Strategic Outline Case

Hereford Eastern River Crossing (ERiC) (SOC)

December 2023

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Quality information

Prepared by	Checked by	Verified by	Approved by
Sonia Sivanesan Principal Consultant	Darren Abberley Associate Director	Alan Boyce Associate Director	Maurice Houkes Associate Director

Revision History

Revision	Revision date	Details	Name	Position
1	10/10/2023	Updated document in response to comments received from HC	Darren Abberley	Associate Director
2	05/12/23	Updated document in response to comments received from HC	Darren Abberley	Associate Director

Prepared for:

Herefordshire Council

Prepared by:

AECOM Infrastructure & Environment UK Limited
The Colmore Building
20 Colmore Circus Queensway,
Birmingham B4 6AT
aecom.com

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1 Executive Summary

1.1 This Strategic Outline Case (SOC) business case is the first stage in a three-stage process to define and make a case for investment in an Eastern River Crossing (ERiC) highway alignment across the River Wye to the east of Hereford city centre.

1.2 The city is located both to the north and south of the River Wye, with only two bridges that carry road traffic. One bridge is the A49 – an urban dual-carriageway that is managed by National Highways and forms part of the Strategic Road Network (SRN). The other; known as the Wye Bridge, is a historic bridge carrying St Martin's Street – a narrow signal-controlled road carrying local traffic in a one-way shuttle arrangement.

1.3 This means that there is significant demand placed on the A49 for carrying road traffic over the river, with traffic being required to route through the city centre in order to make the north-south movement. The lack of alternative routeing choices also means that during times of an incident along the A49, this can cause significant upheaval to the operation of the transport network in Hereford, with significant journey time delays and lengthy diversions to access the next available crossing point.

1.4 Therefore an additional river crossing is deemed as essential in providing an alternative route for addressing the resiliency issues across the city centre's transport network and facilitating the future growth of the city.

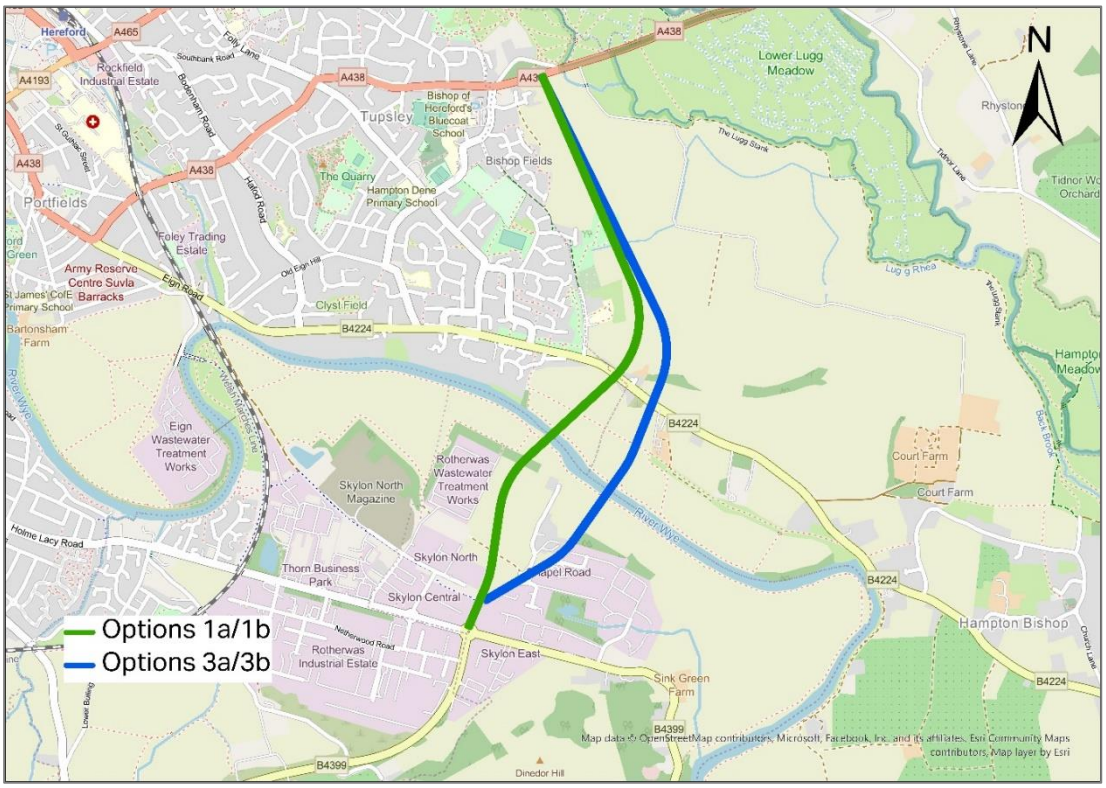
1.5 There have been previous long-standing plans for a river crossing to come forward to the west of the city centre (Hereford Western Bypass and Southern Link Road), however following the Hereford Transport Strategy Review (2020), there was a resolution to stop progress with this option and instead, develop proposals for a river crossing to the east of the city. This Review has shaped the location of the proposals being put forward as part of this SOC.

1.6 Key objectives which an eastern river crossing is expected to achieve are set out below:

1. **Resilience:** Improve resilience (i.e. reduce risk of disruption) in relation to incidents on, and maintenance of, the existing A49 Bridge.
2. **Active travel:** Increase mode share of active travel trips in the study area.
3. **Public transport:** Increase mode share of public transport trips.
4. **Congestion:** Reduce congestion on existing river crossing and in Hereford city centre.
5. **Safety:** Improve road safety and aim to reduce the frequency and severity of incidents within the city.
6. **Environment:** Minimise the impact on the environment, improve biodiversity, and contribute to making Herefordshire 'nature rich'.
7. **Carbon:** Reduce carbon emissions and contribute to achieving net zero.
8. **Growth:** Improve transport links between residential and employment areas to the east of Hereford.
9. **Health & Well-being:** Improve the health and quality of life for local residents.

1.7 Following discussions with key stakeholders and consideration of best practice, a longlist of 18 options were identified which could contribute to the above objectives. The longlist of options was sifted based on each option's performance against objectives and through the use of the DfT's Early Assessment and Sifting Tool (EAST), with four better-performing options being shortlisted and taken forward for further appraisal as part of the SOC. These options are set out as follows, with their alignments highlighted in the map below.

- **Option 1a - Eastern River Crossing (ERiC) Alignment 1 – 30mph** – this option connects to the B4399 at the Chapel Road roundabout and routes north over the River Wye via a bridge viaduct structure before connecting with Hampton Park Road through an at-grade junction. It then continues north, skirting closely to residential receptors to the west before connecting to the A438 to the west of the access road to the A&D plant. LTN 1/20 cycling infrastructure is also included as part of this alignment.
- **Option 1b – ERiC Alignment 1 – 40mph** – this option has the same scope as Option 1a except the speed limit is higher at 40mph. The alignment of Option 1b would be wider to accommodate the faster speeds.
- **Option 3a – ERiC Alignment 3 – 30mph** – this option connects to the B4399 at Chapel Road and partly utilises the existing carriageway of Chapel Road however an additional junction would be required where the alignment deviates to the east of Chapel Road. The option then routes north over the River Wye via a bridge viaduct structure, and then connects with Hampton Park Road, further to the east than Option 1. It then continues north and follows a very similar alignment and shares the same tie-in with Option 1 at the A438. LTN 1/20 cycling infrastructure is also included as part of this alignment.
- **Option 3b – ERiC Alignment 3 – 40mph** – this option has the same scope as Option 3a except the speed limit is higher at 40mph. The alignment of Option 3b would be wider to accommodate the faster speeds



1.8 At SOC stage, an economic appraisal of the scheme benefits has not been undertaken. However, the Hereford Transport Model has been used to analyse changes in traffic flow, journey times and vehicle kilometres against the Do Nothing option to determine the potential impact of the proposed scheme, which found that:

- Traffic flows in the centre of Hereford are forecast to reduce as a result of the implementation of the ERiC scheme
- There are significant journey time savings in Hereford city centre as a result of the ERiC
- It is predicted that there will be a slight reduction in vehicle kilometres across the study area as a result of ERiC

1.9 The remaining assessment of the scheme has been undertaken based upon a qualitative and desk-based assessment only at this stage. This has found that the shortlisted options would

contribute positively towards the majority of the TAG appraisal criteria and identified objectives, apart from in relation to the environment and carbon where some slight to moderate adverse impacts are likely to be experienced. At this stage it is difficult to conclude on value for money. Based on the above findings, it is likely that all of the options may achieve Low or Low-Medium Value for Money, although further work is required to confirm this.

1.10 Cost estimates for each of the shortlisted options have been provided as part of the Financial Dimension. Total scheme costs are set out in the table below. These include costs for the highway works (including the bridge structure), land acquisition, flood compensation, main contractor preliminaries, other development costs and inflation. Costs are also inclusive of a 50% design and construction risk contingency element which is considered to be appropriate given the early stage of scheme design and the risks associated with the project.

Option	Total Cost
Option 1a	£143,764,303
Option 1b	£145,305,347
Option 3a	£192,023,334
Option 3b	£198,318,794

1.11 The Commercial Dimension outlines that, at this early stage in the project's development, various options are being considered for how the scheme would be procured, with no preferred option currently identified.

1.12 The Management Dimension outlines the governance structure that is in place to ensure effective decision making. Detail on the approach to risk management and stakeholder engagement is also provided along with project dependencies. An outline programme for the delivery of the scheme is also set out which targets completion of construction by September 2031.

2 Introduction

2.1 Background

2.1.1 Hereford is a major employment area with a wide catchment area with in / out commuting flows that are heavily dominated by car trips. The city is located both to the north and south of the River Wye, with only two bridges that carry road traffic. One bridge is the A49 – an urban dual-carriageway that is managed by National Highways and forms part of the Strategic Road Network (SRN). The other, known as Wye Bridge, is a historic bridge carrying St Martin's Street – a narrow signal-controlled road carrying traffic in a one-way shuttle arrangement.

2.1.2 Herefordshire Council recently undertook a review of the Hereford Transport Strategy (2020), with a preferred strategy comprising of four packages of measures for the future Hereford transport system being identified:

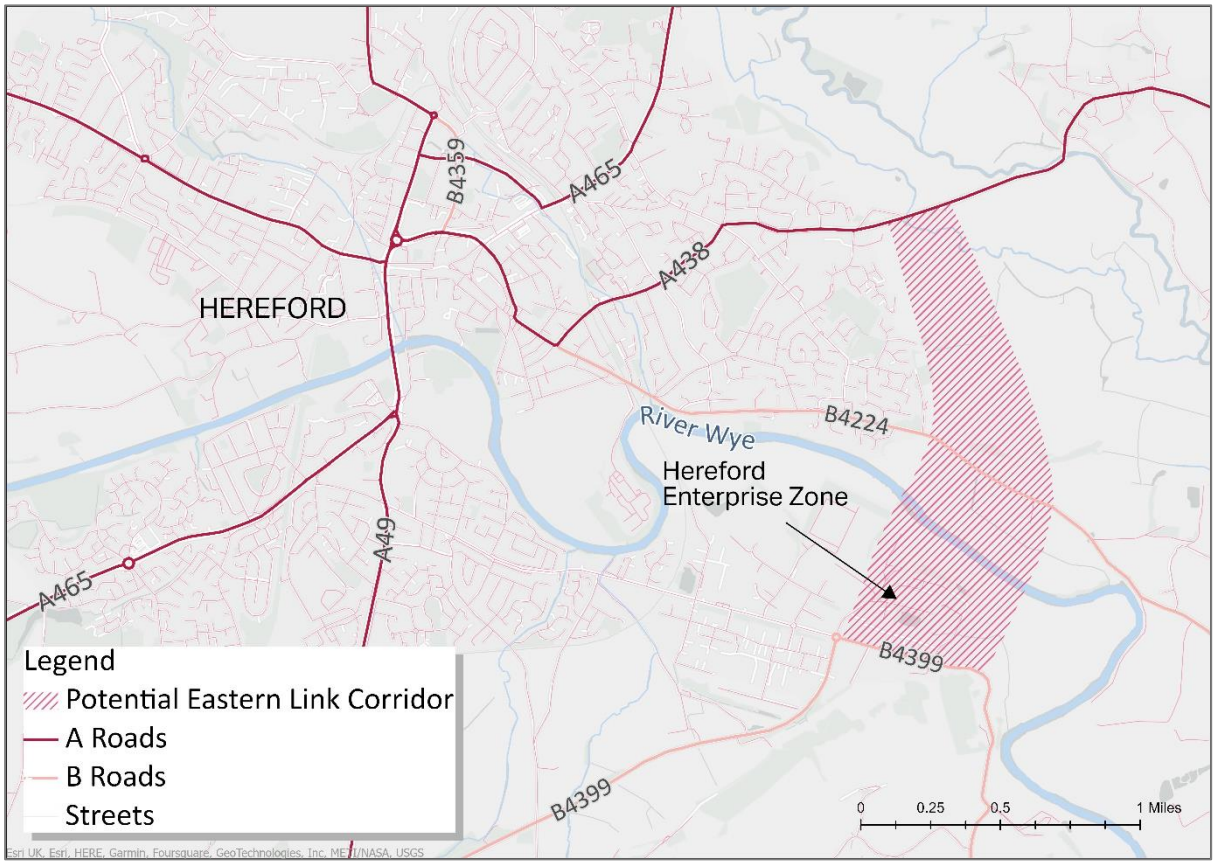
- Walking and cycling measures;
- Improving public transport;
- Managing traffic demand; and
- Providing a new river crossing

2.1.3 An additional river crossing is deemed as essential in providing an alternative route for addressing the resiliency issues across the city centre's transport network and facilitating the future growth of the city.

2.1.4 A key output from the Hereford Transport Strategy Review (2020) was the resolution to stop progress with the western bypass and southern link road. Plans for this route would have included a crossing of the River Wye to the west of the city centre. Instead, the Review committed to develop further proposals for a river crossing to the east of the city, and this has shaped the location of the proposals being put forward as part of this study (see **Figure 2-1**).

2.1.5 It is intended that any such eastern river crossing (ERiC) would be a two-way highway, with LTN 1/20 compliant segregated cycle facilities to encourage active travel along the route. The crossing would require a bridge structure over the River Wye.

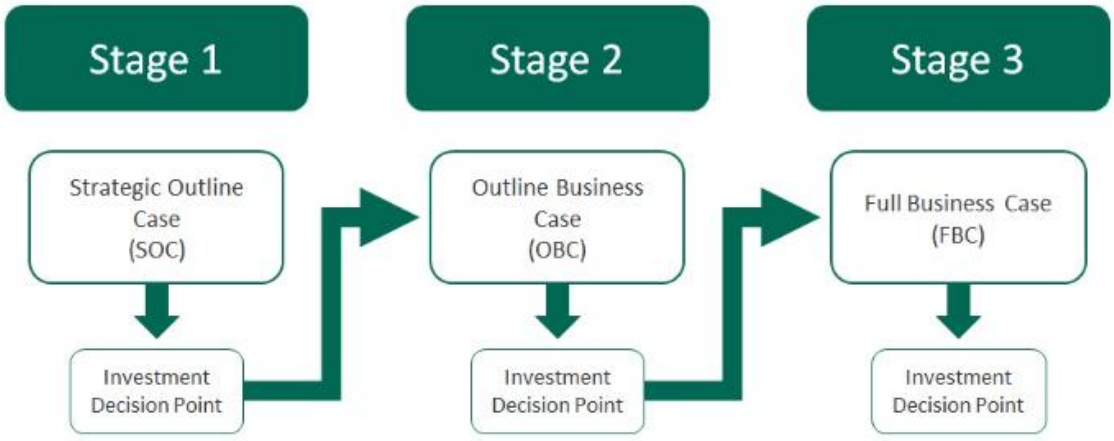
Figure 2-1: Study area and broad location of eastern river crossing



2.2 Approach

2.2.1 In developing proposals for a river crossing to the east of the city centre, Herefordshire Council has commissioned AECOM to develop a Strategic Outline Case (SOC). This forms the first of a three-stage process to define and make a case for the delivery of the scheme, as prescribed in the Department for Transport's (DfT) Transport Business Case Guidance document and set out below.

Figure 2-2 Three-stage business case process



2.2.2 The purpose of the SOC is to establish the potential scope of the transport proposal and set out the rationale for intervention (the case for change). It also demonstrates how the investment will further the organisation's priorities and wider government ambitions (the strategic fit) to determine the 'preferred way forward'.

2.2.3 It considers a longlist of options which are assessed and sifted as part of the Option Assessment Report (OAR) and assembles an optimised shortlist of viable options for more detailed appraisal at OBC stage.

2.3 Structure

2.3.1 The structure of the SOC is underpinned by the Green Book's five-case model, which is the government's best practice model for spending and investment decisions and provides decision-makers and stakeholders with a proven and consistent framework for developing a business case. In this regard, the SOC is structured as follows:

- Section 3: The Strategic Dimension - sets out a robust case for change that demonstrates how the proposal has a strong strategic fit with Herefordshire's priorities, government ambitions and the area in scope
- Section 4: The Economic Dimension – demonstrates the likely value for money of the scheme (as part of this SOC, no monetised impacts are produced, and instead value for money is considered qualitatively in relation to DfT TAG appraisal criteria)
- Section 5: The Financial Dimension - presents the scheme costs, affordability and funding of the proposal.
- Section 6: The Commercial Dimension - provides a high-level overview of the potential procurement strategy.
- Section 7: The Management Dimension - provides a high-level overview of the governance arrangements, along with an outline programme and key risks associated with the delivery of the scheme

3 Strategic Dimension

3.1 Introduction

3.1.1 This section sets out how the project aligns with organisational priorities and key strategy and policy objectives (the "strategic fit"). It summarises the key interdependencies with other projects and the case for change, and outlines the emerging scope of the scheme.

3.2 Organisation Overview

3.2.1 The scheme is being promoted by Herefordshire Council as the local highway authority for the study area. AECOM has been appointed to oversee the design, appraisal and business case processes on behalf of the Council. Continued consultancy support will be required throughout the scheme development process.

3.3 Strategic Context

3.3.1 The scheme has been considered in relation to national, regional, local and organisational policies, initiatives and targets to help develop the strategic context within which it will be developed and demonstrate the level of "strategic fit". This has been considered in detail as part of the OAR which indicated a strong alignment with key policies and objectives at all geographical scales.

3.3.2 The key outputs from this policy review exercise are summarised in the Tables below, beginning at the national level where a clear direction is evident towards a sustainable, low carbon transport system which has the right infrastructure in place to support sustainable transport and reduce emissions. This scheme has a close alignment with this policy direction as highlighted in **Table 3-1**.

Table 3-1: National Policy Review

Document	Summary	Alignment
Decarbonising Transport Setting the Challenge (2020)	The document seeks to accelerate the decarbonisation of transport through the delivery of six strategic objectives focused on mode shift, decarbonising vehicles and fleet, developing place-based solutions, enhancing green technology and innovation and reducing carbon in the global economy.	The scheme aims to improve resiliency and air quality through the provision of a new multi-modal corridor. This will reduce congestion by allowing free flowing movements and provide users a range of alternative modes to travel thus supporting mode shift and helping to alleviate air quality issues present on the A49 corridor.
The UK's Industrial Strategy: Building a Britain Fit for the Future (2018)	The strategy aims to create an economy that boosts productivity and earning power throughout the UK. It is a priority for the UK to develop leadership in low carbon transport and the UK will invest in innovation to develop clean technologies across road, rail, aviation and maritime transport	The scheme will increase the resiliency of the road network and will better support the movement of goods and people by providing an alternative route, which will help to safeguard journey time reliability. The scheme will also support low carbon transport by providing provision for active travel.
National Planning Policy	The NPPF has a significant focus on sustainable economic growth, including ensuring sustainable transport	The scheme reflects the NPPF by providing better provision for cyclists, pedestrians and by providing a free-

Document	Summary	Alignment
Framework (NPPF) (2021)	provision is priority consideration of all planning applications. This will in turn have positive impacts on economic, social and environmental factors.	flowing route for bus users. The scheme will also help to support the local economy and encourage growth in the city centre and east Hereford.
Gear Change: a bold vision for cycling and walking (2020)	Gear Change is about creating a step-change in walking and cycling, transforming the role that these modes play in the transport system. It focuses on providing healthier, happier and greener communities; safer streets; and convenient and accessible travel	The scheme will provide segregated facilities to help to increase safety for non-motorised users. There is a significant opportunity for reducing the number of short journeys being made by car to create a cleaner, healthier, greener and less congested city.
Cycling and Walking Investment Strategy (CWIS) (2022)	The Cycling and Walking Investment Strategy (CWIS) sets out the Government's strategies to make cycling and walking natural choices for shorter journeys or as part of longer journeys. This is to be achieved through better safety, better mobility and better streets.	Providing better provision for cyclists, and pedestrians will increase the use of active modes. It will also align with the aim to convert some of the significant volumes of short journeys being made across Hereford by car, to be made by cycle or on foot.
Cycle Infrastructure Design: Local Transport Note (LTN) 1/20 (2020)	LTN 1/20 provides updated guidance and good practice for the design of cycle infrastructure which should be used in the preparation of Local Cycling and Walking Infrastructure Plans (LCWIPs) and the design of cycling infrastructure.	Cycle infrastructure delivered as part of this scheme will adhere to LTN 1/20 ensuring that it meets the latest guidance for cyclists to help encourage mode shift.
A better deal for bus users (2020)	The document aims to boost patronage by making travelling by bus an attractive option. The plan states that the government is committed to achieving more reliable services that arrive on time, are good value for money, take people where they want to go to encourage more people to use the bus.	The scheme will provide a free flow link to support reliable and efficient public transport movements thus making travel by this mode more attractive and encouraging mode shift. It will also help to reduce congestion in Hereford city centre, thereby improving the reliability of bus services routing through the city,
National Bus Strategy – Bus Back Better (2021)	The strategy's central aim is to get more people travelling by bus and increase patronage. This strategy will make buses more frequent, more reliable, easier to understand and use, better co-ordinated and cheaper.	The scheme will improve bus reliability in the study area by providing a free-flowing route with limited junctions along its stretch. The scheme will also reduce congestion on the road network within the city centre which will improve the reliability of buses.
The Clean Growth Strategy (2018)	To achieve clean growth the UK wants low carbon technologies to be nurtured. 33% of the £2.5 billion allocated to low carbon innovation investments is going toward the transport sector, which is important and required given that 24% of UK emissions are attributed to transport.	The scheme will enhance the use of sustainable modes by providing improved facilities through a multi-modal corridor. This will encourage mode shift away from private cars which will reduce carbon emissions from the transport system.

3.3.3 At the regional level, the Marches LEP Strategic Economic Plan (2019) has been reviewed (**Table 3-2**), which focuses on the importance of an efficient transport network to support economic growth and reduced carbon emissions.

Table 3-2: Regional Policy Review

Document	Summary	Alignment
The Marches LEP Strategic Economic Plan (2019)	The plan highlights that there are several issues with the Marches' road network which cause poor average speeds, long journey times, poor reliability, and urban centres to experience congestion. The plan aims to improve public transport links to address accessibility issues to key training and employment sites, and to reduce 1990 carbon emissions by 57% by 2032.	The scheme will help to ease the congestion experienced on the network around the A49 and help to improve the resiliency of the city centre's transport network. It will also improve connectivity to the Skylon Enterprise Zone at Rotherwas Industrial Estate which should help to increase the attractiveness of the site for inward investment and bolster future economic productivity.

3.3.4 A summary of the local policy review is set out in **Table 3-3** and again demonstrates an emphasis around enhancing economic and environmental objectives but also the health and wellbeing of residents in the area. The scheme will support this through enhanced active mode infrastructure and a more reliable public transport route which will have positive impacts on congestion, emissions and the health and wellbeing of residents.

Table 3-3: Local Policy Review

Document	Summary	Alignment
Herefordshire Joint Local Health and Wellbeing Strategy 2023-2033 (2023)	This strategy seeks to achieve long term changes in the overall health and wellbeing of the population by focusing on the core priorities: best start in life for children and good mental well-being throughout life. These core priorities are supported by six supporting priorities: improving access to local services, support people to live and age well, good work for everyone, support those with complex vulnerabilities, improve housing/ reduce homelessness, and reducing our carbon footprint.	There are high levels of inactivity across Herefordshire whilst levels of child and adult obesity are higher than the national average. The scheme will contribute to the aims of the Strategy through encouraging increased up-take of active modes through the provision of dedicated facilities.
Herefordshire County Plan 2020-2024 (2020)	The Plan seeks to prioritise investment in a number of key areas including the maintenance of the existing highway network, public transport and climate change. The plan aims to improve and extend active travel options throughout the county to help encourage and increase travel by active modes.	The scheme will increase the resilience of the road network through the provision of a multi modal offer. This will positively impact congestion, the environment and health and wellbeing of residents.
Herefordshire Council Local Transport Plan 2016 – 2031 (2016)	The five key objectives set out in the plan are: enable economic growth; provide a good quality transport network for all users; promote healthy lifestyles; make journeys safer, easier and healthier; and ensure access to services for those living in rural areas.	Through the provision of this scheme four out of the five objectives are expected to be achieved. Specifically, the scheme will improve resiliency and therefore support economic growth and the environment through reduced congestion. The multi modal offer will

Document	Summary	Alignment
		also encourage residents to use public and active modes of transport to support overall health and wellbeing.
Herefordshire Local Plan Core Strategy 2011 – 2031 (Adopted in 2015)	Reducing reliance on private cars, meeting the challenge of climate change, and promoting healthy lifestyles are some of the key issues the Council wants to respond to over the next 20 years. The strategy notes that the A49 through Hereford experiences capacity issues and that congestion is problematic in the area. The A49 corridor through Hereford has been identified as an Air Quality Management Area (AQMA). The strategy seeks to reduce reliance on the private car and promote active modes and improve public transport accessibility. Policy HD3 in the Strategy refers to a package of transport improvements for the city to help meet the above objectives.	The scheme will help to reduce the reliance on private cars through dedicated facilities for active modes. This will help to promote the adoption of healthy lifestyles across Hereford. It will also provide an alternative route for crossing the River Wye which will help to reduce vehicular flows along the A49, thus reducing congestion and contribute to reducing emissions within the AQMA.
Herefordshire Bus Service and Improvement Plan (BSIP) (2021)	The plan seeks to develop an integrated bus network which offers value for money, serves key employment locations, supports decarbonisation and supports the wellbeing of residents. BSIP survey findings suggest that only 1% of employees at Skylon Enterprise Zone use the bus to commute.	The scheme will provide a free flowing link to support bus journey time reliability and will also serve the Enterprise Zone providing a new and viable alternative mode offer to employees.
Hereford City Masterplan (Consultation Draft, Spring 2023)	Herefordshire Council is currently preparing a detailed masterplan for Hereford which aims to make the city a greener, healthier, and safer place to live, work and visit, with better connections to nearby villages, towns and counties by all transport modes. A series of strategic objectives have been established which underpin the masterplan; one of which relates to Movement and expanding choice for moving around, using an integrated transport network with better provision for active travel and public transport. It is intended that that this will help to reduce carbon emissions, improve air quality, tackle congestion, encourage healthier lifestyles and better meet the needs of different demographic groups.	The scheme will provide a safe and desirable connection for pedestrians and cyclists which will help to promote active travel and healthy lifestyles, while reinforcing the concept of Hereford as an 'outdoor city'. It will thereby play a key role in supporting and complementing the city masterplan
Big Economic Plan 2023-2050 (2023)	The Big Economic Plan sets out the steps to make Herefordshire a vibrant, healthy, zero carbon, and inclusive place to live, work, study, and visit at all stages of life by 2050. The plan outlines	As mentioned within the Plan the scheme will improve transport time reliability, network resilience, and capacity improvements. The dedicated facilities for active modes will also

Document	Summary	Alignment
	six elements of the Herefordshire economy where actions will be taken to meet the vision of the Economic Plan. One of the elements that the Plan focuses on is surrounding infrastructure and making Herefordshire in 2050 better connected and more accessible, underpinned by a new river crossing in Hereford. The Plan also aims to achieve improved public transport from and between rural communities and higher levels of active travel in Hereford city with fewer short car journeys. The Big Economic Plan specifically mentions progressing the eastern link road and river crossing to improve transport time reliability, network resilience, and capacity within and into the county and in particular, access in and out of Hereford.	encourage their uptake and help to reduce the number of short car journeys.

3.4 Business Strategy

3.4.1 As outlined in **Table 3-3**, at the local level resilience, transport connectivity, health and wellbeing and the environment are key drivers for change in Herefordshire. It is acknowledged that change is needed to support social, economic and environmental factors and to help the county thrive.

3.4.2 The draft Hereford City Masterplan sets out an ambitious outlook for the city focused on enhancing movements and connectivity. It highlights that delivering a new eastern river crossing will first and foremost provide resilience to the transport network in Hereford but also provide the following wider benefits:

- Improve options for active travel and encouraging healthy lifestyles;
- Improve public transport options and reducing reliance on private vehicles;
- Reduce congestion on the existing river crossing and in Hereford city centre and provide additional network capacity to support economic growth;
- Minimise the impact on the environment and contributing to net zero objectives;
- Enhance connectivity to green spaces; and
- Provide better connections across and to destinations along the River Wye.

3.4.3 Delivery of the scheme therefore aligns closely to the overarching strategy for Hereford and is seen as a valuable piece of infrastructure to support the aims and objectives of the Masterplan and other policy and strategy documents.

3.5 Business Portfolio

3.5.1 There are a number of development and infrastructure proposals in Herefordshire that will either directly or indirectly benefit from the implementation of the scheme. Further details of the proposals are provided in the OAR with a summary set out below.

Development Proposals

3.5.2 Proposed developments planned to come forward in the vicinity of the scheme are mapped in **Figure 3-1** below.

Figure 3-1: Proposed developments in vicinity of the scheme

3.5.3 The scheme will link directly in to the Rotherwas Industrial Site where new developments are proposed and where the Skylon Park Enterprise Zone is located. It is considered to be the most strategically important employment areas in Herefordshire offering 48,000m^2 of workplace land with over 200 companies employing in excess of 3,500 employees on site.

3.5.4 There remains a significant amount of developable land on the site thus suggesting that access to this site will become more important to help facilitate economic growth in the area and to allow the area to thrive. The scheme is strategically placed to connect to this site, allowing direct access to it by a range of modes. Increased accessibility will support growth at this site and help to meet the economic related objectives and targets set out for the county.

3.5.5 To the southwest of the site is the Southern Urban Expansion, a mixed use site proposing 1,300 dwellings alongside B1, B2 and B8 employment land and a range of local facilities.

3.5.6 It is likely that the construction of the ERiC scheme will provide a key and alternative route for vehicle users accessing these sites, with all traffic travelling west via the A438 being able to use the new link road without being required to route through the city centre (and vice versa for traffic leaving the sites and heading east). This will help to significantly alleviate flows in the city centre and along the A49 bridge over the River Wye.

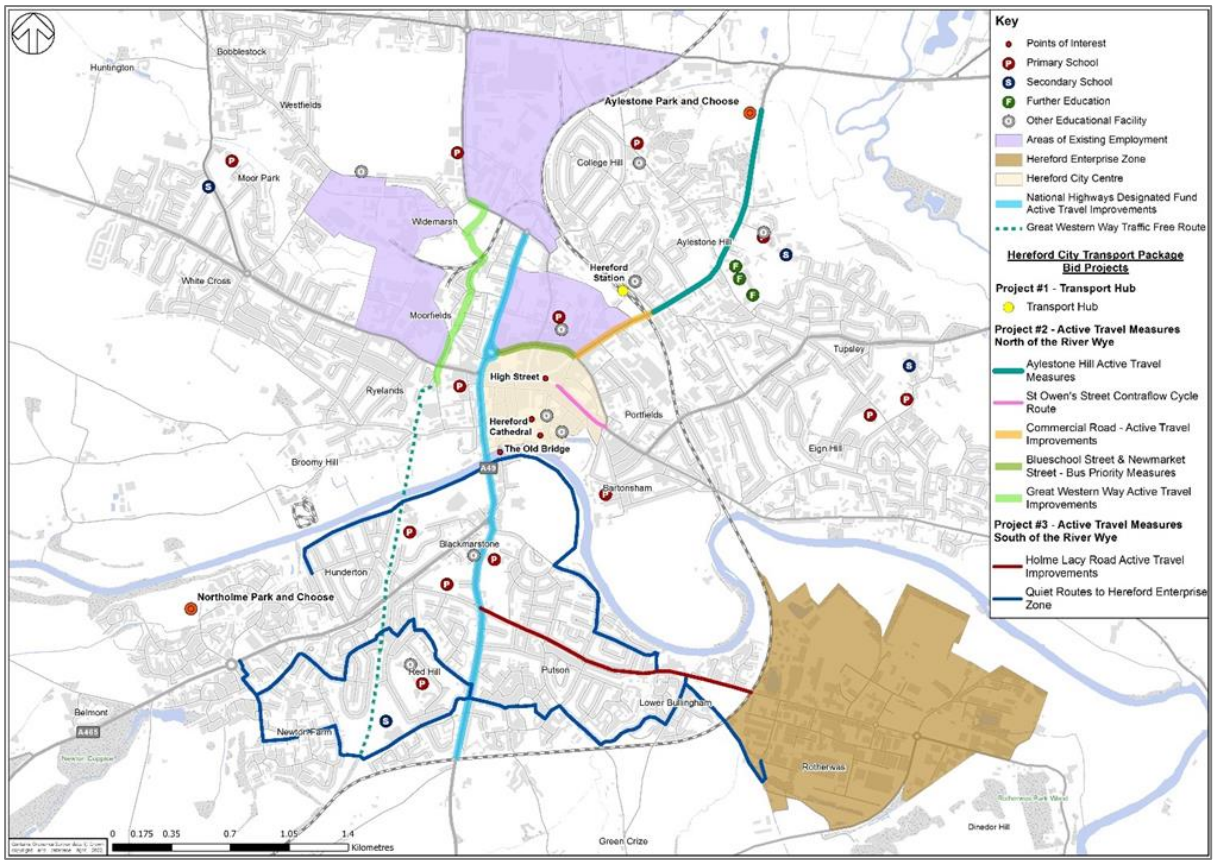
3.5.7 Sites proposed to the west of Hereford include the Western Urban Extension (1,200 dwellings), and Grafton Lane (300 dwellings). Whilst the positive impacts of ERiC on these sites is likely to be less pronounced, the scheme will provide additional network capacity and will reduce demand on key routes through the city centre. This in turn will help to free-up capacity on existing routes which will be required to support the additional vehicular demand derived from the new developments to the west of the city and safeguard the operation of the network.

Infrastructure proposals

3.5.8 The Hereford City Transport Package will be delivered using the recently awarded capital funding from the 'Levelling Up' Fund (LUF). The improvements comprise of the following and are mapped in **Figure 3-2**:

- **Project 1 - Transport Hub**: the development of a new integrated Transport Hub at Hereford railway station, which will link cycling, walking, bus and rail transport in Hereford city centre.
- **Project 2 - Active travel measures north of the River Wye**: a cycle scheme from Aylestone Hill along the A465 and Commercial Road, linking the north and east of the county to the Transport Hub, the city centre, and routes south of the river. Enhancements to St Owen Street one-way cycle scheme will improve access to the city centre and links to Rotherwas.
- **Project 3 - Active travel measures south of the River Wye**: the introduction or improvement of informal 'Quiet Routes' to the Hereford Enterprise Zone. A series of improvements along the Holme Lacy Cycleway to encourage more and safer active travel to work and local services. These improvements along Holme Lacey Road would tie in with the proposed ERiC alignment and therefore help to provide a coherent network for active travel in the south and east of Hereford.

Figure 3-2: Hereford City Transport Package



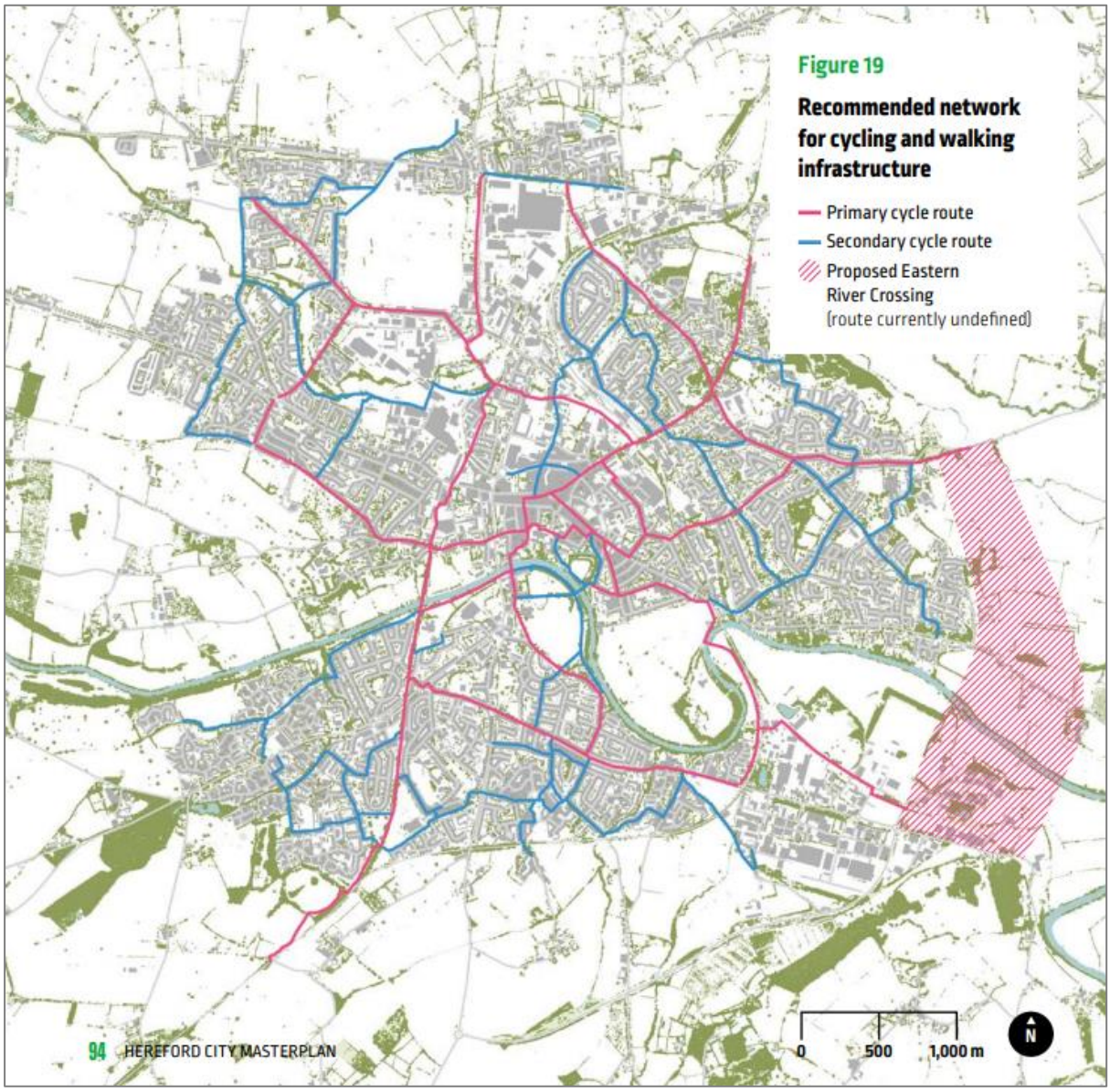
3.5.9 Herefordshire Council has also secured Active Travel Fund (ATF) 4 funding for further active travel improvements, including:

- Aylestone Hill Railway Bridge LTN 1/20 compliant scheme
- Barton Road / A49 junction LTN 1/20 compliant scheme
- School streets at Trinity & Lugwardine Primary schools
- Drop Crossings

3.5.10 The implementation of these measures will help to support the vision of the Hereford City Masterplan and ties in with the Council's emerging local cycling and walking infrastructure

plan. **Figure 3-3** highlights those routes which will be the major focus for improved infrastructure, in relation to the proposed ERiC alignment.

Figure 3-3: Herefordshire Council's recommended network for cycling and walking infrastructure (source: Hereford City Masterplan)



3.5.11 The infrastructure proposals seek to enhance active travel and public transport provision and encourage the use of alternative modes, which in part ties in with the aims of the ERiC scheme. The scheme will also provide a connection to some of the proposed infrastructure improvements, including the primary and secondary cycle network, and the improvements being delivered along Holme Lacy Road though the LUF2 transport package, which will help to further build and enhance the active travel network in Hereford.

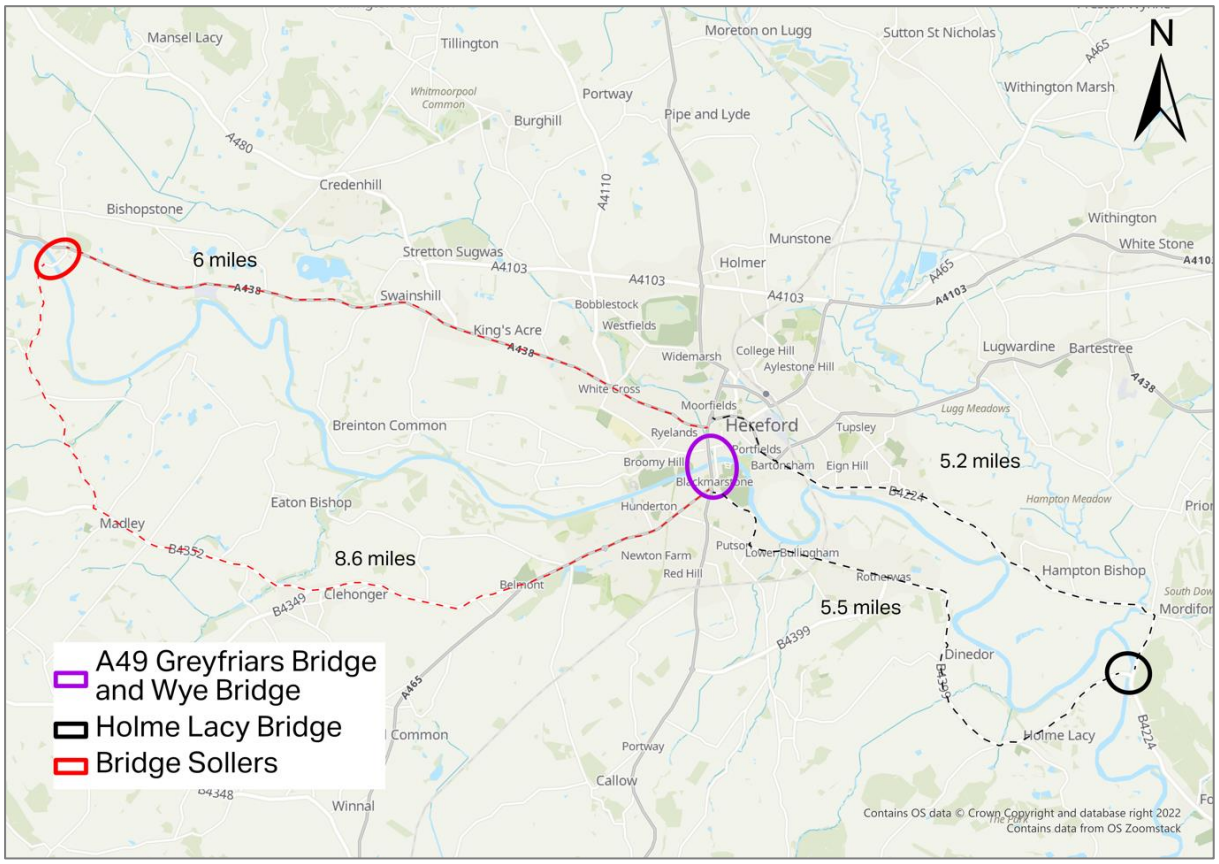
3.5.12 Through the implementation of the ERiC scheme, alongside the other active travel measures planned for the area, a coherent active travel network in Hereford will be provided. This will bring a wide variety of positive impacts including for health and wellbeing, the environment, journey times and overall resilience of the network by encouraging modal shift and reducing vehicular demand.

3.6 Problem Identification and the Case for Change

3.6.1 Hereford's city centre is dissected by the River Wye, with key services, employment

opportunities and residential areas located both to the north and south of the river. This acts as a barrier to movement across the city, with only two bridges carrying road traffic over the river. One bridge is the A49 – an urban dual-carriageway that is managed by National Highways and forms part of the SRN. The other; known as Wye Bridge, is a historic bridge carrying St Martin's Street which is a narrow signal-controlled road carrying traffic in a one-way shuttle movement. The nearest alternative river crossing by road to the west of the A49 is Bridge Sollers, which is a 6-mile drive along the A438. To the east, the nearest road crossing is along the Holme Lacy bridge, which is over 5 miles away from the A49 crossing. The locations of the city centre crossings and their comparative distances from the nearest alternative crossings are set out in **Figure 3-4**.

Figure 3-4 River Wye bridge crossings and comparative locations



3.6.2 A number of transport issues have been identified in Hereford city centre and the surrounding area, many of which relate to the lack of crossings over the River Wye for vehicular traffic and the resultant demand place upon the A49 for carrying north-south traffic across the river and through the city centre.

3.6.3 Analysis of these issues is presented in detail as part of the OAR (Appendix A). **Table 3-4** provides a summary of these issues by transport mode and theme. It is expected that many of these issues would be, at least in part, mitigated against through the provision of an alternative river crossing over the River Wye for vehicular traffic. In this regard, the case for change (in terms of a new river crossing) is also highlighted against each of the identified issues.

Table 3-4 Summary of problem identification and the case for change

Mode / Theme	Summary of Problem Identification	Case for Change
Traffic	Lack of crossing points over the River Wye, leading to traffic routeing through the city centre, creating congestion and increasing journey times (with associated economic and environmental disbenefits)	An alternative river crossing is required to reduce the demand on the existing A49 crossing, provide a more direct route for movements north-south of the river in the east of Hereford and reduce through-traffic flows in the city centre.
	One of the two crossing points in the city centre; Wye Bridge is a narrow signal-controlled road capable of carrying traffic in a one-way shuttle movement only	The Wye Bridge does not provide a suitable alternative to the A49 bridge crossing, and the nearest alternative crossing is at least over 5 miles away in either direction. An additional two-way crossing is required to support traffic demand and provide resilience in times of an incident along the A49.
	Significant city centre through-traffic is at odds with the 'outdoor city' vision of the Hereford City Masterplan	An alternative river crossing is required to move vehicular traffic away from the city centre and enable the vision of the Masterplan to flourish, with its focus on leisure and hospitality interventions around St Martin's Street and the Wye, and reinforce Hereford as an 'outdoor city'.
	AQMA covering parts of Hereford city centre and the A49, with heavy traffic flows likely to be a significant contributing factor	An additional crossing would help to reduce traffic demand (and associated NO_2 emissions) within the AQMA. It would also provide opportunities for sustainable travel which would also help to reduce road user emissions across Hereford.
	High reliance on the private car for commuting which contributes to high vehicular demand on the network	Given the high reliance on the private car, a well-functioning road network is required to support commuter movements and facilitate economic activity and growth across Herefordshire. An eastern river crossing would also provide a connection to the Skylon Park Enterprise Zone for vehicle users, which would improve accessibility to this site and reduce the need to travel through the city centre.
	High average daily traffic flows recorded along the A49 bridge, with the theoretical capacity of the road close to being reached	There is very limited spare capacity along the existing river crossing, and with the significant development growth planned to come forward, the performance of the A49 will worsen. Movements across the river would eventually become so constrained that the future growth of the city and surrounding area would be negatively impacted.
	Average speeds along the A49 are significantly lower than the speed limit, particularly in the PM peak	An alternative river crossing would be helpful in providing additional routeing choice for vehicle users, particularly those accessing employment opportunities in the east such as at the Enterprise Zone. This would help to relieve demand on the A49 and help to improve journey time reliability and average speeds during the peak hours.
	By 2032, the Hereford Transport Model forecasts that the A49 will be operating at full capacity, with large	A river crossing is required before 2032 to provide additional network capacity and avoid a situation where the A49 is operating at full saturation. The

Mode / Theme	Summary of Problem Identification	Case for Change
	forecast traffic flow increases along the alternative river crossings at Bridge Sollers and the B4399 Holme Lacy crossing as traffic re-routes to find the next available river crossings with link capacity.	alternative river crossings are unsuitable for accommodating heavy traffic flows and large vehicles, and would require traffic re-assignment over a long distance just to be able to move north-south of Hereford. Therefore they do not represent viable alternatives once the A49 is operating at full capacity.
Safety	19 reported collisions over the A49 bridge in the last 5 year period. The KSI Severity Ratio is 15.8% which is slightly lower than the national average at 21% for A roads in England (RCGB, 2021).	Each time there is an incident on the A49, the city centre can become grid-locked with lengthy diversions in place. An alternative crossing to the east of the city centre would provide significantly improved resilience during times of an incident along the A49 and reduce the length of diversions required.
	High proportion of reported collisions are rear-end shunts which are commonly associated with slow-moving, queuing traffic	A new crossing to the east of Hereford would help to reduce vehicular demand on the A49 and instances of slow-moving traffic, which would in turn help to reduce the number of rear-end shunts
	High proportion of cyclist collisions reported along the A438 (and in close vicinity to the northern connection of the proposed eastern river crossing)	Plans are in place to improve cycling infrastructure along the A438 in advance of an eastern river crossing coming forward. The scheme will then connect with an upgraded cycle route which will help to provide a safer and coherent route for cyclists.
Socio-economic	People living in the vicinity of the A49 bridge (particularly to the south of the river) are in poor health	If an alternative river crossing was implemented, this could help to reduce traffic demand on the A49, which would have associated benefits in terms of improving air quality and the potential to improve the overall health and quality of life of residents living close to the A49.
	The Herefordshire Health & Wellbeing Strategy highlights a high inactivity across Herefordshire with low fitness levels resulting in more deaths than from smoking, diabetes, and hypertension combined	Improved active travel infrastructure is required to encourage more people to engage in physical activity and reduce the number of deaths being caused by low fitness levels.
Cyclists	Low levels of commuters travelling to work by bike	The cycling infrastructure needs to be improved in order to encourage more people to ride a bike to work. A new river crossing would provide segregated cycle lanes and connect with other cycling improvements being delivered through LUF2, thereby creating a coherent network to encourage more users.
	73% of commuter trips are less than 5km in length, which is significantly higher than the national average	A 5km distance can be cycled in approximately 20 minutes. Therefore, through the provision of improved active travel infrastructure (which the eastern river crossing would help to achieve) there exists an opportunity to convert many of the less than 5km car journeys into cycle trips.
Bus	Frequent bus services connecting eastern parts of Hereford with the city centre	The east of Hereford is already well-served by bus services and therefore the bus services along the eastern river crossing would be able to join-up with a coherent bus network
	Low levels of commuters travelling to work by bus. BSIP survey findings suggest that only 1% of	The eastern river crossing would provide a direction connection with other existing services. The route between the B4399 and the A438 would be

Mode / Theme	Summary of Problem Identification	Case for Change
	employees of at Skylon Enterprise Zone use the bus to commute.	characterised by limited junction connection points and therefore offer a free-flowing route for bus journeys, encouraging more commuters to travel by bus. Access to the Skylon Enterprise Zone would be improved which would help to increase the number of commuters using the bus to travel to this site.

3.7 Scheme Objectives

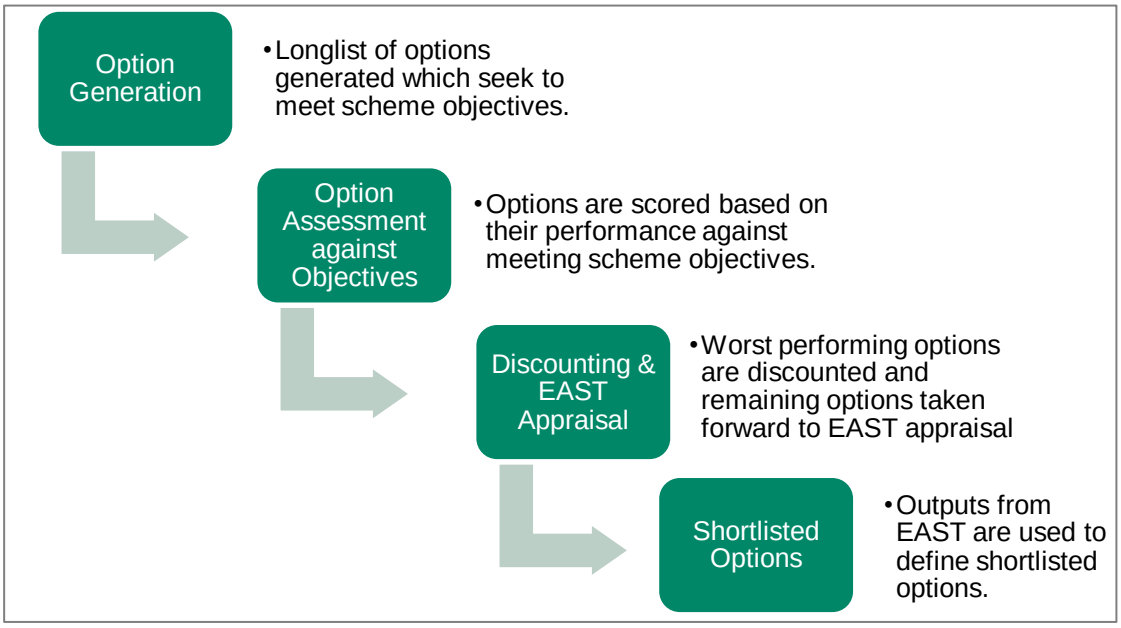
3.7.1 Nine objectives have been identified which have been established following a review of the problems and need for intervention and through liaison with Herefordshire Council and elected Councillors. The objectives seek to tackle the key issues highlighted in **Table 3-4**. As the project develops consideration will be given to setting SMART (Specific, Measurable, Achievable, Realistic and Timebound) targets to sit under these objectives.

1. **Resilience:** Improve resilience (i.e. reduce risk of disruption) in relation to incidents on, and maintenance of, the existing A49 Bridge.
2. **Active travel:** Increase mode share of active travel trips in the study area.
3. **Public transport:** Increase mode share of public transport trips.
4. **Congestion:** Reduce congestion on existing river crossing and in Hereford city centre.
5. **Safety:** Improve road safety and aim to reduce the frequency and severity of incidents within the city.
6. **Environment:** Minimise the impact on the environment, improve biodiversity, and contribute to making Herefordshire 'nature rich'.
7. **Carbon:** Reduce carbon emissions and contribute to achieving net zero.
8. **Growth:** Improve transport links between residential and employment areas to the east of Hereford.
9. **Health & Well-being:** Improve the health and quality of life for local residents.

3.8 Strategic assessment of options

3.8.1 The OAR (Appendix A) provides a detailed account of the process by which options were identified, sifted, and shortlisted, to arrive at an option(s) which would achieve all of the scheme objectives as set out in Section 3.7. This process is outlined in **Figure 3-5**.

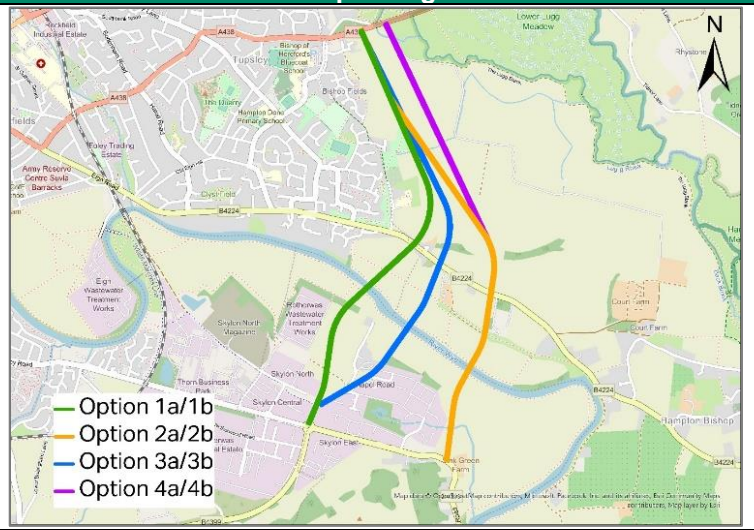
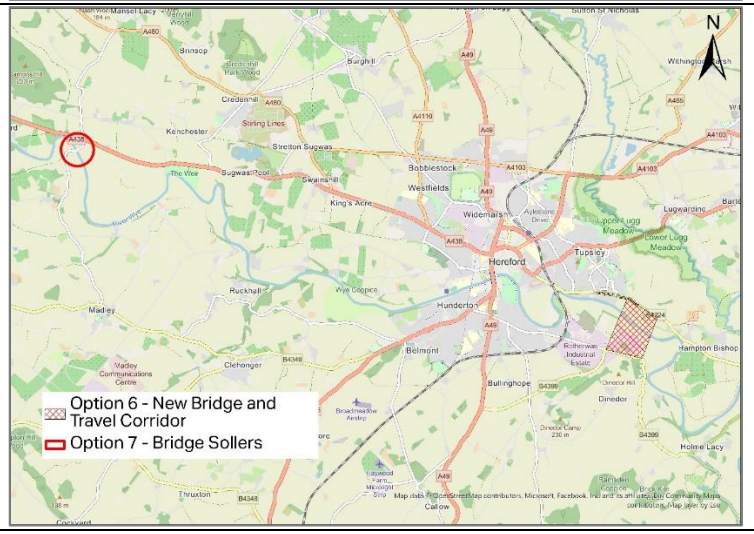
Figure 3-5 Option assessment process

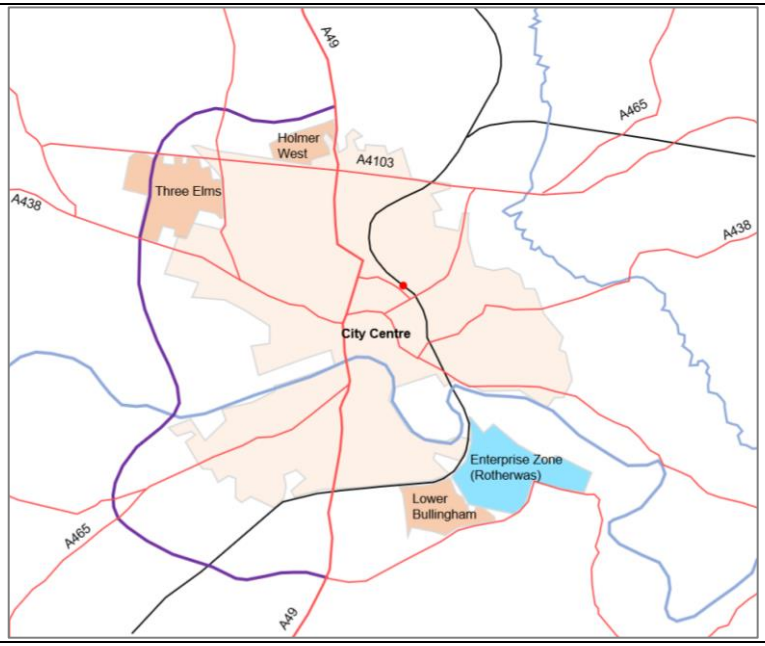
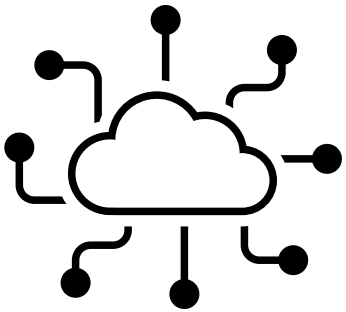


Option Generation

3.8.2 In total, 18 options were identified as part of the option generation process and included on the longlist. These options were agreed with Herefordshire Council and elected Councillors. The full list of options, including a description of their scope is contained within the OAR. **Table 3-5** below provides a summary of the type of interventions that were considered.

Table 3-5 Summary of options contained on the long list

Option type	Description	Map / Image
Eastern River Crossing (ERiC)	Numerous variations of the ERiC alignment were considered as part of the longlist (Options 1a/1b, 2a/2b, 3a/3b, 4a/4b, and 5 (x9 options in total)). All options would cross the River Wye to the east of Hereford via a new bridge structure, with a northern connection point along the A438 and a southern connection along the B4399. All options would also include fully segregated, LTN 1/20 compliant facilities for cyclists. Key differences between the options include: • The location of the tie-in along the A438 / B4399 • Curvature of the route (which would impact upon the length (and associated cost) of the route • Location of at-grade junction with Hampton Park Road • Speed limit (30/40/50/60mph variations)	
Alternative river crossings	Alternative river crossings were considered including: <u>New bridge and active travel corridor (Option 6)</u> A new river crossing that would connect with the B4399 and Hampton Park Road that would only be accessible by public transport and active modes. The option would require a structure to be built over the River Wye and over two public footpaths. <u>Bridge Sollers (Option 7)</u> This option would involve online improvements to the existing Bridge Sollers river crossing from 4.5m country lane to 6.5m road with minor alignment improvements and priority junctions at either end.	

Hereford Western Bypass and Southern Link Road	Option 8 considered the Western Bypass and Southern Link Road, which had previously been considered as part of Herefordshire Council's adopted policies before a decision was made in February 2020 to cease further work on a scheme to the west of the city. The Western Bypass would connect the A49 (Holmer Road) and A465 (Abergavenny Road), whilst the Southern Link Road would connect the A465 (Abergavenny Road) to the A49 (Ross Road), with a bridge structure being required over the River Wye.	
Non-transport interventions	A series of non-transport interventions have also been considered to determine of the issues and challenges confronting Hereford could be addressed without the construction of a large-scale capital infrastructure project. These included: • Increased broadband availability (Option 9) • Improved urban planning (Option 10) • Mobility as a Service (MaaS) apps (Option 11) • Advertisement and promotion of active travel corridors (Option 12) • Demand management / charging (Option 13) • Do Nothing (Making the best use of the existing network) (Option 14)	

3.8.3 Once the longlist had been consolidated, an optioneering process was undertaken, which followed a two-staged approach.

Stage 1 - Option assessment against objectives

3.8.4 As part of this stage, all 18 options on the longlist were scored based on their performance against meeting scheme objectives.

3.8.5 The scorings and justifications for each of the scores awarded are detailed as part of the OAR. From this assessment, the following seven options were discounted based on their poor performance against the scheme objectives:

- New bridge and active travel corridor (Option 6)
- Bridge Sollers (Option 7)
- Increased broadband availability (Option 9)
- Improved urban planning (Option 10)
- Mobility as a Service (MaaS) (Option 11)
- Advertisement and promotion of active travel corridors (Option 12)
- Do Nothing (Option 14)

Stage 2 - EAST sifting

3.8.6 The remaining 11 options which were ranked the highest based on the assessment against the objectives were taken forward for further appraisal using the DfT's Early Assessment Sifting Tool (EAST). This process helped to validate the outcomes from the objectives scoring, and help to further define the shortlist for taking forward for appraisal as part of the SOC.

3.8.7 The 11 options taken forward to EAST included all of the ERiC alignments, the Hereford Western Bypass (Option 8) and one of the 'non-transport' options, namely Demand Management (Option 13).

3.8.8 Based on the assessment of the options against the objectives and in the EAST tool, it was deemed that all of the ERiC options would have a number of benefits and strong strategic fit with the objectives including:

- Improved resiliency in the transport system
- Increased mode share of both public transport and active travel trips
- Reduced congestion in Hereford city centre
- Improved transport links between the residential and employment areas in east Hereford
- Improved health and quality of life of local residents

3.8.9 The Hereford Western Bypass (Option 8) has a number of benefits, particularly in terms of improving resilience and reducing congestion in Hereford city centre. However, this option would not improve the transport links between residential and employment areas to the east of Hereford and would also have adverse environmental impacts, with a large amount of land take required due to the length of the route.

3.8.10 Demand Management (Option 13) would provide disincentives to private vehicle usage and help to promote mode shift towards public transport and active modes. This would have positive environmental impacts in relation to carbon emissions, however these impacts are likely to be minimal and this option would not help to promote economic growth or provide as many socio-distributional benefits as the ERiC options.

Shortlisted Options

3.8.11 Based on the optioneering process, Options 1a/1b and 3a/3b have been taken forward for inclusion on the shortlist. These options are all variations of the ERiC alignments and were found to be the better performing variations. This shortlist (and the process for arriving at the shortlist) has been determined in close coordination with both Herefordshire Council and elected Councillors.

3.9 Scope

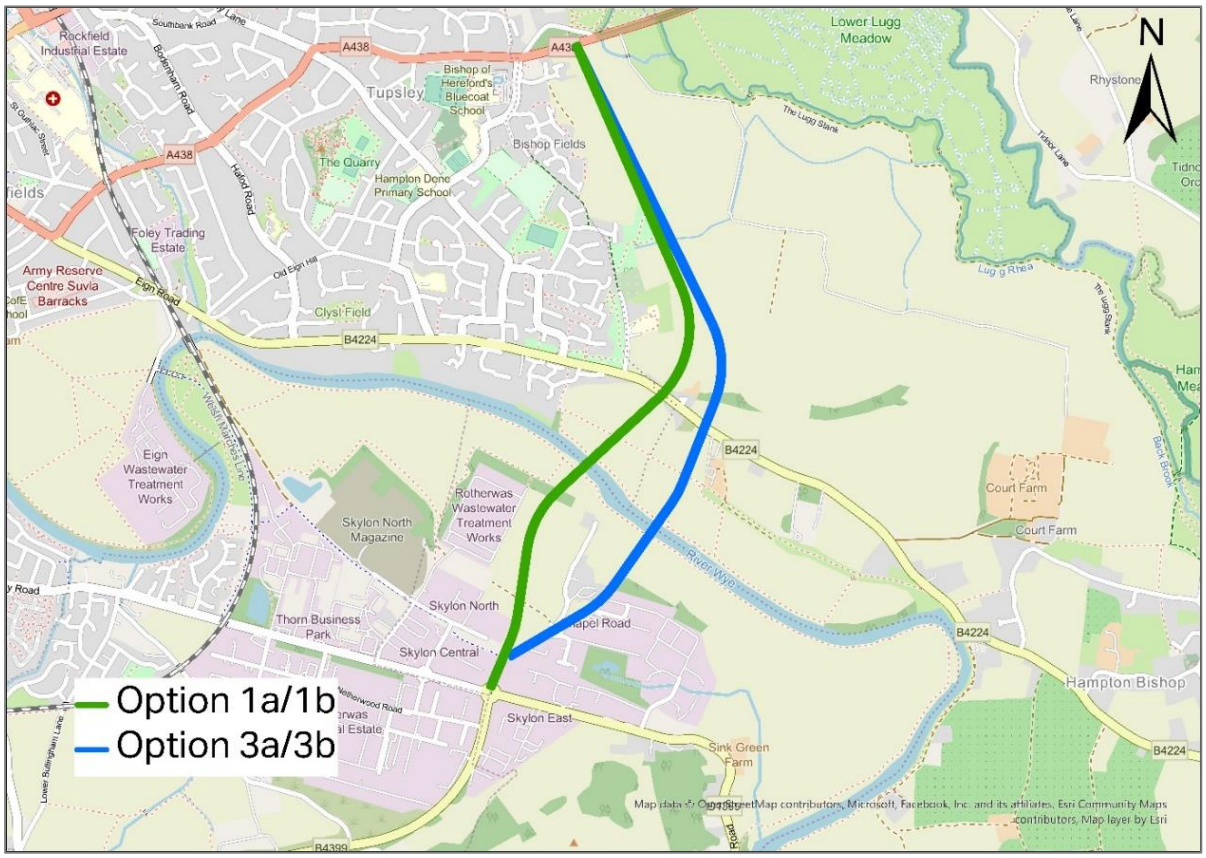
3.9.1 The scope of the options taken forward as part of the shortlist is set out in **Figure 3-6** below.

Table 3-6 Shortlisted options

#	Option	Scope	Description
1a	ERiC Alignment 1 (30mph)	A two-way carriageway which is 14m wide by 2700m long (including footpath, LTN 1/20 cycle facilities, segregation). This is in addition to the bridge construction which is 290m in length.	Both Options 1a and 1b connect to the B4399 at the Chapel Road roundabout around the west of Rotherwas Chapel to an at-grade crossing at Hampton Park Road. They then skirt closely to residential receptors and connect to the A438 to the west of the access road to the A&D plant. This requires a structure to be built over the River Wye as well as two public footpaths. The alignment for Option 1b would be wider to accommodate the faster speeds. LTN 1/20 cycling infrastructure is included as part of these alignment.
1b	ERiC Alignment 1 (40mph)	A two-way carriageway which is 15.3m wide by 2700m long (including footpath, LTN 1/20 cycle facilities, segregation). This is in addition to the bridge construction which is 290m in length.	
3a	ERiC Alignment 3 (30mph)	A two-way carriageway which is 14m wide by 2700m long (including footpath, LTN 1/20 cycle facilities, segregation). This is in addition to the bridge construction which is 485m in length.	Both Options 3a and 3b connect to the B4399 at the Chapel Road roundabout around the east of Rotherwas Chapel to an at-grade crossing at Hampton Park Road. This partly utilises Chapel Road existing carriageway and alignment however an additional junction would be required where Options 3a/3b deviate from Chapel Road's existing alignment. The route then connects to the A438 at the same point as Options 1a/1b. Options 3a/3b are similar to Options 1a/1b except the crossing at Hampton Park Road is more to the east and the option is further away from residential receptors. This requires a structure to be built over the River Wye as well as two public footpaths. The alignment for Option 3b would be wider to accommodate the faster speeds. LTN 1/20 cycling infrastructure is included as part of these alignments.
3b	ERiC Alignment 3 (40mph)	A two-way carriageway which is 15.3m wide by 2700m long (including footpath, LTN 1/20 cycle facilities, segregation). This is in addition to the bridge construction which is 485m in length.	

3.9.2 The alignments of the shortlisted options (which include speed limit variations) are set out in **Figure 3-6**, with the concept designs for the options set out in Appendix B.

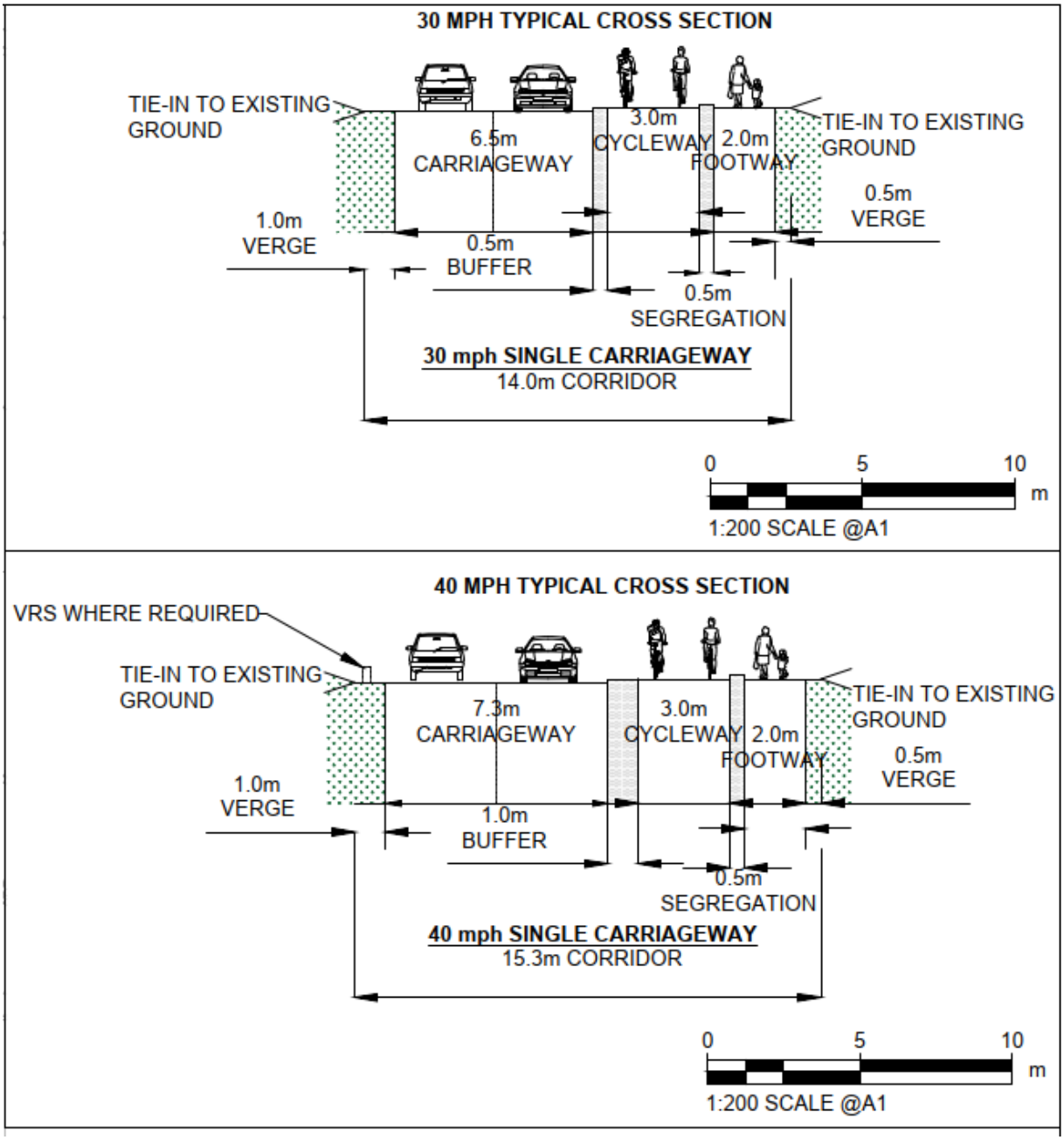
Figure 3-6 Shortlisted options



3.9.3 A typical cross section has been designed for Options 1a and 3a where the speed limit is 30mph (**Figure 3-7**). This comprises 6.5m carriageway width, 3m two-way segregated cycle track and 2m footway on one side of the cross section. The 6.5m carriageway would meet Manual for Streets advice and accommodate two buses to pass each other as per LTN 1/20 recommendations as well as Stagecoach published advice whilst the 3m two-way cycle track complies with LTN 1/20 minimum cycle track recommendations for up to 300 cycle flow per hour. 2m wide footway width meets DfT Inclusive Mobility Guidance recommendations which would accommodate two wheelchair users to pass each other.

3.9.4 Where the speed limit is 40mph, the carriageway width is increased to 7.3m to comply with DMRB CD 127 recommendations. The proposed alignments radii and forward visibility were designed in accordance with DMRB CD 109.

Figure 3-7 Cross sections for the shortlisted options



3.10 Bridge crossings

3.10.1 Each of the proposed ERiC alignments will require the construction of a bridge structure over the River Wye to carry the highway across the river. The bridge crossings will be mostly within agricultural land that is also flood plain, to the north and south of the river. Drawings for the bridge crossing required for each alignment are provided as part of Appendix C.

Flood risk

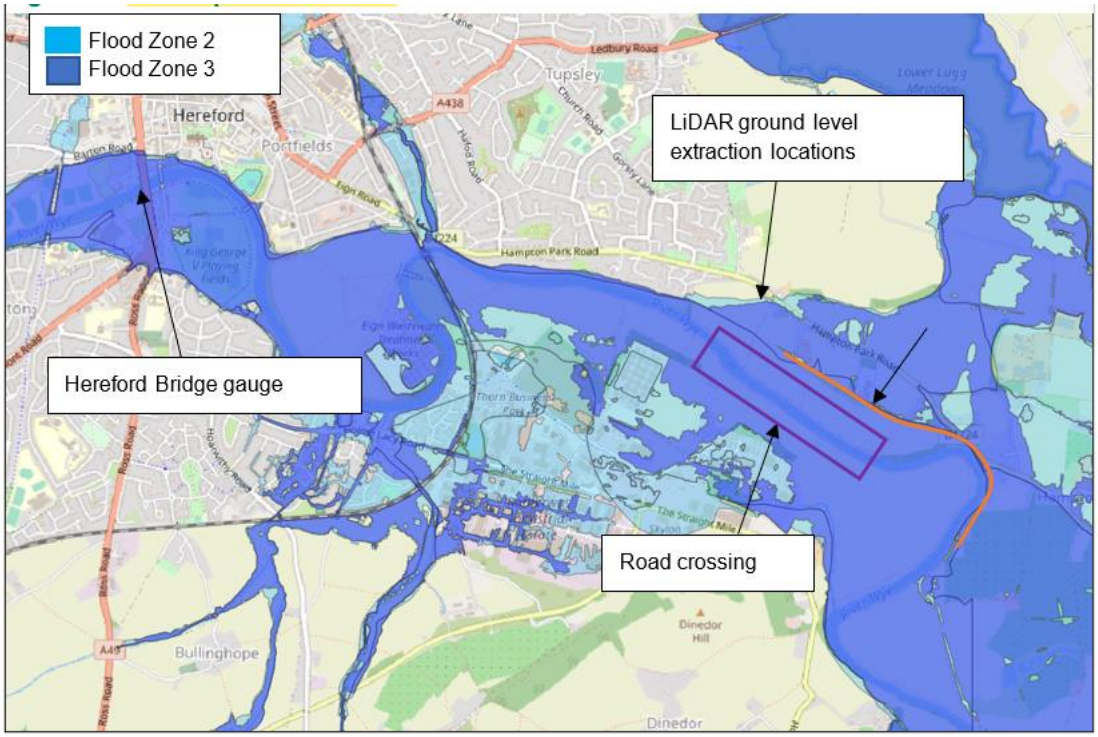
3.10.2 The River Wye floodplain is very wide, and a significant volume of water is conveyed through the floodplain at the location during a flood event (Figure 3-8). Existing maximum flood depths are typically in excess of 1m around the proposed crossing location. This has been taken into account when considering the bridge options, where possible the crossings have utilised open spans to minimise impacts upon the floodplain, and initial mitigation measures have been considered where embankments are required.

3.10.3 Flood levels for the River Wye have been estimated based on publicly available information, Environment Agency modelling data and engineering experience. It should be noted that the Environment Agency model is from 2012, is a strategic scale model for the River Wye, and is associated with a number of limitations which mean that it is not appropriate for prediction of accurate flood levels at the bridge crossing locations.

3.10.4 While the sources of flood level information available have been sufficient for initial optioneering and design of a road bridge, it should be noted that the current flood levels are subject to a high degree of uncertainty and do not reflect the Environment Agency's latest climate change guidance for peak river flows. Based upon current climate change guidance the scheme is located within the Wye MC Management Catchment, and the 'Higher' climate change allowance to 2080 of 49% would be used within the assessment and design of the scheme. It should also be noted that Environment Agency climate change guidance for peak river flows is routinely revised in line with updated climate predictions and methods, and therefore it is likely that the required allowances will change through the course of planning and design of the proposed scheme.

3.10.5 To reflect limitations associated with the available sources of flood level information, including peak river flow allowances, a conservative level has been adopted to represent a 1% Annual Exceedance Probability (AEP) event (a one-hundred-year flood) inclusive of climate change. Estimation of flood levels to apply for consideration of the initial bridge options is documented in paragraphs 3.10.5 to 3.10.7 below.

Figure 3-8 Site map of flood levels



3.10.6 The LiDAR Digital Terrain Model (DTM) provides information on ground level using data collected by remote sensing. The data shows that the approximate ground level at the edge of the Flood Zone 2 (0.1% AEP event) extent is 50m AOD. This provides an indication of the maximum flood level in the 0.1% AEP event on the left bank of the River Wye as shown in Figure 3.8.

3.10.7 LiDAR DTM data shows that the approximate ground level at the edge of the Flood Zone 3 extent (1% AEP event) is 49.3m AOD. This provides an indication of the maximum flood level in the 1% AEP event on the left bank of the River Wye as shown in Figure 3.8. The Environment Agency modelling data supplied to AECOM shows that the 1% AEP plus climate change (20%) level at the scheme location is 49.25 mAOD, whilst the 0.1% AEP level at the scheme location

is 49.7m AOD.

3.10.8 Based upon the above considerations a final flood level of 50.5m AOD has been selected to use as the basis for crossing options. This level has been derived through taking the Flood Zone 2 (0.1% AEP) estimated level of 50mAOD extracted from the LiDAR DTM, and adding an additional allowance of 0.5m for uncertainty.

3.10.9 This has been selected as a conservative estimate for the 1% AEP plus climate change flood level. In line with Environment Agency guidance, an allowance for freeboard of 1m has been applied in order to generate an estimated level for the bridge soffit.

3.10.10 Given the uncertainty associated with the estimated flood levels, a conservative level has been adopted along with a 1m allowance for freeboard, to derive the bridge soffit level.It is recommended that further detailed site specific modelling be undertaken as part of future phases of the project, to inform scheme assessment and further design.

Recommended option for bridge structure

3.10.11 For the River Wye crossing, a three-span structure has been proposed for the shortlisted ERiC alignments, with approach viaduct spans. A single span structure for the river crossing had been initially considered, with spans up to 200m, in the form of a tied arch bridge. This type of structure is generally aesthetically pleasing and will minimise the adverse impact of providing piers in the flood plain thereby reducing any environmental impact during construction. However, the lower profile of the alignment (approximately 7m high) compared to the height of the structure (>9m) will potentially present this structure as visually obtrusive in the landscape. More importantly, this form of construction is not economic to construct (high level costing indicates that this form of structure will cost approximately three times the costs of a traditional three spans bridge) and maintain and hence dismissed.

3.10.12 The below section summarises the recommended option for the bridge structure in relation to the shortlisted ERiC alignments. Where a specific ERiC option is not highlighted, it can be assumed that the preferred approach applies to all shortlisted ERiC options.

River crossing

3.10.13 A viaduct solution is proposed as the preferred approach for the river crossing, reducing any impoundment of flood water at the embankment, albeit for ERiC Option 1a/1b, flood relief culverts are proposed away from the river crossing where the road alignment cannot accommodate a bridge structure due to the restricted headroom and tie-in into existing roads. For future stages of the business case, flood modelling will be required to determine the flood conveyance through the proposals and compared to the baseline scenario for impacts on flood levels. Should this culverted floodplain conveyance, and associated flood compensation, not be acceptable to the Environment Agency, raising of the road alignment would be required for a bridge structure. This will increase the structures construction costs and would mean that a tie-in with Hampton Park Road could not materialise in its current arrangement.

3.10.14 Further analysis is required to be conducted within a hydraulic model to mitigate the flood risk impacts from the design. This is especially true for ERiC Option 1a/1b where a series of design options with flood relief culverts through the embankment on the southern side of the River Wye have been proposed and require investigation.

Span arrangement

3.10.15 The proposed structure for the ERiC Option 1a/1b is a three-span continuous structure. The main span, which will be located centrally over the river, is approximately 80 metres long for Options 1a/1b and 75 metres long for Options 3a/3b. The side spans, located on the north and south are 60 metres long each (Options 1a/1b) / 55 metres long (Options 3a/3b). The overall width of the superstructure will be 15.8 and 15.3 metres for the 40mph and 30mph speed limits respectively (for both ERiC alignments).

3.10.16 Due to the proximity of the footpaths along the river, it is envisaged that there will be a local

diversion of the footpaths during and after construction.

3.10.17 The 'river' span is chosen such that approximately 5m clearance of the main 'river' support from the banks of the river is achieved. It is desirable to fit towpaths on the south and north riverbanks and keep the foundations of main 'river' piers as far back as possible to ensure construction away from the river. In addition, it is preferable for users of the river to pass beneath a structure having an open aspect; the visual impact of piers would be less by placing them away from the banks even if leaf-type piers are chosen.

3.10.18 The span configuration would be (from south to north) as summarised in **Table 3-7** below.

Table 3-7 Proposed span arrangements

	ERiC Option 1a/1b	ERiC Option 3a/3b
Span configuration and articulation (from south to north)	**25m** simply supported steel-concrete composite deck over intermediate piers **60-80-60m** continuous steel-concrete composite deck over intermediate piers **2x 32.5m** continuous steel-concrete composite deck over intermediate piers	**30-40-30m** continuous steel-concrete composite deck over intermediate piers **55-75-55m** continuous steel-concrete composite deck over intermediate piers **30-40-30m** continuous steel-concrete composite deck over intermediate piers **30-40-30m** continuous steel-concrete composite deck over intermediate piers
Total Viaduct length	290m	485m
Comments	Additional culverts at least 40m long required at the southernmost end of the viaduct spans (between chainages 550 – 750)	No additional culverts

3.10.19 The span arrangement was selected such that:

- Freeboard of at least 1m is satisfied for the 1% Annual Exceedance Probability (AEP) with 70% climate change flood level.
- Longer spans and reduction of piers and foundations within the floodplain is achieved. However, long spans will require bigger and more complex expansion joints making their replacement more difficult.
- Splicing within areas of high moments and shears is avoided assuming transportation of steel girders of 25-27m maximum length to the floodplain site.
- Reduce the need of using very heavy craneage to move site or shop spliced girders into place.
- Very steep variation of girder depth of adjoining spans is avoided as much as possible.

Superstructure form

3.10.20 The superstructure will consist of three pairs of weathering steel girders with a composite cast in-situ concrete deck slab formed on permanent formwork units and cantilever edge units. Intermediate steel bracing will be provided along the length of the pairs of girders.

3.10.21 The girders will be locally hunched over the intermediate supports. The girder over the pier will have the greatest depth; approximately 3m reducing to 2.75m on the spans.

3.10.22 The steel-concrete composite superstructure will consist of three pairs of weathering steel girders with a composite cast in-situ concrete deck slab formed on permanent formwork units and cantilever edge units. Intermediate steel bracing will be provided along the length of the pairs of girders.

Articulation

River Wye Bridge

3.10.23 It is proposed that the bridge be continuous but not integral at the intermediate and end supports. Thermal movement will be accommodated by expansion joints at the north abutment of the north side span and at the south pier of the south side span. Continuity of the deck will be achieved through the concrete deck slab composite with steel diaphragms resting on top of bearings.

3.10.24 At intermediate piers the pier girders can be connected together transversely with a steel diaphragm supported on three bearings (i.e.,3 bearings per pier for a 6 girder deck). At the north abutment, the deck will be supported on bearings under each steel girder.

River Approach Viaduct

3.10.25 It is proposed that the viaduct spans be continuous but not integral at the intermediate and end supports. Thermal movement will be accommodated by expansion joints provided at the ends of each continuous section. Continuity of the deck will be achieved through concrete deck slab composite steel diaphragms supported by bearings under each paired girder.

3.10.26 At intermediate piers the pier girders can be connected together transversely with a steel diaphragm supported on three bearings (i.e.,1 bearing per pier column supporting each paired girder).

Abutment

3.10.27 The north abutment will be a full height cantilevered abutment wall of reinforced concrete construction, supporting the vertical loads from the bridge and acting as retaining wall for the embankment. Its connection to the deck will be via bearings and will be supported on piled foundations. A maintenance gallery will be provided at the rear of the bearing shelf.

3.10.28 The inspection gallery access is to be designed above flood level to remain clear of flood water at all times.

3.10.29 The south abutment at the end of the viaduct span will be a full height full width reinforced concrete cantilever wall supporting the vertical loads from the viaduct and acting as a retaining wall for the south embankment. Its connection to the deck will be via bearings and will be supported on piled foundations. A maintenance gallery behind the bearing shelf will not be provided, as the bearing shelf and expansion joint can be accessed from the front and sides of the south abutment for inspection and maintenance.

Pier

3.10.30 The shape of the intermediate supports will be chosen upon completion and recommendations of the aesthetical appraisal in accordance with CD 351. Each intermediate support will be of either elliptical, circular or orthogonal (leaf type) shape.

3.10.31 In case of discrete reinforced concrete columns of either elliptical, circular or orthogonal shape, each separate column will be situated beneath each pair of the main girders of the River Crossing Bridge and steel-concrete composite part of the Approach Viaduct spans. There will be one bearing on the top of each column connecting it to the steel diaphragm within the deck. In the case of singular orthogonal wall pier (leaf-type pier), three bearings will be placed on top of the wall piers spaced such that each bearing will be beneath one pair of main girders, connecting the pier to the steel diaphragm within the deck.

3.10.32 The piers at intermediate expansion joints will have a capping beam at the top to support two rows of bearings from the adjoining continuous decks with bearings supporting each plate girder at these locations.

Foundations

3.10.33 Reinforced concrete bored piles will support the bridge substructure (piers and abutments) and will help to control differential settlement between supports.

Parapets

3.10.34 Vehicle parapet N2/W2 1.5 m and 1.0m high with mesh infill in accordance with BS EN 1317 at east edge adjacent to footway/cycleway and west edge of the bridge respectively will be provided.

Street lighting

3.10.35 At this stage, lighting has not been included as part of the design or costings for the bridge structure. In the next design stage, we will investigate the need for including street lighting, based on the speed limit of the route and length of the bridge, and considering safety of users, environmental impacts, maintenance and cost impacts.

3.10.36 Lighting provision on the verges on either side of the deck may be necessary for the safety of Non-motorised Users (NMU's) using the footway and cycleway. It is anticipated that this lighting could be provided at low-level if required. Again, this will be considered in more detail as part of the next design stage.

3.10.37 The ducts within the verges of the deck will accommodate any required services on the deck e.g., power cables for street lighting or low-level NMU lighting. Ducts will be positioned with at least 75mm horizontal spacing at a convenient location across the footway to ease future maintenance.

Drainage

3.10.38 The carriageway on the bridge deck features a 2.5% crossfall and both verges fall towards the carriageway at a 2.5% gradient. The longitudinal profile of the deck is hogging, on a crest, the gradient falls towards each end of the structure.

3.10.39 The preferred drainage solution for the deck would be for surface water runoff to drain naturally towards the ends of the structure under gravity. However, the gradient of the deck is believed to be insufficient to allow for this; it is expected that a dedicated drainage solution will be required to convey water to the ends of the deck.

3.10.40 Should a dedicated deck drainage system prove necessary as expected, Combined Kerb Drainage (CKD) units are recommended as the most simple and economic drainage system available. The carriageway is cambered and CKDs on either edge of the carriageway are proposed to intercept surface water runoff and carry it towards either end of the deck and discharged into manholes. Perforated sub-surface drainage conduits will be provided on the low side of the deck and positively drained to discharge into the road drainage system off the bridge deck.

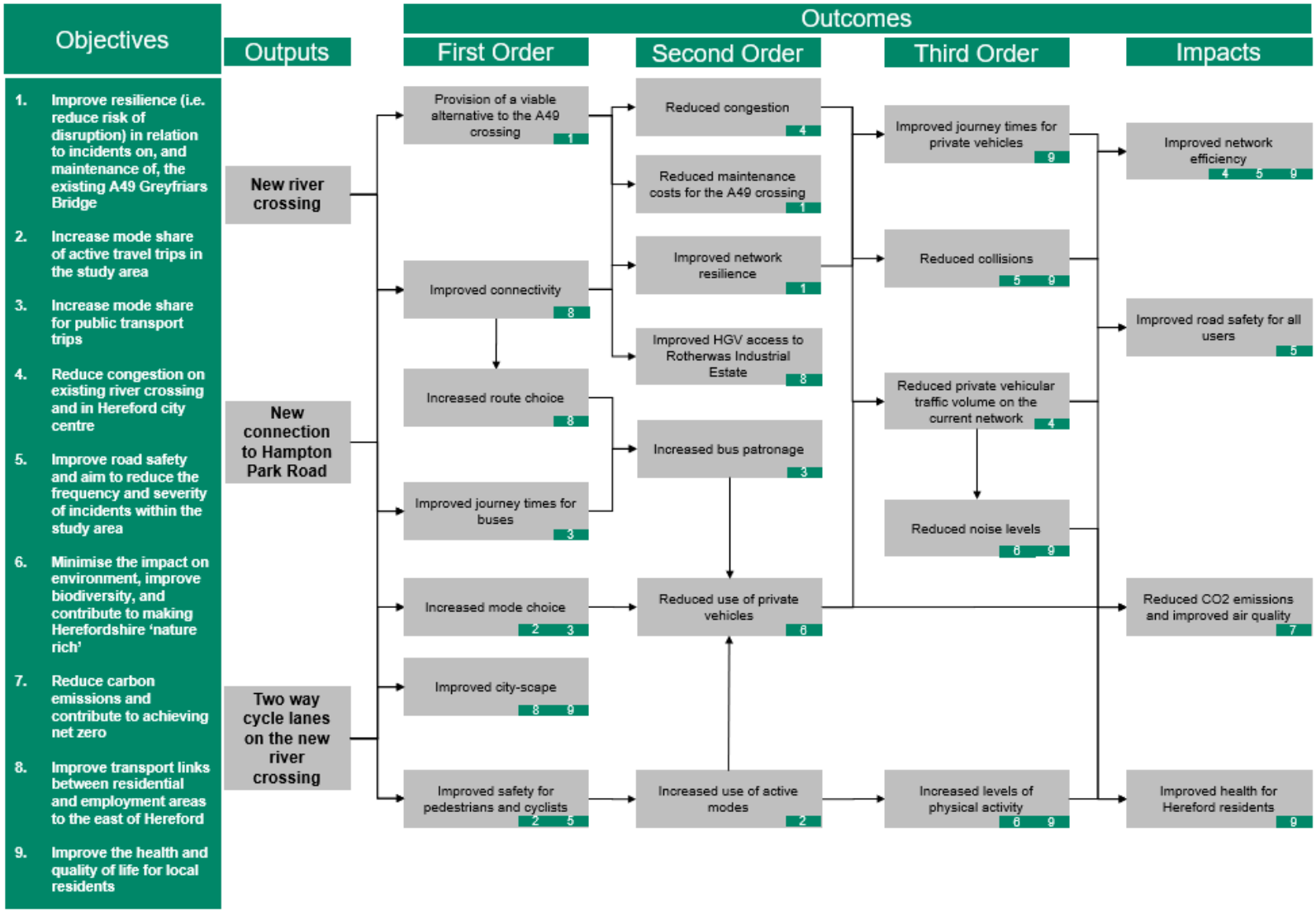
3.10.41 This solution does require some routine maintenance to remain operational, as the kerb units can become blocked if not regularly cleared, leading to drainage issues. However, the alternative solution would be to provide an underslung carrier drain to the soffit of the deck, this option is undesirable as it would require the drainage system to penetrate through the deck, this requires complex detailing and carries higher potential for drainage defects. The carrier drain would also need to be fixed to the deck soffit, which would represent a significant maintenance liability.

3.10.42 Back of wall drainage, in accordance with Cl. 513 of the Specification for Highway Works, will be provided to the abutments and wingwalls to discharge water from the adjacent embankment, which in turn will be picked up by the reinforced soil drainage system. In addition, the reinforced soil blockwork system includes open joints.

3.11 Strategic benefits

3.11.1 Based on the objectives as set out in Section 3.7 and the scope of the shortlisted options as set out in Section 3.9, a logic map has been produced which sets out key outcomes which are likely to be derived from the implementation of ERiC if all of the objectives were to be achieved. Whilst there are four shortlisted options, the strategic benefits derived from each option are likely to be very similar and therefore only one logic map has been produced.

Figure 3-9 Logic map



3.11.2 The logic map details the scheme objectives, inputs, outputs, and impacts of the scheme and follows the theory of change approach to detail the steps that will be taken to achieve the scheme objectives.

3.11.3 The numbers shown against the objectives and some of the logic steps show how the objectives can be mapped against these and demonstrate the steps through which the outputs of the scheme are anticipated to achieve each of the objectives.

3.11.4 Key strategic benefits of the scheme, along with key beneficiaries and an early indication of how the benefits will be measured is set out in **Table 3-8.** Any expected difference in strategic benefit between the four shortlisted options is also outlined as part of this table.

Table 3-8 Strategic benefits

Benefit Type	Beneficiary	How will it be measured?	Difference in benefits achieved by each shortlisted option
Network improvements – resilience	Residents, businesses, visitors	Rerouting of traffic flows along new route	N/A
Network improvements – improved journey times	Residents, businesses, visitors	Change in journey times Change in speeds at peak hours	Slight additional benefit from Option 1b & 3a – a higher speed limit is likely to have a larger positive impact on journey times
Accessibility – enhanced mode choice	Residents	Change in cycle uptake Change in bus patronage Change in traffic flows	Slight additional benefit from Option 1a & 3b – cycling alongside a 30mph route may be more desirable than a 40mph route
Environment – reduced NO_2 and improved air quality	Residents and businesses	Change in NO_2 emissions	N/A
Safety – reduced collisions, specifically slight collisions	Residents and visitors	Change in number of collisions	N/A
Health and Wellbeing – increase physical activity	Residents	Change in cycle uptake Change in obesity levels Change in physical activity	Slight additional benefit from Option 1a & 3a – cycling alongside a 30mph route may be more desirable than a 40mph route

3.11.5 At Outline Business Case stage, further consideration will be given to target setting in relation to the identified scheme objectives. Monitoring and Evaluation and Benefits Realisation Plans will also be produced to plan for how the scheme impacts will be assessed, monitored, and delivered.

3.12 Constraints

3.12.1 A number of environmental and engineering constraints associated with the scheme have been identified as set out below.

Environmental

3.12.2 Constraints are set out in detail within the OAR, which also contains map-based illustrations of the constraints across the study area. Key environmental constraints are summarised below. Constraints are identified based on their interaction with the broad ERiC corridor (**Figure 2-1**) which contains alignments of both of the shortlisted alignments.

- There are two Grade II Listed Buildings, including the Whistle Field 18th Century House, and 'Milepost at SO538403', a Scheduled Monument at 'Ring ditches and rectilinear enclosures east of Tupsley' and Rotherwas Chapel. Any new highway infrastructure within the proposed corridor has the potential to impact upon the setting of these designated assets.
- The open agricultural landscape and flat topography on a wide flood plan means that visual implications will be felt across a wide area and could bring intrusion to the residential areas on the outskirts of Hereford.
- The proposed ERiC corridor crosses the River Wye Special Area of Conservation (SAC) which would result in a Habitats Regulation Assessment (HRA) being carried out. It may also cause indirect impacts on two nearby ancient woodlands.
- The corridor would also permanently seal land classified as Agricultural Land Classification (ALC) Grades 1 to 3a for agricultural use, whilst three nearby historic landfills pose a potential ground contamination risk.
- The corridor crosses a Minerals Safeguarding Area (MSA) for superficial sand / gravel, and a strong case would need to be made for the benefits of the route outweighing the impact of sterilisation.
- The crossing of Ordinary Watercourses and the River Wye could result in adverse impacts upon these watercourses and increase flood risk. The corridor would fall within Flood Zones 2 and 3 and as such would require a Flood Risk Assessment (FRA). It would also lead to an increase in impermeable area and subsequently increase surface runoff and flood risk and therefore a drainage strategy would be required.

Engineering

3.12.3 A high level 2D and 3D geometric design has been undertaken for the shortlisted alignments. The design highlighted some potential constraints that will need to be considered in the next design stages and/or during construction. These include:

- The proposed alignments encroach on third-party land therefore the feasibility of the scheme is dependent on successful land acquisition.
- The proposed bridge across River Wye will likely need to extend across Flood Zones 2 & 3 which will result in a longer span and thus higher construction costs. Further flood mitigation assessment will need to be investigated and assessed in the next design stage.
- The existing topography along the proposed alignments, as obtained from LIDAR data publicly available online, appears to be hilly with several hills and steep slopes that exceed 10% in several locations. Therefore, the proposed road vertical design will not match the existing topography since the maximum recommended longitudinal gradient for a single carriageway is 6-8% as per DMRB CD109. This would result in considerable cut/fill sections which will have consequences in both construction costs and construction difficulties. A topographical survey is recommended in the next design stage to confirm the existing ground topography. Additionally, Ground Investigation is recommended in the next design stage to further assess the challenges related to cutting within the existing hills. Early Contractor Involvement will be useful to advise on construction difficulties and challenges related to cut/fill sections construction. Proposed high level vertical profile designs for the two short listed alignments are included as part of the OAR.
- At the intersection between Option 3a/3b and Hampton Park Road, the speed limit along Hampton Park Road is unrestricted although it drops to 40mph in close proximity to the intersection location. It is recommended to extend the 40mph speed limit up to the junction approaches to be more consistent with the ERiC speed limit of 30/40mph. Maintaining the existing speed limit at Hampton Park Road would require excessive visibility splay requirements on the approach to the junction which might require additional third-party land take.
- At the intersection between the ERiC and the A438, the speed limit along the A438 is unrestricted although it drops to 40mph in close proximity to the intersection location. It is recommended to extend the 40mph speed limit up to the junction approaches to be more

consistent with the ERiC speed limit of 30/40mph. Maintaining the existing speed limit along the A438 would require excessive visibility splay requirements on the approach to the junction which might require additional third-party land take.

- Two existing public footpaths run both sides of the river. These will need to be continued and integrated into the proposed bridge design potentially by enabling them to continue beneath the proposed bridge across the river.

3.13 Interdependencies

3.13.1 The scheme interdependencies are set out below. Interdependencies are the strategic programmes and projects that the ERiC scheme may interact with or link towards.

- Improvements to the cycling infrastructure along the A438 are planned to be delivered. These improvements will help to alleviate the cyclist safety issues along this stretch and are required to come forward in advance of the ERiC being delivered.
- Further active travel measures are being delivered in the vicinity of the study area as part of the Levelling Up programme and through the award of ATF4 funding. The delivery of these measures is important in helping to complement the ERiC scheme and enabling the scheme to join-up with a coherent network of active travel infrastructure

3.14 Risks

3.14.1 Project risks will be managed and reported to ensure they are kept up to date throughout the lifecycle of the project as is set out in the **Management Dimension**.

3.14.2 A scheme risk register (Appendix D) and risk management strategy has been produced to identify the current scope of risks associated with the scheme.

3.14.3 The risk register identifies the risks associated with the project. They have been categorised into types, these being:

- Financial;
- Delivery;
- Operational;
- Reputational; and
- Environmental.

3.14.4 Top project risks identified for the scheme to date are outlined in **Table 3-9**. These risks, and the full risk register have been reviewed with mitigation measures identified for each risk to reduce the impact that this will have on the outputs and outcomes of the scheme. Further details of the risk register and risk management strategy are provided in the **Management Dimension**.

Table 3-9 Top project risks

Risk	Mitigation
Inability to secure funding, resulting in the project not going ahead. *(Financial Risk)*	Development of a robust business case to ensure a successful funding outcome.
Scheme does not receive stakeholder support, threatening the viability of the scheme and negatively impacting upon the reputation of the Council. *(Delivery Risk)*	Stakeholder engagement at the preliminary design stage to informed detailed design. Early political approval and engagement with those affected throughout the construction phase in order to minimise and manage disruption.
Capital costs exceed capital budget, leading to a funding shortfall which would result in	Large contingency included in the cost estimate to allow for potential cost overruns.

either the scheme being de-scoped or further funding required. *(Financial Risk)*	Early engagement with designers and contractors to ensure scope is clear and costs remain within budget will also help to mitigate cost overruns.
The scheme crosses the River Wye and is located in Level 3 Flood Plain which could result in adverse impacts upon the watercourse and increased flood risk. *(Environmental Risk)*	Extensive and detailed flood modelling will be required and flood compensation measures will need to be agreed with the Environment Agency. Scheme design, including bridge crossing may change subject to the outcomes of the modelling. A drainage strategy, water quality risk assessment and a Water Framework Directive assessment would also be required.
A number of other environmental designations in the vicinity of the scheme including the River Wye Special Area of Conservation (SAC) and Site of Scientific Interest (SSSI) where a number of species and habitats covered by European Directives could be impacted. There could also be impacts on the setting of two Scheduled Monuments. *(Environmental Risk)*	Detailed air quality, noise and habitat surveys, impact assessments and mitigation strategies will be developed in liaison with Natural England. Engagement with Historic England will also be required with the potential for archaeological investigation being needed to understand any scheme impacts on the Scheduled Monuments.

4 Economic Dimension

4.1 Introduction

4.1.1 This section outlines the appraisal that has been undertaken for the shortlisted options against the DfT TAG appraisal criteria, under the headings of Economy, Environment and Society, as well as the scheme objectives.

4.2 Longlist appraisal

4.2.1 The OAR outlines the longlist identification and sifting process undertaken for this project, which is also summarised as part of the **Strategic Dimension**. A longlist of 18 options were developed- nine of these options are the different alignments of the ERiC and the different speed limits being considered on each alignment.

4.2.2 Each option was sifted against the scheme objectives on a 11-point scoring range. The 11 highest scoring options in terms of their performance against the objectives were taken through to assessment using the Early Assessment Sifting Tool (EAST). The results of the EAST found that two of the ERiC alignments (with differing speed limit options) were suitable for taking forward for further appraisal and comparison against the Do Nothing option as part of this SOC:

- Option 1a – ERiC Alignment 1 (30mph)
- Option 1b – ERiC Alignment 1 (40mph)
- Option 3a – ERiC Alignment 3 (30mph)
- Option 3b – ERiC Alignment 3 (40mph)

4.2.3 The scope of these options is reported on as part of the **Strategic Dimension**.

4.3 Methodologies, assumptions and data

4.3.1 A series of quantitative data and qualitative based assessments have been used at this stage in the business case process to inform the appraisal. It is considered that the approach adopted is proportionate for this stage of the business case process. An Appraisal Methodology Report (ASR) has been produced (Appendix E) which sets out the proposed methodology and scope of appraisal work planned for the next stage of the business case.

Quantitative assessments

Traffic Modelling

4.3.2 The Hereford Transport Model (HTM) has been used as the main tool for quantifiably assessing the impacts of the ERiC. The HTM, developed in March 2016, was developed in accordance with the principles set out in the DfT's Transport Analysis Guidance (TAG). The model provides data on traffic flow, journey times and vehicle kilometres. The proposed ERiC has been represented in the transport model as a single carriageway link open to all traffic with roundabouts connecting to the existing road network at B4399 (Rotherwas), Hampton Park Road and A438 (between Hereford and Lugwardine).

4.3.3 To assess the impact of the proposed ERiC, the scheme has been represented using the 2032 forecast year of HTM. The modelling has been undertaken in the highway assignment model. This approach is considered proportionate for the SOC stage, it will include the reassignment impacts but not any changes related to mode of travel or time of travel. The alignment modelled represents the proposed ERiC at a strategic level.

4.3.4 The proposed ERiC has been considered with two speed limits, forming two Do Something

scenarios:

- Do Something A (DSA) – 30mph (Options 1a/3a)
- Do Something B (DSB) – 40mph (Options 1b/3b)

4.3.5 Given the minimal differences between the alignments of the shortlisted ERiC options, only one alignment has been modelled, based on the differing speed limits.

4.3.6 An economic appraisal has not been undertaken at the SOC stage. However, the changes in traffic flow, journey times and vehicle kilometres have been analysed against the Do Nothing option to determine the potential impact of the proposed scheme. The outputs of the modelling are detailed in the "Traffic Modelling Report" (Appendix F). A high-level summary of the key findings is set out below:

- Traffic flows in the centre of Hereford are forecast to reduce as a result of the implementation of the ERiC scheme
- There are significant journey time savings in Hereford city centre as a result of the ERiC
- It is predicted that there will be a slight reduction in vehicle kilometres across the study area as a result of ERiC

4.3.7 These changes in traffic flow, journey times and vehicle kilometres are likely to result in moderate economic benefits for the proposed scheme.

Greenhouse Gas (GHG) Emissions Assessment

4.3.8 A GHG assessment has been undertaken to provide a high-level indicative estimate and comparison of the GHG emissions associated with the construction and some elements of the operation of the four shortlisted options. The full details of this assessment, including the methodology adopted and the results calculated are contained within the "Greenhouse Gas (GHG) Emissions Assessment Report" which features as Appendix G to this SOC. Key findings from the report are summarised below.

4.3.9 The total GHG emissions calculated for each option is set out in **Table 4-1** below. These emissions include those associated with the construction and some elements of the operation of the option where benchmarks were available (maintenance, energy), but exclude road-user emissions associated with the use of each option.

Table 4-1 GHG emissions by option

Option	Carbon emissions (tCO_2e)
Option 1a	11,279
Option 1b	11,746
Option 3a	17,081
Option 3b	17,717

4.3.10 As can be seen from **Table 4-1**, Options 3a/3b are expected to produce higher carbon emissions than Options 1a/1b. This is largely due to the fact that bridge construction accounts for a large proportion of the total emissions produced for all options, and Options 3a/3b involve the construction of a much larger bridge structure (485m in length, compared to 290m for Options 1a/1b). Option 3b is expected to produce the highest carbon emissions, as compared to Option 3a, the road alignment requires a wider cross-section due to the higher speed limit of 40mph.

4.3.11 The embodied carbon of materials and products used in the construction of the options is by far the most significant contributor of emissions, compared to other stages of the Lifecycle Carbon Assessment such as the transportation of construction materials / workers, waste and construction activities.

4.3.12 In terms of road user emissions, it is expected that road user carbon may increase (compared to the Do Nothing) with the introduction of the ERiC due to the release of induced demand. However, this effect is likely to be relatively small due to counteracting effects from shorter journeys and modal shift which could be encouraged from the LTN 1/20 cycle facilities provided

and congestion alleviation along key routes in Hereford city centre.

Qualitative assessment

4.3.13 The remaining assessment of the scheme has been undertaken based upon a qualitative and desk-based assessment only at this stage.

4.4 Social cost-benefit analysis of the shortlist

4.4.1 Table 4-2 summarises the performance of each of the shortlisted options against the TAG appraisal criteria, based upon quantitative and qualitative assessments. The full appraisal summary tables for each option can be found in Appendix H. All options score positively against the majority of criteria for the Economy and Social although all of the options have predominantly adverse impacts on the Environmental criteria compared to a Do Nothing scenario.

Table 4-2 Comparison of qualitative scores by option

Impacts		ERiC Option 1a (30mph)	ERiC Option 1b (40mph)	ERiC Option 3a (30 mph)	ERiC Option 3b (40 mph)
Economy	Business users & transport providers	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
	Reliability impact on Business users	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
	Regeneration	Neutral	Neutral	Neutral	Neutral
	Wider Impacts	Slight beneficial	Slight beneficial	Slight beneficial	Slight beneficial
Environmental	Noise	Slight adverse	Slight adverse	Slight adverse	Slight adverse
	Air Quality	Slight beneficial	Slight beneficial	Slight beneficial	Slight beneficial
	Greenhouse gases	Slight adverse	Slight adverse	Slight adverse	Slight adverse
	Landscape	Large adverse	Large adverse	Large adverse	Large adverse
	Townscape	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
	Historic Environment	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
	Biodiversity	Large adverse	Large adverse	Large adverse	Large adverse
	Water Environment (flood risk)	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
	Water Environment (water quality)	Moderate adverse	Moderate adverse	Moderate adverse	Moderate adverse
Social	Commuting and Other users	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
	Reliability impact on Commuting and Other users	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
	Physical activity	Slight beneficial	Slight beneficial	Slight beneficial	Slight beneficial
	Journey quality	Slight beneficial	Slight beneficial	Slight beneficial	Slight beneficial
	Accidents	Slight beneficial	Slight beneficial	Slight beneficial	Slight beneficial
	Security	Neutral	Neutral	Neutral	Neutral
	Access to services	Moderate beneficial	Moderate beneficial	Moderate beneficial	Moderate beneficial
	Affordability	Neutral	Neutral	Neutral	Neutral
	Severance	Slight adverse	Slight adverse	Slight adverse	Slight adverse
	Option and non-use values	Slight beneficial	Slight beneficial	Slight beneficial	Slight beneficial
Public	Cost to Broad Transport Budget	£100-150M	£100-150M	£150-200M	£150-200M

	Indirect Tax Revenues	Neutral	Neutral	Neutral	Neutral

4.5 Wider analysis

4.5.1 **Table 4-3** provides an assessment of how each of the options perform against the identified scheme objectives. It shows that all options perform positively against the majority of scheme objectives, except for negative environmental and carbon impacts.

Table 4-3 Option contribution towards objectives

#	Objectives	Option 1a (30mph)	Option 1b (40mph)	Option 3a (30mph)	Option 3b (40mph)
OBJ 1	Resilience: Improve resilience (i.e., reduce risk of disruption) in relation to incidents on, and maintenance of, the existing A49 Greyfriars Bridge	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
OBJ 2	Active travel: Increase mode share of active travel trips in the study area.	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
OBJ 3	Public transport: Increase mode share of public transport trips.	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial	Moderate Beneficial
OBJ 4	Congestion: Reduce congestion on existing river crossing and in Hereford city centre.	Moderate Beneficial	Significant Beneficial	Moderate Beneficial	Significant Beneficial
OBJ 5	Safety: Improve road safety and aim to reduce the frequency and severity of incidents within the city.	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial
OBJ 6	Environment: Minimise the impact on the environment, improve biodiversity, and contribute to making Herefordshire 'nature rich'.	Moderate Adverse	Moderate Adverse	Moderate Adverse	Moderate Adverse
OBJ 7	Carbon: Reduce carbon emissions and contribute to achieving net zero.	Slight Adverse	Slight Adverse	Slight Adverse	Slight Adverse
OBJ 8	Growth: Improve transport links between residential and employment areas to the east of Hereford.	Significant Beneficial	Significant Beneficial	Significant Beneficial	Significant Beneficial
OBJ 9	Health & Well-being: Improve the health and quality of life for local residents.	Slight Beneficial	Slight Beneficial	Slight Beneficial	Slight Beneficial

4.6 Distribution analysis

4.6.1 A DfT distributional impacts screening assessment has been undertaken, giving consideration to the range of measures contained within the shortlisted options (see Appendix I). This

indicates the following topics, where a more detailed distributional impacts assessment may be required at the OBC stage:

- User Benefits
- Noise
- Air Quality
- Accidents
- Severance
- Accessibility
- Personal Affordability

4.7 Place-based analysis

4.7.1 The DfT business case guidance indicates that place-based analysis is required where a proposal has geographically focused objectives, or where impacts of nationally significant interventions may differ spatially (where this is proportionate). The objectives of this study are area-wide, with the aim of benefiting all areas of the study area equally (as far as possible). It is therefore not considered necessary, or proportionate, to undertake a place-based analysis at this time. This requirement will be revisited at the OBC stage.

4.8 Value for Money

4.8.1 At this early stage of project development and without the availability of suitable analytical tools, it was not considered proportionate to undertake any detailed monetised assessment of potential scheme benefits. This will, however, be conducted as part of the OBC. Assessment to date has focused on qualitative appraisal, which means it is not possible to produce Benefit to Cost Ratios (BCR), which typically form the starting point for a value for money assessment.

4.8.2 Consideration has, however, been given to the scale of anticipated scheme impacts against the Appraisal Summary Table criteria, as well as the indicative scheme costs, to provide some qualitative assessment of the relative value for money of the shortlisted options, based upon professional judgement. This is outlined in **Table 4-4** below.

Table 4-4 Indicative Value for Money

Option	Indicative Cost	Moderate (+ +) or Significant (+ + +) Beneficial Impacts	Moderate (- -) or Significant (- - -) Negative Impacts	Estimated Value for Money Category
1a (30mph)	£100-150m	Journey time savings (+ +) Reliability for Business (+ +) Commuting (+ +) Reliability for Commuting (+ +) Access to Services (+ +)	Landscape (- - -) Townscape (- -) Historic Environment (- -) Biodiversity (- - -) Water Environment (- -)	**Low to Medium** – Modelling indicates the significant reduction in congestion in Hereford City Centre and improved journey times. Also provides network resilience and reliability. Value for money will depend upon impacts of the negative Historic Environment impact. Wide cost range potentially affecting affordability.
1b (40mph)	£100-150m	Journey time savings (+ +) Reliability for Business (+ +)	Landscape (- - -) Townscape (- -) Historic Environment (- -)	**Low to Medium** – Modelling indicates the significant reduction in congestion in Hereford

		Commuting (+ +) Reliability for Commuting (+ +) Access to Services (+ +)	Biodiversity (- - -) Water Environment (- -)	City Centre and improved journey times. Also provides network resilience, reliability, and greater JT savings than 1a and 3a. Value for money will depend upon impacts of the numerous negative environmental impacts. Wide cost range potentially affecting affordability.
3a (30mph)	£150-200m	Journey time savings (+ +) Reliability for Business (+ +) Commuting (+ +) Reliability for Commuting (+ +) Access to Services (+ +)	Landscape (- - -) Townscape (- -) Historic Environment (- -) Biodiversity (- - -) Water Environment (- -)	**Low** – Modelling indicates the significant reduction in congestion in Hereford City Centre and improved journey times. Also provides network resilience and reliability. Wide cost range potentially affecting affordability.
3b (40mph)	£150-200m	Journey time savings (+ +) Reliability for Business (+ +) Commuting (+ +) Reliability for Commuting (+ +) Access to Services (+ +)	Landscape (- - -) Townscape (- -) Historic Environment (- -) Biodiversity (- - -) Water Environment (- -)	**Low** – Modelling indicates the significant reduction in congestion in Hereford City Centre and improved journey times. Also provides network resilience, reliability, and greater JT savings than 1a and 3a. Wide cost range potentially affecting affordability.

4.8.3 At this stage it is difficult to conclude on value for money, however none of the options are currently indicated to represent poor value for money, although further work is required to confirm this. The appraisal work to date presented in **Table 4-2** indicates that all the options have positive impacts against some of the TAG appraisal criteria and **Table 4-3** shows that they also contribute positively towards the majority of the scheme objectives. However the significant scheme costs associated with all of the options is likely to have a large impact on the value for money of the options.

5 Financial Dimension

5.1 Costs

5.1.1 The capital costs for the four shortlisted ERiC options have been developed by AECOM who have been appointed via the Professional Services Partnership (PSP3) of the Midlands Highways Alliance, to support in the development of the SOC. The cost estimates are based upon the concept designs proposed by AECOM as set out in Appendix B.

5.1.2 Costs have been derived by compiling outline Bills of Quantities capturing the main construction items to calculate an overall construction cost. For the purposes of this estimate, the construction cost is defined as the Total Works Cost, plus Main Contractor Preliminaries, Traffic Management, Utilities, Flood Compensation and Land Acquisition (with inflation and design & construction risk contingency also included).

5.1.3 Capital costs have been derived from Spon's Price Book for Civil Engineering Works, 2023.

5.1.4 All costs exclude VAT. All input costs are expected to be recoverable by the Council as the works undertaken will be in line with its core functions.

Land acquisition

5.1.5 There will be costs associated with agricultural land acquisition for all four of the shortlisted options. According to DEFRA, the Agricultural Land Classification (ALC) for land in the vicinity of the scheme is Grade 1/2[1], which signals very good to good quality land. For good quality land such as this, arable land is currently valued at approximately £11,000/ac[2], however prices will be dependent on negotiations with individual landowner(s) and their agents.

5.1.6 Additional information also needs to be factored in, such as how much land is required in total for the construction and operation of the scheme. This will include islanded parcels of land, the purchase of land that is no longer suitable for farming and potentially compensation for other assets that will be lost or disturbed as a result of the scheme, for example field entrances. Whilst no specific allowance has been made for this, significant contingency allowance has been included within the costs which will help to cover potential additional land costs.

5.1.7 Costs will be reviewed at OBC stage and will include engagement with Herefordshire Council's Estates Team as a means of locally verifying the calculated costs.

Bridge crossing

5.1.8 A key component of the scheme costings will be costs associated with the construction of the river approach viaduct. A breakdown of the costings is set out in **Table 5-1** below.

Table 5-1 High level, top down estimate of options for River Approach Viaduct

Options	ERiC Option 1a/1b	ERiC Option 3a/3b	Commentary on Assumptions and Costs
Type of deck	Steel-concrete composite	Steel-concrete composite	All references to pages are references to SPONs 2023
Type of abutment	Abutment wall	Abutment wall	Full Height Cantilever Abutments

[1] https://magic.defra.gov.uk/MagicMap.aspx
[2] https://rural.struttandparker.com/article/english-estates-farmland-market-review-winter-2022-2023/?utm_campaign=SP_RUR_Awareness_0123_Farmers%20Weekly%20Farmland%20Market%20Review%202023&utm_medium=email&utm_source=Eloqua

Options	ERiC Option 1a/1b	ERiC Option 3a/3b	Commentary on Assumptions and Costs
Type of foundation	Bored piles	Bored piles	Heavily dependent on GI so not included in cost allowance
Type of pier	Either Leaf-type pier or discrete columns of either orthogonal, elliptical, or circular shape	Either Leaf-type pier or discrete columns of either orthogonal, elliptical, or circular shape.	Pier type dependent on recommendations of Aesthetic Appraisal in accordance with CD 351 so not included in cost allowance
Span length (m)	25 – 60 – 80 – 60 – 32.5 – 32.5m Steel-concrete composite	30 – 40 – 30 – 55 – 75 – 55 – 30 – 40 – 30 – 30 – 40 – 30m	
Width (m)	15.8m (40mph, 1b) 15.3m (30mph, 1a)	15.8m (40mph, 3b) 15.3m (30mph, 3a)	
Total area (m^2)	4582 (40mph, 1b) 4437 (30mph, 1a)	7663 (40mph, 3b) 7420.5 (30mph, 3a)	
Culverts	14 no. culverts Width: 6.5m Height: 3.5m Length: 40m (40mph, 1b) Length: 35m (30mph, 1a)	None	
Estimated costs from Spons 2023: Approximate Estimating Rates	(Text taken from SPONS) “These costs are taken per m² of deck area between abutments. The rates include all items associated with the bridge and abutments including excavation, reinforcement, formwork, concrete, bearings, expansion joints, waterproofing, finishes, and simple parapet, but exclude any approach works and foundations.”		
Cost of steel-concrete composite (£/m^2)	£6700/m^2	£6700/m^2	SPONs 2023 gives a rate of £3850 to £6700/m^2. Although there may be some economies of scale, due to the length of the structure, the higher rate is chosen to allow for market volatility, and complexity of working above a river while also mitigating against difficult ground conditions should they arise.
Culverts (£/m^2)	£1750/m^2	£1750/m^2	Estimate from previously costed schemes for a single culvert. There are potential for cost savings from economies of scale

Options	ERiC Option 1a/1b	ERiC Option 3a/3b	Commentary on Assumptions and Costs
			considering the number of culverts to be built.
Cost[3]	£37,069,400 (40mph, 1b) £35,301,650 (30mph, 1a)	£51,342,100 (40mph, 3b) £49,717,350 (30mph, 3a)	ERiC Option 1 cost estimate does not include backfilling of culverts and flood compensation as these are covered elsewhere. Culverts and flood compensation are not required for ERiC Option 3

Flood compensation

5.1.9 Due to the topography of the land, which reduces the length of the open span viaduct which could be feasibly constructed, flood compensation will be required in order to offset displaced flood volumes where the crossing is embanked. Costs have been estimated for the compensation storage for Option 1a/1b, and are based upon an estimated required compensation storage volume of 28,538.8m3. The total cost equates to £646,442.44.

5.1.10 The primary cost for the compensation storage will be for excavation works. Other activities, such as potential landscaping or the construction of inlet/outlet structures have not been accounted for at this stage.

5.1.11 Options 3a/3b are subject to a longer bridge span which means that flood compensation costs are not required.

Design and construction risks

5.1.12 The estimate includes a 46% contingency allowance for design and construction risks, for each of the four options. It is considered that a robust contingency allowance is provided given the early stage of scheme design and the number of risks associated with the scheme. It is also important that the risk allocation offers suitable contingency to account for the uncertainty around future costs as these have increased significantly over the past 12-18 months and could further increase by the time work begins on the project.

Inflation

5.1.13 The construction cost estimate has been inflated from Q1 FY 2023/24 to Q1 FY 2031/32 based on the expected completion of the scheme construction. Costs have been inflated based on forecasts within the BCIS Tender Price Index (TPI) (latest issue March 2023). In this regard, inflation has been applied as set out in **Table 5-2** and in alignment with the funding profile for the scheme as outlined in **Table 5-4**. It is considered that a substantial inflation allowance is appropriate given the current market uncertainty caused by various factors (i.e. war, Brexit, material & labour supply issues).

Table 5-2 Inflation allowances

Time Period	Inflation	Description
April 23 – April 25	8.25%	A year-on-year increase from the latest SPONS data to the beginning of the assumed funding period
FY 26/27	4.04%	An average of year-on-year future forecasts as provided in the BCIS TPI
FY 27/28	4.04%	

[3] SPON's 2023 gives a range of £3650 to £6700/m^2 for a single span steel composite bridge. For comparison purposes, assuming favourable ground conditions and efficiencies from economies of scale resulting from a multipin structure, the structures costs for options 1a and 3a will be reduced to £22.6m and £28.6m respectively using the lower end of the cost rate.

FY 28/29	4.04%	
FY 29/30	4.04%	
FY 30/31	4.04%	
FY 31/32	4.04%	

Estimates

5.1.14 The cost estimates for each of the four shortlisted options are set out in **Table 5-3** below, with a more detailed breakdown, including the list of assumptions and exclusions is included as part of Appendix J.

5.1.15 In calculating the costs for preliminaries, C3 utilities and design, costs have been derived based on a % uplift (specified in **Table 5-3**) on the total cost of the highway works, bridge construction, culverts and flood compensation.

5.1.16 For traffic management, costs have been derived based on a 20% uplift on the cost of the highway works only.

Table 5-3 Cost estimates of the shortlisted options

Element	Option 1a	Option 1b	Option 3a	Option 3b
Highway Works	£11,742,617	£12,248,308	£15,429,880	£15,938,024
Bridge Construction	£29,727,900	£30,699,400	£49,717,350	£51,342,100
Culverts	£5,573,750	£5,573,750	-	-
Flood Compensation	£646,442	£646,442	-	-
Preliminaries (20%)	£9,742,635	£9,833,580	£13,029,445	£13,456,024
Traffic Management (20%)	£2,348,523	£2,449,661	£3,085,975	£3,187,604
C3 Utilities (20%)	£9,742,635	£9,833,580	£13,029,445	£13,456,024
Design (10%)	£4,871,317	£4,916,790	£6,514,722	£6,728,012
Land Acquisition Costs	£214,500	£242,000	£214,500	£225,500
Design & Construction Risks (46%)	£34,791,081	£35,164,015	£46,469,807	£47,993,313
Inflation	£33,340,435	£33,697,819	£44,532,206	£45,992,189
Total Construction Cost (excl. VAT)	£143,764,303	£145,305,347	£192,023,334	£198,318,794

5.2 Funding

5.2.1 No funding for the scheme is currently secured. It is likely that DfT funding would be required to support the delivery of the scheme. Other additional funding sources will be explored as the business case for the scheme develops. The availability of local funds within the council as an alternative is limited.

5.2.2 The funding profile for the ERiC scheme is set out in **Table 5-4**. It is expected that the funding profile will be the same for all options. This profile is based upon a 17 month construction period with a target of project completion by September 2031, and aligns with the project programme as set out as part of the **Management Dimension**. The percentages indicate the estimated proportion of spend of the total cost of the scheme in each year. At this stage, these are indicative only and are subject to change as the development of the scheme progresses and the delivery programme becomes clearer.

Table 5-4 Funding profile

Option 1a						
2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
1%	1%	1%	7%	25%	50%	15%
£1,195,338	£1,243,630	£1,293,872	£9,423,016	£35,013,235	£72,855,539	£22,739,671
Option 1b						
£1,208,151	£1,256,960	£1,307,742	£9,524,023	£35,388,550	£73,636,495	£22,983,423

Option 3a						
£1,596,591	£1,661,093	£1,728,201	£12,586,149	£46,766,534	£97,311,804	£30,372,960
Option 3b						
£1,648,935	£1,715,552	£1,784,860	£12,998,784	£48,299,768	£100,502,158	£31,368,733

5.3 Affordability assessment

5.3.1 The project is only affordable if appropriate funding sources are identified. The cost estimates for the scheme have been developed with a contingency of 50% appropriate for the given stage of design and current uncertainties around future costs. It is expected that investment in improving connectivity for all users in the east of Hereford, including improving accessibility to the Skylon Enterprise Zone, will help to incentivise further investment into Hereford by the private sector which will lead to further growth and improved productivity.

5.3.2 The key financial risks (see Risk Register, Appendix D) which could affect the funding and quality of the project are outlined below. These risks apply to all of the shortlisted options.

Table 5-5 Key financials risks

No.	Description	Impact	Mitigation Measure
1	Inability to secure funding for the scheme	The project does not go ahead. Resiliency issues in Hereford would persist, and pressure on the A49 would continue to grow, impacting upon its performance. The future growth of the city centre would be threatened by a poorly-performing highway network, severed by the River Wye.	Development of a robust business case for the project has been undertaken to ensure a successful funding outcome.
2	Increase in capital costs (materials, equipment)	Capital costs exceed capital budget, leading to a funding shortfall which would result in either the scheme being de-scoped or further funding required	Large contingency included in cost estimate to allow for potential cost overruns. Mitigated by early engagement with building designers and contractors to ensure scope is clear and costs remain within budget, and regular financial monitoring.

6 Commercial Dimension

6.1 Introduction

6.1.1 This section describes the commercial case for the ERiC scheme.

6.1.2 At this stage of the business case development, the Commercial Dimension is emerging at a strategic level and will be updated and refined as the business case progresses for the scheme.

6.2 Output Based Specification

6.2.1 Multiple outputs and outcomes must be considered with regard to procurement options. These include:

- Delivery of the scheme within the available funding;
- Delivery of the scheme to the specified timescale of the programme;
- Ensuring full commitment to the scheme;
- Ensuring 'Best Value' is delivered;
- Offer of an affordable 'whole life' cost;
- The project outputs align with the wider aims and objectives;
- Reduction of risks to a level that is as low as practically possible – notwithstanding this, it is also important to ensure any transfer of risk to a third party does not impact on scheme quality, affordability, or the ability to deliver best value; and
- Establish contractor and stakeholder engagement throughout the whole process from early planning to scheme delivery.

6.3 Procurement Strategy

6.3.1 Procurement is an integral part of the project management process. The procurement strategy should seek to ensure:

1) Value for Money: HC is under a duty to secure value for money in all of its transactions;
2) Compliance with legislation: a wide variety of statutes and regulations apply to procurement; and
3) Avoidance of fraud and corruption: procurement must be visible and tightly controlled to limit potential fraud and avoid any suggestion of corruption.

6.3.2 The management of the development and delivery of the works are to be the responsibility of HC. The procurement approach for ERiC is to be developed in line with the Council's Procurement and Commissioning Strategy, which sets out its aim to be an *"innovative, agile commissioning organisation that secures better outcomes by commissioning the right services from the right provider, at the right time and at the right price".*

Procurement Options

6.3.3 A number of routes to market are available to HC for implementation of the ERiC scheme. These include:

1) In-House Delivery;

2) Midlands Highways Alliance Framework (Medium Services Framework 4 (MSF4);

3) Find a Tender Service (FTS); and

4) National and Regional Frameworks.

6.3.4 The advantages and disadvantages of each of these routes are set out below.

In-house Delivery

6.3.5 HC has limited and insufficient in-house capacity/capability in the current operating model to undertake such a project. Most scheme delivery has been through the Balfour Beatty Living Places (BBLP) public realm contract although different options are currently being pursued such as via MHA+. Utilising the BBLP contract remains an option but would be expected to have to demonstrate value for money as part of any procurement exercise. Changes to any future operating model may provide the opportunity to boost capacity/capability but specialist resources would likely need to be found from outside the organisation.

Midlands Highways Alliance Framework (MHA) – MSF4

6.3.6 The MHA, of which HC is a member, was formed in 2007 with a key objective to develop an effective procurement option for the delivery of highway civil and municipal engineering schemes, which could make it a suitable option for the procurement of the ERiC scheme. The framework is used as a model for regional alliances being set up across the country. The common aim is to work together to improve performance, share best practice and make efficiency savings in the delivery of highway services.

6.3.7 The benefits of using the MHA framework for HC and ensuring best value to the public purse are set out below:

- Obtains contractor experience and input to the construction methodology and programme to ensure the implementation programme is robust and achievable
- Supports speedy mobilisation of contractors
- Use of an NEC4 Option C contract, with mature and well-established risk allocation and transfer between parties
- Able to measure performance through the MHA Framework and management tools, with significant previous experience and demonstrable best value of this procurement route

6.3.8 The current MHA Medium Schemes Framework 4 (MSF4) commenced in June 2022 and allows for Early Contractor Involvement (ECI), building on collaboration, knowledge sharing and a spirit of trust and openness which sets the basis for a ‘no surprises’ culture – critical for successful and timely project delivery. The ability to mobilise quickly also allows greater time and opportunity for contractor engagement and value engineering to achieve lower outturn costs.

6.3.9 The ethos of the framework is to achieve efficient methods by working collaboratively. All parties are expected to share experiences and innovation for the mutual benefit of the framework community.

Find a Tender Service (FTS)

6.3.10 The project could be tendered through the FTS which would constitute an open tender for construction activity on the project and provides the opportunity for any contractor to tender for the work, which increases the level of competition and can result in bids from a greater number of suppliers.

6.3.11 Whilst this process theoretically enables a high level of competition and coverage in the market, there are associated risks for HC with the quality of responses and the willingness of the larger organisations who are enabled and experienced in this type of work to respond to an open tender.

6.3.12 The overall timescales associated with this route are also typically 3-6 months longer that utilising a framework which would have implications for the project delivery programme.

Other National and Regional Frameworks

6.3.13 National frameworks such as the SCAPE National Infrastructure Framework or other regional frameworks could be used. However, these routes generally take a longer time to undertake the necessary internal audit checks, which delays procurement, adding risk to the delivery timescales.

7 Management Dimension

7.1 Introduction

7.1.1 This section forms the management case for the scheme. It describes how the scheme will be delivered through project management best practice, confirming that the timescales are realistic and demonstrating that an appropriate governance structure is in place to oversee the project. It also sets out some of the key risks associated with the scheme and the approach to risk management. Like the Commercial Dimension, the Management Dimension is emerging at a strategic level and will be updated as the business case progresses.

7.2 Evidence of similar projects

7.2.1 The delivery of the ERiC scheme will build upon HC's experience from other local schemes as detailed below:

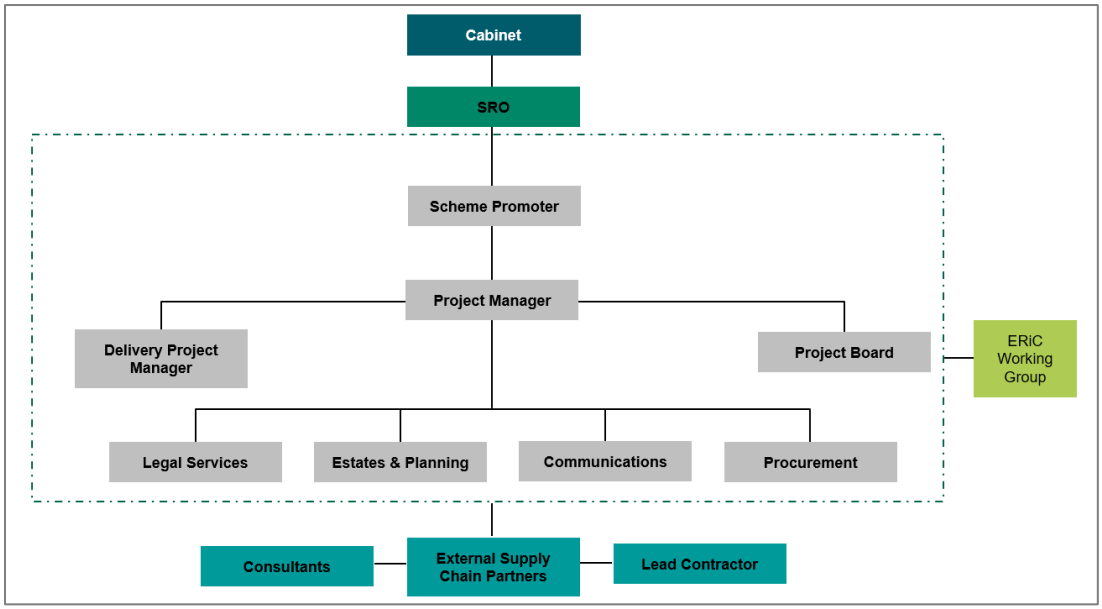
- The £34m Hereford City Link Road, opened to traffic in December 2017
- The Southern Link Road in Hereford, which gained planning approval and CPO/SRO before it was cancelled
- Development of the Hereford Western Bypass which reached Outline Business Case.

7.3 Governance, organisational structure and roles

7.3.1 HC will be the lead authority in terms of scheme delivery, with the scheme being situated in Herefordshire and the connecting road network forming part of the Local Road Network that is managed by the Council.

7.3.2 The structure of the project governance is set out below in **Figure 7-1**.

Figure 7-1 Governance arrangements



7.3.3 HC is currently undergoing a corporate restructure, with significant personnel changes expected. For this reason, no specific individuals have been allocated to the defined roles. These will be populated as part of the OBC submission.

7.4 Programme

7.4.1 A high level project programme is set out in Appendix K and summarised in **Table 7-1**.

Table 7-1 Key programme milestones

Description	Timeframe
Preparation of SOBC	October 2022 - October 2023
Decision to Proceed	December 2023
OBC and Economic Appraisal	January 2024 – March 2025
Preliminary Design	January 2024 – June 2024
Public Consultation on Options	November 2024 – January 2025
OBC Funding Decision	April 2025 – December 2025
Full Business Case	January 2026 – April 2029
Flood Modelling and Approval	January 2026 – June 2028
Public Consultation for Planning	May 2026 – August 2026
Environmental Impact Assessment	January 2026 – October 2027
Planning Determination	November 2027 – October 2028
Detailed Design	August 2028 – April 2029
FBC Funding Release	May 2029 – August 2029
Compulsory Purchase Order Process	September 2029 – April 2030
Construction	May 2030 – September 2031

7.5 Project Dependencies

7.5.1 Key project dependencies at this stage are outlined below. This will be reviewed and updated as necessary as the business case progresses.

Securing funding: without funding, the project could not go ahead as planned.

Environmental constraints: detailed design of the scheme will need to incorporate any environmental mitigation required, including flooding compensatory measures.

Securing planning and other statutory consents: all consents will be required in a timely manner for the scheme to progress and stay on programme. There will be a need for effective engagement with all of the relevant statutory consultees to ensure all requirements of the planning and statutory processes are met, assessments meet expected standards and evidence is provided within the allotted timescales.

Land acquisition: the development of the scheme is dependent upon private land being acquired. The negotiation of the land will be the responsibility of HC. The affected landowners will be contacted at the relevant points to begin negotiation. In the first instance, HC will attempt to acquire land and rights through negotiation and agreement. This is the preferred

arrangement which would hopefully satisfy all parties. If land cannot be secured via this means, then a Compulsory Purchase Order will be made under the Highways Act 1980 and the Acquisition of Land Act 1981.

Internal approvals: the process of securing the necessary approvals through HC's various boards could add delay to the programme.

Resource for delivery: The Midlands region is experiencing a period of high demand in the construction industry to support economic growth. This could result in reduced availability of experienced contractors and consultants which could add delays to the programme and increase costs.

Unprecedented events: the delivery of the scheme is dependent on no future unprecedented events such as global pandemics or conflicts taking place which could cause programme delays and/or lead to increased costs of materials.

7.6 Risk Management

Approach

7.6.1 The management of risk and uncertainty will be key to the successful delivery of the ERiC project, as it will identify threats to project delivery and enable effective risk management actions to be assigned. An effective risk management process requires:

- a continuous approach to risk management;
- a thorough approach to risk identification;
- active risk avoidance and mitigation;
- effective communication of risks throughout the project team and an escalation process in place to ensure that risks and issues can be managed at an appropriate level of authority dependent upon their severity; and
- delivery of the scheme objectives to budget, programme and quality.

Risk Register

7.6.2 A risk register has been prepared and submitted as Appendix D. This sets out the risks associated with the project and identifies the likelihood and impacts, risk owners, mitigation strategy, and dates. The risk register will be an evolving document that will continue to be updated as the project progresses.

7.6.3 The risk register also sets out the different types of risks against the following categories:

- Financial;
- Delivery;
- Operational;
- Reputational; and
- Environmental.

7.6.4 Five of the top risks (based on their impact and likelihood ratings) are summarised in **Table 7-2** below, including detail on their proposed mitigation. More detail on these risks, and all other risks is contained within the risk register.

Table 7-2 Summarised risk register

Risk	Mitigation
Inability to secure funding, resulting in the project not going ahead. *(Financial Risk)*	Development of a robust business case to ensure a successful funding outcome.
Scheme does not receive stakeholder support, threatening the viability of the scheme and negatively impacting upon the reputation of the Council. *(Delivery Risk)*	Stakeholder engagement at the preliminary design stage to inform detailed design. Early political approval and engagement with those affected throughout the construction phase in order to minimise and manage disruption.
Capital costs exceed capital budget, leading to a funding shortfall which would result in either the scheme being de-scoped or further funding required. *(Financial Risk)*	Large contingency included in the cost estimate to allow for potential cost overruns. Early engagement with designers and contractors to ensure scope is clear and costs remain within budget will also help to mitigate cost overruns.
The scheme crosses the River Wye and is located in Level 3 Flood Plain which could result in adverse impacts upon the watercourse and increased flood risk. *(Environmental Risk)*	Extensive and detailed flood modelling will be required and flood compensation measures will need to be agreed with the Environment Agency. Scheme design, including bridge crossing may change subject to the outcomes of the modelling. A drainage strategy would also be required.
A number of other environmental designations in the vicinity of the scheme including the River Wye Special Area of Conservation (SAC) and Site of Scientific Interest (SSSI) where a number of species and habitats covered by European Directives could be impacted. There could also be impacts on the setting of two Scheduled Monuments. *(Environmental Risk)*	Detailed air quality, noise and habitat surveys, impact assessments and mitigation strategies will be developed in liaison with Natural England. Engagement with Historic England will also be required with the potential for archaeological investigation being needed to understand any scheme impacts on the Scheduled Monuments.

7.7 Stakeholder Engagement

7.7.1 Given the early stages of the scheme development, limited stakeholder engagement has been carried out, save for consultation with elected Councillors on the alignment of the route which helped to inform the shortlisting process.

7.7.2 A stakeholder engagement strategy has been developed as part of the SOC development and is included in Appendix L and as part of the Appraisal Specification Report (Appendix E). This document is owned by the project manager and will be updated as the project develops.

7.7.3 The engagement strategy sets out how Herefordshire Council will work collaboratively to engage with stakeholders on the project. It also sets out the key stakeholders and describes their interest and role in the scheme.

Appendix A Option Assessment Report

Appendix B Concept Designs of Shortlisted Options

Appendix C Bridge Crossing Drawing

Appendix D Risk Register

Appendix E Appraisal Specification Report

Appendix F Traffic Modelling Report

Appendix G Greenhouse Gas (GHG) Emissions Assessment Report

Appendix H Appraisal Summary Tables

Appendix I Distributional Impacts Screening Assessment

Appendix J Cost Estimates

Appendix K Programme

Appendix L Stakeholder Engagement Strategy