Roundabout, the principal pinch point on the A40 into Cheltenham. These reductions offset the forecast issues without intervention. |
| A40 Regeneration Areas – Improving Connectivity and Resilience | The scheme will improve connectivity between the M5 and west Gloucestershire, including key regeneration areas such as the Forest of Dean. |

# 3. Economic Case

## 3.1. Overview

The proposed scheme aims to increase the capacity of Arle Court Roundabout to alleviate the existing issues at the junction and go some way to mitigate the impact of the expected increase in demand which will be caused by development directly relying on this network.

The scheme is expected to produce Present Value Benefit (PVB) of £104.14m over the 60-year appraisal period (2021 - 2080), principally as a result of travel time savings (£100.78m) but also vehicle operating costs benefits of £4.26m and change in Government Indirect Tax of £-1.53m.

The total scheme construction costs expressed as a Present Value of Costs (PVC) is £7.74m.

Overall assessment of costs and benefits generated by the project shows that the scheme achieves a **Benefit Cost Ratio figure of 13.45** with a Net Present Value (NPV) of approximately £96.34m. The scheme can be therefore categorised as achieving **very high value for money** in the classification provided by DfT.

The sensitivity analysis carried out informs that on the optimistic scenario, where demand is expected to grow until 2031 levels in line with forecasting report prepared by Jacobs (Appendix B), the NPV reaches £336m, resulting in a BCR of 44.49.

The Social and Distributional impacts assessment informs that the scheme has a neutral impact overall to air quality and noise, as there is no significant impact to income quintiles 1-3 or 5.

## 3.2. Methodology

### 3.2.1. Modelling

The modelling for the economics was based on the Paramics model described in section 2.8 and covered two scenarios (Do Minimum and Do Something 3) in two forecast years (2021 and 2031).

The Do Minimum scenario consists of the base network with changes at just one junction. This is to reflect the recent changes made to the A40 / Telstar Way / Whittington Road junction which have been implemented since the development of the base model.

The Do Something 3 network consists of the Do Minimum network with improvements implemented at Arle Court Roundabout as per the Jacobs Forecasting Report and changes documented in Section 2.8.2.

Following the review of the Amey/Jacobs models documented in Appendix A, minor changes to the coding of the Base, Do Minimum and Do Something 3 model networks were applied. These were considered to have a significant impact on forecast year network statistics, and therefore results. Full detail of the changes made can be found in Section 2.8 of Appendix A.

#### 3.2.1.1. Compatibility with Economic Appraisal

To quantify the economic impacts, the Paramics models were converted into ones suitable for producing outputs for economics analysis. Table 3-1 lists the parameters defined by Systra which are essential to undertaking fixed trip matrix economic assessments.

**Table 3-1 - Paramics and TUBA Parameters**

| Parameter | Setting / Comment |
|---|---|
| Seed Value | It is essential to undertake both the Do Minimum and Do Something model runs using the same random seed values in each case. This ensures consistency of the number of trips released and in their modelled characteristics. |
| Preserve Choice | The “preserve choice” option must be toggled on in all models. This ensures consistency of release link within a zone where multiple options exist. |

| Parameter | Setting / Comment |
|---|---|
| Simulation Time | The simulation must be run for long enough to ensure that all trips that are released between 07:00 and 19:00 complete their journey and are recorded in the outputs. |

New Base, Do Minimum and Do Something (DS3), Paramics models were therefore set up following these settings, whilst keeping the original models separate for other forms of analysis. Additionally, with regards to the simulation time parameter, it was decided to carry out a total of 30 runs for the 2021 models and 40 runs for the 2031 models, with an extra cool-down hour without demand. This was to ensure that there are enough model runs where the additional simulated traffic during the AM and PM peaks was able to completely leave the network over the modelled period.

The runs were further filtered by removing those where the mean difference in distance and travel time from the average exceeded 15% for the 2031 models and 10% for the 2021 and Base models. This was to remove runs which experienced extreme changes from the average and were therefore potentially skewing the results. A list of the runs removed during this process is shown in Table 3-2.

**Table 3-2 - Count and Seed Values of the Paramics Model Runs Removed During the Filtering Process**

| Model | Year | Count | Seed Value(s) | Count | Seed Value(s) |
|---|---|---|---|---|---|
| *Base* | 2017 | 3 | 7, 12, 30 | 8 | 1, 15, 16, 18, 20, 22, 26, 29 |
| Do Minimum | 2021 | 0 | - | 6 | 1, 10, 14, 15, 16, 21 |
| | 2031 | 0 | - | 13 | 3, 4, 8, 9, 10, 12, 16, 20, 24, 29, 30, 32, 37 |
| Do Something 3 | 2021 | 2 | 5, 6 | 0 | - |
| | 2031 | 2 | 4, 13 | 8 | 1, 4, 6, 8, 16, 25, 26, 32 |

Despite the same demand matrices being used across the DM and DS3 models, and due to how Paramics assigns trips, there are occurrences where a trip may occur for a particular Origin-Destination (OD) movement in one model and not the other. For TUBA modelling, these OD pairs need to be consistent across all modelled years for the AM and PM peaks separately, else TUBA flags a serious warning. Therefore, the model outputs were filtered across the years for the AM and PM peaks individually to contain only OD pairs which occurred across the Base, DM and DS models. The difference between the unfiltered demand and the final demand appraised is considered to be insignificant in the context of this study, see Table 3-3 below.

**Table 3-3 – Difference and Proportion of Demand Filtered from the 2017, 2021 and 2031 Matrices**

| Time | Demand Year | Unfiltered Total | Filtered Total | Difference | % Difference |
|---|---|---|---|---|---|
| AM (08:00 – 09:00) | Base (2017) | 27168 | 27114 | -54 | -0.20% |
| | 2021 | 28622 | 28566 | -56 | -0.20% |
| | 2031 | 31503 | 31442 | -60 | -0.19% |
| PM (17:00 – 18:00) | Base (2017) | 27565 | 27408 | -157 | -0.57% |
| | 2021 | 28861 | 28696 | -165 | -0.57% |
| | 2031 | 31678 | 31497 | -181 | -0.57% |

### 3.2.2. Estimation of Costs

The scheme capital costs have been estimated as £9.23m (2019 prices) see table below. A risk adjustment has been included which amounts to £1.47m (2019 prices). Table 3-4 displays the breakdown of the capital costs of the scheme in 2019 prices.

**Table 3-4 – Capital cost of the Arle Court scheme**

| Project Cost Components | Capital Cost Items | Cost Estimate Status* | Costs by year (£) | | | | Totals |
|---|---|---|---|---|---|---|---|
| | | (O/P/D/T) | Year of Estimate: | | | | |
| | | | 2018/19 | 2019/20 | 2020/21 | 2021/22 | |
| Design & Management | Design fees, Surveys and trial holes, Land Purchase | P | £422,767 | £2,112,000 | £588,000 | £20,000 | £3,142,767 |
| Construction including Traffic-Related Maintenance | Non-Routine Re-construction | P | - | £813,000 | £3,810,000 | - | £4,623,000 |
| | Site clearance, Diversions of Statutory services. Widening and re-Surfacing of carriageway. | | | | | | |
| Contingency | Risk Adjustment | P | - | £585,000 | £880,000 | - | £1,465,000 |
| Indirect Tax | Non-Recoverable VAT (if applicable) | - | - | - | - | - | - |
| Total Cost | (NB – Base cost + 3% inflation) | P | £422,767 | £3,510,000 | £5,278,000 | £20,000 | £9,230,767 |

*O = Outline estimate, P= Preliminary estimate, D = Detailed estimate, T = Tender price

### 3.2.3. Maintenance Costs

The BCR has been calculated using capital costs only. To cover two surface treatments and a surface course resurfacing, the cost of the ongoing maintenance is estimated as £23.20 per $m^2$. Over a 30-year design life this would equate to £0.77 per $m^2$ per year. The scheme will construct additional carriageway area of 4000 $m^2$. The additional maintenance liability would therefore equate to £3,080 per year and GCC will include for this in maintenance budgets, and therefore does not impact on the budget and LEP funding for the Scheme. Therefore, operation and maintenance costs will be negligible for calculating the BCR.

### 3.2.4. Economic Appraisal Approach

Economic assessment compares the monetised costs and benefits of the proposed scheme against the alternative without scheme scenario. It also considers non-monetised impacts to provide a broad view of the scheme performance beyond that captured in the BCR.

The Economic Assessment for this scheme was carried out using standard procedures and economic parameters as defined by TAG Unit A1 – Cost Benefit Analysis.

The results from the different elements of the economic assessment are presented in TEE, PA and AMCB tables. The following key economic statistics are used to demonstrate the case for the scheme:

- The PVB (Present Value of Benefits) represents the total monetised benefits from the scheme, including the impact of the scheme on central government indirect tax revenues, discounted to 2010 prices and values;
- The PVC (Present Value of Costs) represents the total scheme investment and maintenance costs;
- The NPV (Net Present Value) represents the absolute difference between the PVB and PVC; and
- The BCR is the ratio of PVB to PVC and represents the scheme's overall value for money.
- The Appraisal Summary Table (AST) helps to summarises all the monetised, qualitative and quantitative impacts of the scheme.

## 3.2.5. Software used for the Appraisal

TUBA (Transport Users Benefit Appraisal) software (version 1.9.13) was used in this appraisal. This version incorporates the latest values set out in the DfT WebTAG data book (version v1.12) published in May-2019. This software has been produced by the DfT to carry out transport scheme economic appraisals using a 'willingness to pay' approach with fixed or variable demand. As noted, the economic impacts of a scheme are derived by comparing the future year situation with the scheme (Do Something scenario) to the situation without the scheme (Do Minimum).

## 3.2.6. TUBA Modelling Assumptions

An economic assessment to facilitate the quantification and monetisation of scheme costs and benefits is undertaken over a 60-year economic appraisal period in accordance with the requirement of TAG Unit A1.1. Economic assessment results are presented in the form of Transport Economic Efficiency (TEE), Public Accounts (PA), and Analysis of Monetised Costs and Benefits (AMCB) tables. The results are also input to an Appraisal Summary Table (AST) and combined with qualitative assessments which demonstrate overall VfM.

The following sections provide details of how the various elements of the Paramics transport model outputs have been used within the TUBA economic assessment to conduct the economic appraisal.

### 3.2.6.1. Time Periods

The Paramics model was developed for a base year of 2017. This model has been used to develop forecast models for 2021, which corresponds to the scheme opening year, and 2031 forecast years for a Do Minimum scenario and a Do Something scenario.

Models have been developed for AM and PM peak periods, which cover:

- AM Peak: 0700 to 1000
- PM Peak: 1600 to1900

For input into TUBA, outputs were taken from the model in the peak hours:

- AM Peak: 0800 to 0900 hours
- PM Peak: 1700 to 1800 hours

Although 3-hour demand matrices were assigned using 3-hour average demand profile, the first and the last hours acted as the warm up period and cooling off period respectively.

### 3.2.6.2. Demand

Three matrix levels, one for car, one for LGV's and one with a combination of OGV1 and OGV2 are included within the model:

- Matrix Level 1 = Car (100%)
- Matrix Level 2 = LGV (100%)
- Matrix Level 3 = HGV with split of OGV1 (50%) and OGV2 (50%)

Accordingly, the Paramics model has produced demand, time and distance skims/matrices required for TUBA assessments for three user classes only namely for Car, LGV and HGV.

#### 3.2.6.3. Derivation of Annualisation Factors

Annualisation factors are used to scale-up the modelled hours to represent traffic in peak periods throughout the year. In line with the calibration and validation methodology and in order to guarantee accuracy in the economic analysis, only demand of the AM peak hour of 0800-0900 and the PM peak hour of 1700-1800 were used in the economic analysis. To obtain annualisation factors, a comparison analysis of single hour demand to the overall 3-hour demand for the AM and PM peaks was carried out. Based on this analysis the peak hour to peak period expansion factors were derived as:

- AM Peak: 2.64
- PM Peak: 2.76

Using this expansion factor, the derived annualisation factors are as follows:

- Weekday AM Peak – 668
- Weekday PM Peak – 698

Note: Number of weekdays was considered 253 days (365 total days in a year, reduced by 104 weekend days and 8 Bank Holidays)

#### 3.2.6.4. User Classes and Journey Purposes

As explained in the previous section, the demand matrices have been taken from the M5 Junction 11 and 12 Paramics Discovery Model developed by Amey/Jacobs that disaggregates the demand by purpose in three user classes. These three user classes have been further segregated into following seven user classes as per WebTAG guidelines as required for the TUBA economic appraisal:

- Car Commuting;
- Car Business;
- Car Other;
- OGV1;
- OGV2;
- LGV Personal; and
- LGV Freight.

The Car user class was disaggregated using TUBA default purpose splits defined in the economics file[8]. The LGV user class was disaggregated into LGV Personal and LGV Freight using the WebTAG Data Book Table A1.3.4, giving a default proportional split of 12% for LGV Personal and 88% for LGV Freight. The HGV user class was disaggregated into 50% of OGV1 and 50% of OGV2 using the original split of matrix level 3 used in the M5 Junction 11 and 12 Paramics Discovery Model developed by Amey/Jacobs.

#### 3.2.6.5. Travel Time Savings

Travel time savings are calculated using the ‘rule of a half’ applied to generalised time skims from the Traffic Model. Since there are no modelled tolls, and parking costs are not included in the M5 Junction 11 and 12 Paramics Discovery Model developed by Amey/Jacobs, generalised time equates solely to in-vehicle time.

Travel times in the traffic model are represented in seconds. These have been converted to vehicle hours and annualised for each time period, so that annual travel time savings can be calculated.

Annual time savings are calculated for each modelled year by comparing the DS and DM time skims extracted from the Paramics model. Benefits for non-modelled years are calculated via linear interpolation between modelled years, and flat-line extrapolation beyond the final modelled year. However, the impact of discounting on estimated benefits means that the benefits ‘curve’ declines towards the end of the appraisal period.

Default economic assumptions have been applied, as contained in the TUBA software (v1.9.12) and based on the guidance contained in the DfT WebTAG data book (version v1.11.1) published in November-2018.

#### 3.2.6.6. Vehicle Operating Cost Savings

Vehicle operating costs (VOCs) are calculated for both fuel and non-fuel elements of the journey, based on formulae set out in the DfT’s WebTAG guidance. The ‘rule of a half’ formula is broadly applied as for travel

[8] TUBA default purpose splits are based on WebTAG Data Book Table A 1.3.4.
Default purpose split: for AM Peak 16.5% Car Business, 44.1% Car Commute and 39.4% Car Other, while for PM Peak 11.8% Car Business, 41.3% Car Commute and 46.9% Car Other.

times, but with vehicle operating costs being based on distance travelled (vehicle-kilometres) and average vehicle speeds. The change in distance travelled as the result of the scheme is measured by comparing the Paramics model skim matrices values in DM and DS. Additionally, the average network speed for each scenario is derived from the time and distance Paramics skim matrices and the change is then measured by comparing the DM and DS values.

All assumptions relating to fuel costs, duty and vehicle efficiency are those contained in the default TUBA economics file. The same annualisation factors as defined above are applied to derive VOC benefits.

### 3.2.7. Present Value of Costs

The scheme construction costs have been estimated by the engineering team. These include the results of a quantified risk assessment (rather than Optimism Bias) and the effects of construction price inflation, as presented in section 3.2.2.

To convert the costs to Present Value Costs (PVC), the following adjustments have been applied:

- Values converted into 2010 prices;
- Real inflation added (i.e. Tender Price Index or Retail Price Index depending on the cost type less background inflation);
- Optimism bias was considered at 15%. As scheme costs are based on an estimation stage prior to the detailed design, an optimism bias of 15% to the total costs was applied, in line with guidance set out in DfT TAG unit A1-2.
- Conversion to market prices (using a factor for the average rate of indirect taxation in the economy of 1.19); and
- Discounting to 2010 at 3.5% per annum.

## 3.3. Environment

A high-level proportionate assessment has been conducted to gauge the environmental sensitivity of the scheme, providing information on environmental features and impacts within a 2km search area. Suggested mitigation measures and further studies required to limit these impacts that can be implemented as the scheme progresses are also provided where impacts are assessed to be significant.

### 3.3.1. Biodiversity

A desktop assessment and extended Phase 1 Habitat Survey were conducted in 2018. In addition, Atkins have undertaken a Preliminary Ecological Appraisal (PEA) of the Scheme in September 2019, as well as further bat surveys of the buildings. It is therefore important to note that this summary is based on incomplete survey information and, as a consequence, may not identify all of the biodiversity issues associated with the scheme.

The desktop survey found two statutory sites within 2km of the works required to deliver the transport scheme: Badgeworth Site of Special Scientific Interest (approximately 900m to the South) and Griffith Avenue Local Nature Reserve (approximately 1.4km to the east). There should be no impact from the Phase 1 Scheme on any statutory or non-statutory sites.

There are a range of habitats within and adjacent to the Scheme footprint. These are generally low-value areas of scrub, hedgerow, and grassland. The Scheme will impact upon these areas.

Several of the trees within the Scheme area and the properties and trees proposed to be demolished within the construction compound (White Lodge and Pine Lodge property area) have been assessed as having potential for roosting bats. Atkins has completed Preliminary Roost Assessments and Ground Level Tree Assessments for all trees and structures within the White Lodge and Pine Lodge property area to identify their suitability for bat roosts. All the trees were assessed as having low or negligible roost potential. All the buildings were also assessed as having low or negligible bat roost potential except for White Lodge House, which was assessed as having moderate bat roost potential. Further bat surveys have been scheduled to determine the presence or likely absence of any bat roosts with the buildings assessed as having low or moderate bat roost potential. If any bat roosts are identified, further surveys may be required to determine roost status. Bats and their roosts have legal protection and a licence would have to be obtained from Natural England to permit demolition of any structure(s) containing a bat roost. Appropriate mitigation, such as restrictions to timing of demolition and provision of alternative roost habitat, would also likely be required.

It is recommended that as many of the mature trees in the garden at White Lodge are retained as possible and that all trees categorised as having ‘low’ bat roost potential are re-surveyed immediately prior to felling of the

tree. Where trees are not removed, there is a potential for the works to impact on any bat roosts indirectly through noise, vibration and light pollution.

There are multiple ponds within 500m of the Scheme, including the pond within the garden of White Lodge. The Atkins PEA will determine the number and location of ponds within 500m of the Scheme and assess the risk of impacts to great crested newts (GCN). Given the location and extent of works, it is anticipated that a precautionary method of working (including measures such as pre-works checks for GCN and habitat manipulation) would be appropriate mitigation. However, it should be noted that if the survey considers there to be a high chance of impacting on GCN or their habitat during the works, further surveys during March to June 2020 may be required and a licence may need to be applied for from Natural England. This could potentially impact on the construction programme.

There are areas of scrub within the works that are suitable for the commuting, foraging, or resting of other amphibians and reptiles such as common frog, common lizard and grass snake. The removal of the scrub could have an impact on the habitats of these notable species. A precautionary working method would be advised as mitigation to protect any reptiles (which are protected by UK law from killing and injury) or amphibians present during site clearance.

There are areas of vegetation that are suitable for nesting birds. All UK wild birds and their nests are protected under the Wildlife and Countryside Act 1981. Any removal of vegetation suitable for nesting birds during the nesting season (typically March to August inclusive in southern England) will require a nesting bird check 24-48 hours prior to removal.

The Atkins PEA and further bat surveys will identify the need for any further ecological field surveys prior to commencement of works to ensure findings are complete and up to date and mitigation is appropriate.

### 3.3.2. Water environment

Hatherley Brook, a main river, runs beneath the A40 Gloucester Road, to the east of the centre of Arle Court Roundabout for which there is an associated flood risk. The proposed scheme does not fall within the floodplain of the Hatherley Brook and it is not anticipated that it will directly impact upon the watercourse. There is an existing ordinary watercourse east of Badgeworth Road culverted underneath the A40 however Phase 1 is not likely to impact on this water course.

The Risk of Flooding from Surface Water (RoFSW) maps show that the Arle Court Roundabout itself and sections of the A40 to the south of the roundabout have a medium to high risk of flooding from surface water. The works at Arle Court Roundabout will increase the hardstanding by widening the road and therefore there is potential to alter the surface water flow from the surrounding land. As a result, the movement of surface water into Hatherley Brook and the ordinary watercourse may be altered. The need for improved drainage will be investigated during the detailed design stage and appropriate measures shall be put in place to ensure risk of flooding from potential increased surface water is avoided.

The need for a Flood Risk Assessment and Drainage Strategy will be discussed with the Lead Local Flood Authority (Gloucestershire County Council) and Environment Agency. Detailed design will be progressed in consultation with the Lead Local Flood Authority and Environment Agency to discuss any flood management actions/issues under the Flood and Water Management Act 2010. Appropriate pollution prevention measures will be implemented during works to prevent contamination to the water environment.

The overall effect of the scheme with appropriate mitigation measures in place is considered to be **neutral**.

### 3.3.3. Geology

The British Geological Survey (BGS) online open geosciences mapping indicates that the scheme is underlain by the Charmouth Mudstone Formation, part of the Lias Group, which is classified by the Environment Agency as a Secondary (Undifferentiated) Aquifer. No artificial ground is recorded, however Made Ground associated with the previous phases of construction along the scheme is expected to be encountered.

The Coal Authority online interactive map does not identify the site to be within a Coal Mining Reporting Area. No historical mining or quarrying is noted at the site.

Atkins has previously undertaken a ground investigation to the east of the site in 2013, associated with the A40 Arle Court Bus Lane. The scope of the investigation included three window samples, four super heavy dynamic probe tests, 11 dynamic cone penetration tests, 17 hand dug pits and two pavement cores. Ground conditions within the investigation area were generally recorded as Made Ground to depths between 1.40m to 5.70m, overlying reworked/weathered Charmouth Mudstone Formation to depths between 5.00m and 8.00m bgl, where the Charmouth Mudstone Formation became stiff to very stiff. The thickness of the Charmouth Mudstone Formation was not proven as part of the investigation.

In February 2019 Geotechnical Engineering Ltd. conducted a ground investigation specified by Amey. The scope of the investigation included two boreholes and six California Bearing Ratio (CBR) tests on and adjacent to the Arle Court Roundabout. Ground conditions encountered generally confirmed the expected geology, generally consisting of Made Ground to depths between 0.20m and 0.70m, overlying soft to firm clay in one location (0.40m to 1.00m bgl), in turn overlying a stiff becoming very stiff clay of the Charmouth Mudstone Formation, which was described as a stiff becoming very stiff grey silty clay with mudstone lithorelicts and extremely to very closely spaced planar smooth fissures to c. 7.0m bgl. Fossils were present and limestone cobbles were also identified. No groundwater was recorded during drilling. The weathered Charmouth Mudstone was underlain by the solid strata comprising extremely weak indistinctly structured Mudstone with fossils and shells to 7.39m bgl.

No groundwater was encountered during the 2013 investigation, with subsequent monitoring recording groundwater levels between 5.50m and 5.76m bgl. During the 2019 investigation, groundwater was encountered in BH01 at 0.35m bgl (no rise after 20 minutes) with a seepage noted in CBR04 at 0.70m bgl. Post investigation monitoring recorded a groundwater level of 0.55m bgl in BH01, above the response zone of 1.00m-7.38m bgl. It was recommended that further monitoring was undertaken to characterise groundwater levels.

The topography of the surrounding area appears to be relatively level, with the exception of below ground walkways associated with the roundabout. However, given the potential for residual shear planes to be present in the Lias Clay Group strata it is recommended that a watching brief is kept of any excavations by a suitably qualified Engineer in order that any shear planes may be identified.

There is an historical landfill site (Land off Hatherley Lane) that intersects the scheme in the south east. The landfill was operated from 21/04/1994 to 06/10/1994, which is understood to have accepted inert waste. The landfill site was redeveloped as a park-and-ride- area and car sales outlet and is covered in hardstanding.

As part of the 2019 investigation, five soil samples from the Made Ground were submitted for analysis including metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons speciated to the TPHCWG fractions, BTEX and asbestos. The concentrations were assessed using published screening criteria (C4SLs and S4ULs) and Atkins ATRISK values in the absence of published criteria. The end use of Public Open Space (Parks) was adopted as it was considered to be suitably conservative, while still representative of the proposed end use.

The majority of contaminants analysed were below the adopted screening criteria, with the exception of three Poly-Aromatic Hydrocarbons (PAHs) (benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene). The PAHs are not considered to be sufficiently volatile to pose a risk to human health through vapour inhalation, therefore the only relevant pollutant pathway is through direct contact. The risk to future site users will be mitigated through the presence of hardstanding, the use of a clean capping layer or removal and validation of the affected soils off-site to a licenced facility.

Asbestos was assessed based on the limit of detection (0.001%), however, no asbestos was detected in the samples analysed.

There is no additional information on current or historical potential contamination issues along the scheme and consequently a full assessment of contamination risk cannot be completed. However, the most significant contamination source based on a review of readily available online data is anticipated to be the historical landfill and Made Ground along the scheme. It is possible that the tarmacadam/bituminous material may contain coal tars which will be classified as hazardous waste and if it is confirmed that coal tars are present then the tarmacadam will be required to be disposed of at a suitably licensed landfill facility.

The stiff to very stiff weathered Charmouth Mudstone is likely to be suitable founding strata for any proposed structures, pending confirmed loads.

The Charmouth Mudstone is a potentially pyritic strata and as such is a suitable sulphate resistant buried concrete used in construction. Sulphate testing undertaken during the 2013 investigation indicated elevated concentrations of sulphate, with a concrete design class of DS-4 and ACEC Class of AC3s (three samples of Made Ground and two from the Charmouth Mudstone Formation). The 2019 investigation included sulphate testing of one sample form the Charmouth Mudstone Formation and four from the Made Ground), with results indicating a design sulphate class of DS-1 and ACEC class of AC-1 (mobile groundwater and brownfield site). As the BRE guidance advises that the Lower Lias Clay (Charmouth Mudstone Formation) is a geological stratum most likely to have substantial sulphate concentrations, and the difference between the results of the two investigations, a sulphate design class of DS-4 and ACEC class AC-Ss should be adopted or further testing undertaken.

The nearest Mineral Safeguarding Areas (MSA) for sand and gravel and are over 1km away to the north-east and therefore the Scheme will not sterilise any identified MSAs.

Additional ground investigation in the vicinity of the former landfill may be required to determine the geo-environmental constraints and hazards that could impact on the propose scheme. This can be completed in conjunction with the geotechnical ground investigation.

Appropriate Construction Environmental Management Plans (CEMP), Site Waste Management Plans (SWMP) and/or Materials Management Plans (MMP) should be in place prior to commencement of works. Consultation with the EA and LA will be required should visual evidence of contaminated land be identified during the works.

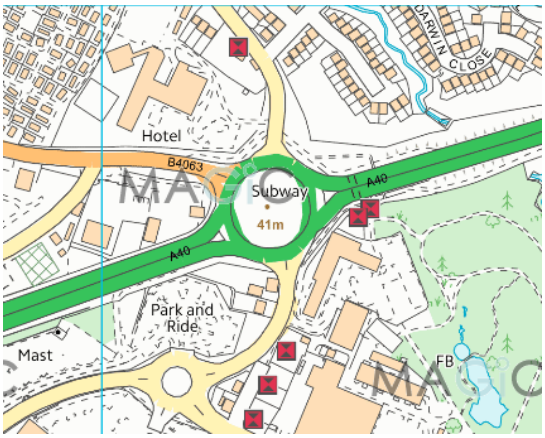
The overall effect of the scheme is **neutral**.

### 3.3.4. Heritage

The historic environment is recognised as an irreplaceable resource that should be preserved in a manner appropriate to its significance. There are three Grade II listed buildings (in two locations) which are located immediately adjacent to the works on A40 Gloucester Road (Figure 3-1):

- Gate piers, railings and gates to Arle Court and Lodge to Arle Court, both fronting onto A40 Gloucester Road overlooking the subway part of the scheme, 85m East of the centre of Arle Court Roundabout.
- Redgrove Cottages with attached wall and outbuildings is located on Hatherley Lane, with cottages five and six being closest to the scheme at 147m South of the centre of Arle Court Roundabout.

**Figure 3-1 - Listed buildings adjacent to the site**




Consultation with the local Conservation Officer has confirmed that the scheme will not distract from the significance of the heritage assets cited above. There may be an opportunity to enhance these heritage assets through further consultation with the local Conservation Officers.

In the wider landscape there is a degree of archaeological potential, but the proposals are confined to the existing highway boundary and works on the original construction of the A40 are likely to have removed or significantly truncated any archaeological remains which existed. Consultation with the County Archaeologist confirmed that there is a low risk that any archaeology will be impacted by the works and that there is no requirement for an archaeological investigation or recording to be undertaken in relation to this scheme.

The impact of the scheme would therefore be **neutral**, and this topic has been scoped out from further assessment, however the potential for enhancement of these assets, has where possible, been taken into consideration in the scheme design.

### 3.3.5. Landscape and visual

This surrounding area consists of predominantly residential and commercial properties including several hotels in close proximity as well as areas of amenity grassland. Despite the number of properties and businesses there is currently considerable screening and amenity vegetation, and this positively contributes to the local landscape character. The majority of existing screening vegetation is expected to remain in most of the locations following the implementation of the proposed roadworks, although areas of vegetation are expected to require cutting back and some vegetation removed along the A40, B4043 and Hatherley Lane.

There are several mature trees and shrubs located along the A40, sections of which may sustain root damage and/or required full tree removal, particularly adjacent to the Park and Ride entrance/exit and the Scania Depot, subject to detail design.

Opportunities exist for mitigation planting along most of the A40 to maintain the current structural and screening qualities. However, where opportunities are very limited, such as along the blue iron boundary fence of the Scania Depot close to Arle Court roundabout, alternative replacement planting such as hedge planting or similar would add interest and partly mitigate the loss of screening vegetation.

It is understood that there are no longer any Tree Preservation Orders (TPOs) present along the A40 within the scope of the Arle Court Roundabout scheme, previous TPOs adjacent to the Scania Depot were deleted from the order in 1988.

The hedge running along the eastbound verge of the B4063 on the approach to Arle Court roundabout would require extensive pruning back in some locations but is not anticipated to require complete removal, subject to detail design. There would therefore be some loss of amenity following the works, but the hedge should soon regrow to provide similar amenity value. If, following detailed design or during site work, the hedge does need to be removed, replacement planting would be provided.

Three no. lime trees on the eastbound approach to the roundabout are scheduled to be removed. These are in an acceptable condition and liaison with Jury's Inn is recommended to explore the relocation of these trees within the grass area of the hotel's grounds. This would help retain screened views from the hotel to the roundabout and retain the qualities of the Green Belt edge.

There is one TPO tree adjacent to the Harthurstfield Park bungalows, which would require careful monitoring during construction to ensure its roots are not impacted. Written permission may be required from the local authority to carry out any works to the protected tree.

At present the site compound is anticipated to be located between Hatherley Lane and the A40. The majority of this area is to be cleared, although retention of some boundary vegetation will ensure the screening and amenity value will be retained. The properties overlooking the site compound, Redgrove Cottages, would be negatively impacted, due to this loss of amenity and screening. Planned mitigation measures, including retention of as much vegetation as possible and appropriate replacement planting will help to limit the impact.

Further detail design is required, but tree loss may occur on the roundabout itself and adjacent to the underpass on the eastbound A40. These trees currently provide amenity value and would be replaced with semi-mature trees of similar species.

The finalised design and construction methods to be used, as well as the effect on the existing trees as determined by the arboricultural survey, are required to fully assess the landscape and visual impacts of this phase and inform landscape design proposals.

Consultation with residents and businesses are recommended due to the area having both highly sensitive residential receptors and several hotels located in the vicinity. Construction would impact both, but this would be temporary and mitigation proposals for retaining, protecting, relocating and replanting where possible would be proposed.

Opportunities for enhancement and replacement planting are limited but would be explored in the final design in locations such as to the north east of the roundabout, between the proposed carriageway and the footway leading to the underpass, subject to the limitation of space and constraints of underground and overground utilities. This would help soften the built features and prominence of the highway corridor within this area and ensure the qualities of this Greenbelt edge location are retained and enjoyed by those nearby or passing through.

The impact of the proposed works overall is expected to be **slight adverse** on the landscape and visual amenity of the area.

### 3.3.6. Air Quality

The Proposed Scheme is located within the Cheltenham Borough Council (CBC) Air Quality Management Area (AQMA), declared for exceedances of the national $NO_2$ annual mean objective. The current AQMA is under review and monitoring data published in the Annual Status Report 2018 confirmed that Air Quality Objectives are only exceeded in the north of Cheltenham town centre.

Atkins was commissioned to undertake an air quality assessment to support the proposed improvement scheme at Arle Court. This air quality assessment included a review of existing air quality conditions, a qualitative assessment of construction dust and dispersion modelling to estimate the impacts and potential for significant effects due to the operation of the Proposed Scheme.

Local air quality impacts for Phase 1 of the proposed scheme were assessed following the guidance presented in TAG Unit A Chapter 3[9], updated May 2019.

Traffic data used were provided by the Atkins Transportation Team for the with and without scheme scenarios for an opening year (2021) and forecast year (2031). The study area was defined by the extents of the traffic model area.

Road sources included in the traffic model were modelled using DEFRA's Emission Factor Toolkit (EFT) v9.0[10] published in May 2019. For this assessment, traffic data were input as annual average daily LDV and HDV[11] flows respectively and the annual average daily speed from the traffic model.

Total emissions of NOx and $PM_{2.5}$ for each link in the with and without scheme scenarios were calculated in the opening (2021) and forecast (2031) years. It was assumed that emissions of NOx and $PM_{2.5}$ would change incrementally between these two years and would remain unchanged post 2031 for the remainder of the 60 year appraisal period. The change in emissions is presented in the Appraisal Summary Table and air quality valuation workbook. The change in NOx and $PM_{2.5}$ emissions were used to determine a Net Present Value (£) for air quality for the proposed scheme.

### Greenhouse Gases

Changes in greenhouse gas emissions were assessed following the guidance presented in TAG Unit A Chapter 4. The traffic data and emissions data prepared for the air quality study area were also used to calculate total emissions of $CO_2$ with and without the proposed scheme.

The change in $CO_2$ emissions as a result of the Proposed Scheme was calculated in the opening (2021) and forecast (2031) years. It was assumed that emissions of $CO_2$ would change incrementally between these two years and would remain unchanged post 2031 for the remainder of the 60 year appraisal period.

### Assumptions

Vehicle emission factors are only available within the EFT up to 2030 and therefore the 2030 factors were used in the calculations for the forecast year (2031). This limitation is considered conservative, given that vehicle emissions are expected to improve further in the future, and is consistent with industry practice.

## Results

### Air Quality

| Methodology | |
|---|---|
| Appraisal (WebTAG) | **Emissions 60 year period (tonnes):**<br>$PM_{2.5}$: 13<br>NOx: 114<br>**Monetary £(NPV)**<br>$PM_{2.5}$ NPV: -£1,138,847<br>NOx NPV: -£538,452<br>Total value of change in air quality: -£1,677,299 |

The Cheltenham city-wide Air Quality Management Area (AQMA) covers the extent of the proposed scheme, but is unlikely to be significantly affected by changes in road traffic emissions as a result of the proposed scheme, as evidenced in the air quality assessment.

Overall there would be an increase in $PM_{2.5}$ and NOx emissions across the traffic model area as a result of increases in road traffic movements across the wider traffic modelled area.

-

[9] Department for Transport - TAG Unit A3 -Environmental Impact Appraisal, published May 2019, Available from [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/825064/tag-unit-a3-environmental-impact-appraisal.pdf]

[10] Department for Environment and Rural Affairs – Emissions Factor Toolkit v9.0, published May 2019, Available from [https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html]

[11] LDV – Light Diesel Vehicles - weight<3.5 tonnes and HDV – Heavy Diesel Vehicles - weight > 3.5 tonnes

### Greenhouse Gases

| Methodology | |
|---|---|
| Appraisal (WebTAG) | **Change in non-traded carbon over 60y ($CO_2$e tonnes)**<br>+82,379<br>**Monetary £(NPV)**<br>-£3,716,694 |

The change in non-traded carbon dioxide emissions in the opening year 2019 would be +741 tonnes $CO_2$e due to an increase in road traffic movements across the wider traffic model area. The results of the TAG assessment show that over the 60 year period there would be an increase in $CO_2$ emissions, (+0.2% in opening year and +1.5% in forecast year) with a commensurate damage cost of £3.7m.

### Conclusions

The results of this assessment suggest the proposed scheme is likely to result in increased emissions of NOx, $PM_{2.5}$ and $CO_2$, as a result of increased road traffic movements across the traffic model area.However, this is not considered significant.

## 3.3.7. Noise and Vibration

Phase 1 project involves a number of improvements to the junction and its approaches, including carriageway widening in a number of areas. Whilst the project will also involve resurfacing of the junction, it has not been necessary to consider the effects of this aspect of the proposal, due to the low traffic speeds on and around the junction (<20 kph).

The proposed Phase 1 improvements are part of a larger package of works (Phases 1-4), the cumulative effects of which will be the subject of a separate Environmental Impact Assessment (EIA). However, for the purposes of the business case for Phase 1, only the potential effects of the Arle Court roundabout scheme were considered.

The Scheme is designed to alleviate congestion around the junction, and therefore accommodate larger traffic flows at higher average speeds than is possible in the current scenario. The effects of these predicted changes have been modelled, in addition to the physical changes on and around the junction.

### Study Area

The study area for the assessment of noise and vibration effects is defined in the DMRB 11:3:7 as 600 m from the carriageway edge of any proposed new routes or existing routes to be bypassed or improved, and 600 m from any other affected routes within 1 km of the proposed new routes or altered existing routes. An affected route is defined as where it is calculated that there is a possibility of a change of 1dB LA10,18h in the short term or 3dB LA10,18h in the long term (assessed between the opening year and the future year).

The DMRB provides the following methodology for identifying the size and extents of the study area:

1. Identify the start and end points of the physical works associated with the road project;
2. Identify the existing routes that are being bypassed or improved and any proposed new routes between the start and end points (for each option);
3. Define a boundary 1 km from the carriageway edge of each of the options identified in (2) above;
4. Define a boundary 600 m from the carriageway edge around each of the options identified in (2) above and also 600 m from any other affected routes within the boundary defined in (3) above. The total area within these 600 m boundaries is termed the 'calculation area';
5. Identify any affected routes beyond the boundary defined in (3) above; and
6. Define a boundary 50 m from the carriageway edge of routes identified in (5) above.

The study area includes several Noise Important Areas (NIAs), as follows:

- NIA 3898, a small local-authority NIA, approximately 350 m west of the junction.
- NIA 3899, a local authority NIA covering an area of the A40 approximately 300 m east and west of the junction.
- NIA 6036, a local authority NIA covering approximately 1.2 km of the A40 between Telstar Way and Granley Road.

### Methodology

Noise modelling has been undertaken to predict noise levels with and without the Scheme in its projected opening year (2021) and future assessment year (2031). This information was used to complete a detailed assessment in accordance with the guidance contained within the DMRB 11:3:7, consisting of the following elements:

- Prediction of daytime ($L_{A10, 18h}$) noise levels in the short-term (Scheme opening) and the long-term (future assessment year) at noise-sensitive receptors in the study area using the Calculation of Road Traffic Noise (CRTN) procedures and the advice in DMRB 11.3.7, Annex 4 / Interim Advice Note 185;
- Prediction of night-time ($L_{night}$) noise levels in the long-term at noise-sensitive receptors within the study area; and
- Assessment of noise levels at traffic links located in the wider area.

To complete the assessment, as outlined above, the following traffic scenarios have been modelled and assessed:

- Do Minimum (without the Scheme) in the opening year (DM 2022);
- Do Something (with the Scheme) in the opening year (DS 2022);
- Do Minimum in the future assessment year (DM 2037) and
- Do Something in the future assessment year (DS 2037).

The noise modelling was undertaken using NoiseMap v5.2.4 software and traffic projections provided by Atkins' transport team. The traffic data comprised 18-hour average annual weekly traffic flows for each traffic link in the study area and the wider area, and the corresponding traffic speed and fleet composition for each traffic link. The noise modelling software predicted the road traffic noise levels at sensitive receptors by implementing the calculation procedure detailed in CRTN, which involves calculating the Basic Noise Level at 10 m from the kerb using the traffic parameters described above and considering topography, ground absorption and screening from intervening structures.

No existing noise mitigation measures are present in the study area. The topographical model was built from scheme drawings and LiDAR DTM 2m data at locations further away from the Scheme.

Ordnance Survey base mapping (MasterMap) were used to establish the relevant noise sensitive receptors within the appropriate calculation area. This included residential noise sensitive receptors and non-residential noise sensitive receptors, such as schools, medical facilities and places of worship.

All buildings in the noise model were set to 6 m in height. Noise maps were generated in each case at 4 m height with a grid resolution of 10 m.

### Results

The noise modelling results are presented in the following figures  Appendix G.:

- Absolute Noise Levels ($L_{A10, 18h}$), Do Minimum (2021) [1:5750 scale]
- Absolute Noise Levels ($L_{A10, 18h}$), Do Something (2021) [1:5750 scale]
- Absolute Noise Levels ($L_{A10, 18h}$), Do Minimum (2031) [1:5750 scale]
- Absolute Noise Levels ($L_{A10, 18h}$), Do Something (2031) [1:5750 scale]
- Noise Level Change, Short Term ($L_{A10, 18h}$) – Do Something Opening Year (2021) vs Do Minimum Opening Year (2021) [1:5750 scale]
- Noise Level Change, Long Term ($L_{A10, 18h}$) – Do Something Opening Year (2021) vs Do Minimum Opening Year (2031) [1:5750 scale]

## Assessment

### Potential Significance of Environmental Effects

As a starting point, assessment of the Scheme is undertaken using the magnitude of change descriptors provided in the DMRB 11:3:7. These are summarised in Table 3-5.

**Table 3-5 - Classification of magnitude of noise impacts**

| Short-term noise change ($L_{A10,18h}$, dB) | Long term noise change ($L_{A10,18h}$, dB) | Magnitude of impact (adverse or beneficial) |
|---|---|---|
| 0 | 0 | No change |
| 0.1 - 0.9 | 0.1 - 2.9 | Negligible |
| 1 - 2.9 | 3 - 4.9 | Minor |
| 3 - 4.9 | 5 - 9.9 | Moderate |
| 5+ | 10+ | Major |

Table Source: IEMA (2014) and DMRB Volume 11, Section 3, Part 7, HD 213/11

Detailed predictions have been carried out for a total of 1,552 residential receptors identified within the study area.

The sections below detail the short-term and long-term impacts of the Scheme. For short-term impacts, a comparison is made between the Do Something and Do Minimum scenarios in 2021, the opening year of the Scheme. For long term impacts as a result of the Scheme, a comparison is made between the Do Minimum scenario in 2021 and the Do Something scenario in 2031. Long-term impacts without the Scheme have also been considered.

### Daytime road traffic noise levels

Table 3-6 to **Table 3-8** show the predicted changes in daytime noise levels (06:00 to 00:00) for residential and non-residential receptors in the study area. The predicted daytime noise levels throughout the study area are shown in noise change contours provided in Figure 4 and 5 to illustrate how road traffic noise levels change in the short-term and the long-term.

The predicted changes in daytime road traffic noise levels in the short term with the Scheme are shown in Table 3-6 and Figure 4 in the appendix G.

**Table 3-6 - Short-term traffic noise magnitude changes with the Scheme**

| Change in noise level | | DMRB impact magnitude | Number of dwellings | Number of other sensitive receptors |
|---|---|---|---|---|
| Increase in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 1,374 | 0 |
| | 1 - 2.9 | Minor | 90 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |
| No change | 0 | No change | 63 | 0 |
| Decrease in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 25 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |

Table 3-6 and Figure 4 in the appendix G show that when the Scheme becomes operational, most properties will be subject to negligible increase in noise levels. No change is expected at 63 properties and a further 25 properties will be subject to a negligible decrease in noise level.

A minor increase in noise level is expected at 90 properties when the scheme becomes operational. Changes at these properties are due to predicted increases in road traffic flow and/or average speeds on nearby roads, and the location of these properties is summarised as follows:

- 5No. properties on Hatherley Lane / Redgrove Cottages, south of the Arle Court Roundabout;
- 2No. properties north and south of Badgeworth Road, west of the Arle Court Roudabpout and north of Gloucester Road;

- 1No. property at the junction between Badgeworth Road and Elm Garden Drive, west of the Arle Court Roundabout and north of Gloucester Raod;
- 7No. properties in the south-east of Harthurstfield Park, northwest of the Arle Court Roundabout, and north of Cheltenham Road;
- 18No. properties east and west of Fiddlers Green Lane, north of the Arle Court Roundabout;
- 1No .property on Castlemain Drive, north of the Arle Court Roundabout;
- 22No. properties on Miserden Road, east of the Arle Court Roundabout and south of Gloucester Road;
- 7No. properties on Stanway Way, east of the Arle Court Roundabout and south of Gloucester Road;
- 7No. properties on Coberley Road, north of Whittington Road; and
- 18No. properties on Sotherby Drive, east of the Arle Court Roundabout and north of Gloucester Road.

For road traffic noise levels of minor magnitude, it is normally concluded that these would not result in changes to behaviour or response to noise, and hence would not give rise to a potentially significant effect.

The predicted changes in daytime road traffic noise levels in the long-term with and without the Scheme are shown in Table 3-7 (without Scheme) and **Table 3-8** / Figure 5 in the appendix G (with Scheme).

**Table 3-7 - Long-term traffic noise magnitude changes without the Scheme**

| Change in noise level | | DMRB impact magnitude | Number of dwellings | Number of other sensitive receptors |
|---|---|---|---|---|
| Increase in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 153 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |
| No change | 0 | No change | 53 | 0 |
| Decrease in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 1,348 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |

**Table 3-8 - Long-term traffic noise magnitude changes with the Scheme**

| Change in noise level | | DMRB impact magnitude | Number of dwellings | Number of other sensitive receptors |
|---|---|---|---|---|
| Increase in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 1,548 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |
| No change | 0 | No change | 4 | 0 |
| Decrease in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 0 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |

**Table 3-8**, and Figure 5 in the appendix show that in the long term, most receptors will be subject to a negligible increase in noise levels, as opposed to a negligible decrease without the Scheme, as shown in Table 3-7.

With the Scheme it is predicted that 1,548 properties will be subject to a negligible increase in noise level, with no change predicted at four properties. Overall, the potential impacts of the scheme on daytime noise levels in the long term are negligible, and hence would not cause changes to behaviour or response to noise and vibration. As such, these will not give rise to a significant environmental effect in the long term.

Although there are minor impacts at some receptors expected in the short term, other factors must also be taken under consideration, such as the absolute level of noise. For this purpose, the absolute noise levels predicted at noise sensitive receptors in the opening year of the Scheme have been compared with the SOAEL of 68 dB $L_{A10, 18h}$.

Analysis of the absolute level noise contour maps (Do Something 2021 / Do Something 2031) for the daytime indicates that there is potential for the SOAEL to be exceeded for at least one property close to Gloucester Road (22 Miserden Road).

It is therefore concluded that there is potential for a significant environmental effect upon this receptor in the short term. However the SOAEL would not be exceeded at any other receptors for which there is also a minor increase in noise.

### Night-time road traffic noise levels

The change in road traffic noise levels at night throughout the study area has also been considered in the assessment of the Scheme.

Table 3-9 and **Table 3-10** show the change in night-time noise levels in the long-term for properties with predicted noise levels above 55 dB $L_{night}$, as required by the DMRB 11:3:7.

**Table 3-9 - Long-term traffic noise magnitude changes without the Scheme**

| Change in noise level | | DMRB impact magnitude | Number of dwellings | Number of other sensitive receptors |
|---|---|---|---|---|
| Increase in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 0 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |
| No change | 0 | No change | 1 | 0 |
| Decrease in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 18 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |

**Table 3-10 - Long-term traffic noise magnitude changes with the Scheme**

| Change in noise level | | DMRB impact magnitude | Number of dwellings | Number of other sensitive receptors |
|---|---|---|---|---|
| Increase in noise level, $L_{A10,18h}$ dB | 0.1 - 0.9 | Negligible | 16 | 0 |
| | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |
| No change | 0 | No change | 1 | 0 |
| | 0.1 - 0.9 | Negligible | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Decrease in noise level, $L_{A10,18h}$ dB | 1 - 2.9 | Minor | 0 | 0 |
| | 3 - 4.9 | Moderate | 0 | 0 |
| | ≥ 5 | Major | 0 | 0 |

**Table 3-10**, and Figure 8 in the appendix show that in the long term, most receptors with predicted noise levels >55 dB $L_{night}$ will be subject to a negligible increase in noise levels, as opposed to a negligible decrease at most receptors with predicted noise levels >55 dB $L_{night}$ without the Scheme, as shown in Table 3-9.

With the Scheme it is predicted that 16 properties will be subject to a negligible increase in noise level, with no change predicted at one property. Overall, the potential impacts of the scheme on night-time noise levels in the long term are negligible, and hence would not cause changes to behaviour or response to noise and vibration. As such, these will not give rise to a significant environmental effect in the long term.

### Changes to road traffic noise levels in the wider area

To determine the potential effects within the wider area, the Basic Noise Levels (BNLs) were calculated using the methodology in the CRTN for road links outside of the detailed calculation area.

In the short-term and the long-term, the BNL calculations indicated that there are no affected road links outside of the DMRB detailed calculation area.

### Noise Important Areas (NIAs)

In accordance with the Environmental Noise (England) Regulations 2006, and as defined within DEFRAs Noise Action Plan: Roads (2 July 2019), Important Areas with respect to noise from major roads outside agglomerations are where the 1% of the population that are affected by the highest noise levels from major roads are located (according to the results of the Round 3 strategic noise mapping).

In general, any increases in noise levels within NIAs are to be avoided, whilst improvements in noise level (i.e., a reduction) should be delivered, where possible.

Analysis of the short-term and long-term change maps for NIAs indicate that there may be non-negligible (but still minor) increases in road traffic noise for receptors in the following NIAs:

- NIA 3898, a small local-authority NIA, approximately 350 m west of the junction.
- NIA 6036, a local authority NIA covering approximately 1.2 km of the A40 between Telstar Way and Granley Road.

The above indicates a need to further consider noise mitigation for receptors in the NIAs 3898 and 6036. However, since both of these NIAs are positioned significantly beyond the Phase 1 works boundary, it would not be reasonable or effective to consider noise mitigation measures for these areas as part of the Scheme. As an alternative, opportunities for reducing and minimising potential impacts on these NIAs will be considered during detailed design work for Phase 2 (NIA 3898) and Phase 3-4 (NIA 6036) which may include, for example, the provision of noise barriers and/or low noise road surfacing.

### Noise Insulation Regulations (NIRs)

Regulation 3 of the UK Noise Insulation Regulations 1975 (as amended 1988), imposes a duty on authorities to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible (residential) buildings, subject to meeting certain criteria, as follows:

- the relevant noise level[12] is greater by at least 1dB(A) than the prevailing noise level[13] and is not less than the specified level[14], and

[12] "relevant noise level" means the level of noise, expressed as a level of L 10 (18-hour), one metre in front of the most exposed of any windows and doors in a facade of a building caused or expected to be caused by traffic using or expected to use any highway;

[13] "prevailing noise level" means the level of noise, expressed as a level of L 10 (18-hour), one metre in front of the most exposed of any windows and doors in a facade of a building caused by traffic using any highway immediately before works for the construction of a highway or additional carriageway, or for the alteration of a highway, as the case may be, were begun;

[14] "specified level" means a noise level of L 10 (18-hour) of 68dB(A).

- noise caused or expected to be caused by traffic using or expected to use the highway makes an effective contribution to the relevant noise level of at least 1 dB(A).

It is important to note that the above refers to the effects of noise cause by a new or improved highway, and not to any effects on the wider road network as a result of the Scheme.

Analysis of the absolute noise level maps[15] and change maps indicates that there are no dwellings in the vicinity of the junction improvements where noise levels have the potential to meet both of the above criteria. There is therefore no risk that the Phase 1 scheme would, in and of itself, trigger works or grants in respect of the NIRs.

### WebTAG Appraisal

An appraisal of predicted changes in noise level across the study area (as determined in accordance with DMRB 11:3:7) was completed, in accordance with the online Transport Analysis Guidance (WebTAG) for Noise. For each one decibel change in average noise level, a monetary value is assigned for the change in the following health impacts: amenity (annoyance), acute myocardial infarction, dementia, stroke and sleep disturbance.

Completion of the TAG workbook for noise yields a result of -£875,984 for the Net Present Value of the Scheme. The negative value indicates a net increase in noise as a result of scheme development, and hence a net adverse effect on health and wellbeing.

## Summary

In summary, the assessments undertaken in relation to proposed Phase 1 scheme as outlined above have shown that:

- The Scheme could have significant, adverse environmental effects in the short term upon one property close to Gloucester Road (22 Miserden Road).
- However the Scheme would have no significant, adverse environmental effects on any receptor in the long term.
- The Scheme may increase noise levels within NIA 3898 and NIA 6036, and in accordance with DEFRAs Noise Action Plan: Roads (2 July 2019), this is to be avoided, whilst improvements in noise levels (i.e. a reduction) should be delivered, where possible.
- There are no properties qualifying for works or grants in respect of the Noise Insulation Regulations 1975 (as amended 1988).
- An appraisal of the scheme in accordance with WebTAG indicates a Net Present Value of -£875,984, i.e. a net increase in noise and a net adverse effect on health and wellbeing.

As a result of the above it will be necessary to consider noise mitigation for receptors in proximity to NIA 3898 and NIA 6036. However, since both of these NIAs are positioned significantly beyond the Phase 1 works boundary, it would not be reasonable or effective to consider noise mitigation measures for these areas as part of the Scheme. As an alternative, opportunities for reducing and minimising potential impacts on these NIAs will be considered during detailed design work for Phase 2 (NIA 3898) and Phase 3-4 (NIA 6036) which may include, for example, the provision of noise barriers and/or low noise road surfacing.

# 3.4. Social and Distributional Impacts

This section provides details of the methodology followed to deliver the Social and Distributional Impacts (SDI) appraisal. Social impacts (SI) cover the human experience of the transport system and its impact on social factors, on different indicators and Distributional impacts (DI) consider the variance of impacts across different social groups. The analysis of SDIs is mandatory in the appraisal process and undertaken in accordance with WebTAG guidance Unit A4.1 (Social Impact Appraisal) and A4.2 (Distributional Impact Appraisal) and is a constituent of the Appraisal Summary Table (AST).

The indicators considered for social or distributional impacts are shown in Table 3-11.

**Table 3-11 Indicators considered for social and distributional impacts**

| Indicator | Social Impact | Distributional Impact |
|---|---|---|

15 Note that a correction of +3 dB must be added to the free-field values shown on these maps.

| | | |
|---|---|---|
| User Benefits | | ✓ |
| Air Quality | | ✓ |
| Noise | | ✓ |
| Personal Security | ✓ | ✓ |
| Severance | ✓ | ✓ |
| Accessibility | ✓ | ✓ |
| Personal Affordability | ✓ | ✓ |
| Accidents | ✓ | ✓ |
| Physical Activity | ✓ | |
| Journey Quality | ✓ | |
| Option Values and Non-Use Values | ✓ | |

A full analysis of the social and distributional impacts can be found in Appendix D.

## 3.4.1. Social Impacts Assessment

The social impacts assessment is summarised in the following eight sub-sections, covering each of the eight indicators assessed.

### 3.4.1.1. Physical activity

The scheme will introduce a new controlled crossing over Fiddler's Green Lane, enhancing pedestrian facilities and promoting physical activity. Arle Court Roundabout is expected to form part of a dedicated cycle route linking Gloucester and Cheltenham in the future, which will benefit physical activity.

Therefore, the physical activity impact of the scheme is assessed as **slight beneficial**.

### 3.4.1.2. Journey quality

The scheme maintains all existing pedestrian and cycle facilities and there is unlikely to be any significant impact to traveller care for cyclists. The scheme includes the widening of the subway below the A40 at Arle Court Roundabout, which may reduce overcrowding of the underpass. Hence there is a slight beneficial impact for pedestrians. The scheme includes the resurfacing of the road over the scheme extent. This may improve the smoothness of ride for motorists, hence having a slight beneficial impact to the environment for motorists. The construction of new bus stops at the Park and Ride will have a slight beneficial impact to cleanliness for public transport users as a new construction is assumed to be clean, of good condition and have no graffiti.

At this stage there is not enough information to assess travellers' views as part of this assessment.

An aim of the scheme is to increase capacity of the Arle Court Roundabout, which is forecast to reduce travel time for motorists and hence have a moderate beneficial impact to frustration. There is also a moderate beneficial impact to frustration for public transport users as reduced congestion and the additional on-slip at the A40 westbound may reduce travel distances and times, hence improving the reliability of buses in the area. There is unlikely to be any impact to traveller stress for cyclists, as all cycle routes are maintained.

Overall, there is a slight beneficial impact to journey quality for motorists, pedestrians and public transport users. Cyclists are unlikely to be significantly impacted by the scheme, hence there is a neutral impact to journey quality for this these users. Therefore, the overall impact of the Arle Court Improvement Scheme to journey quality is **slight beneficial**.

### 3.4.1.3. Accidents

According to the Traffic Modelling report, the Do Something 3 option was found to marginally improve journey times in the 2021 AM and PM Peaks when compared to the original DS1 scenario and showed significant improvements to queueing on almost all the approach arms to the Arle Court Roundabout. This accident assessment is qualitative and based on historical accidents which occurred on links with a greater than 10% change in traffic speed as a result of the scheme. All approaches to the Arle Court Roundabout generate a greater than 10% increase in traffic speed, likely as a result of increased capacity leading to reduced congestion. Between January 2013 and December 2017 twelve accidents occurred on or directly next to Arle Court Roundabout. Increased traffic speeds through and on approach to Arle Court Roundabout will

subsequently lead to an increased probability of accidents occurring. Therefore, it is estimated there will be a **slight adverse** impact to accidents as a result of this scheme.

#### 3.4.1.4. Security

The scheme includes a small movement of the existing bus stop at the Arle Court Park and Ride and the addition of a new bus stop on the opposite side of the road. It is assumed that the bus stops will have sufficient lighting and surveillance cameras, so will not impact users' perceptions of personal security. However, reduced journey distances and times as a result of the additional link to the A40 westbound may cause a mode shift from private car to public transport. This would increase the number of people waiting at bus stops and hence improve perceptions of security through informal surveillance. It is assumed that there will be no change to site perimeters, landscaping or emergency call facilities, hence having a neutral impact. Overall, the beneficial impacts to security resulting from informal surveillance are likely to be small. Hence, the overall impact to security is **neutral**.

#### 3.4.1.5. Accessibility

It is not expected that the frequency or routeings of buses will be altered as a result of the Arle Court Improvement Scheme. However, it is assumed that there will be journey time savings as a result of reduced congestion though the roundabout, the addition of a bus lane on the B4063 approach to the roundabout and the additional on-slip from the Park and Ride to the A40 westbound. Therefore, there is a **slight beneficial** impact to accessibility due to the scheme.

#### 3.4.1.6. Personal Affordability

The calculation of impact in the appraisal tables are based on vehicle operating costs (fuel and non-fuel) for home-based 'commuting and other' trips (i.e. excluding business users). Only highways benefits have been modelled, and only internal to internal trips within an assessment area. The outputs of the 60- year appraisal from TUBA show nearly £5 million benefit, as a result of the scheme. This benefit is as a result of reduced vehicle operating costs, both fuel and non-fuel. Increased capacity through Arle Court roundabout will reduce congestion in the area. This will reduce vehicle operating costs as there's reduced vehicles idling, braking and accelerating while queueing.

Increased vehicle speeds can lead to increased fuel consumption which may cause vehicle operating costs to increase in some cases. However, this is small compared with the affordability benefits caused by the scheme. In other words, the scheme decreases the costs associated with operating a car. Therefore, the overall impact of the scheme to personal affordability is **moderate beneficial**.

#### 3.4.1.7. Severance

Speed changes resulting from the Arle Court scheme have been examined to determine the effect on severance. These generally occur on roads that are not accessible to pedestrians such as dualled areas of the A40 and the M5. However, there are links with a significant increase in speed on minor routes radiating from Arle Court that can be accessed by pedestrians. It is likely that increased speeds will increase severance on these routes. There are also changes in speed (mainly increases) around Innsworth (east of Gloucester). Within the eastern suburbs of Cheltenham there are approximately the same number of links with increased traffic speed as decreased traffic speed. Hence, not significantly impacting severance within this area.

Overall, it is likely that the effect of the Arle Court scheme on severance will be **slight adverse** mainly due to the effects on vehicle speed on minor routes radiating out from Arle Court Roundabout.

#### 3.4.1.8. Option Values and Non-Use Values

TAG Unit 4.1 requires that option values and non-use values are assessed if the scheme being appraised includes measures that will substantially change the availability of transport services within the study area (e.g. the opening or closure of a rail service, or the introduction or withdrawal of buses serving a particular rural area). The scheme includes the addition of a bus stop from the Arle Court Park & Ride to the A40 westbound. However, this doesn't significantly change any bus routes, or the bus services provided in the area. Therefore, there are no significant changes to transport services, so this indicator **will not be assessed.**

### 3.4.2. Distributional Impacts Assessment

An assessment of eight indicators has been undertaken for this DI assessment. The impact area has been determined for each indicator as an area likely to be affected by the Arle Court Improvement Scheme. The full analysis of the distributional impacts can be found in Appendix D.

The distributional impact appraisal matrix for income and vulnerable groups, as described in WebTAG Unit 4.2, are shown in Table 3-12 and Table 3-13.

There is a neutral impact overall to air quality and noise as there is no significant impact to income quintiles 1-3 or 5. However, there is a slight adverse air quality impact for income quintile four and a slight beneficial impact to noise for this income group, as shown in Table 3-12.

There are beneficial impacts for all income quintiles and overall for user benefits and affordability. The overall impact is slight beneficial for both these indicators since there are slight beneficial impacts for income quintiles 1-3.

**Table 3-12 – Distribution of impacts across income groups**

| | Distributional impact of income deprivation | | | | | Are the impacts evenly distributed? | Key impacts – Qualitative statements |
|---|---|---|---|---|---|---|---|
| | 0-20% | 20-40% | 40-60% | 60-80% | 80-100% | | |
| Air Quality | **0** | **0** | **0** | × | **0** | **No** | There are neutral air quality impacts for all income quintiles other than income quintile 4, which has a slight adverse impact. |
| Noise | **0** | **0** | **0** | ✓ | **0** | **No** | There is a slight beneficial noise impact for income quintile 4 and neutral impacts for all other income groups. |
| User Benefits | ✓ | ✓ | ✓ | ✓✓ | ✓✓✓ | **No** | There are beneficial user benefits for all income quintiles. However, the majority of benefits are concentrated within postcodes belonging to income quintiles 4 and 5. |
| Affordability | ✓ | ✓ | ✓ | ✓✓✓ | ✓✓✓ | **No** | There are beneficial affordability impacts for all income quintiles. However, there is a large beneficial impact for quintiles 4 and 5 and slight beneficial for quintiles 1, 2 and 3. |

Key: ✓✓✓ Large Beneficial ✓✓ Moderate Beneficial ✓ Slight beneficial 0 Neutral
× Slight adverse ×× Moderate adverse ××× Large adverse

**Table 3-13 – Distribution of impacts across vulnerable groups**

| Impact | Social groups | | | | | Qualitative statement |
|---|---|---|---|---|---|---|
| | Children & young people | Older people | Women | Disabled | BME | |
| Noise | ✓ | - | - | - | - | There is a slight beneficial impact to noise for children due to there being reduced traffic flow near several schools in the area |
| Air Quality | **0** | - | - | - | - | Air quality impacts generally occur in more rural areas, with low proportions of children. |
| Accidents | × | **0** | - | - | - | There are a greater number of historical accidents involving children on links with an increase in traffic speed than links with a decrease in traffic speed. |
| Security | **0** | ✓ | ✓ | ✓ | **0** | There are slight beneficial impacts for older people, women and disabled people due to increased informal surveillance at the Park & Ride. |
| Severance | **0** | × | - | **0** | - | It may be more difficult for older people to cross the road due to increased traffic speed on links towards Arle Court Roundabout. |
| Accessibility | **0** | ✓ | **0** | ✓ | **0** | Public transport journey times may be reduced as a result of the scheme, having a beneficial impact to older people and disabled people. |

Key: ✓✓✓ Large Beneficial ✓✓ Moderate Beneficial ✓ Slight beneficial 0 Neutral
× Slight adverse ×× Moderate adverse ××× Large adverse

## 3.5. Reliability Impacts

Reliability impacts have not been explicitly assessed or monetised following WebTAG guidelines. However, it is expected that the additional capacity will improve reliability due to the reduction in congestion and result in consistent benefits throughout the day but most significantly during peak hours.

## 3.6. Economic Appraisal Results: Core Scenario

This chapter sets out the results of the economic appraisal for the core scenario in line with the assessment methodologies set out in chapter 3.

### 3.6.1. Core Scenario definition

The following section describes the Core Scenario benefits analysis during normal operation in terms of savings relating to travel times, vehicle operating costs and user charges user benefit.

The forecasting report (Appendix B) produced by Jacobs informs that it was decided to use the NTEM District level growth factors for forecasting the future car demands from 2017 base demand, and National traffic model (NTM) forecast growth for LGV and HGV. These high-level growth factors have not been adjusted locally and the impact of uncertainty around demand forecast was not taken into account. The Forecasting method did not feature an uncertainty log covering the central forecasting assumptions made in the model that will affect travel demand and supply.

There is however information on the economic development in the area of the model until 2021, namely there are targets set for Gloucestershire over the growth period out to 2021. The First LEP Strategic Economic Plan (SEP) identifies unlocking employment land in a growth zone with good access to the M5 as especially important. Specifically, in the model area the SEP informs that funding has been secured for Cheltenham Cyber Business Park with occupation expected in 2021. The Gloucestershire, Cheltenham and Tewkesbury Joint Core Strategy 2011-2031 identifies housing needs following the National Planning Policy Framework and Guidance, that take as its starting point the official population forecasts and household projections. The Joint Core Strategy does not project other housing developments in addition to the national households forecast.

In the long term there is no significant development identified in the vicinity of the model area, therefore we understand that the high-level growth applied in 2031 lacks in detail for the local area of the model. Due to the nature of the microsimulation model, with a focus on a limited local area, the demand forecast would be more appropriately represented if adjusted to reflect the local conditions and uncertainties. Given that the high level (District and National) forecast growth has been applied unadjusted to the study area, we have capped the growth to the forecast year 2021 in the core scenario, since 2021 is the most illustrative forecast scenario in the context of this project. This scenario represents the realistic demand scenario. Additional demand scenarios (a conservative and optimistic scenario) were tested in the sensitivity analysis (section 3.9)

### 3.6.2. Transport Economic Efficiency (TEE)

All benefits and costs were calculated in monetary terms and expressed as present values (PV) in 2010 prices, discounted to 2010.This enables direct economic comparison with other schemes which may have very different timescales.

Table 3-14 below presents the TEE table for the core scenario TUBA assessment results.

**Table 3-14 – Transport Economic Efficiency Benefits (all values in £000s)**

| | |
|---|---|
| **Non-business: Commuting** | |
| **User benefits** | **TOTAL** |
| Travel time | 41,714 |
| Vehicle operating costs | 859 |
| User charges | 0 |
| During Construction & Maintenance | 0 |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | 42,572 |
| | |
| **Non-business: Other** | **ALL MODES** |
| **User benefits** | **TOTAL** |
| Travel time | 33,201 |
| Vehicle operating costs | 906 |
| User charges | 0 |
| During Construction & Maintenance | 0 |
| **NET NON-BUSINESS BENEFITS: OTHER** | 34,107 |
| | |
| **Business** | |
| | |
| **User benefits** | |
| Travel time | 25,862 |
| Vehicle operating costs | 2,495 |
| User charges | 0 |
| During Construction & Maintenance | 0 |
| **Subtotal** | 28,357 |
| | |
| **Private sector provider impacts** | |
| Revenue | 0 |
| Operating costs | 0 |
| Investment costs | 0 |
| Grant/subsidy | 0 |
| **Subtotal** | 0 |
| Other business impacts | |
| Developer contributions | 0 |
| **NET BUSINESS IMPACT** | 28,357 |
| | |
| **TOTAL** | |
| | |
| **Present Value of Transport Economic Efficiency Benefits (TEE)** | 105,036 |

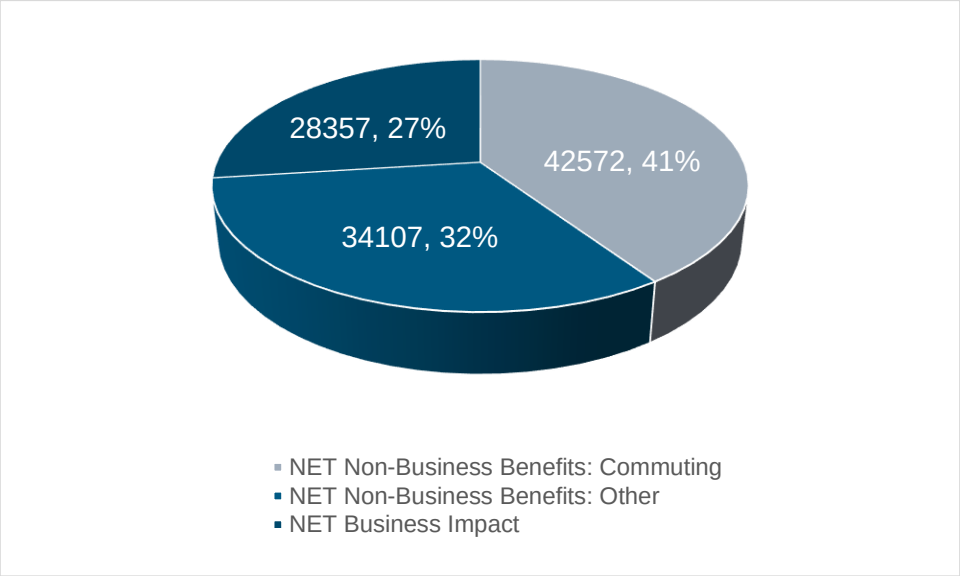
Notes: Benefits appear as positive numbers, while costs appear as negative numbers. All entries are discounted present values, in 2010 prices and value

The economic appraisal conducted in compliance with WebTAG (Data Book), evaluates the travel time savings and the vehicle operating costs (VOC) that the scheme is forecast to produce.

The scheme is forecast to produce net benefits for all users of £100.77 million from the travel time and £4.26 million from vehicle operating costs. In conclusion, the transport economic benefits assessment predicts the scheme will deliver overall net benefits for all users of £105.04 million. It should be noted that no private sector provider impacts benefits nor developer contributions were considered. In addition, the impact of delays during construction and maintenance was not assessed.

Closer analysis of the results, presented in Figure 3-2, shows that transport economic benefits accrued from non-commuting purposes of non-business users is 32%. Net business benefits account for 27%, and non-business commuters' account for 41% of the total value of transport economic benefits

**Figure 3-2 – Core Scenario Transport economic efficiency structure by travel purpose**




### 3.6.3. Present Value of Benefits (PVB)

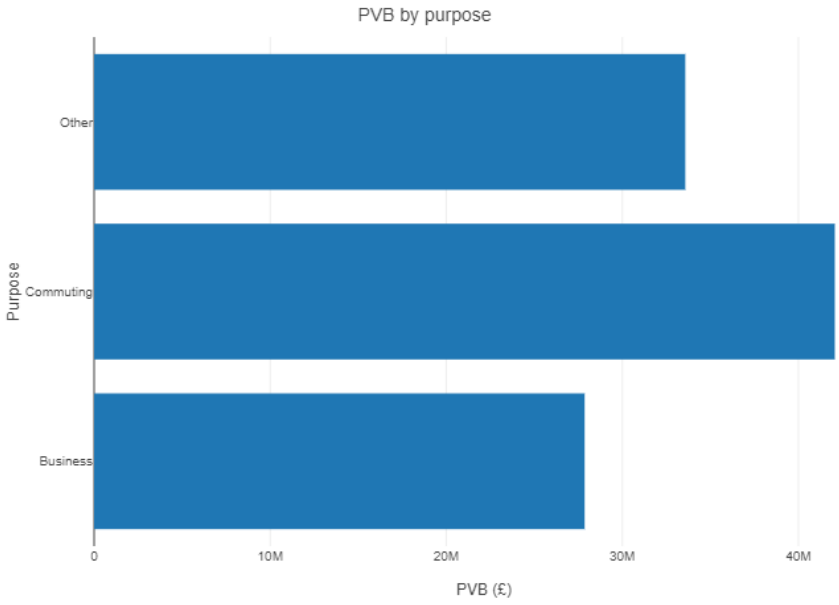
The scheme is expected to bring a Present Value Benefit (PVB) of £104.14m over the 60-year appraisal period (2021 - 2080). These benefits are generated by travel time savings and vehicle operating costs benefits of £105.04 m and change in Government Indirect Tax of £-1.53 m.

The scheme is estimated to provide user benefits of £2,663k during the first forecast modelled year (2021), and £2,182k during the second modelled year (2031). The PM peak provides higher benefits than the AM peak throughout the 60-year appraisal period, as shown in Figure 3-3, which is in line with a higher traffic demand in the PM.

**Figure 3-3 - Core Scenario profile of Present Value of Benefit per year**


Over the 60-year appraisal period, the distribution of benefits by purpose follows in Figure 3-4

**Figure 3-4 – Core Scenario Benefit profile breakdown by Purpose**




## 3.6.4. Present Value of Costs (PVC)

The scheme construction costs have been estimated by the engineering team, as detailed in section 3.2.2. To convert the costs to present value the calculations presented in section 3.2.7 have been performed. The total scheme construction costs expressed as a PVC is £7.74m.

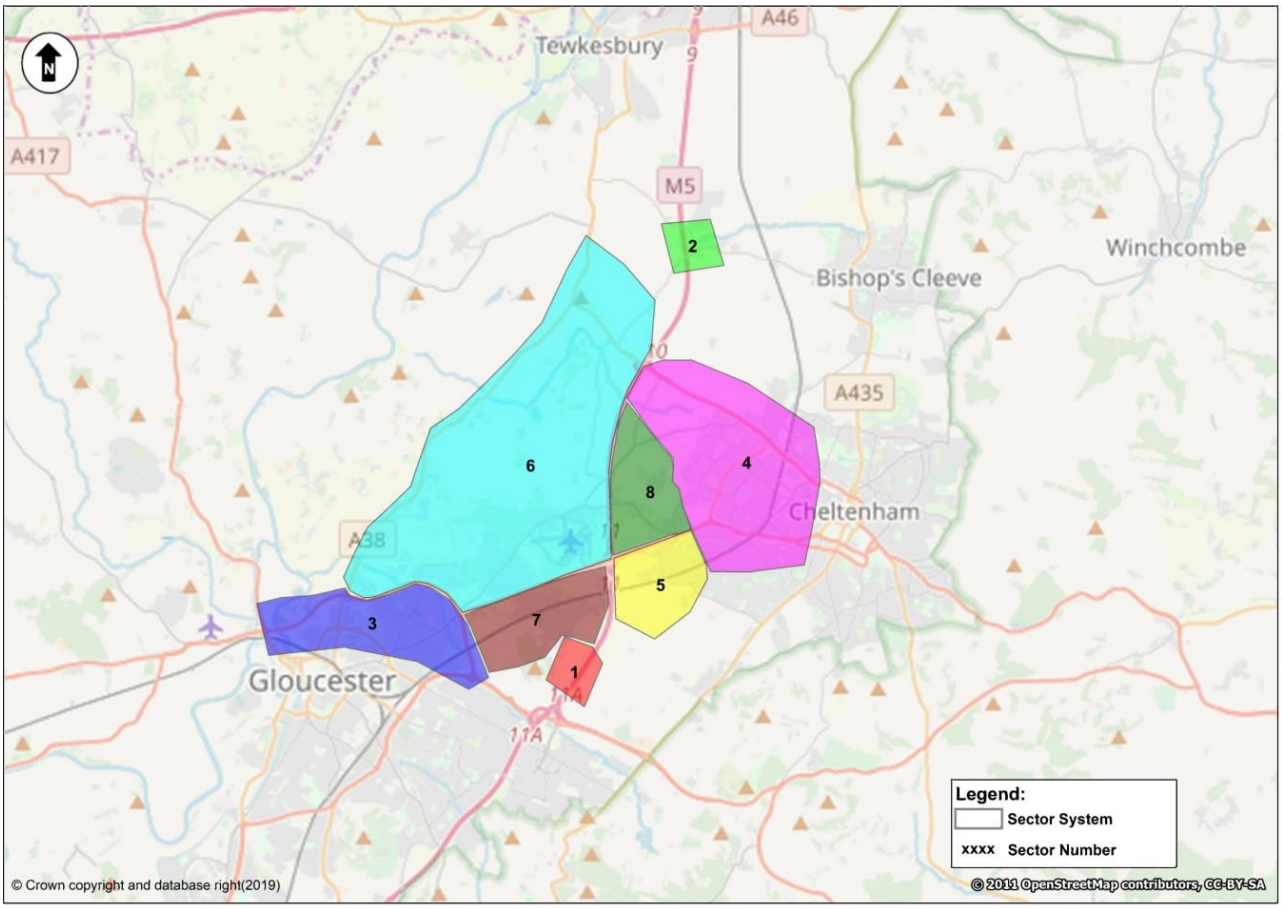
## 3.6.5. Spatial Distribution of Benefits

To understand the spatial distribution of benefits from the scheme, sector analysis was carried out. The following section describes the sector system used for the study.

### 3.6.5.1. Sector System

A system of eight sectors was developed to provide grouping of zones that are expected to be affected in similar manner by the scheme. The proposed sector system is composed of two sectors in the vicinity of the scheme (two sectors immediately north and south of Arle Court junction), two sectors for the strategic M5 long distance trips running north and south of J11 and the remaining four sectors providing geographical groupings of more distant local areas that are quite likely to feed trips through A40 / Arle Court corridor. The sector system is shown in Figure 3-5 below.

**Figure 3-5 - Sector System**




A detailed description of the sectors adopted in the sector system is listed below:

- Sectors 1 and 2 capture strategic traffic running on the M5.
- Sector 3 is the built-up area of Gloucester within the A40 northern and A417 eastern bypasses.
- Sector 4 is rest of Cheltenham east of the scheme.
- Sector 5 is the build-up area of Cheltenham south of Arle Court including The Reddings and Badgeworth which lie very close to the scheme.
- Sector 6 is the villages west of M5 and north of A40 such as Staverton Bridge, Innsworth and Churchdown (N) and Gloucester Airport.
- Sector 7 is remaining part of Churchdown south of A40.
- Sector 8 is the area immediately north of the scheme extending to include Fiddler's Green and Golden Valley.

### 3.6.5.2. Sectoral distribution of journey time benefits

Sectoral journey time benefits are shown in Figure 3-6 and Table 3-15 below.

**Figure 3-6 – Core Scenario Sectoral Distribution**

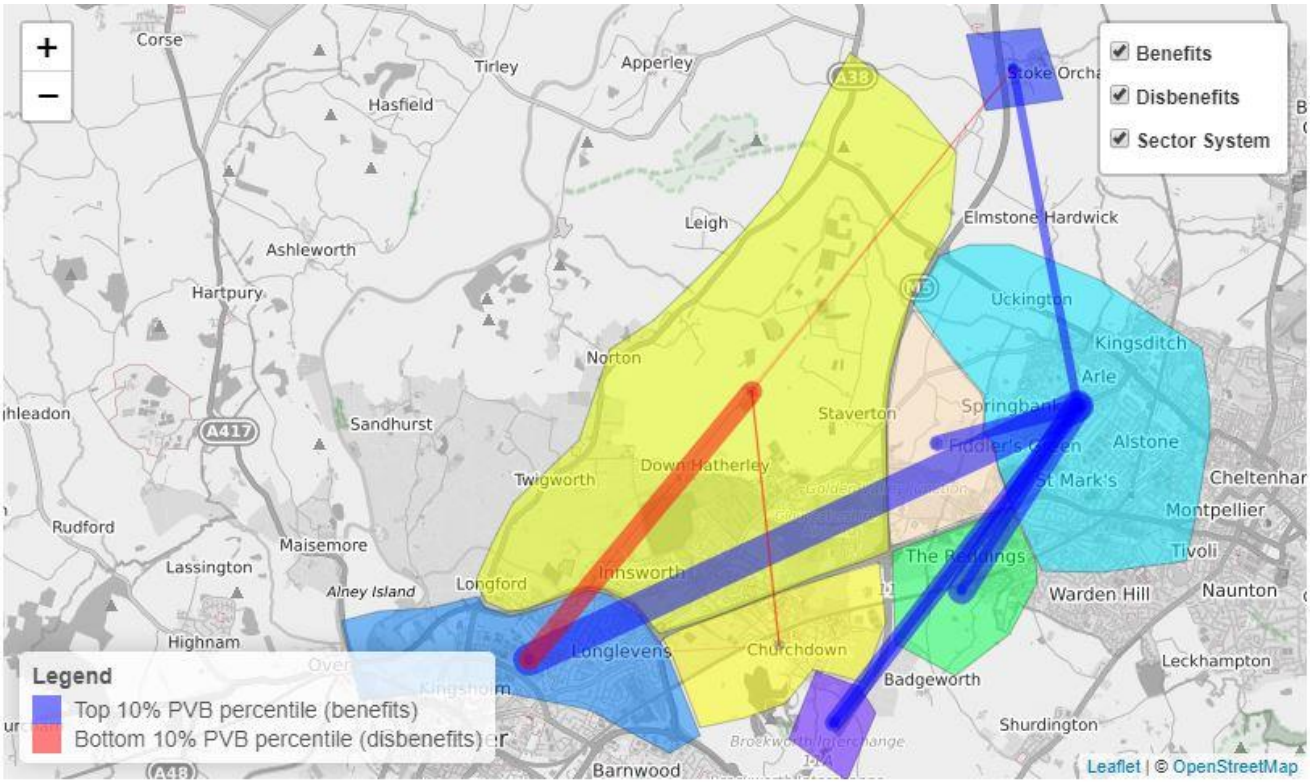


**Table 3-15 – Sectoral distribution of travel time benefits**

| Table | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 235.79 | -50.65 | 8619.49 | 476.93 | 316.30 | -3.56 | 183.96 | **9778.25** |
| 2 | 3016.10 | 0.00 | 1353.08 | 4368.16 | 771.63 | 243.10 | 85.08 | 314.51 | **10151.64** |
| 3 | 141.12 | -274.63 | 836.67 | 15215.93 | 1095.93 | 2775.45 | 71.02 | 645.61 | **20507.11** |
| 4 | 4363.72 | 3373.59 | 3801.55 | 1024.12 | 4593.41 | 2744.93 | 577.89 | 1718.85 | **22198.05** |
| 5 | 1810.64 | 894.89 | 1897.47 | 13147.43 | 1128.92 | 3095.76 | 153.47 | 1249.99 | **23378.56** |
| 6 | 2527.15 | -459.80 | -10117.26 | 2110.04 | 2800.72 | -1556.98 | -1046.01 | 271.55 | **-5470.60** |
| 7 | -3.13 | -48.46 | -226.94 | 1014.01 | 386.24 | -78.32 | -4.21 | 30.96 | **1070.15** |
| 8 | 4175.02 | 1482.79 | 2623.03 | 7336.30 | 2441.86 | 882.09 | 153.57 | 69.27 | **19163.94** |
| Total | **16030.62** | **5204.18** | **116.95** | **52835.48** | **13695.63** | **8422.32** | **-12.76** | **4484.71** | **100777.11** |

Note - Cells in red are the bottom 5 movements and cells in green are the top 5 movements. All values are in £000 in 2010 market prices discounted to 2010.

It can be observed from Table 3-15 that approximately 23% of all scheme journey time benefits are experienced by trips with origin in sector 5 and 52% of all journey time benefits are experienced by trips with destination in sector 4.

Focussing on the 60-year appraisal period, the movements with the highest benefits are:

- £15.22m - Sector 3 to Sector 4
- £13.15m - Sector 5 to Sector 4
- £8.62m - Sector 1 to Sector 4
- £7.34m - Sector 8 to Sector 4
- £4.59m - Sector 4 to Sector 5

The highest benefits can be observed in movements originating from sector 3 to sector 4.

Some sector-to-sector movements are forecast to experience a dis-benefit, and the movements with the highest dis-benefits are:

- – £10.12m - Sector 6 to Sector 3
- – £1.56m - Sector 6 to Sector 6
- – £1.05m - Sector 6 to Sector 7
- – £0.46m - Sector 6 to Sector 2
- – £0.27m - Sector 3 to Sector 2

Compared with sector time benefits, sector time disbenefits are relatively low.

## 3.6.6. Public Accounts

The Public Accounts table below brings together the costs of the scheme and the revenue and tax changes which would result. The revenue and tax changes which follow from changes in traffic routes and speeds are derived from the TUBA output, while the capital and operating costs, less any offsetting developer contributions, are as described.

**Table 3-16 – PA Table (all values in £000s)**

| | |
|---|---|
| **Local Government Funding** | |
| Revenue | 0 |
| Operating Costs | 0 |
| Investment Costs | 7,742 |
| Developer and Other Contributions | 0 |
| Grant/Subsidy Payments | 0 |
| **NET IMPACT** | 7,742 |
| | |
| **Central Government Funding: Transport** | |
| Revenue | 0 |
| Operating costs | 0 |
| Investment Costs | 0 |
| Developer and Other Contributions | 0 |
| Grant/Subsidy Payments | 0 |
| **NET IMPACT** | 0 |
| | |
| **Central Government Funding: Non-Transport** | - |
| Indirect Tax Revenues | 1,532 |
| | |
| **TOTALS** | |
| **Broad Transport Budget** | 7,742 |
| **Wider Public Finances** | 1,532 |

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

### 3.6.7. Analysis of Monetised Costs and Benefits

The table below presents the Analysis of Monetised Costs and Benefits (AMCB) analysis.

**Table 3-17 – Analysis of Monetised Costs and Benefits (all values in £000s)**

| | |
|---|---|
| Noise | Not assessed |
| Local Air Quality | Not assessed |
| Greenhouse Gases | 632[16] |
| Journey Quality | Not assessed |
| Physical Activity | Not assessed |
| Accidents | Not assessed |
| Economic Efficiency: Consumer Users (Commuting) | 42,572 |
| Economic Efficiency: Consumer Users (Other) | 34,107 |
| Economic Efficiency: Business Users and Providers | 28,357 |
| Wider Public Finances (Indirect Taxation Revenues) | -1,532 |
| Present Value of Benefits (PVB) | 104,136 |
| Broad Transport Budget | 7,742 |
| Present Value of Costs (PVC) | 7,742 |
| OVERALL IMPACTS | |
| **Net Present Value (NPV)** | 96,394 |
| **Benefit to Cost Ratio (BCR)** | 13.451 |

## 3.7. Appraisal Summary Table (AST)

Following the production of the AMCB table, the relevant values in the TEE/PA/AMCB tables are transcribed to the AST and are complemented by the environmental and social and distributional impacts assessment results. The AST table is reproduced in Appendix E.

## 3.8. Value for Money Statement

The Value for Money (VfM) assessment is carried out as a staged process to ensure that a complete and robust analysis is undertaken. A VfM statement has been produced for the core scenario using information within the AST to provide a summary of the conclusions from the VfM assessment. The DfT VfM categories and their relationship with BCRs to be generated through the cost-benefit analysis is presented below.

[16] Greenhouse gases taken from TUBA assessment. These values are converted into a monetary value, calculating a net present value (NPV) of the greenhouse house benefits over the appraisal period.

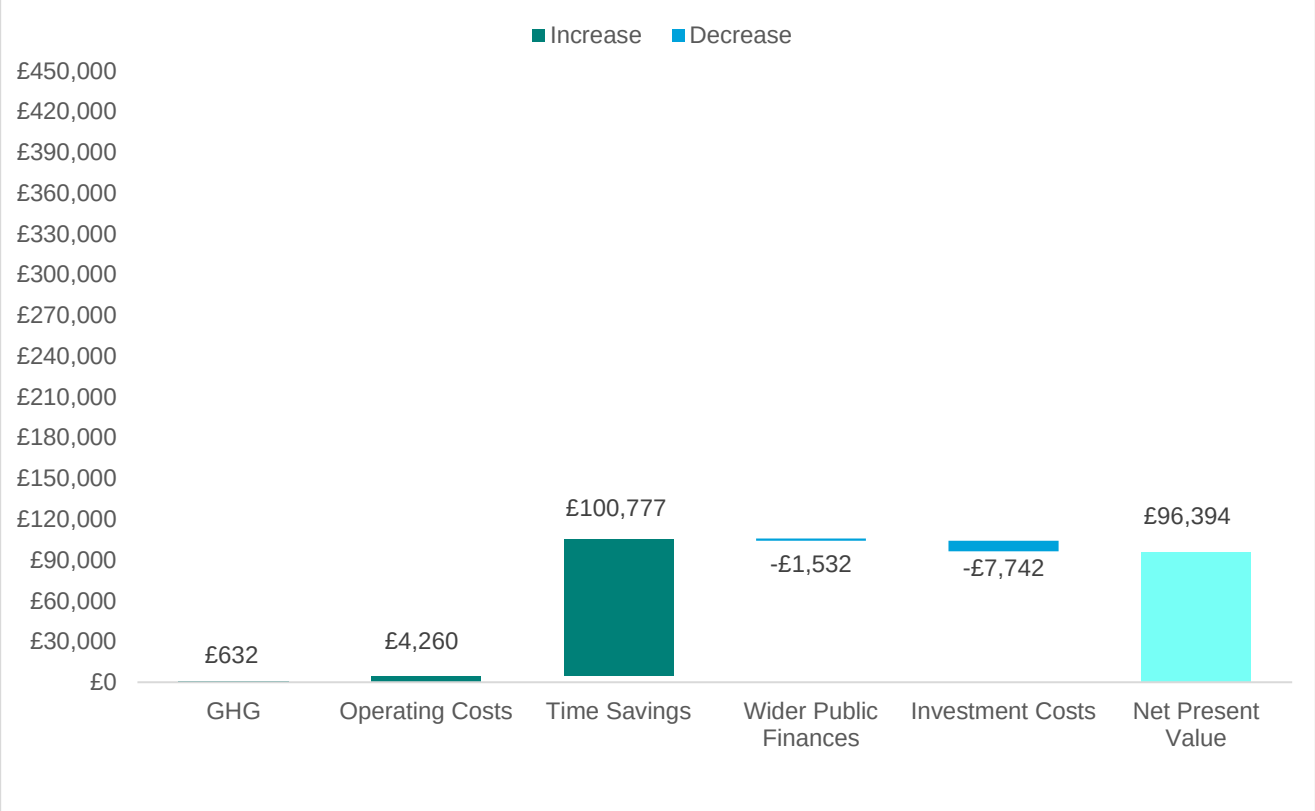
**Table 3-18 - DfT VfM Categories**

| BCR | Category |
|---|---|
| Less than 1.0 | Poor |
| 1.0 to 1.5 | Low |
| 1.5 to 2.0 | Medium |
| 2.0 to 4.0 | High |
| Greater than 4.0 | Very High |

Overall assessment of costs and benefits generated by the project shows that the scheme achieves a Benefit Cost Ratio figure of 13.45 with a Net Present Value (NPV) of approximately £96.40 million. The scheme can be therefore categorised as achieving very high value for money in the classification provided by DfT This BCR value confirms the importance of the scheme and urgency of its implementation. The majority of benefits derives from time savings, because current poor traffic conditions cause long delays to all types of trips and thus hinder the productivity of local communities and local economic growth. This scheme will help to overcome these issues which otherwise would have a cumulative negative impact in the next few years.

The structure of the benefits is presented in Figure 3-7, presented as the cumulative benefits from lower benefits to higher benefits and lower disbenefits to higher disbenefits, adding up to the Net Present Value.

**Figure 3-7- Value for Money of the scheme, costs and benefits structure, £000s**




A number of other benefits have been assessed qualitatively as part of this Business Case. These include Environmental impacts (biodiversity, heritage, landscape, air quality, noise and vibration and water environment/ flooding) and Social impacts (social and distributional impacts, physical activity, journey quality, accidents, security, access to services, affordability, severance). Reliability impacts on commuting and other users was not assessed as part of this study.

The Value for money statement table summarises the benefits in each category and clarifies which monetised assessments were completed.

**Table 3-19 - Value for Money Statement**

| Scheme Name | Arle Court Phase 1 |
|---|---|
| Description of Scheme | • The provision of an additional lane to the circulatory of the signalised roundabout;<br>• Corresponding additional lanes to the A40 on the approaches and exits to and from the junction;<br>• Providing a new bus lane on the B4063 Staverton approach to the roundabout, also improving facilities for cyclists;<br>• Bus lane modifications to improve journey times for public transport<br>• Widening the Hatherley Lane arm to the south-side of the roundabout, improving access to the Arle Court Park and Ride (P&R);<br>• Investigating other cycling improvements as part of this phase<br>• Proposal to improve cyclist access at specific junctions, such as Fiddlers Green Lane<br>• Park and Ride Entrance/Exit westbound (towards Gloucester) from Arle Court Roundabout; and<br>• Relocating the bus stop at the P&R and building a new one on the other side of the road to take advantage of the bus only slip. |
| PV Costs (in £000s) | |
| PVC, 2010 prices/values | **7,742** |
| PV Benefits (in £000s) | |
| Physical Activity | Not Assessed |
| Urban Realm | Not Assessed |
| Travel Time savings | 100,777 |
| Vehicle operating costs (Fuel) | 2,627 |
| Vehicle operating costs (Non-fuel) | 1,633 |
| Indirect Taxation Revenues | -1,532 |
| Greenhouse gases | 632 |
| Deduction to account for private sector contributions | 0 |
| PVB, 2010 prices/values | **104,136** |
| | |
| Accidents | Not Assessed |
| Air Quality | Not Assessed |
| Noise | Not Assessed |
| Wider Impacts | Not Assessed |
| Public Transport Impacts | Not Assessed |
| Benefit to Cost Ratio | 13.451 |
| Value for Money category | **Very high** |

The detailed Appraisal Summary Table is presented in Appendix E.

## 3.9. Sensitivity testing

This section describes the sensitivity tests carried which reflect the uncertainty in local demand growth factors.

The sensitivity testing carried out consisted of comparing the PVB derived from the TUBA appraisals of the following alternative scenario:

- **The optimistic scenario,** where demand will grow until the last forecasting year 2031, in line with what was set out in the forecasting report (Appendix B).

Table 3-20 summarises the results of the sensitivity test. Results produced from this analysis show that the expected BCR range from 13.451 to 44.485.

**Table 3-20 Summary of Forecast Growth Sensitivity Tests (values in £000s)**

| Item | Core | Optimistic |
|---|---|---|
| Greenhouse Gases | £632 | £2,250 |
| Economic Efficiency: Consumer Users (Commuting) | £42,572 | £141,069 |
| Economic Efficiency: Consumer Users (Others) | £34,107 | £116,388 |
| Economic Efficiency: Business Users and Providers | £28,357 | £89,667 |
| Wider Public Finances (Indirect Taxation Revenues) | -£1,532 | -£4,971 |
| **Present Value of Benefits (PVB)** | **£104,136** | **£344,403** |
| Broad Transport Budget | £7,742 | £7,742 |
| **Present Value of Costs (PVC)** | **£7,742** | **£7,742** |
| | | |
| **Net Present Value (NPV)** | **£96,394** | **£336,661** |
| **Benefit to Cost Ratio (BCR)** | **13.451** | **44.485** |

# 4. Commercial Case

## 4.1. Introduction

The Commercial Case provides evidence that the proposed investment can be procured, implemented and operated in a viable and sustainable way. The aim is to achieve best value during the process, by engaging with the commercial market.

## 4.2. Expected Outcomes from the Commercial Strategy

The outcomes which the commercial strategy must deliver are to:

- Confirm that procedures are available to procure the scheme successfully;
- Check that available/ allocated capital funds will cover contractor and Construction costs;
- Verify that risk allowance is sufficient; and
- Ensure that arrangements have been made to handle cost overruns.

## 4.3. Procurement - Scheme Procurement Strategy

GCC have identified three procurement options for the delivery of LEP funded schemes. The alternative options are:

**A. Full PCR 2015 compliant tender (Schemes greater than OJEU limit of £4,551,413)**

GCC would opt for an 'open' tender, where anyone may submit a tender, or a 'restricted' tender, where a Pre-Qualification is used to whittle down the open market to a pre-determined number of tenderers. This process takes approximately one month and the first part is a 35 day minimum period for GCC to publish a contract notice on the OJEU website.

Once the tenders are received, they will be assessed and a preferred supplier identified. There is a mandatory 10 day 'standstill' period, during which unsuccessful tenderers may challenge the intention to award to the preferred contractor.

**B. Open Tender (Schemes greater than £1M but less than OJEU limit)**

GCC would opt for an 'open' tender, where anyone may submit a tender. The tender would include a set of eligibility criteria and a quality submission. Depending on the exact tender assessment method chosen the contractors would be required to meet a quality threshold score or selected using a quality / price evaluation.

Schemes will be procured via ProContract and this would include prior notifications of the tender approximately 4 weeks before the formal tender. Depending upon the complexity of the scheme supplier engagement presentations will be arranged.

The minimum tender period is 5 weeks but could be longer for more complex schemes. All suppliers that meet the eligibility criteria will be assessed and a preferred supplier identified.

**C. Delivery through Term Maintenance Contract (TMC) (Schemes less than £1M)**

This option is strictly not procurement as the TMC is an existing contract. The TMC is based on a Schedule of Rates agreed at the inception of the contract. The price for each individual scheme is determined by identifying the quantities of each required item into a Bill of Quantities. TMC may price 'star' items if no rate already exists for the required item. If the scope of a specific scheme is different from the item coverage within the TMC contract a new rate can be negotiated.

The preferred procurement route for is **Option A, Full PCR 2015 compliant Tender,** as the scheme is above the PCR 2015 financial limit.

For budget certainty the scheme will be procured on a lump sum basis as an ECC Option A contract (Lump Sum with Activity schedule). This option is preferred as the scheme will be fully designed with a clear specification of works which allows for a greater transfer of risk to the Contractor through a priced contract. The Activity Schedule used in this form of contract also gives greater confidence in the Contractor's price. This is as a result of the importance given to the Contractor's programme, as tenderers have to plan the scheme whilst preparing their Activity Schedule. This also means the programme is realistic and more likely to be adhered to as payments to the Contractor are linked to their activity schedule.

The ECC Option A contract is Gloucestershire County Council's preferred method of delivery for this size and type of highway scheme. This ensures consistency with internal processes, staff members, supply chain, benchmarking, performance etc. which should all aid successful delivery.

## 4.4. Cheltenham Park and Ride (P&R)

### 4.4.1. Operation Arrangements

The facility has been in operation since 1998 and is a key part of Gloucestershire County Council's 2015-2031 LTP. It also plays an essential role in reducing congestion and improving air quality in Cheltenham town centre, providing parking for 576 vehicles, with regular bus services to the town centre and Gloucestershire Royal Hospital.

The viability of the Park & Ride is integral to the overall scheme, and also to the improvements across the area, and the County are committed to the long-term future of the Park and Ride.

In terms of commercial arrangements, GCC own the site outright, and their Integrated Transport Unit (ITU) pays the site maintenance upkeep (business rates, electricity, ground work etc). ITU retains the revenue from bus departure charges and will retain parking revenue after expenses. There is no contract for the P&R service, and it is a commercial operation by Stagecoach. Stagecoach sign up to the Arle Court site licence and pay a per bus departure charge.

### 4.4.2. Recent changes to charging regime

Since it opened, there has been a steady increase in demand for parking at the Arle Court site, with many motorists not being able to park and use the bus services. This in turn resulted in several public complaints, lost revenue for the bus operators and negative media coverage for GCC and the bus operators. A GCC review identified that a large percentage of vehicles parked on the site were present because employees from local businesses were effectively using the facility as a free car park, rather than for getting buses into the town centre. One of the key concerns was from the bus operators in relation to lost revenue. The Council also had a number of concerns in relation to the impact on genuine users, the resultant impact of more cars driving into the town centre instead of making use of the facilities, and their impact on the environment. Achieving a balanced solution to the problem that helped all parties benefit was a key consideration. A new system for parking was launched on 13 May 2019. Users of the P&R bus service now get their free parking validated by entering their registration number on one of two new high-tech solar powered touchscreen machines. The machine then produces a ticket with a unique QR code which the user validates when they board the P&R bus and pay their fare. Validation details are automatically sent via the system to the parking enforcement officer's device, so that genuine P&R users aren't ticketed unduly.

The new arrangement therefore permits free parking for genuine users of the P&R bus services and limited parking for 150 non-bus users. Non-bus users pay (£6 all day or £3 after 1 PM) for a space using the existing mobile parking application.

### 4.4.3. Long term plans

GCC has an ambition to add an additional deck for parking at the site to increase capacity and change the focus from a Park & Ride to a Park & Interchange. Future plans are subject to obtaining funding and/or contributions from local developers. The M5-J10 HiF bid includes a request for funding to improve and increase the capacity of the Park and Interchange.

## 4.5. Commercial Risk Assessment

The table below provides a summary of the identified commercial risks surrounding the scheme.

| Qualitative Commercial Risk Assessment | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scheme Commercial Risk Item** | **Likelihood of Risk Arising (✓)** | | | **Impact Severity (✓)** | | | **Predicted Effect on Scheme Procurement, Delivery & Operation (✓)** | | | **Immediate Bearer of Risk and Suggested Mitigation** |
| | **Low** | **Medium** | **High** | **Slight** | **Moderate** | **Severe** | **Slight** | **Moderate** | **Severe** | |
| ***Scheme construction is delayed and/or costs increase.**<br><br>**E.g. from unexpected engineering difficulties.** | | ✓ | | | | ✓ | | ✓ | | GCC, as scheme promoter, bears the risk.<br>Ensure that scheme development, design, procurement and construction procedures are sufficiently robust to minimise likelihood of construction difficulties. |
| **Ongoing maintenance costs of scheme higher than expected** | ✓ | | | ✓ | | | ✓ | | | GCC, as scheme promoter, bears the risk.<br>Ensure that scheme design, materials selection and construction procedures are sufficiently robust to minimise likelihood of maintenance issues. |

**Table 4-1 Scheme Commercial Risk Assessment**

*Risk allocation will be apportioned between GCC and the Contractor undertaking the site works. This will be based upon NEC principles and regular on-site Risk Management meetings will be held to ensure prompt mitigation of risks.

# 5. Financial Case

## 5.1. Project Costs

Commitment to funding the scheme will be sought at the full LEP Board meeting in December 2019.

This section considers the capital costs associated with the proposed scheme investment.

## 5.2. Breakdown and Time Profile of Project Costs

**Table 5-1 - Breakdown of scheme capital costs, 2019 prices**

| Project cost components | Capital cost items | Estimate status* | Costs by year (£) | | | | Totals |
|---|---|---|---|---|---|---|---|
| | | | 2018/19 | 2019/20 | 2020/21 | 2021/22 | |
| Design & Management | Design fees, Surveys and trial holes, Land Purchase | P | £422,767 | £2,112,000 | £588,000 | £20,000 | £3,142,767 |
| Construction including Traffic-Related Maintenance | Non-Routine Re-construction | P | - | £813,000 | £3,810,000 | - | £4,623,000 |
| | Site clearance, Diversions of Statutory services. Widening and re-Surfacing of carriageway. | | | | | | |
| Contingency | Risk Adjustment | P | - | £585,000 | £880,000 | - | £1,465,000 |
| Indirect Tax | Non-Recoverable VAT (if applicable) | - | - | - | - | - | - |
| **Total Cost** | **(NB – Base cost + 3% inflation)** | **P** | **£422,767** | **£3,510,000** | **£5,278,000** | **£20,000** | **£9,230,767** |

*O = Outline estimate, P = Preliminary estimate, D = Detailed estimate, T = Tender price

## 5.3. Project Funding

This section considers the capital funding requirements and commitments for the proposed scheme investment.

### 5.3.1. Sources of Funding

The sources of funding for the scheme are summarised below.

**Table 5-2 - Scheme funding sources and profile of contributions**

| | 2018/19 | | 2019/20 | | 2020/21 | | 2021/22 | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Capital | Rev | Capital | Rev | Capital | Rev | Capital | Rev | |
| LEP funding (Growth Deal 3) | £422,767 | n/a | £3,510,000 | n/a | £5,278,000 | n/a | £20,000 | n/a | £9,230,767 |
| GCC | - | n/a | - | n/a | - | n/a | - | n/a | - |
| **Total** | **£422,767** | **n/a** | **£3,510,000** | **n/a** | **£5,278,000** | **n/a** | **£20,000** | **n/a** | **£9,230,767** |

All figures are in outturn prices

### 5.3.2. Security and earliest availability of funds

**Table 5-3 - Security and availability of scheme funding contributions**

| | | Security of funding contribution (✓) | | | Earliest available date for securing fund contribution | |
|---|---|---|---|---|---|---|
| Funding source | Fund details | Low | Medium | High | Part funding date | Full funding date |
| LEP | LEP | | | ✓ Subject to approval by the LEP Board | n/a | On Board approval November 2019 |
| GCC | GCC – Capital Funds | n/a | n/a | n/a | n/a | n/a |

This FBC has been reviewed and accepted for submission by GCC's S151 officer. As scheme promoter, GCC will be liable for any future cost overruns associated with the delivery of the suite of transport schemes. This will be funded from within the scheme funding envelope of the full £22 million Capital grant or alternative funding, such as the highways capital programme, Section 106 developer contributions, Community Infrastructure Levy, etc.

As stated in the County Council's Constitution, 'Directors are responsible for ensuring that variations in capital project estimates that occur during the course of a contract are contained within the resources allocated to that service'. The scheme's costs will be monitored and managed accordingly..

Funding for delivery for each of phase of the WCTIS Cyber Park Scheme is subject to variation in scope, market forces and risks being realised, agreement is in place with the GFirst LEP that funding can be transferred between phases to reflect underspend/overspend and this will be reflected in the extent of scheme developed in phases 3 and 4 of the works.

## 5.4. Financial Risk Management Strategy

This section examines the risks associated with the costs and financial requirements of the onsite infrastructure and engineering works. It considers the mitigation that may be needed to handle the identified risks, if they arise.

### 5.4.1. Risks to the Scheme Cost Estimate and Funding Strategy

Table 5-4 shows the financial risks and suggested mitigation measures associated with this scheme.

**Table 5-4 - Qualitative financial risk assessment**

| Scheme financial risk item | Likelihood of risk arising (✓) | | | Impact severity (✓) | | | Predicted impact on scheme delivery and outcome (✓) | | | Suggested mitigation |
|---|---|---|---|---|---|---|---|---|---|---|
| | Low | Medium | High | Slight | Moderate | Severe | Slight | Moderate | Severe | |
| Unforeseen increase in scheme cost reduces the VfM (i.e. BCR nearer to 1.0 'low') | ✓ | | | ✓ | | | ✓ | | | Scheme will be amended to reduce costs whilst ensuring that agreed Outputs are achieved.<br>In the event of cost overruns, GCC would value engineer the schemes to fit the available budget. |
| Earmarked / secured funds do not cover current scheme capital cost | | ✓ | | | ✓ | | | ✓ | | As above |

## 5.5. Ongoing Maintenance

For information only (and not accounted for in the BCR), to cover two surface treatments and a surface course resurfacing, the cost of the ongoing maintenance is estimated as £23.20 per $m^2$. Over a 30-year design life this would equate to £0.77 per $m^2$ per year. The scheme will construct additional carriageway area of 4000 $m^2$.

The additional maintenance liability would therefore equate to £3,080 per year and GCC will include for this in maintenance budgets, and therefore does not impact on the budget and LEP funding for the scheme.

## 5.6. Land Purchase

Works are all within the highways boundary and the only requirement for land purchase is for the works compound. The land purchase necessary for the works compound has been completed successfully by GCC's Asset Management Property Services Team.

# 6. Management Case

## 6.1. Overview

The Management Case outlines how the proposed scheme and its intended outcomes will be delivered successfully. It gives assurances that the scheme content, programme, resources, impacts, problems, affected groups and decision makers, will all be handled appropriately, to ensure that the scheme is ultimately successful.

## 6.2. Project Governance, Roles and Responsibilities

### 6.2.1. Project Governance

GCC have set up a clear and robust structure to provide accountability and an effectual decision-making process for the management of the LEP funded schemes. Each scheme will have a designated project manager who will be an appropriately trained and experienced member of GCC staff.

A detailed breakdown of meetings (along with the attendees, scope and output of each) which make up the established governance process is set out below.

### 6.2.2. Project Board Meetings (PBM)

Project Board Meetings are held monthly to discuss individual progress on each scheme and are chaired by Gloucestershire County Council term contractor Project Managers (PMs). Attendees include representatives for different aspects of LEP management (i.e. Communication, Traffic, Risk Management, and GCC Consultants design and/or construction team). Progress is also discussed in technical detail raising any issues or concerns for all to action. A progress report, minutes of meeting and an update on programme dates are provided ahead of the meeting for collation and production of the LEP Progress and Highlight Report.

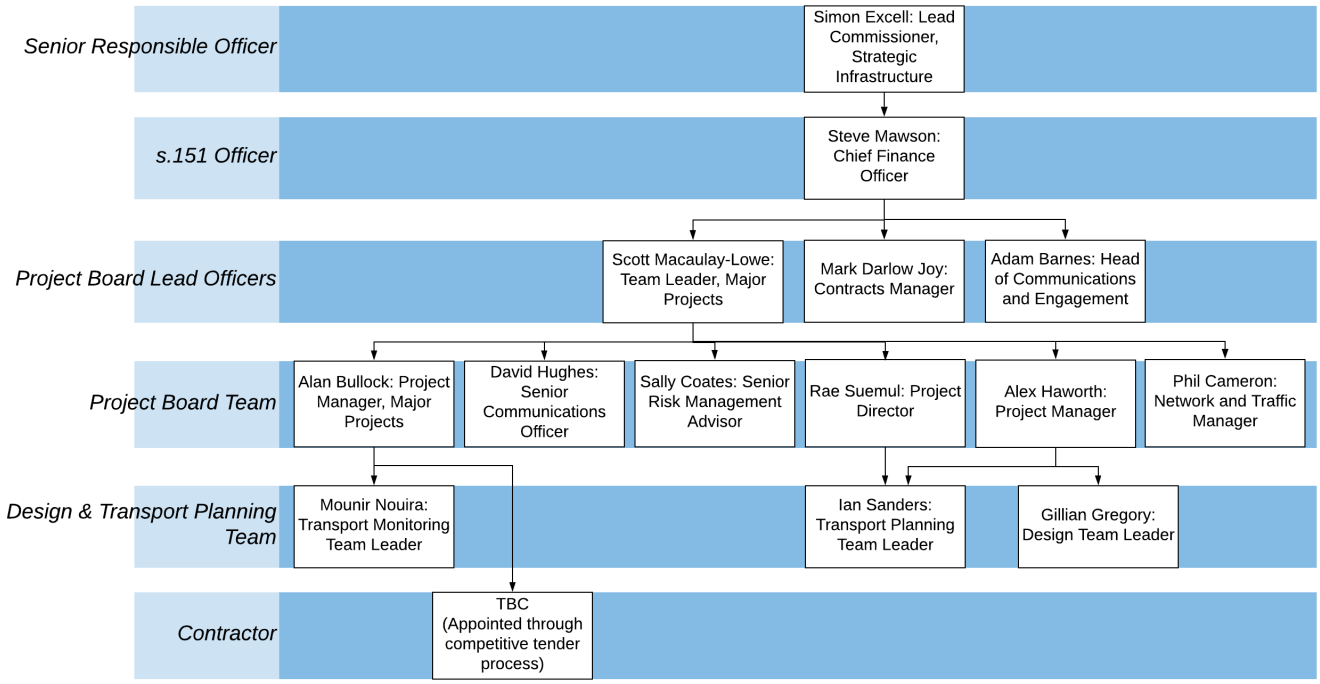
### 6.2.3. LEP Progress and Highlight Report

The Progress and Highlight Reports sent by the GCC PMs comprise of the following updates; general progress, project finances, issues, risks and meeting dates. The report also identifies any areas of concern or where decisions are required by the PBM. An agreed version of the latest Progress and Highlight Report is issued to the PB meeting attendees during the meeting.

## 6.3. Project Management Structure

Gloucestershire County Council and their Consultants have agreed a project management structure for the project, as shown in Figure 6-1 below.

**Figure 6-1 - Project Management Structure**




## 6.4. Public Share Events

A total of two Public Share Events covering Phases 1 and 2 of the West of Cheltenham Transport Improvement Scheme – UK Cyber Park have been held at two different locations in Cheltenham:

1. 18th June 2019 (14:00 – 19:00): Jury's Inn Hotel, Gloucester Road, Cheltenham GL51 0TS
2. 20th June 2019 (17:30 – 21:00): St Mark's C of E Junior School, Robert Burns Avenue, Cheltenham GL51 6NU

The attendance at the events was unprecedented: the most highly-attended public drop in sessions ever held by Gloucestershire County Council for a highways scheme, with close to 500 people visiting across the two sessions. The events were promoted following a full letter drop of 1,600 letters (area covered shown in Figure 6-3), press releases, social media, personal invites to key stakeholders, promotion on the Gloucestershire County Council Website and promotion on local radio. At both events, presentation boards were provided with large scale artist's impressions, general arrangement plans and graphics together with scheme introduction, background and Frequently Asked Questions. A number of GCC and Atkins staff were on hand to answer questions from key stakeholders and members of the public. Attendees were offered a personal tour of information available and in-depth discussions about issues, concerns and improvements. Most attendees took the opportunity to ask questions and give their own views of the scheme using feedback forms that were available for people to leave comments. In addition, key stakeholders were invited to provide a formal written response either online, or through the GCC Major Projects Email Inbox.

**Figure 6-2 – Artists Impression for Phase 1**


Aerial view of proposed layout
East approach A40

Artist impression of proposed layout
West approach

**Figure 6-3 - Letter drop area**

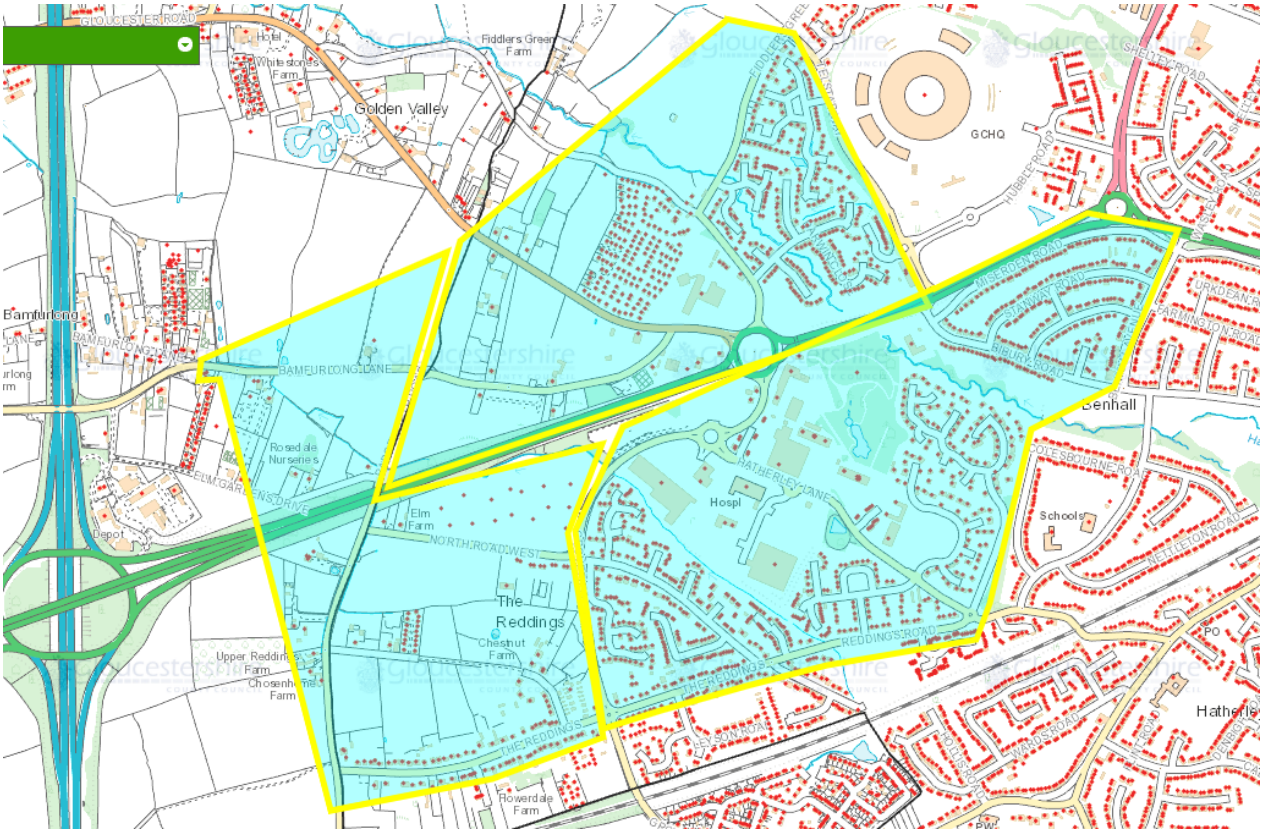



**Figure 6-4 - Presentation boards at the 18th June event, Jury's Hotel Cheltenham**

### 6.4.1. Feedback form responses

On the feedback form, attendees were asked if they agreed or disagreed that four different objectives would be achieved by the scheme. The results of the feedback from the sessions are summarised in Table 6-1 below.

Overall the statements received more agreement than disagreement (181 'agree' responses vs 162 'disagree' responses).

- People were most sceptical about the walking and cycling provision, with 45 respondents indicating that they thought that the scheme wouldn't increase walking and cycling provision against 39 who agreed that it would; but
- More people agreed that the scheme would alleviate congestion than disagreed (62 vs 40); and
- More people agreed that the scheme would encourage development in the West of Cheltenham (38 vs 35).

Opinion was split on whether the scheme represents good use of public monies. One key factor contributing to negative responses, especially in the first event, was concerns about the difficulty getting out of Fiddler's Green Lane at peak times. Over half (65) (Table 6-2) of the feedback forms submitted referred to this concern. The location of the venue meant a high number of local residents were in attendance which is one of the reasons Fiddler's Green Lane received such a high level of feedback. Our responses to these concerns are summarised in the same table.

**Table 6-1 - Summary of the feedback at the Public Share Events**

| Statements | Agree | Neither agree nor disagree | Disagree |
|---|---|---|---|
| Alleviate existing congestion at Arle Court Roundabout and on the A40 (from Arle Court to M5 J11) | 62 | 32 | 40 |
| Encourage future development in the West of Cheltenham area by releasing network capacity | 38 | 59 | 35 |
| Increase the level of walking and cycling provision for the West of Cheltenham areas | 39 | 51 | 45 |
| Represent good use of public monies | 42 | 47 | 44 |
| **Total** | **181** | **189** | **164** |

*50 spoiled/missed questions. 20 of the attendees responded online after the events.*

The feedback form also had a box where respondents could write any further comments and feedback. Key themes were identified from these comments and are shown in Table 6-2 below, along with our responses to these comments.

**Table 6-2 - Themes identified from the comment box responses**

| Theme | Examples | Mentions | How we responded to and / or addressed the comments |
|---|---|---|---|
| Fiddler's Green Lane | Attendees commented to say that traffic already has difficulty entering the roundabout from Fiddler's Green Lane particularly during the morning and evening peak periods and there was concern that adding an extra lane to the roundabout would only make this worse. | 65 | The design team are continuing to review options for improving access from Fiddler's Green Lane, especially given the larger size of the new design and the arrangement of the islands. Possible improvements include increasing the length of the two-lane approach to the roundabout and associated lining. This would reduce the chance of vehicles turning left being blocked by traffic waiting to turn right. |

| Theme | Examples | Mentions | How we responded to and / or addressed the comments |
|---|---|---|---|
| | Some suggested signalisation or changes to the layout to improve the operation of this arm. | | Signalisation of the Fiddlers Green Lane arm will be considered but is unlikely given the geometry of the roundabout, which does not allow this arm to be easily signalised without a large detrimental impact on the operation of the roundabout. |
| Walking and cycling provision | Attendees thought that the scheme could focus more on walking and cycling provision with concerns over the safety and suitability of present cycle routes in the area.<br>Some commented that shared use paths were not as effective as segregated lanes. | 25 | The design team have fully considered walking and cycling during the design of the scheme. At Arle Court, there is existing pedestrian and cycle provision of the off carriageway National Cycle Network route and shared use facilities and the measures included within the design will ensure consistency of the route. The designers are looking to ensure all existing facilities are maintained and where possible, local enhancements are made.<br>Following the feedback, the scope of the scheme was changed to include a new controlled crossing over Fiddler's Green Lane.<br>The importance of cycle provision within Phases 3 & 4 was also recorded and will be taken forward.<br>In addition, cycling routes from Cheltenham to Gloucester and existing plans from CBC and Highways England regarding cycling (including from GCHQ to the station) are being considered and have been accommodated within the designs. |
| Air quality / climate change | Increased traffic taking advantage of the extra capacity at the roundabout could increase greenhouse gas emissions and air quality concerns at a time when the 'climate emergency' is hitting the headlines. | 16 | While highway improvements may in certain cases result in more traffic attracted to the network, free-flowing traffic is integral to mitigating the impact of road traffic on air-quality. The overall impact on Air Quality of the scheme has been fully assessed, and is expected to be neutral. |
| Alternative proposal / scepticism | Attendees suggested modifications to the design or consideration of different options. These included building a Hamburger lane (with good experience from Elmbridge Court) and full signalisation of the junction. | 71 | It was explained at the public share that alternatives had been explored, but that some of the schemes suggested are not possible due to the known limited budget for scheme and constraints. |
| Impact on adjacent properties and businesses | Most of these comments related to concern over lost business during construction. | 6 | Any full road closures will be limited to night time working, allowing businesses to remain open during working hours. Restrictive working outside of peak periods will be accommodated wherever possible. GCC have purchased two properties, White Lodge and Pine Lodge for the widening of Hatherly Lane. The impact on the other nearest adjacent properties will |

| Theme | Examples | Mentions | How we responded to and / or addressed the comments |
|---|---|---|---|
| | | | be fully considered in the detailed design, and where improvements can be made in terms of screening and/or improving the level of vegetation, this will be implemented. |
| Cyber Park | Concern that some of the anticipated journey time benefits would be short-lived once traffic from Cyber Park starts using Arle Court. | 20 | It was clarified that the overall scheme would not mitigate for the full Cyber Park development but will assist in bringing forward potential developments in the West of Cheltenham by addressing some of the existing traffic issues. It was made clear that it would be incumbent on GCC and the developer to continue to provide the necessary transport infrastructure improvements as part of any planning application/transport assessment. The team were also able to provide further information on the proposals for M5 J10 and the positive impact this would have on A40 traffic |
| Modal shift | Responses described induced demand resulting from increasing highway capacity, potentially encouraging single-occupancy car use instead of public transport. | 12 | The improvements to the P&R are integral to the scheme, as well as improvements for the buses. Stagecoach are supportive of the scheme in both the Arle Court changes and the P&R amend to the egress. In addition, the funding bid submission for M5 J10 includes an allocation of funding for improvements to the P&R. |
| M5 J10 | Upgrading J10 of the M5 would alleviate some of the pressure on Princess Elizabeth Way and at Arle Court Roundabout to J11. | 12 | J10 is subject to a live bid submitted by GCC and their partners, in seeking funding for a full-movements junction. It is not a question of transferring the funds from this scheme to J10 as the quantum of scheme and monies required are of a different scale. |
| Local issues (parking / limiting access to Fiddler's Green Lane) | Responses were related to the implications for access to residents using Fiddler's Green Lane and undesirable parking in local areas. | 8 | Parking issues are affected by the recent changes to the P&R charging protocol. Parking issues are best addressed directly with parking enforcement as and when they arise. |
| Consideration of development in the area | Responses were centred around wider concerns about planning allocations sites to the west of Cheltenham. | 29 | Although it is known that the Cyber Park and North West Cheltenham (Elms Park) Strategic Allocation Sites are close to full planning applications, there are at present no agreed Transport Assessments or trip generations/distributions that are agreed by the Council (submitted by the developers). Therefore, the scheme **is not** solely for the enabling of the North West Cheltenham and West Cheltenham developments and is not specifically for their benefit, but to relieve current traffic congestion and facilitate early development for all potential developments. However, all planning applications are subject to approval in |

| Theme | Examples | Mentions | How we responded to and / or addressed the comments |
|---|---|---|---|
| | | | terms of traffic and typically require a full Transport Assessment with appropriate mitigation proposed to enable the application. |

*13 of the attendees of the 20th June event responded online after the event.*

### 6.4.1. Formal responses

In addition to the feedback received at the Public Share Events, a number of formal responses and emails to the Major Projects team at GCC were also received from key stakeholders in the area. These included politicians, members of the Walking, Cycling and Horse-riding Assessment and Review (WCHAR) group, planning officers and local employers. Comments followed a similar theme to the Public Share Event, focusing on:

- Cycling provision – responses emphasised the need to encourage cycling in the area, especially with the sort of businesses likely to be attracted by the Cyber Park; and
- Fiddler's Green Lane – formal responses and emails again highlighted perceived issues on the Fiddler's Green Lane arm of the junction. Suggestions for improvement included:
  - A change to the lane allocations to make the first lane left only, enabling left turners to get past queueing right turners;
  - Full signalisation of the roundabout;
  - Yellow hatching; and
  - Changes to the signal timings to increase intergreen time, providing opportunities for traffic to enter the roundabout from Fiddler's Green Lane and the B4063.

Two stakeholders in particular gave detailed responses:

- GCHQ, whose main Benhall site lies just to the east of the proposed scheme; and
- Stagecoach West, the principal bus operator in Cheltenham.

Both responses from these organisations were generally supportive of the scheme but had further comments and suggestions. The respondent on behalf of GCHQ suggested extending the third lane on the A40 westbound out of Arle Court Roundabout further towards the M5. This would be to reduce the need for rapid lane changes soon after leaving the junction, preventing a potential bottle neck and queueing back into the roundabout. This suggestion was considered carefully but ruled out due to the physical constraints of the scheme, including:

- The offside lane would need to extend past the bus merge facility to avoid merging the traffic from the left and the right at the same point;
- A third lane westbound cannot be accommodated to the M5 without extending the Badgeworth Road bridge at significant expense; and
- There would be further earthworks requirement and also environmental impact in terms of the loss of trees in the vicinity.

The 100m desirable minimum merge length has been provided and drivers do expect to merge at the location.

GCHQ also echoed the concerns of others that sustainable modes of travel should not be negatively impacted and if possible, be enhanced. Finally, he supported adding in "keep clear" boxes to reduce blocking back preventing other traffic flows across the junction.

The Managing Director of Stagecoach West welcomed the proposals, stating that existing issues at the junction are leading to unreliable journey times and reduced take-up of public transport. He highlighted that the 94 service, which uses the roundabout, is the most popular in the county and that the scheme will benefit some 2.5 million passenger journeys per year.

### 6.4.2. Changes to the design following feedback

The formal responses and the comments received in the questionnaires at the public share events highlighted that stakeholders felt strongly that walking and cycling provision should be prioritised. In response to this, the scope of the scheme was changed to include a new controlled crossing on Fiddler's Green Lane, providing a safer and more attractive route across the roundabout.

## 6.5. Communications and Engagement Management

GCC have a tried and tested Communication and Engagement Management Plan which is used on all major projects. Effective use of the plan has resulted in limited adverse feedback from the public and ensured successful delivery of schemes both from a project management and public relations perspective. This section will provide further information on how stakeholders are identified, how they are communicated to and the methods/ techniques used to communicate.

### 6.5.1. Aims and objectives

The main aim of the Communication and Engagement Plan is to ensure that stakeholders and members of the public are kept informed throughout the development and implementation of a scheme. This can range from keeping key stakeholders updated with critical information, (essential to the successful delivery of the scheme) to providing information to the public.

**Table 6-3 - Stakeholder categorisation approach**

| Stakeholder Category | Stakeholder Characteristics |
|---|---|
| Beneficiary | Stakeholders who will receive some direct or indirect benefit from the scheme. |
| Affected | Stakeholders who are directly affected by the scheme in terms of its construction and/ or operation |
| Interest | Stakeholders who have some interest in the scheme, although not affected directly by its construction or operation |
| Statutory | Stakeholders who have a statutory interest in the scheme, its construction, operation or wider impacts |
| Funding | Stakeholders who are involved in the funding of the construction or operation of the scheme |

### 6.5.2. Engagement categories

The information supplied to stakeholders can vary depending on their involvement with the scheme. The following table indicates the level of engagement that the variety of stakeholders can expect in relation to this scheme.

**Table 6-4 - Stakeholder engagement levels**

| Engagement Category | Details of Engagement Method |
|---|---|
| Intensive consultation | Stakeholders who are directly affected by the scheme and whose agreement is required in order for the scheme to progress. Consultation throughout the design and implementation. |
| Consultation | Stakeholders who are affected by the scheme and can contribute to the success of its design, construction or operation. Consultation at key stages. |
| Information | Stakeholders with some interest in the scheme or its use. Information to be provided at appropriate stages. |

## 6.6. Communications and Engagement Strategy

The Table below summarises the strategy for managing engagement with stakeholders for the scheme. It itemises the relevant stakeholders and interests and indicates the stakeholder category with which each is associated.

Liaison has taken place with the following stakeholders:

**Table 6-5 - Stakeholder management strategy and method**

| Name of Stakeholder / Interested Group | Stakeholder Category | Engagement and Consultation Level | Engagement Method |
|---|---|---|---|
| Property owners and businesses operating in building affected by the works | Affected | Intensive consultation | Pre-exhibition briefing<br>Direct contact with owners and where appropriate their agents. |
| Local MPs | Interest | Consultation | Pre-exhibition briefing |
| Elected Members | Interest | Intensive consultation | Pre-exhibition briefing |
| Scheme users | Beneficiary | Consultation<br>Information | Public Share Events |
| Local press/radio | Interest | Information | Pre-exhibition briefing |
| Local Enterprise Partnership | Beneficiary<br>Funding | Information | Through LGF Business Cases & progress reports |

The following list details the statutory consultees who were contacted by email and provided with an overview of the scheme and copies of the current plans:

- Gloucestershire Constabulary;
- Gloucestershire Fire and Rescue Service;
- South Western Ambulance Service;
- Road Haulage Association;
- Freight Transport Association;
- GCC Highway Records;
- GCC Local Highway Manager; and
- Parish/Town/District Council.

## 6.7. Evidence of Previously Successful Management Strategy

GCC continue to deliver a wide and varied range of highway schemes from design conception through to delivery. The following examples are selected from a range of schemes that demonstrate GCC delivery capability and support the success of the management and governance strategy used.

Since 2014, the A40 Gloucester Northern Bypass has seen significant junction improvements funded through both the GFirst LEP and the DfT. Primarily these improvements have focussed on delivering additional network capacity at key pinch points, to alleviate congestion and improve journey times. The Walls Roundabout, C&G roundabout, Elmbridge Court roundabout and Over roundabout have all been subject to significant highway improvements in the last 5 years – Over roundabout being completed most recently in 2018. All of these schemes were managed by GCC from feasibility, through detailed design, procurement and construction. These projects are good examples of schemes previously completed by GCC which had a very similar management structure to the proposed Arle Court Roundabout scheme.

The Walls and C&G scheme, completed in October 2014, was designed to support economic development, job creation and social regeneration, improving access with high quality connections between the urban centres,

transport hubs and development sites. The overall objectives of the scheme were to unlock the development potential of the area, attract inward investment and maximise job opportunities for local people.

The scheme was successfully delivered within budget and on programme through the adoption of a robust management approach. The total value of the scheme was £3.1M of which £0.5M was funded by Central Government. The scheme was procured through an open tender process using the NEC 3 Option A contract which will also be the preferred method for this scheme

GCC also worked in partnership with Griffiths contractors Ltd on the Elmbridge Court Roundabout major scheme. This was a £6.4m contract to improve capacity and reduce journey times on the A40 at the busiest roundabout in the County. This scheme follows the management strategy set out in this business case and was completed both on time (September 2017) and on budget.

Finally, Over roundabout was completed in autumn 2018, again using the tried and tested procurement and management/governance methods detailed in this FBC.

Other recently completed schemes within the portfolio included the junction, signals and footway/cycleway improvements scheme at Metz Way/Abbeymead Avenue. This was a smaller contract (£1.4m), but one set across a number of sites (eight in total) that required a different approach to how the scheme was procured, the on-site management and stakeholder communications.

GCC acknowledges the importance of continual assessment for the appropriateness of the management and governance structure within our major schemes. And whilst recent projects can demonstrate a high level of success, we continue to work with our Members, commercial support, consultants and delivery partners to ensure that we deliver future schemes to the same, high standard.

The scheme is intended to be delivered using a collaborative approach between GCC staff and their appointed support organisations. GCC have identified appropriately trained and experienced staff that will be responsible for the management of the scheme. The identified staff fulfilling the GCC Project Manager and Atkins Project Manager roles, have been ring-fenced to support the scheme throughout its duration, from design through scheme procurement and onto construction supervision. They will have more junior staff available to support them as required.

GCC will utilise dedicated Professional Services Consultant resource through an existing contract to undertake design and also arrange early contractor involvement (ECI), where appropriate, to the design process to ensure best value.

## 6.8. Design and Construction Methodology

### 6.8.1. Design Methodology

The scheme design is standard detail and in accordance with current issues of:

- Gloucestershire County Council's Manual for Gloucestershire Streets;
- Design Manual for Roads and Bridges;
- Local Transport Notes;
- Inclusive Mobility;
- Traffic Signs Manual and Traffic Signs Regulations and General Directions 2016;
- Sustrans Handbook for Cycle Friendly Design.

### 6.8.2. Construction Methodology

The proposed works all involve standard construction methodology in accordance with Specification for Highway Works. The proposed works do not require special construction techniques and could be wholly carried out by conventional methods.

The Contractor selected for the works will have a proven track record in carrying out similar works.

### 6.8.3. Works compound

The proposed works compound for construction is situated within land to the south-west of Arle Court Roundabout. The location of the proposed compound is shown in the figure below and has been taken into account for Environmental impacts for this business case.

**Figure 6-5 - Works compound proposals**


The works compound will consist of hardstanding areas for material storage and welfare facilities. The proposed compound boundary treatment along Hatherley Lane and the A40 would be close boarded fencing.

Access to the works compound will be from Hatherley Lane. A minimum of 10m from the edge of Hatherley Lane shall be surfaced with bituminous material.

## 6.8.4. Demolition

Demolition of White Lodge and the adjacent property will be required to allow widening of Hatherley Lane and the area will also be used for the establishment of the works compound and potential expansion of the Park & Ride facility at some time in the future.

Standard demolition methodologies in accordance with current best practice shall be utilised, including mitigation measures for noise, dust, and the removal of demolition waste.

## 6.8.5. Traffic management

The traffic management arrangements for the scheme will be based on the requirement to meet constraints in respect of HE strengthening works at M5 JCT 11 and Staverton Bridge, which are programmed to run concurrently with the works. There will be programme constraints ensuring traffic management restriction are not in place during Public Holidays, Cheltenham Festival of Racing in March and other significant festivals in the annual Cheltenham calendar. The HE works and the Festivals have the potential to substantially increase traffic flows in the area.

The methodology of delivery of the construction works for the roundabout and all approaches and exits therefore, will be shaped to maintain existing flow capacity during peak traffic hours. This will be achieved by off-carriageway working behind Varioguard barrier and some night and off-peak working when we can safely reduce flow capacity without detriment to vehicle movements. Traffic orders will be in place to reduce road speed on approaches to the roundabout during the works and the successful contractor will be charged with

booking roadspace and liaising with HE, GCC and Stakeholders via direct contact and (where appropriate) social media.

## 6.9. Legal Powers Required for Construction

### 6.9.1. Land/Access

Works are all within the highways boundary and the only requirement for land purchase is for the works compound. The land purchase necessary for the works compound has been completed successfully by GCC's Asset Management Property Services Team.

### 6.9.2. Traffic Regulation Orders (TRO)

It is likely that TRO's will be required and the processing of these has been programmed. A study of the section of road where changes are proposed will be undertaken to determine what Traffic Regulation Orders (with regards to the Road Traffic Regulation Act 1984) or other formal procedures may be required. In relation to the changes proposed, these could include:

- Waiting restriction changes – new or revised parking restrictions, loading restrictions;
- Turning bans – left or right turn bans, U-turn bans;
- Box Junctions;
- Speed Limit changes – any reduction or increase;
- Footway use changes – i.e. if a shared use foot/cycle way is proposed.

### 6.9.3. Environmental Restraints

As part of the preliminary design, environmental site walkovers have been carried out and desktop environmental scoping reports.

Where further detailed design work or environmental surveys are required, any mitigation or identified risk will be included in the Risk Register and costed for.

## 6.10. Project Programme

The following milestone dates are from the Scheme's delivery programme:

**Table 6-6 - Programme key dates**

| Activity | Target Date |
|---|---|
| Submit Full Business Case for Approval | 04/10/2019 |
| Detailed Design Start | 22/07/2019 |
| Detailed Design End | 01/11/2019 |
| Approve Full Business Case | 10/12/2019 |
| Issue Supplier Engagement Notice | 25/11/2019 |
| Issue Tender Documents | 10/12/2019 |
| Tenders Return | 10/02/2020 |
| Complete Tender assessment and award | 16/04/2020 |
| Construction Start | 18/05/2020 |
| Construction End | 16/04/2021 |

## 6.11. Benefits realisation strategy

The benefits realisation strategy is designed to allow benefits that are expected to be derived from the scheme to be planned for, tracked and realised. It also sets out the evaluation of the scheme delivery, including construction and budget management.

The outputs and outcomes are those expected to be derived from the scheme:

- **Outputs** - tangible effects that are funded and produced directly as a result of the scheme; and/or
- **Outcomes** - final impacts brought about by the scheme in the short, medium and long term.

The scheme objectives and desired outputs / outcomes are summarised in Table 6-7.

The monitoring of the benefits realised against each objective is controlled within the Monitoring and Evaluation Plan which will set out the necessary data and information requirements to track the performance of the objectives.

**Table 6-7 - Logic map between scheme objectives and desired outputs and outcomes**

| Objective | Output / outcome |
|---|---|
| Contribute to accelerating the release of the employment land associated with the 'West Cheltenham' Strategic Allocation along with the other strategic allocations in the JCS adjacent to GCHQ, which includes the proposed Cyber Park and Cyber Innovation Centre | Improvement to roads<br>New roads<br>New lanes<br>Increased traffic capacity for the corridor<br>- *This outcome will contribute to the objective by providing the capacity needed for new employment developments* |
| Deliver transport benefits to people living and working in Gloucestershire by improving traffic flows on one of the most important and busiest sections of Gloucestershire's road network | Improvement in journey time along the A40 |
| Aim to have an overall neutral impact on the Cheltenham Air Quality Management Area (AQMA) | Neutral impact on the Cheltenham AQMA |
| Maintain and improve the options for sustainable travel modes through the junction and on the approaches; walking, cycling, and where feasible providing for enhanced public transport facilities | New cycleways<br>Enhanced public transport facilities |

Tracking the scheme benefits will be a key element in understanding the success of the scheme. Table 6-8 links the benefit realisation for specific measures with responsibility. It is also important to refer to the Risk Register for specific risks and associated controls throughout the project.

**Table 6-8 - Benefits realisation responsibilities**

| Measure | Benefits Realisation | Responsibility |
|---|---|---|
| Delivery on time | Through contract management | Contractor |
| Delivery on budget | Through contract management | Contractor |
| Accelerating the release of employment land | New employment delivered at Strategic Sites | GCC / Cheltenham Borough Council / Developers |
| Wider transport benefits | Realisation involves completion of the scheme to enhance capacity at the junction | LEP / GCC |

## 6.12. Monitoring and Evaluation Plan

The purpose of the Monitoring and Evaluation Plan is to identify how the scheme benefits (direct and wider) and actual scheme delivery, (including construction and budget management), are to be evaluated.

The Monitoring and Evaluation Plan is to be owned by the Senior Responsible Officer (SRO), although ownership will be reviewed and delegated as necessary.

To determine whether the scheme benefits are being realised, the desired outputs and associated outcomes have been converted into measurable indicators of scheme benefits, as set out in Table 6-9 below.

In order to evaluate the impacts of the scheme, baseline data will be collected which will allow the pre-scheme opening situation to be quantified. This is required for benefit assessment indicators #05, #06, #07, and #08. This will include the following:

- Automatic Traffic counts (ATCs);
- Journey Times on the A40,
- $NO_2$ concentrations; and
- Accident records – data to be obtained from GCC over a 5-year period.

There are already permanent ATC sites on the A40 either side of Arle Court Roundabout and these will enable monitoring of traffic volumes travelling along the A40. In addition, temporary counters will be placed on the other arms of the junction to provide a full picture of the level of traffic demand. Baseline traffic surveys will be carried out (or taken from recent data) prior to the construction of the scheme, while avoiding any planned roadworks in the local area. $NO_2$ monitoring data will also be obtained from Cheltenham Borough Council.

The scheme implementation monitoring will focus on scheme delivery including the extent to which the construction programme was delivered within the estimated timescales and budget.

A Monitoring Report will be produced prior to scheme opening detailing the baseline survey data. After opening, studies will be carried out approximately one year and five years later. These will include assessment against the scheme details and desired outcomes, with benefit indicator #06 (minimal accidents along the A40 corridor) covered in the five-year post opening study only to allow sufficient evidence to compare the situation before and after scheme opening.

**Table 6-9 - Outputs and outcomes - indicators and targets**

| Ref # | Benefit (Desired output / outcome) | Benefit indicator | Target | Type | Specific data requirements |
|---|---|---|---|---|---|
| Desired outputs | | | | | |
| 1 | Improvement to roads (including new signals and increased capacity) | Completion of project | 1km (length of roads improved by the scheme, from give way lines to the limit of works) | Highway Improvement | n/a |
| 2 | New Roads and Cycleways | Completion of project | 0.28km new cycleway (B4063) | Highway Improvement | n/a |
| 3 | New lanes created (for through traffic and improved right-turn provision) | Completion of project | 1.2km (new lanes) | Highway Improvement | n/a |
| 4 | Enhanced public transport facilities | Completion of the project | New bus-only slip from the P&R to the A40 | Highway Improvement | n/a |

| | | | | | |
|---|---|---|---|---|---|
| | | | westbound carriageway | | |
| Desired outcomes | | | | | |
| 5 | Improvement in journey time along the A40. | Reduced journey times along the A40 | Reduction in vehicle journey times immediately after the scheme is implemented | Quantitative | Basemap |
| 6 | Minimal accidents along the A40 corridor | Number of accidents<br>Baseline | No increase in accidents 5 years after construction | Quantitative | Accident data |
| 7 | Increased traffic capacity for the corridor | Increasing traffic flows through the junction | Increased actual flow through the roundabout overall, and especially on the A40 movements one year after opening | Quantitative | Traffic counts (ATC) |
| 8 | Neutral impact on the Cheltenham AQMA | Stable $NO_2$ concentration | No statistically significant increase in annual mean $NO_2$ concentration in the Affected Road Network after opening | Quantitative | $NO_2$ diffusion tubes |

## 6.13. Risk Register

A project risk register is to be maintained throughout the scheme duration. The Project Risk Register is included as Appendix F and a Construction phase risk register will be developed with the Contractor and proactively managed during the construction phase.

# 7. Conclusion

## 7.1. Summary

The Arle Court Roundabout Scheme is a critical section of infrastructure for Cheltenham and connects both local and strategic routes across the County.

The most significant benefit from the scheme is derived from reductions in travel times, however, the level of benefits far exceeds the cost of the scheme resulting in a high PVB (Present Value Benefits) value and a high BCR (Benefit Cost Ratio). The scheme generates a PVB of £104.14m over 60 years.

It is also important to note that the Economic Case for the scheme produces a BCR value of **13.45**, which corresponds to "**Very High Value for Money**".

Further justification for the selection of the scheme is detailed throughout the report and in the results of traffic modelling and analysis via the Business Case.

It is also advised that the planned improvements would provide further betterment and future-proofing of the corridor for increased traffic flows that are anticipated, due to significant ongoing and future development in the local area.

## 7.2. Recommended Next Steps

Development and delivery of the scheme should be approved.

Due to the outcomes reported in this study, and the anticipated return on the public funded aspects of the proposal, it is advised that the scheme represents good value for money, meets the criteria of schemes for the LEP, and therefore should be approved for funding.

# Appendices

# Appendix A.

Modelling Technical Note

# Appendix B.

Modelling Forecasting Report

# Appendix C.

Modelling Validation Report

# Appendix D.

Social and Distributional Impact Assessment

# Appendix E.

Appraisal Summary Table (AST)

# Appendix F.

Risk Register

# Appendix G.

Noise Modelling Figures

# Appendix H.

Air Quality Report

# Appendix I.

Scheme Layout, General Arrangement