Oxford to Cambridge expressway

Strategic Outline Business Case

Executive Summary

Policy Context

The creation of Highways England in 2015 changed the way road investment happens for England's motorways and major roads. Funding is now determined every five years via a Road Investment Strategy (RIS), which is set by the Secretary of State for Transport. This stable investment over five year periods allows Highways England and the Department for Transport to plan for long-term, strategic challenges and opportunities relating to the England's road network.

The improvements outlined in the first RIS, published in December 2015 for the period 2015 - 2020 are currently being implemented. As such, there is a need to plan the investment which will be delivered as part of the second RIS period and beyond. In order to inform the development of the second RIS and longer term plans, Highways England is working closely with stakeholders and has developed a suite of eighteen Route Strategies to collate evidence on performance across the entire Strategic Road Network (SRN). In addition, six Strategic Studies have also been developed which aim to address complex problems at specific locations. One of these investigates linking Oxford to Cambridge via Bedford and Milton Keynes with a new Expressway.

This report builds upon previous work, including the 'Oxford to Cambridge Expressway Strategic Study: Stage 3 Report' to deliver a Strategic Outline Business Case (SOBC) for the Missing Link of the Oxford to Cambridge Expressway. The Missing Link is the section between the Milton Keynes and Oxford, which includes a new route to connect the M1 to the M40 (the M1-M40 link) and sub-options improving the connection between the M40 to the A34 at Abingdon (M40-A34 section). This SOBC does not cover road improvements in the wider Expressway Arc.

This report forms part of Highways England's Project Control Framework (PCF) Stage 0 and as such acts as the first step in a robust and clearly structured process for the management and delivery of schemes on the SRN. The PCF process in its entirety from Stage 0 to Stage 7 is shown in Figure I.

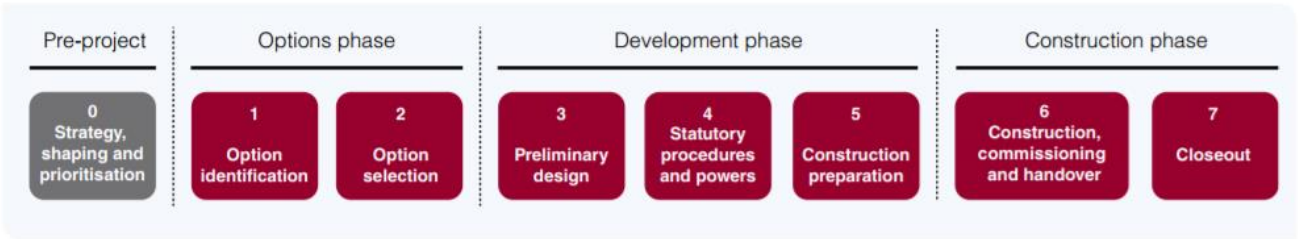

Figure I: Highways England's PCF Process

Regional Context

The need for improved east-west connectivity in the Oxford–Milton Keynes–Cambridge region has been identified by local partners, including Local Enterprise Partnership (LEPs) and England's Economic Heartland (EEH). This support is significant given proposals for the formalisation of EEH as the regional Sub-National Transport Body.

The National Infrastructure Commission (NIC) in its 2017 report 'Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc' acknowledged the current constraints on economic development in the region. The report specifies that in order to achieve the transformational change and unlock the full economic potential of the Oxford-Milton Keynes-Cambridge region, a new deal will be required between central government and local areas, including:

- Aligning national investment in new east-west multi-modal transport infrastructure including improved east-west rail links and completion of the Oxford to Cambridge Expressway Missing link by 2030; and

- Seeking local commitment to double housing delivery, in exchange for certainty over infrastructure development and freedom to plan/shape the future growth being planned for.

Oxford, Milton Keynes and Cambridge are three of the fastest growing, most innovative and productive economic areas in the UK with key strengths in the 'Knowledge Economy'. The strong economic performance of these urban areas is due in part to excellent connectivity with London via well-established road and rail links. However, east-west connectivity is currently poor, resulting in Oxford, Milton Keynes and Cambridge being better connected to London than each other. Subsequently, the delivery of an Expressway alongside improved east-west rail links has the potential to bring knowledge intensive firms closer together boosting access to labour and product markets.

The Oxford-Milton Keynes-Cambridge region is also one of the most significant growth corridors in the country with substantial growth in jobs and housing planned. However, due to the lack of capacity and poor east-west connectivity rates of house building in the area are slow with recorded housing completions and future local plan housing allocations still below that required to service the local needs in full. This chronic housing shortfall is stifling further investment and access to opportunities. The region may become less attractive for businesses as employers will struggle to attract and retain skilled workforce.

The delivery of an Expressway, supplemented by improved east-west rail connectivity, could help unlock strategic growth sites including along the Knowledge Spine (Science Vale to Bicester), within Aylesbury Vale, Milton Keynes, Bedford and St Neots, Cambourne and Bourne Airfield along the A428 corridor.

In order to unlock maximum benefit, it is likely that local transport infrastructure improvements will be needed in addition to delivery of the Expressway. This is why the government is commissioning EEH to analyse how communities not on the route of the Expressway can benefit from it. The provision of local infrastructure improvements may help ensure that benefits are felt across the region and not just in locations immediately adjacent to the Expressway.

The existing primary east-west road route currently suffers from congestion and poor journey time reliability particularly during peak travel periods. Without the Expressway these problems will be exacerbated by future increases in travel demand, resulting in worsening of congestion on the primary east-west road route, reduced journey time reliability and increased journey times.

Various data sources, including the South East Regional Transport Model and the Department for Transport's (DfT) Trafficmaster data have been used to analyse existing travel patterns and journey speeds across the study area. Initial analysis shows that there is a low level of strategic end-to-end journeys between Oxford and Cambridge. The evidence also shows relatively low levels of daily commuter movements between the main economic areas of Cambridge and Milton Keynes as well as Milton Keynes and Oxford, demonstrating that a lack of east-west connectivity and associated poor journey times has created a barrier to movement between these three key economic centres.

The analysis of the existing and future problems in the study area allowed the definition of key objectives and the identification of corridor options which have been subject to a proportionate assessment for PCF Stage 0 as reported in this study.

Strategic Objectives

England's SRN, which Highways England manage is vital to the success of the UK. Highways England supports the country and its economy by ensuring safe, efficient and reliable journeys on the network of major roads. This allows goods and people to move through England and beyond.

The importance of the SRN to people, the economy and the environment is reflected in a set of strategic objectives which provide focus for the development and assessment of intervention options. The objectives for the Expressway and the Missing Link were defined in collaboration with a formal Stakeholder Reference Group and are consistent with the overarching objectives from the DfT's Single Departmental Plan. They are listed in Table A.

#	Theme	Description
1	**Connectivity**	Provide an east-west strategic transport package of measures that delivers enhanced connectivity through faster, safer and more reliable connections across the corridor in the broad arc from Oxford to Cambridge via Milton Keynes.
2	**Economic Growth**	Build on the ambition to unlock the economic potential in the corridor by facilitating strategic growth to the benefit of the UK economy through increased employment, housing and productivity.
3	**Skills and Accessibility**	Promote accessibility and wider socio-economic benefits, by improving access to job opportunities at key employment centres, developments, and at education, leisure, health and retail facilities whilst creating wider employment opportunities.
4	**Planning for the Future**	Reduce traffic on local roads to improve the environment for communities and contribute to better safety, security and health whilst promoting sustainable transport modes.
5	**Environment**	Improve quality of life and provide a healthy, natural environment, reducing congestion and supporting sustainable travel modes and promoting equality and opportunity.
6	**Innovation**	Apply innovative technology wherever possible to support the sustainable planning, construction and operation of the transport measures.

Table A: Objectives used to assess Intervention Options

Corridor Options

There are five committed schemes within the study area identified in the RIS published in December 2015 which go some way to addressing existing problems along the Oxford–Milton Keynes–Cambridge corridor:

- A14 Cambridge to Huntingdon (north-south);
- A428 Black Cat to Caxton Gibbet (east-west);
- M11 Junctions 8 to 14 Technology Upgrade (north-south);
- A34 Oxford Junctions (primarily north-south); and
- and A34 Technology Enhancements (north-south).

The A428 scheme will complete the dualling of the A428 resulting in a continuous dual carriageway standard route from Cambridge to Milton Keynes forming a key part of the Oxford to Cambridge Expressway. Therefore, this SOBC examines only the impact of providing the missing link between the M1 at Milton Keynes and the A34 at Oxford as shown in Figure II.

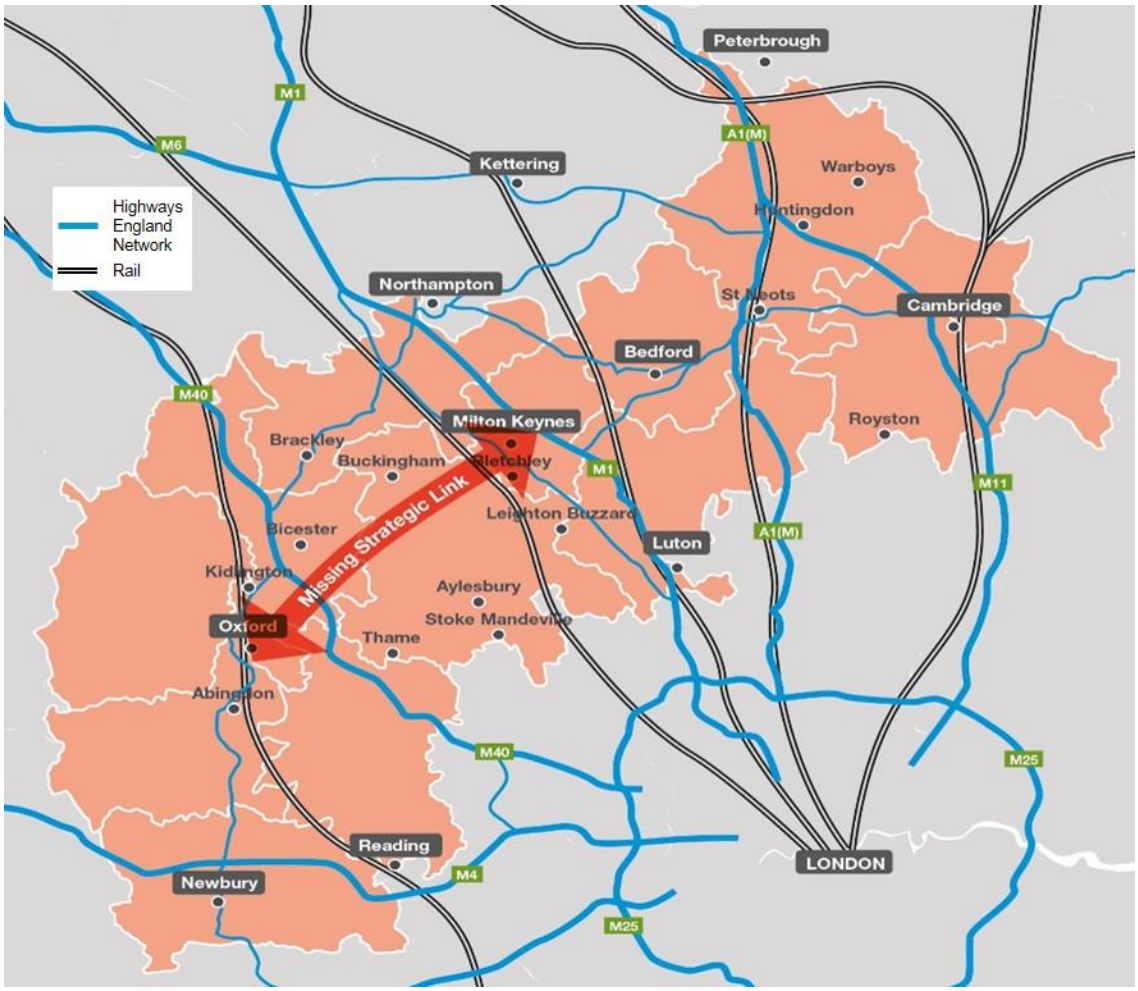

Figure II: Missing Strategic Link Plan

Following the establishment of the case for intervention, a long-list of options was developed from the established evidence and on the basis of feedback from stakeholders on intervention concepts gathered during project workshops. The first step was the development of a long list of options followed by option sifting and appraisal. This identified 36 intervention options covering all spatial scales and transport modes e.g. road, rail, technology, local access, behaviour change and high quality public transport.

The long list of options was then appraised using a bespoke Strategic Assessment Tool and sifted using the DfT's Early Assessment and Sifting Tool (EAST) comparing the Strategic, Economic, Managerial, Financial and Commercial case for each option. The EAST sifting process identified three shortlisted options for the Missing Link between the M1 and the M40 and sub-options for the M40 to A34 section. (shown in Figure III) as well as other complementary measures.

The corridor options comprise:

- Option A – Southern Option via Aylesbury (Green);
- Option B – Central Route via a shared East-West Rail Corridor (Purple); and
- Option C – Northern Route via Buckingham (Blue).

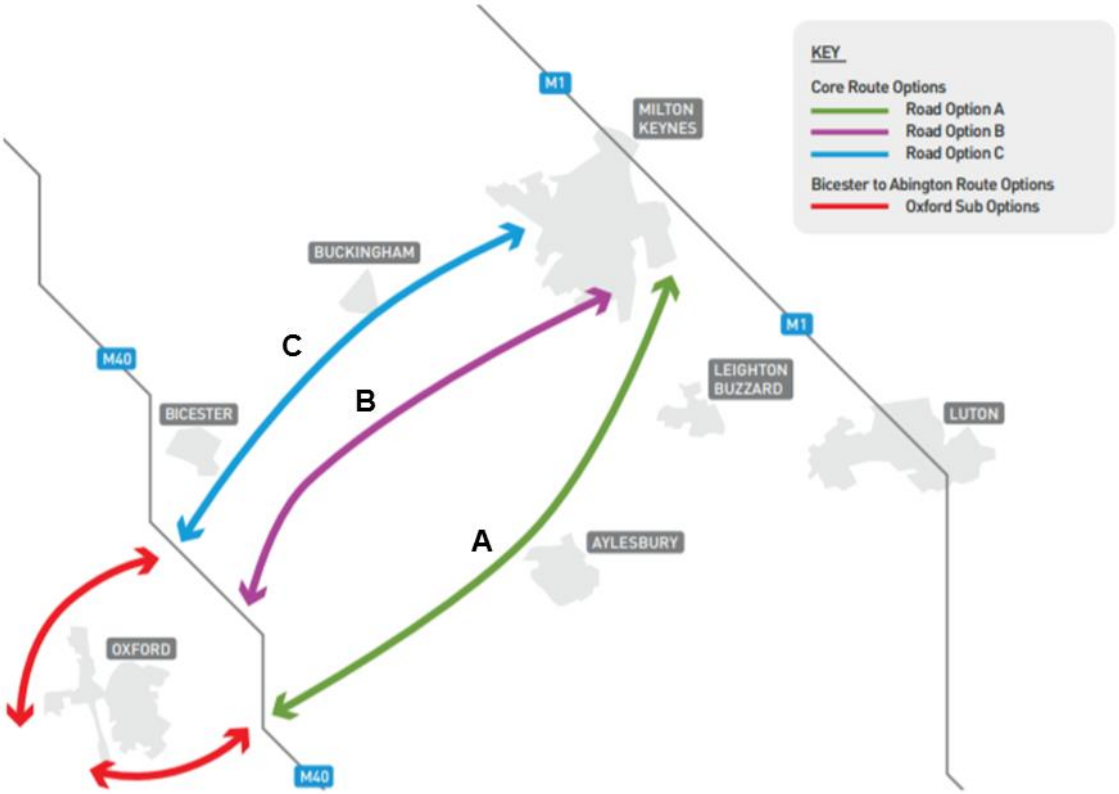

Figure III: Corridor Options

Complementary Measures

The shortlisted Expressway options form part of a wider package of transport measures, as listed below. These elements are common to each Expressway corridor option with shortlisted options considering all modes of travel across the corridor.

- East West Rail: maximising choice for journeys in the corridor and beyond;
- Technology: utilising current Expressway technology standards and consideration of the future role of technology for improving journeys by all modes;
- Rail Integration: maximising interchange between all modes, including road and rail;
- Local access/mobility: complementary measures as part of existing regional transport plans, such as City Deal and devolution; and
- Non-motorised users: ensuring Expressway options include measures for cycling, walking and equestrians.

Economic Analysis

A proportionate economic assessment has been undertaken of the potential costs and benefits for each of the Missing Link corridors as part of this study, using the South East Regional Transport Model and available evidence. The analysis concluded that all corridor options are expected to generate significant amounts of journey time savings as well as having a large positive impact on safety. The estimates of costs and benefits allowed an indicative benefit to cost ratio (BCR) to be calculated for each option. These BCRs are summarised in Table B.

	Option A	Option B1	Option B2	Option C1	Option C2
Benefit Cost Ratio	1.2	1.3	1.2	1.1	1.1

Table B: Benefit Cost Ratio for the different corridor options

The results of the economic assessment and the BCRs estimated within this SOBC should be regarded only as an initial indication of scheme value for money due to the early stage of scheme modelling, the lack of detail on the potential options and the subsequent high level assumptions used in the calculation of scheme costs and benefits. Further appraisal of each option will be undertaken in future analysis, including as part of PCF Stage 1 reporting.

In addition, it is expected that the Missing Link together with the remainder of the Expressway Arc will boost economic activity, making locations connected by the scheme more attractive for private sector investment and thereby providing significant productivity, agglomeration and dependent development benefits. However, due to the proportionate approach adopted for this SOBC, a full range of wider economic impacts have not yet been analysed. Thus, it is important to note that the economic analysis included in this report does not take in to account the ambitious regional housing and employment growth planned which the Expressway and associated East-West rail scheme will support. However, these will be investigated in detail as part of the subsequent PCF Stage 1 reporting and will be taken into account when selecting the Preferred Corridor Option.

Conclusion

The evidence shows that there is a lack of strategic east-west transport connectivity within the Oxford-Milton Keynes-Cambridge region. The existing route, despite its strategic, regional and local importance, suffers from congestion and delays, particularly during peak travel periods. The variable road standards negatively affect the capacity, reliability, resilience, safety and attractiveness of the existing east-west route.

The current transport conditions have resulted in low levels of interaction between the main economic areas and creates a barrier to delivering future housing and economic growth. Transport problems are likely to be exacerbated by expected future increases in travel demand, housing supply issues are likely to worsen. This will make the region unattractive to businesses as employers will struggle to attract and retain skilled workers.

The new Expressway along with other transport interventions, including improved east-west rail connectivity, are critical to overcoming existing local, regional and national infrastructure deficits. They will help connect skilled people with jobs, link employment clusters and create an efficient national transport network that enables housing and job growth to be delivered in a way that supports the efficient movement of goods and people.

In addition to the ambitious plans for housing and employment already enshrined in Local Plans the NIC report sets out a vision for the region including a transformational goal of an additional one million homes by 2050. The greater aspirations of the NIC depend on strong linkages between Oxford, Milton Keynes, Cambridge and the other towns in the study area. The proposed Expressway would help to deliver on the required linkages and connectivity needed to deliver this growth.

A new Expressway standard route can be provided within the Arc between the M4 and the M11 through the upgrade of the existing A34, A421 and A428. These would leave a gap between the M1 at Milton Keynes and the A34 at Abingdon south of Oxford. This provision of this Missing Link is the subject of this Strategic Outline Business Case.

A proportionate economic assessment of the Missing Link section demonstrates that the shortlisted corridor options will generate significant direct travel time savings and will have a large positive impact on safety. Wider economic benefits have not yet been assessed but are expected to be significant. Likewise, the NIC aspirational growth targets have not been accounted for but are expected to enhance the case further.

Considering current high-level scheme cost estimates and expected monetised benefits based on the work undertaken to date, Corridor Option B2 demonstrates the highest value for money. This will need to be confirmed through further analysis of the qualitative and quantitative impacts of each corridor option including an assessment of the full range of wider economic benefits.

Recommendations and Next Steps

This SOBC has confirmed that this indicative assessment shows the benefits of the Missing Link between the M1 at Milton Keynes and the A34 at Abingdon south of Oxford are likely to provide some value for money. Thus the scheme is promising enough to take forward to the next stages of assessment which will take account of wider economic impacts, including related housing and employment delivery. This further assessment will allow robust estimates of value for money for each of the three corridors.

As part of the subsequent PCF Stage 1 the scheme options will be reconfirmed and assessed in terms of environmental impacts, traffic forecasts, safety and economic benefits including refinement of the cost estimate of each option.

It is clear that the provision of the Missing Link will allow the proposed Expressway to resolve many of the connectivity issues currently present in the East-West arc. This in turn will provide the conditions required to achieve a transformational change and to unlock the full economic potential of the Oxford-Milton Keynes-Cambridge region as envisaged by the National Infrastructure Commission.

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1. Setting the Scene

1.1 Background

The Oxford to Cambridge Expressway[1] Strategic Study has been commissioned by the Department for Transport (DfT) and undertaken on their behalf by Highways England. The requirement for this study was set out in the Road Investment Strategy (RIS) published in December 2014, which announced a programme of six strategic studies to explore options to address some of the Strategic Road Network's (SRN) emerging challenges. Challenges relating to the Oxford-Milton Keynes-Cambridge corridor are listed below:

- The broad arc from Oxford-Milton Keynes-Cambridge includes some of the UK's most successful, productive and fastest growing economic areas. Existing east-west road and rail connections between these knowledge-intensive economies are notably poor. There is no continuous and direct dual carriageway or rail link between Oxford, Milton Keynes and Cambridge creating a significant infrastructure barrier that risks constraining growth.
- An east-west Expressway would complement East West Rail (EWR) and support the continued growth and attractiveness of the corridor as a place to live and work. An east-west Expressway would provide network resilience, improved local, regional and strategic connectivity and support the delivery of planned growth across the corridor.
- This study examines the case for creating an Expressway to connect the towns and cities of the 'Brain Belt' together. It also considers enhancements to existing roads along the route, including the A34 around Oxford. This study takes into account work already planned including EWR.

The Oxford to Cambridge Expressway Strategic Study interacts with two other RIS strategic studies: M25 South-West Quadrant and A1 East of England (from the M25 to Peterborough) as well as the EWR scheme being progressed by Network Rail. There is a strong interrelationship between all three RIS studies and with EWR, in terms of addressing east-west connectivity across the corridor and supporting growth.

The RIS identifies that much of an Expressway could be created through improvements to the existing road network including the committed widening of the A428 from Caxton Gibbet to the Black Cat Roundabout, resulting in an Expressway from Cambridge to Milton Keynes. However, a gap will remain between the M1 at Milton Keynes and the M40 near Oxford. The provision of this "Missing Link" would therefore be necessary to complete the east-west Expressway.

The National Infrastructure Commission (NIC) in its 2017 report 'Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc'[2] acknowledged the current constraints on economic development and views multi-modal infrastructure investment as a key catalyst to enabling economic growth and competing in the global market.

The study team has actively engaged with a wide range of stakeholders including England's Economic Heartland (EEH) Alliance – subnational transport body, who have identified this study as one of its strategic priorities. EEH recognises greater economic benefit can be achieved by investing in the transport system on a wider strategic basis than at the individual county level.

Discussions with the study areas Local Enterprise Partnerships (LEPs), County Councils and Local Planning Authorities have also established strong support for investment in strategic transport

[1] An Expressway is an A-road that is as well- designed as a motorway and is able to offer the same standard of journeys to users. At a minimum, Expressways will be largely or entirely dual carriageway standard roads that are safe, well-built and resilient to delays, have junctions that are largely or entirely grade separated, include modern safety measure and construction standards and technology to manage traffic and provide better information to drivers (RIS 1, December 2014)

[2] https://www.nic.org.uk/wp-content/uploads/Partnering-for-Prosperty.pdf

infrastructure that improves east-west connectivity, which is viewed as vital to supporting housing and economic growth in their respective regions.

The Stage 3 Report for the Oxford to Cambridge Expressway Strategic Study was published in November 2016[3]. This reported upon the initial sifting of a long-list of options that addressed the study objectives. This sifting was carried out using the Early Assessment and Sifting Tool (EAST).

1.2 The Oxford to Cambridge Expressway – The Missing Link

Initial work, detailed in the Stage 3 report, covered the "Expressway Arc" between the M4 and M11. It identified three corridors for further development. These corridors are shown in Figure 1-1 and are routes via Aylesbury (Option A), the East-West Rail Corridor (Option B) and the existing A421 Corridor (Option C). All three corridors include improvements to sections of the A34, A421 and A428 to complete the Expressway Arc. It is only between the M1 at Milton Keynes and the A34 at Abingdon that the Expressway Arc options differ.

This SOBC is concerned with the section between the Milton Keynes and Oxford, termed the "Missing Link", including a new road to connect the M1 to the M40 (the M1-M40 link) and sub-options improving the connection between the M40 to the A34 at Abingdon (M40-A34 section). This SOBC does not cover road improvements in the wider Expressway Arc.

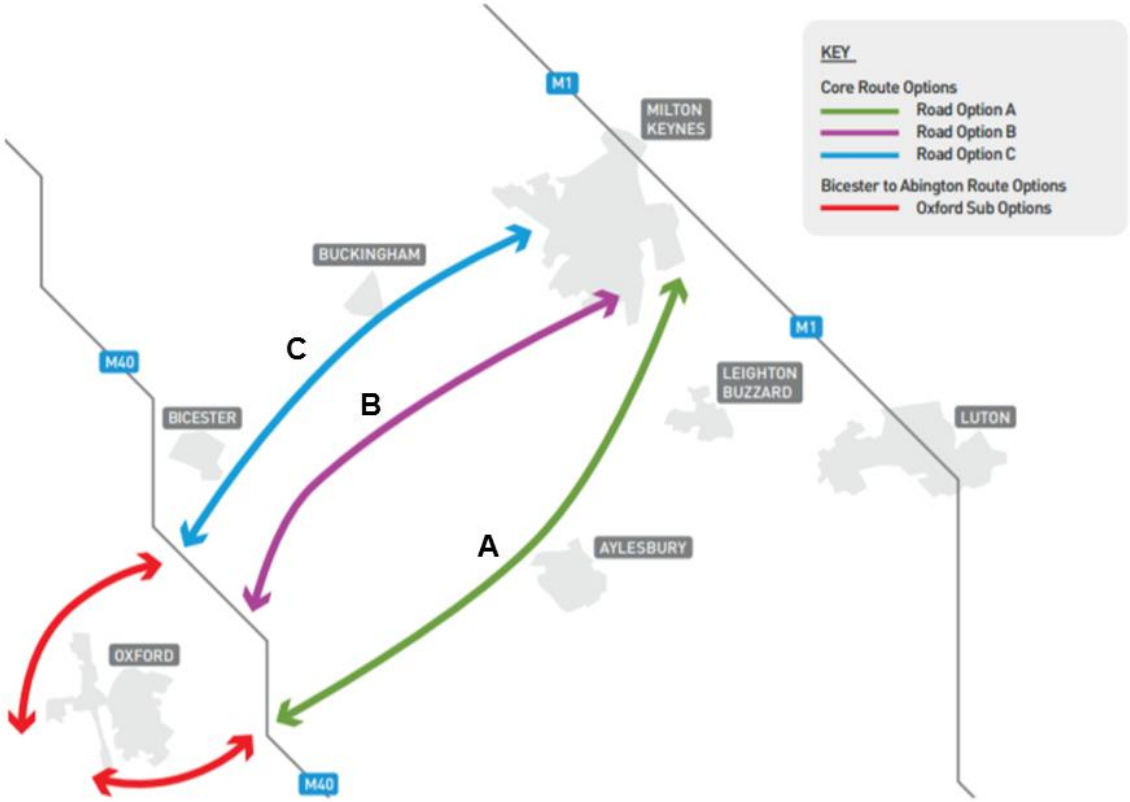


Figure 1-1 Expressway Corridor Options

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/571353/oxford-to-cambridge-expressway-strategic-study-stage-3-report.pdf

1.3 The Strategic Outline Business Case

The initial assessment of the three short listed Expressway options showed that the benefits were promising enough to take them forward to the next stage of the assessment, the results of which are reported in this Strategic Outline Business Case (SOBC).

This SOBC has been developed in line with HMG Treasury's advice and uses its best practice five case model. This approach shows whether schemes:

- Are supported by a robust **case for change** that fits with wider public policy objectives – the 'strategic case';
- Demonstrate **value for money** – the 'economic case';
- Are **commercially viable** – the 'commercial case';
- Are **financially affordable** – the 'financial case'; and
- Are **achievable** – the 'management case'.

Each case is covered in the following sections of this report followed by conclusions and recommendations for next steps.

2. Strategic Case

2.1 Introduction

The Strategic Case sets out the rationale for investment in the Oxford to Cambridge Expressway and in doing so, for the Missing Link. The Oxford to Cambridge Expressway consists of:

- Improvements to existing A34, A421 and A428 to bring to expressway standard; and
- Provision of a new route between the M1 to Oxford – known as the Missing Link.

Whilst this SOBC relates only to the Missing Link, this narrative relates to the Expressway Arc in its entirety. It is only once the Missing Link is completed will the strategic value of the entire route be realised.

This strategic case is informed by a robust evidence base covering the existing and future transport related problems and economic challenges within the study area, which the scheme aims to address. It builds upon the initial analysis from the Stage 3 report and takes into account further evidence, including the findings of the NIC report 'Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc'.

2.2 Business Strategy

The Oxford to Cambridge Expressway strategic study is sponsored by the DfT and has been commissioned by Highways England on their behalf. The DfT are responsible for planning and investing in transport infrastructure to keep the UK on the move. Relevant to this strategic study, the DfT are responsible for investing in, maintaining and operating around 4,300 miles of the motorway and trunk road network in England through Highways England.

> The Oxford to Cambridge Expressway will improve the operation of the strategic road network, reduce congestion on the existing east-west road routes within the study area, maintain high standards of road safety and support the maritime sector by providing improved connectivity between southern and eastern ports.

The DfT strategy as set out in the Single Departmental Plan 2015 to 2020 recognises that transport is at the heart of the economy and better transport provides opportunities and increases productivity. Improved connectivity can reduce business costs, increase product choices, increase labour markets and support economic growth.

The strategy also recognises that economic growth in recent decades has been too dependent on London. Transport investment and improved connectivity in other regions will unlock the potential of other cities providing opportunities for regional economic growth.

> The Oxford to Cambridge Expressway will support the delivery of these DfT objectives. The Oxford-Milton Keynes-Cambridge corridor is one of the most significant growth corridors in the country, improved strategic east-west transport will support its continued economic growth, provide new opportunities, help create a modern, inter-connected nationwide transport network linking the study area into the wider economy and improve journeys by increasing journey time reliability which is crucial for business confidence and residents daily travel experiences.

2.2.1 Road Investment Strategy 2015/16 – 2019/20

The DfT is committed to investing in improvements to the Strategic Road Network (SRN) as identified in the RIS for the period 2015 to 2020.

The RIS investment includes the dualling of the A428 within the study area between the A1 and the Caxton Gibbet Roundabout to an Expressway standard. As a part of this scheme, major improvements are proposed to the A1 Black Cat Roundabout.

> The completion of the committed A428 Improvement scheme will create an Expressway between Cambridge and Milton Keynes, resulting in the section between Milton Keynes and Oxford – the Missing Link - requiring detailed consideration of Expressway Options.

The RIS also identified the requirement for a programme of Strategic Studies to explore options to address some of the SRN's large and complex challenges. One of the Strategic Studies identified in the RIS was the Oxford to Cambridge Expressway Study. The RIS identified that the existing transport connections between Oxford, Milton Keynes and Cambridge are notably poor and create an artificial barrier between hubs of knowledge-based growth. The RIS identifies that much of an Expressway connecting Oxford, Milton Keynes and Cambridge can be created through the committed A428 improvement, however a strategic gap will remain between Milton Keynes and Oxford.

> The Oxford to Cambridge Expressway Study responds to the requirements of the RIS through the identification of issues and potential for Expressway interventions within the study area. The results of the study are intended to ensure that informed investment decisions are made for RIS 2 which cover the investment period 2020 to 2025.

2.3 Drivers for Change

2.3.1 Internal Drivers for Change

The key internal business drivers relate to the objectives and resultant policies of national, regional and local bodies. These policies are centred on facilitating economic growth through investment in transport infrastructure improvements.

The National Infrastructure Commission (NIC) was established in 2015 to provide an analysis of the UK's long-term infrastructure needs. It will deliver a long-term plan and assessment of national infrastructure needs early in each parliament, setting out what Government is expected to do over the next five-year period.

The NIC published their latest report Partnering for Prosperity: A New Deal for the Cambridge-Milton Keynes-Oxford Arc (CAMKOX Arc) in November 2017. The report stated that the Arc must be considered a national priority in order that the world-class research, innovation and technology within it can drive the growth of the UK economy. However, the chronic under-supply of homes in the arc could jeopardize this potential growth. As a consequence, a doubling in the annual rates of building new homes had to occur in order that the economic potential is achieved.

> The National Infrastructure Commission has a transformational goal of an additional one million homes in the corridor by 2050.

The report stated the provision of key East West transport infrastructure will be important enablers in ensuring that the land is unlocked for new settlements. It called on National and Local Governments to work together with developers and investors to align the delivery of infrastructure and major new settlements.

One of the recommendations called for a clearly defined and accepted route for the 'Missing Link' of the Oxford to Cambridge Expressway to be established by 2025 and for road to be open by 2030. Additionally, there is considered benefit in locating the 'missing link' in the same broad corridor as East West Rail thereby creating a multi-modal transport spine that can support the development of large scale new developments.

2.3.2 External Drivers for Change

This section includes an overview of relevant regional and local economic and transport policy. Strategic Economic Plans (SEPs) developed by the LEPs within the study area have been examined to confirm their support for the Oxford to Cambridge Expressway. The evidence of their support is provided in Table 2-1.

The study area includes England's Economic Heartland Strategic Alliance (covering Buckinghamshire, Oxfordshire and Northamptonshire) and the Oxfordshire, South East Midlands, Buckinghamshire, Berkshire, Thames Valley, Greater Cambridge and Greater Peterborough LEPs.

Table 2-1: Local and Regional Support Evidence

Strategic Economic Plans	Description
England's Economic Heartland (EEH) Subnational Transport Body	EEH have provided a clear response to the Government, supporting strategic investment in the Heartland's economy to propel the global cluster onto the world's competitive stage and provide much needed resilience for the UK economy as a whole. EEH are supporting the full delivery of East West Rail and East West Expressway to open up areas for housing and better access to employment.
Greater Cambridge Greater Peterborough Local Economic Partnership (GCGP)	The Oxford to Cambridge Expressway (including the committed RIS A428 improvement) will help address the east-west connectivity transport concerns identified by GCCP. The Expressway intervention will facilitate the continued growth of this nationally significant and internationally competitive economy.
South East Midlands Local Economic Partnership (SEMLep)	The Oxford to Cambridge Expressway will help address the east-west connectivity transport concerns identified by SEMLep. The Expressway intervention will unlock key housing and commercial sites along the A421 corridor and Bicester, provide improved access between jobs and homes and support the efficient movement of freight through the region. The Expressway will positively support SEMLep's aspirations for growth and help unlock the full growth potential of the region.
Oxfordshire Local Economic Partnership (OxLep)	The Oxford to Cambridge Expressway would help support economic growth in Oxfordshire by improving strategic transport links with Milton Keynes and onwards to Cambridge. Improved east-west connectivity along the corridor will unlock significant development sites including around Bicester, deliver 45 minute journey times between the Science Vale and Milton Keynes, expanding labour catchments and further boosting economic growth.
Thames Valley Berkshire Enterprise Partnership (TVB)	The growth of the economy is fundamentally shaped by connectivity. Within TVB, Heathrow is crucial to support on-going inward investment, the M4 motorway and Great Western Mainline provides important links to London. Congestion on the transport networks is threatening to undermine the intrinsic growth potential.
Buckinghamshire Thames Valley Enterprise Partnership (BTV)	Buckinghamshire Thames Valley Enterprise Partnership recognises that in order the deliver higher levels of growth in Buckinghamshire capital funding is required to ensure infrastructure develops appropriately to match population growth (particularly for transport). Relevant to this study is BTV's support for Network Rail's East-West Rail scheme. BTV identifies that if the growth forecasts for the region are to be realised, transport connectivity to other key economic centres needs to be improved and traffic congestion in south Buckinghamshire needs to be addressed.

2.4 Problem Identification

In order to demonstrate the Strategic Case for investment, the current constraints and opportunities within the study area need to be understood. This section presents the transport and economic challenges and opportunities relevant to investment in an Oxford to Cambridge Expressway. These two sets of challenges and opportunities are linked; improvements to the SRN will enable economic growth by reducing business costs, improving labour mobility, enabling economies of scale and agglomeration, helping attract inward investment and unlocking key development sites.

2.4.1 Existing Route Standard

The most direct east-west road route across the study area linking Oxford, Milton Keynes and Cambridge is approximately 108-111 miles in length (depending on the route via the M40 or via Bicester). The route sections are of variable standard and quality which affects journey speeds, reliability and accident rates. A number of sections of the existing route are contrary to modern SRN standards. Figure 2-1 to Figure 2-5 provide detail):

A34 Botley
Along this section of A34, there are a number of residential properties in close proximity to the A34. This section includes a 50 mph speed limit and is an Air Quality Action Area.

A34 Botley
There are a number of direct access points onto the A34 from local housing areas, particularly between the A420 Botley Interchange and the A423 Hinksey Hill Interchange.

Figure 2-1 Existing constraints on the primary East-West route: A34

A43
From the M40 to the A421 dual carriageway has local at-grade access junctions.

A41/A4421
The A41 is a dual carriageway to the outskirts of Bicester, but not Expressway standard owing to direct accesses onto it including roundabout junctions with the B4030 and the town centre; and
The A4421 is a single carriageway with eight roundabouts to negotiate around Bicester and direct access at multiple points along the route in addition to the formal roundabouts.

Figure 2-2 Existing Constraints on the Primary East-West Route: A43 and A41/A4421

A421 Tingewick
From the A43 to Milton Keynes, the A421 is predominantly a single carriageway route with regular at-grade junctions.

A421 Buckingham
The A421 routes around the south side of Buckingham and includes four at-grade roundabout junctions.

Figure 2-3 Existing Constraints on the Primary East-West Route: A421 from A43 to Milton Keynes

A421 Milton Keynes
The A421 through Milton Keynes is an urban dual carriageway road and has significant local at-grade access junctions including 14 roundabouts from Snelshall Street to the Kingston Roundabout.

A421 Milton Keynes
The A421 urban dual carriageway through central Milton Keynes provides an important local access function as well as supporting strategic through traffic.

Figure 2-4 Existing Constraints on the Primary East-West Route: A421 Milton Keynes

A428
From the A1 Black Cat Roundabout to Caxton Gibbet, the single carriageway road has regular at-grade access junctions.

A428
The A428 includes three at-grade roundabout junctions between the Great North Road and Cambridge Road that provide local access into St. Neots.

A428
East of St. Neots the A428 continues a single carriageway standard road to the Caxton Gibbet roundabout. On this section of the A428 there are a series of priority controlled at-grade local access junctions.

Figure 2-5 Existing Constraints on the Primary East-West Route: A1 and A428

As demonstrated in figures Figure 2-1 to Figure 2-5 the existing east-west route that directly connects Oxford, Milton Keynes and Cambridge comprises sections of dual carriageway, single carriageway and urban dual carriageway of variable standards, speeds and access standards. Oxford, Milton Keynes and Cambridge are located within relatively close proximity, however poor connectivity acts as a constraint on growth – meaning that economic interactions are restricted, and there is less potential for gains from economic scale and agglomeration benefits that could boost productivity. For

example, the distance between Milton Keynes and Oxford is approximately 30 miles, but to travel by dual carriageway requires a 60 mile route.

> The committed RIS scheme will address the existing constraints on the A428 from the Black Cat roundabout to Caxton Gibbet, creating an Expressway Standard route from Cambridge to Milton Keynes; however without investment in a new Expressway link a strategic gap will remain between Milton Keynes and Oxford.

2.4.2 Route Function

The existing east-west route provides important strategic, regional and local functions. A summary of the main functions are provided in Figure 2-6.

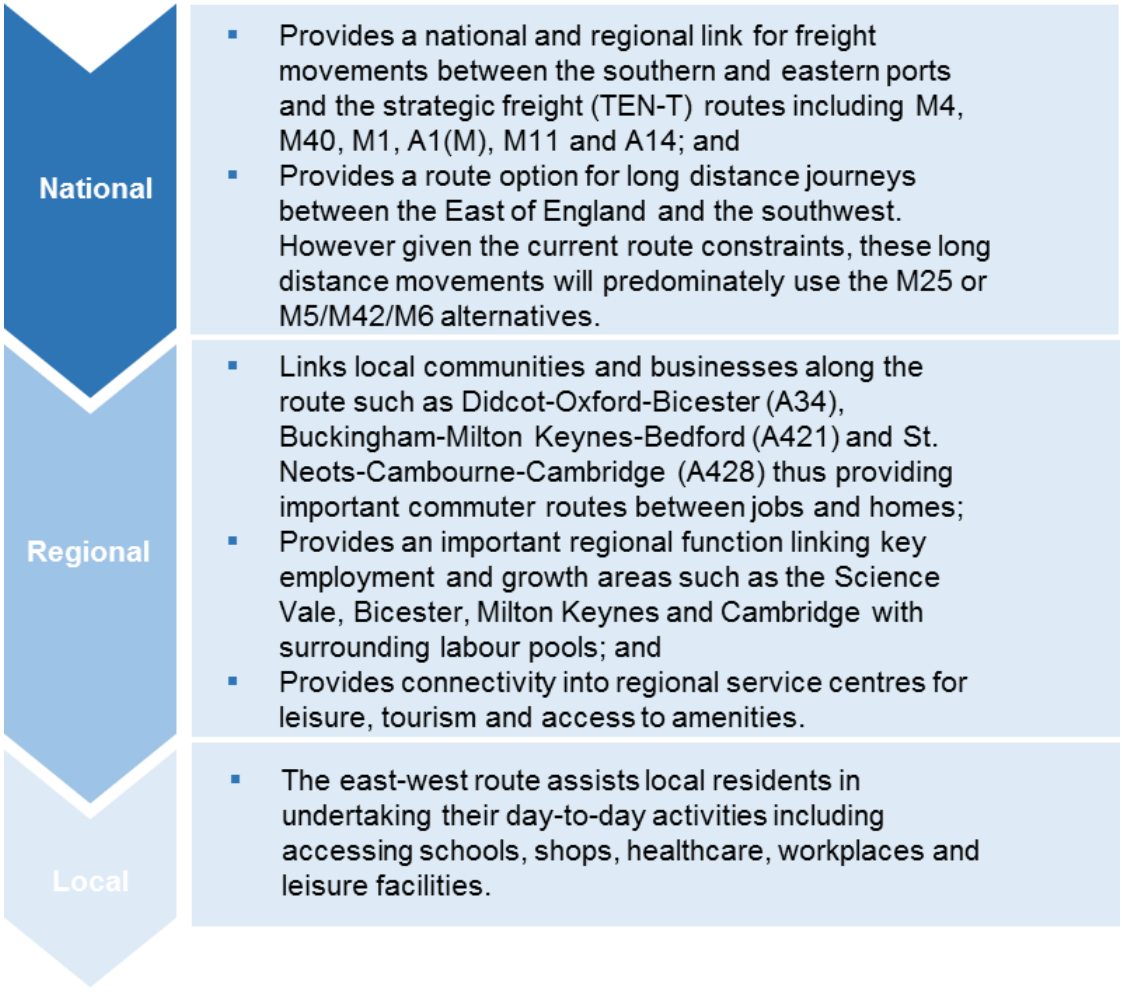


Figure 2-6 Role of the Primary East -West Route

The existing east-west route provides connectivity to the SRN including the M4, M40, M1, A1, M11 and A14. Sections of the east-west route therefore serve important strategic freight functions, providing local connectivity to freight routes as well as strategic connections towards the southern and eastern ports via the A34 and A14 respectively.

In particular, the A34 within the study area has a relatively high freight flow which is likely to continue to grow as the southern ports have aspirations to expand along with the economy as a whole. Time savings, shorter distances and more reliable journeys are critical for freight operators and have a direct impact on their operating costs.

The existing east-west route currently provides a low strategic end-to-end function due to the existing journey times and the variable route standard. Long distance movements between the East of England and southwest predominately route via the M25 or the M6-M5 corridors which provide a higher standard and more reliable journey.

The congestion and journey time constraints on the existing east-west route results in limited inter-regional commuting and interaction between Oxford, Milton Keynes and Cambridge. Each of these fast growing cities draws workers from the surrounding towns and rural areas, but not from within these established urban conurbations.

The existing east-west route therefore predominantly serves regional and local functions. There are a number of communities along the route that have substantial commuting flows into the main towns and cities including Didcot, Abingdon, Oxford, Bicester Buckingham, Milton Keynes, Bedford and Cambridge.

The existing route therefore provides an important regional function linking homes and jobs, for example:

- A34: Didcot-Abingdon-Oxford-Kidlington-Bicester;
- A421: Buckingham-Milton Keynes-Bedford; and
- A428: St Neots-Cambourne-Cambridge.

The east-west route also provides an important local function providing access to the main cities and towns which provide health, education, professional services and retail opportunities.

An Oxford to Cambridge Expressway will positively address the functional issues with the existing east-west route including:

Strategic: A new Expressway will facilitate trade through improved connectivity between southern and eastern ports, will increase strategic car and freight movements between the East of England, South West England and South Wales and help address challenges on the M25 orbital and London growth pressures whilst also providing strategic network resilience;

Regional: A new Expressway will unlock significant planned growth within the corridor, support the regional economic growth aspirations by bringing jobs, homes, businesses and world leading universities closer together to enable growth by reducing business costs, improving access to markets, improving labour mobility and enabling economies of scale and agglomeration.

Local: Sections of a new Expressway will provide local benefits by improving access to jobs and services.

2.4.3 Public Transport Alternatives

Currently there are limited public transport alternatives to east-west car travel within the corridor. The corridor has good radial links into London and the north, but there is no direct rail link between Oxford, Milton Keynes and Cambridge resulting in long and unattractive journey times via London, Coventry or Leicester. The East West Rail (EWR) scheme will address this in the medium to long term and provides an essential public transport link between centres.

The committed EWR scheme will connect Oxford, Milton Keynes (via Bletchley) and Bedford. A new East West Rail Corridor is being established to accelerate delivery of the central section between Bedford and Cambridge aiming for completion by the mid-2020s with various route options currently under consideration. This will create a continuous east-west rail connection which will allow for travel between the study corridor urban centres without the need to pass through London. There is also scope to travel between East Anglia, the South West and Wales on this route.

The National Infrastructure Commission Report "Partnering for Prosperity: A New Deal for the Cambridge-Milton Keynes-Oxford Arc, November 2017" confirmed their view that East West Rail is a key enabler in unlocking land for new settlements.

In addition, East West Rail will significantly improve public transport connectivity between the main urban centres within the corridor (Oxford, Milton Keynes, Bedford and Cambridge) providing benefits to local residents and employees living and working within the station catchment areas.

The main communities along the east-west route are currently connected by the X5 Coach service. The service provides an unattractive end-to-end journey time from Oxford to Cambridge and vice versa. However, the service does provide an important commuter link between local communities including St Neots-Cambridge, St Neots-Bedford, Bedford-Milton Keynes and Buckingham/Bicester-Oxford.

Sections of the existing east-west route (A34, M40, A421 and A1) are also used by a wide range of local, regional and national bus and coach services. Traffic congestion along the route, particularly during peak travel periods has direct negative impact on bus and coach journey times and journey time reliability.

> The studies for both an Expressway and East West Rail have identified that there is currently a lack of east west transport connectivity across the study area. Both the Expressway Road and East West Rail would be complementary strategic interventions, delivering improved east-west connectivity within the study area, have a positive impact on travel reliability (including bus and coach routes), provide greater network resilience and enhance future local, regional and national connectivity, supporting economic growth.

2.4.4 Route Performance

Sections of the existing east-west road route are congested during peak travel periods. This results in significant journey time delays which are predicted to worsen in the future as the existing road infrastructure comes under additional pressure from travel demand generated by housing and employment growth. Delays as a result of increased congestion will be a cost borne by businesses, reducing business efficiency, productivity, access to markets and labour pools thus reducing the attractiveness of the corridor for inward investment. Increased congestion negatively impacts on access to services for local people and the local environment in which they live and travel.

Route Congestion

Trafficmaster data analysis shows that end-to-end vehicle journeys from Oxford to Cambridge currently take between 2 hours 15 minutes to 2 hours 25 minutes in AM and PM peak periods. Compared to overnight journey times (when network conditions are typically free flowing), peak period

congestion adds 20-30 minutes on to the overall journey time. The main congestion hotspots on the route are summarised in Figure 2-7 and

Figure 2-8.

Investment in an Expressway intervention will provide congestion relief to the existing east-west route in the study area. In particular delays and congestion will be reduced on the A34, A421 and A428 as a result of the scheme.

Journey Reliability and Average Vehicle Speed

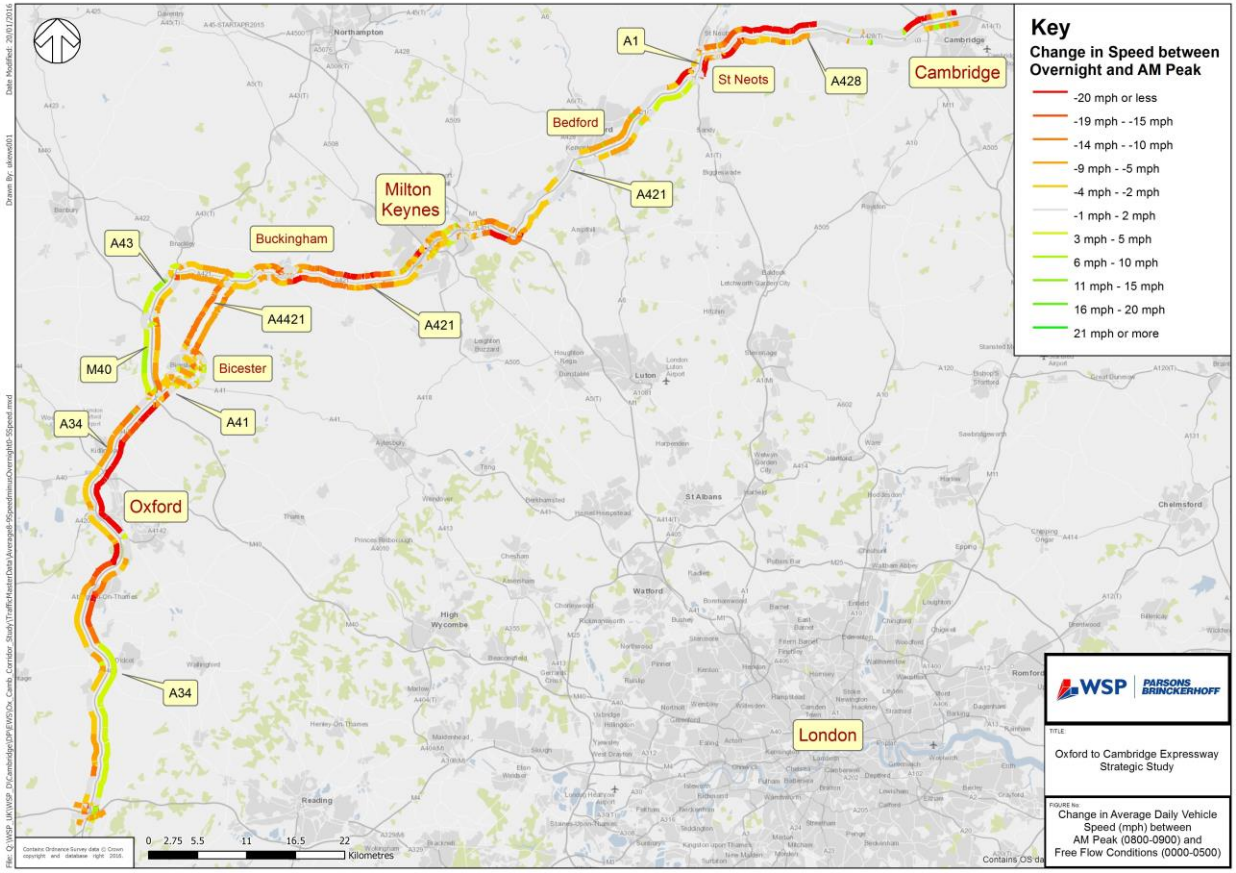
The levels of traffic, road standards and quality of the single carriageway sections on the east-west route affect journey speeds and reliability. Journeys on the existing SRN sections of the route between Oxford, Milton Keynes and Cambridge have a typical reliability of 60%-80%, which is lower than the national average. The SRN journey reliability analysis is summarised in

Figure 2-9.

Figure 2-10 shows that sections of the east-west route have considerable variability in speeds compared to the existing speed limit.

Investment in an Expressway intervention will have a positive impact on journey time reliability. Increased route capacity would reduce average speed variability during the peak travel periods and reduce accident rates in comparison to the single carriageway sections of the existing east-west route.

Figure 2-7: Main areas of congestion (AM peak)

AM Peak	Locations
	■ A34 southbound between M40 and A4142 Southern Bypass; ■ A34 northbound on approach to the A4142 Southern Bypass; ■ Single carriageway sections of the A421 and A4421 between M40 and Milton Keynes; ■ Eastbound and southbound approaches to the A1 Black Cat roundabout; ■ Single carriageway sections of the A428; and ■ A428 eastbound approach to Girton Interchange.

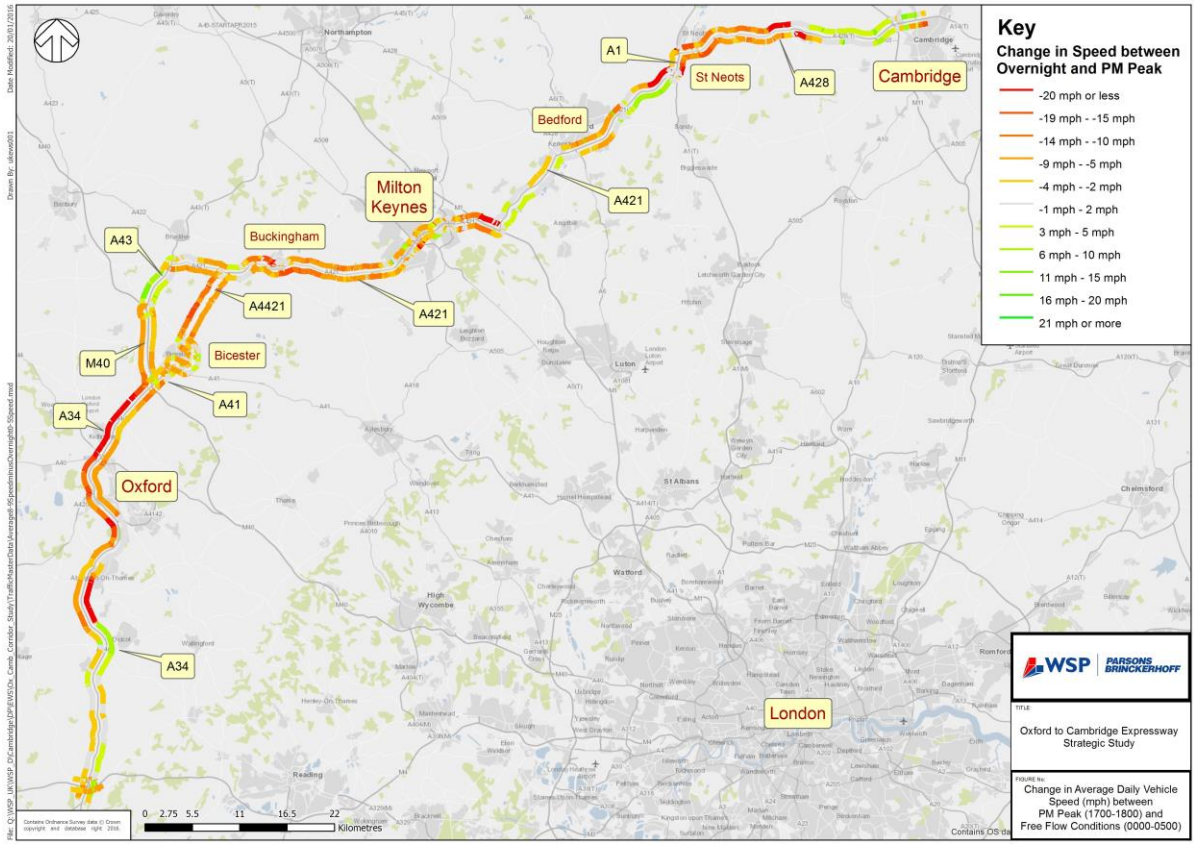
PM Peak	Locations
	■ A34 northbound between A4142 Southern Bypass and M40; ■ A34 southbound between Marcham and Milton Interchanges south of Oxford; ■ Single carriageway sections of the A421 and A4421 between M40 and Milton Keynes; ■ Eastbound and southbound approach to the A1 Black Cat Roundabout; and ■ Single carriageway section of the A428.

Figure 2-8: Main areas of congestion (PM peak)

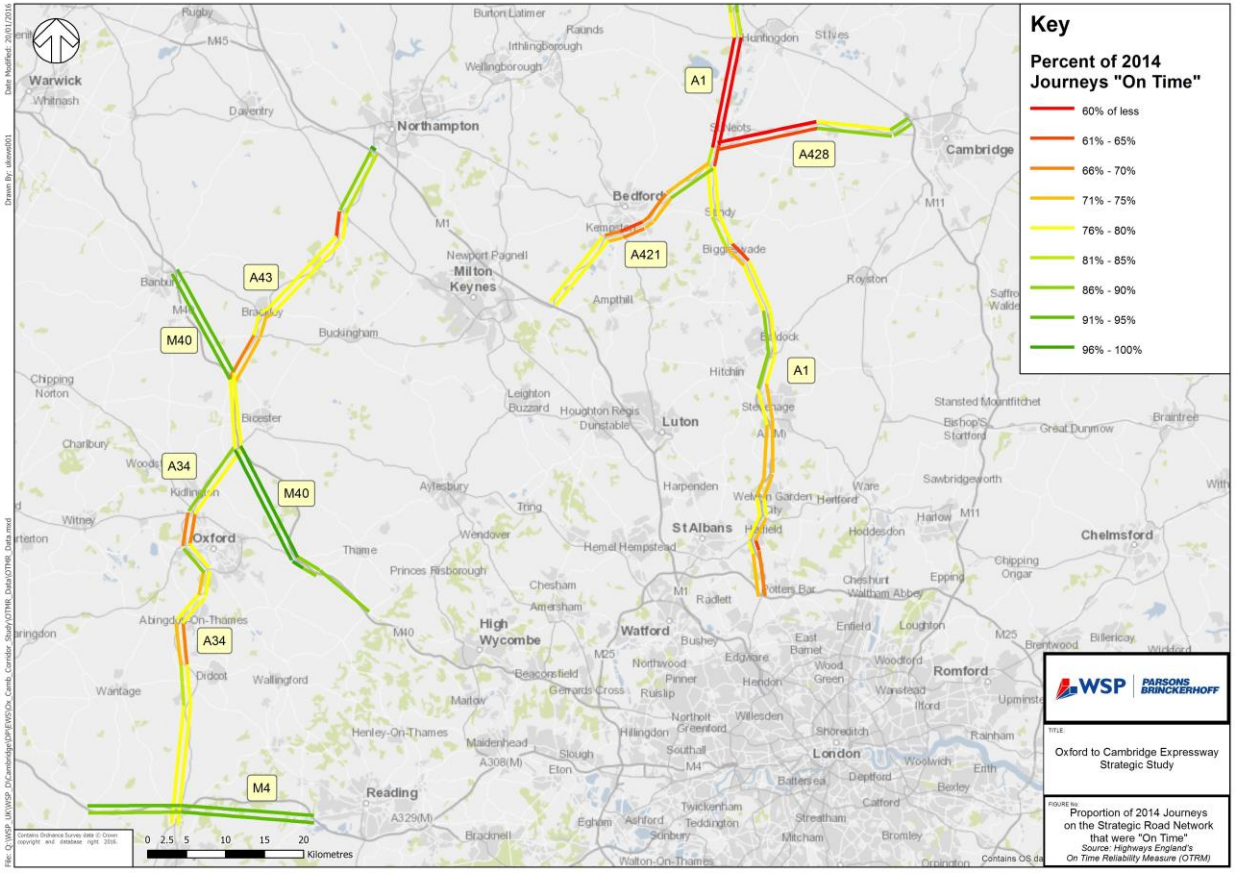
SRN Journeys 'On Time'	Locations
	■ A428: A1 to Caxton Gibbet, fewer than 60% of journeys are on time; ■ A34: 66%-70% of journeys on time around Oxford; ■ A34: South of Didcot, 76%-80% of journeys on time; and ■ A421: 60%-70% of journeys on time around Bedford.

Figure 2-9: Proportion of SRN journeys 'on time' (2014)

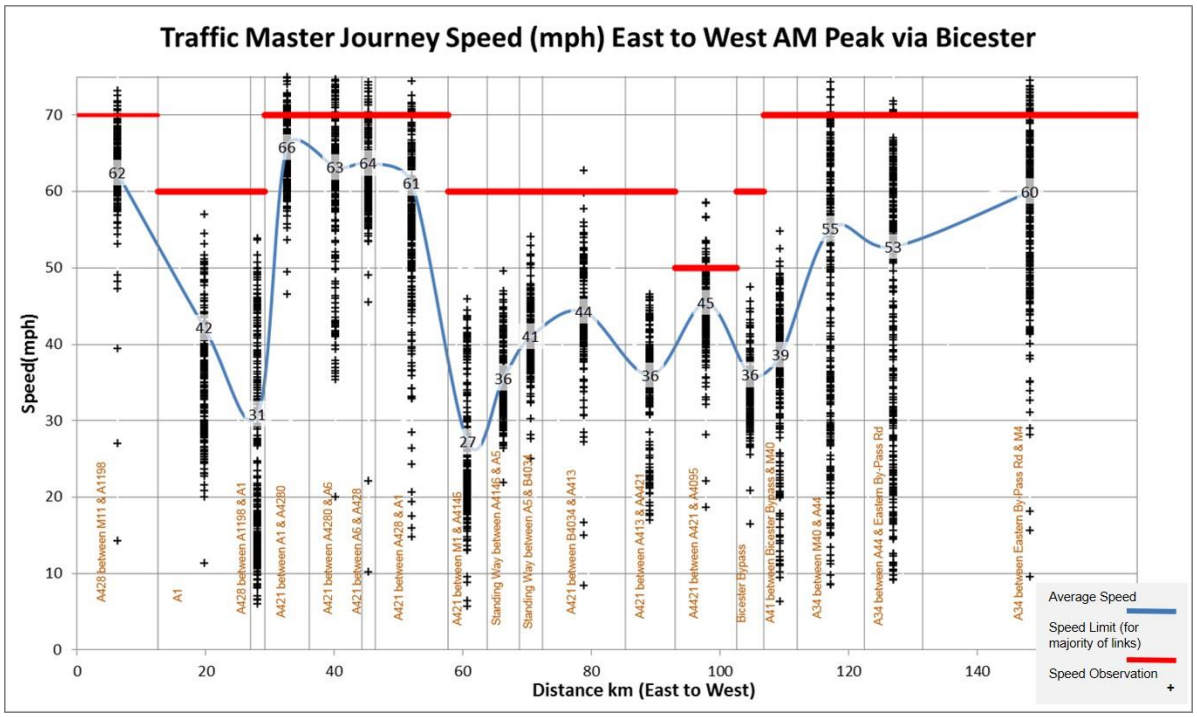


Figure 2-10 Am Peak Speed Variability on the existing East-West Route

2.4.5 Route Capacity

Sections of the route are currently operating close to or at capacity during the peak travel periods including:

- A34: Around Oxford and towards the M40;
- A421: Around Buckingham and through Milton Keynes on approach to the M1; and
- A428: Around St Neots to Caxton Gibbet.

By 2035 traffic flows on the route are forecast to increase by up to 40%[4] resulting in additional sections of the route operating over capacity including:

- A34, south of Oxford, around the western side of Oxford and to the M40;
- M40, Junction 9 to 10;
- A421 single carriageway east of the A4421;
- A421 Expressway between Bedford and Milton Keynes; and
- A428 single carriageway section.

This additional growth in traffic will inevitably increase delays further leading to lower average speeds than currently experienced and decrease further the connectivity between the urban areas in the corridor.

[4] Traffic forecasts are based on current housing and growth projections and do not take into consideration the transformational growth suggested in the NIC report which would be dependent on provision of additional transport infrastructure.

Investment in an Expressway intervention will have a positive impact on the capacity of the SRN within the study area. The intervention will provide increased strategic road capacity, reducing congestion, improving journey time reliability and providing strategic,

regional and local travel benefits. If strategic east-west transport improvements are not delivered, the networks will be operating over-capacity, further increasing journey time variability and delays. Delays as a result of increased congestion will be a cost borne by businesses, further restricting business efficiency, investment and access to local, regional and global markets.

2.4.6 Network Safety

The evidence base shows that sections of the east-west route suffer from a relatively poor safety record when compared to national trends. In particular, the single carriageway sections of the A421 and A428 have a higher accident rate when compared to the dual carriageway standard route sections.

2.4.7 Economic Challenges and Opportunities

The economic landscape and growth opportunities for the corridor need to be considered to understand whether there is a future need for improved transport connectivity and capacity to impact economic performance. The economic challenges and opportunities have been considered in the context of the transformational change proposed in the recent report by NIC whilst also considering the growth aspirations of the LEP's and planning authorities within the study area.

2.4.7.1 NIC Report

In March 2016, the NIC was asked to consider how to maximise the potential of the Cambridge-Milton Keynes-Oxford corridor as a single, knowledge-intensive cluster that competes on a global stage, protecting the area's high quality environment, and securing the homes and jobs that the area needs. The final report 'Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford arc' was published in November 2017.

The NIC report suggests that the CAMKOX Arc already contributes significantly to the UK economy; and increasingly so, with the area witnessing some of the highest levels of growth and productivity in the UK, sustained by a growing and well qualified workforce.

The NIC acknowledges that rates of house building in the area are slow and prices are high. This is both an historic and future trend, with recorded housing completions and future local plan housing allocations still below that required to service the local needs in full. This chronic housing shortfall is stifling further investment and access to opportunities.

The proposed east-west infrastructure improvements – the Expressway and EWR – provide a once-in-a-lifetime opportunity to increase the scale of investment and plan for the future.

In order to achieve the transformational change being considered, the report calls for a new deal between central government and the local authorities in the arc, including:

- Aligning national investment in new east-west multi-modal transport infrastructure to unlock development of ambitious new and expanded settlements, in terms of planning and design. Fundamental need to commit £1bn to fund improved East West Rail links and complete missing link of Expressway by 2030;

- Local commitment to double housing delivery, in exchange for certainty over infrastructure development and freedom to plan/shape the future growth being planned for.

The NIC report is explicit in the scale of development being proposed, a doubling of house building will generate one million new homes across the CAMKOX Arc by 2050. This will include a need to expand existing settlements in a cohesive manner but also can only be achieved by planning for major new large scale settlements (ranging from 10,000 new homes up to 150,000 with the potential to grow to city scale).

It is accepted however, that delivering development of this scale is unlikely to happen if left to market forces alone without direct intervention from statutory bodies.

The need to maximise the CAMKOX Arc's success is built on an economic assessment of the role investment in infrastructure will play in unlocking additional housing. At current housing completion levels, it is suggested the area could support another 335,000 jobs to 2050, increasing economic output by £85bn. However, the transformational growth in housing could support around 1.1m new jobs increasing annual economic output by £163bn.

The NIC report was welcomed by key political figures including the mayor of Cambridgeshire and Peterborough Combined Authority who expressed confidence that the Cambridge-Oxford expressway would mean concrete benefits for Cambridgeshire residents who have to rely upon the heavily congested A428 and would play a key role in tackling the housing crisis in the region[5].

2.4.7.2 Local economic growth aspirations

Prior to the NIC report the LEPs and planning authorities within the study area already had ambitious housing and employment growth plans, with approximately 235,000 new dwellings and 270,000 new jobs to be delivered in their proposed Local Plans. Several strategic development sites are proposed within the study area including along the A34 corridor, A428 corridor and in the southern fringe of Milton Keynes.

The demand for housing and economic development will increase travel demand across the study area. The evidence base has shown that sections and some junctions along the existing primary east-west route are operating at or close to capacity during the peak travel periods. Traffic levels across the existing primary east-west route are forecast to increase by 32%-40% by 2035 (

Table 2-2) based on TEMPRO 6.2 growth forecasts, see overleaf.

[5] https://www.nic.org.uk/securing-truly-exceptional-economic-contribution/

Section	2014 AADT	2035 AADT	Change	% Change
A428 (M11 to Caxton Gibbet)	29,360	41,036	11,676	39.8%
A428 (Caxton Gibbet to A1)	20,765	28,360	7,595	36.6%
A1	53,267	73,078	19,811	37.2%
A421 (A1 to A6)	41,920	55,367	13,447	32.1%
A421 (A6 to M1)	35,506	46,895	11,389	32.1%
A421 (Milton Keynes)	25,829	34,115	8,285	32.1%
A421 (Milton Keynes to A4421)	19,055	26,422	7,366	38.7%
A421 (A4421 to A43)	8,018	11,004	2,986	37.2%
A43 (A421 to M40)	34,870	47,855	12,985	37.2%
M40	100,501	137,113	36,612	36.4%
A34 (M40 to A40)	65,416	86,366	20,950	32.0%
A34 (A40 to A4142)	69,612	91,906	22,294	32.0%
A34 (A4142 to A415)	54,271	71,651	17,381	32.0%
A34 (A415 to M40)	55,127	73,120	17,994	32.6%

Table 2-2: Forecast traffic increase 2014 to 2035 in Annual Average Daily Traffic (AADT)

The expectation is that freight traffic generated in the south and east coast ports will continue to grow, and growth in the UK economy as a whole will only accelerate this growth. Overall freight (Heavy Good Vehicles (HGV)) traffic is forecast to increase between 2014 and 2041 by an average of 22%.

Increased congestion on the A34 and the existing east-west routes connecting the ports will have direct cost impacts for hauliers. Time savings, shorter distances and more reliable journeys are critical for freight operators and have a direct impact on operating costs and the economy.

If no improvements are made to the existing east-west corridor, future traffic growth will result in substantial increases in journey times, delay, congestion and capacity issues across the route. Sections of the A34 and single carriageway sections of the A421 and A428 are forecast to be operating over capacity by 2035.

> Given the national economic importance of the corridor, failure to address these growth challenges, and invest accordingly in east-west transport links within the study area, is likely to constrain economic growth along the Oxford to Cambridge corridor.

2.5 Need for Intervention

The current performance and limitations of the existing east-west route are considered to be a major barrier to future economic development of the corridor. It is imperative that improvements are delivered in order to tackle the issues and to meet the aims of the Government, Highways England, England's Economic Heartland, the LEPs, Local Authorities and stakeholders. The existing infrastructure will constrain future economic growth and thus there is a strong business need for improvements to the existing east-west road network within the corridor.

The need for intervention is summarised in the following table:

Case for intervention in the corridor

There is a lack of strategic east-west transport connections within the broad arc from Oxford-Milton Keynes-Bedford-Cambridge (the study area);

The most direct east-west road route through the study area is via the A34, M40/A43 or A41/A4421, A421, A1 and A428. The route is of variable standard, including sections of single carriageway (A421 and A428) and passes through central Milton Keynes;

Sections of the existing primary east-west road route provide important national and regional freight functions (A34) and provide access to the SRN network including the M40, M1, A1, A14 and M11;

Sections of the existing primary east-west road provide important regional and sub-regional functions, linking communities along the route with the main employment and service centres;

Despite the strategic, regional and local importance of the existing route, the variable road standards affect the capacity, reliability, resilience, safety and attractiveness of the existing east-west route;

The current peak period performance of the A34 and the single carriageway sections of the A421 and A428 are constraining its use, restricting labour market catchments, regional connectivity and the delivery of housing sites and economic growth;

Oxford, Milton Keynes and Cambridge are three of the fastest growing, most innovative and productive cities in the UK. Their success can be ascribed to their strengths in the Knowledge Economy resulting in highly successful economies that contribute disproportionately towards the UK economic output. The Oxford-Milton Keynes-Cambridge corridor is one of the most nationally significant growth corridors, investment in strategic east-west transport will facilitate their continued economic growth to the benefit of the UK economy as a whole;

The NIC has a transformational goal of an additional one million homes in the corridor by 2050;

Without strategic transport interventions the forecast increase in travel demand and traffic growth will significantly increase delays and congestion on the primary east-west route, constraining economic growth of the communities within the study area and the key growth areas of Oxford, Milton Keynes and Cambridge;

There is a need for improved connections across the study area and into main urban areas and local centres. Interventions will have a positive impact on journey time reliability, network resilience, regional and local connectivity, benefiting local residents and enabling the delivery of new jobs and homes; and

This in turn will deliver economic benefits in the form of reduced business costs, improved access to markets, improved productivity and inward investment. This will enable the study area to continue to contribute significantly to the national economy.

Failure to address the identified challenges and invest accordingly in east-west transport links within the study area is likely to constrain economic growth along the Oxford to Cambridge corridor, and preclude the significant development opportunities highlighted by the LEPs, not to mention the transformational growth proposed by the NIC. In the absence of transport interventions, congestion along the existing highway network is expected to intensify, leading to increased journey times for commuters and businesses.

It is clear therefore that, given the Government's agenda and ambition for growth, failure to intervene is not a sustainable or viable option.

In the longer term, households may choose to relocate closer to employment opportunities, thus placing pressure on the local housing market. Alternatively, businesses may choose to relocate to locations which support a deeper pool of labour, and which have better links to suppliers and customers.

Firms within the 'knowledge economy' also benefit greatly from economic agglomeration, relying on recruiting workers with highly specific skill sets to work within localised clusters of economic activity. Worsening transport links will undermine the effective density of the cities along the corridor, and limit the extent to which the productivity benefits generated through proximity to competitors and collaborators can be achieved.

2.6 Objectives

The current and future issues in the corridor and the need for intervention have been used to generate a set of intervention-specific transport objectives.

The purpose of these intervention specific objectives was to provide a focus for the development and assessment of interventions to ensure that they were tackling the identified issues. The intervention specific objectives are consistent with the overarching objectives from the Single departmental plan describing the DfT's objectives for 2015 to 2020. The intervention specific objectives are identified in Table 2-3.

#	Theme	Description
1	**Connectivity**	Provide an east-west strategic transport package of measures that delivers enhanced connectivity through faster, safer and more reliable connections across the corridor in the broad arc from Oxford to Cambridge via Milton Keynes.
2	**Economic Growth**	Build on the ambition to unlock the economic potential in the corridor by facilitating strategic growth to the benefit of the UK economy through increased employment, housing and productivity.
3	**Skills and Accessibility**	Promote accessibility and wider socio-economic benefits, by improving access to job opportunities at key employment centres, developments, and at education, leisure, health and retail facilities whilst creating wider employment opportunities.
4	**Planning for the Future**	Reduce traffic on local roads to improve the environment for communities and contribute to better safety, security and health whilst promoting sustainable transport modes.
5	**Environment**	Improve quality of life and provide a healthy, natural environment, reducing congestion and supporting sustainable travel modes and promoting equality and opportunity.
6	**Innovation**	Apply innovative technology wherever possible to support the sustainable planning, construction and operation of the transport measures.

Table 2-3: Intervention specific transport objectives

The objectives were defined in collaboration with stakeholders. A Stakeholder Reference Group (SRG) has been established to provide input into the project as it develops. The SRG includes:

- Local Enterprise Partnerships;
- County Councils;
- District and Unitary Planning Authorities;
- Transport Associations; and
- Environmental Groups.

These objectives have been used to sift a long list of options covering road, rail, local access, behaviour change and high quality public transport interventions and select preferred short listed options as set out in subsequent sections of this document.

2.7 Options

2.7.1 Scope

The geographical scope of the study area for option identification focuses on the broad arc from Abingdon – Oxford – Milton Keynes – Bedford – Cambridge.

Figure 2-11 shows a map of the approximate geographical scope of the study area along with the existing SRN.

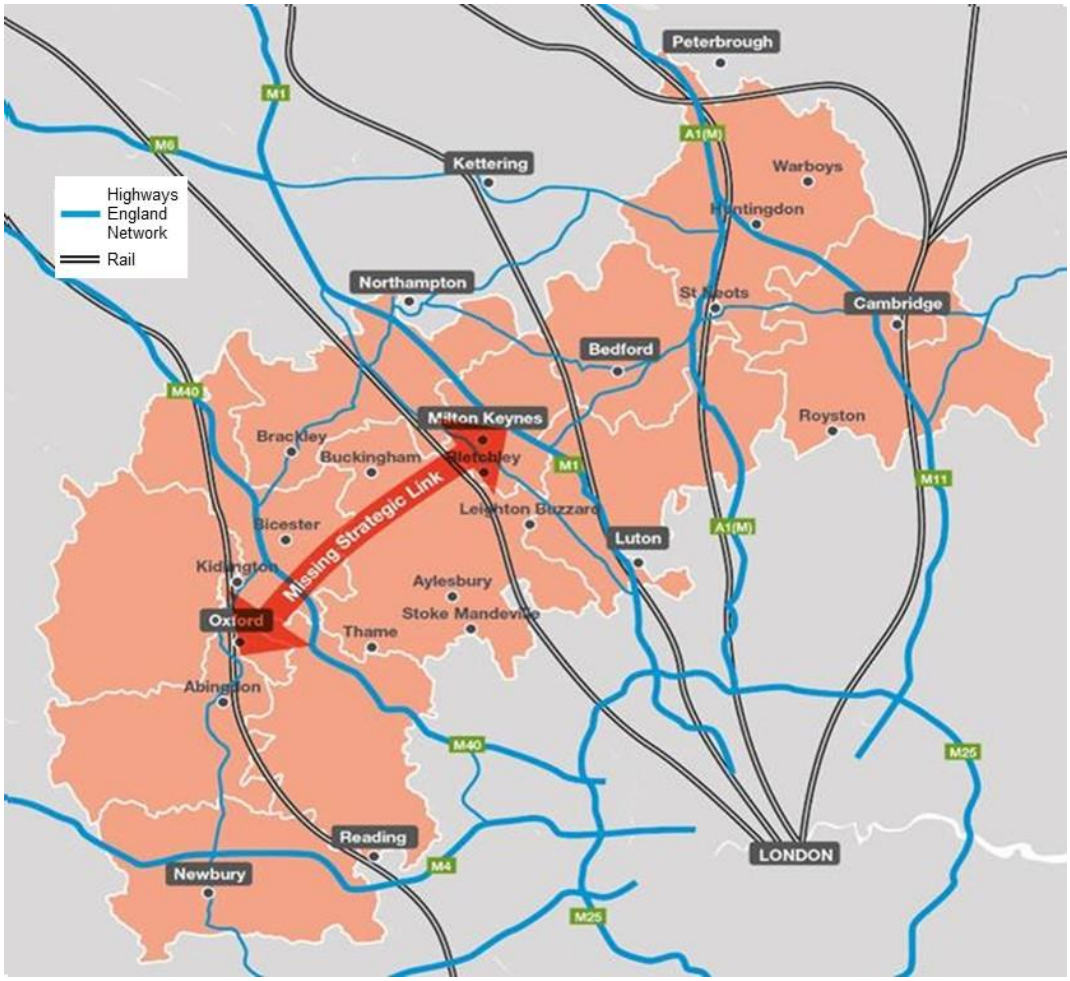


Figure 2-11: Study area map showing Missing Link and Strategic Road and Rail networks

A structured and staged approach to the development and assessment of the Expressway Options has been followed.

2.7.2 Option development

As detailed in the Oxford to Cambridge Expressway Strategic Study: Stage 3 Report[6] a long list of interventions was developed that were likely to achieve or contribute to achieving the study objectives.

[6] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/571353/oxford-to-cambridge-expressway-strategic-study-stage-3-report.pdf

In total 36 options were developed covering all modes and spatial scales. The list of options includes six main types of measure including:

- 15 No. Road improvement options;
- 3 No. Rail improvement options;
- 6 No. Technology options;
- 3 No. Local Access options;
- 6 No. Behaviour Change options; and
- 3 No. High Quality Public Transport Options.

An initial appraisal of the long-listed options against six strategic objectives and whether the option would form part of a wider package of measures was undertaken using a bespoke strategic assessment tool.

During the next stage the project team sifted the long-list of 36 options to a short-list of interventions that address the study objectives using DfT's Early Assessment and Sifting Tool (EAST).

The EAST appraisal highlights differences in the options, such that a short list of options can be recommended to take forward to the next stage of more detailed appraisal work.

Subsequently, an initial assessment of the traffic impact of a new Expressway linking Oxford, Milton Keynes and Cambridge has been undertaken using a bespoke spreadsheet model. The outputs from the spreadsheet model have also been used to undertake an initial economic appraisal of an Expressway intervention.

2.7.3 Shortlisted Corridor Options

The option sifting resulted in three main Expressway corridor options scoring highest. The shortlisted corridor options from this process are shown in Figure 2-12 and summarised below:

- Corridor Option A – Southern Option via Aylesbury (Green);
- Corridor Option B – Central Option generally following the EWR corridor (Purple); and
- Corridor Option C – Northern Option via the existing A421 route (Blue).

The corridor options include a number of sub-options related to different routing variants around Oxford.

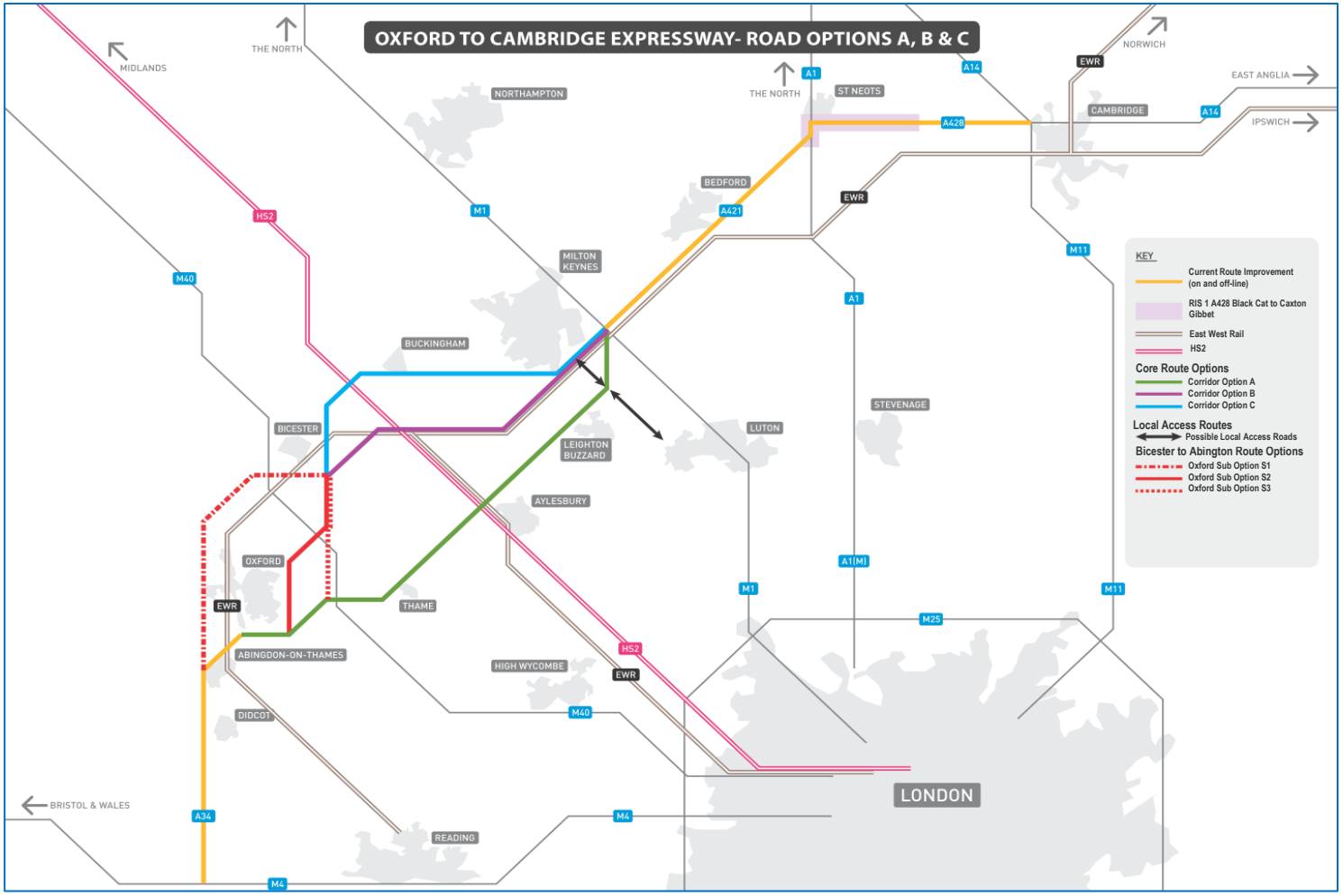


Figure 2-12: Shortlisted intervention corridor options

The shortlisted Expressway corridors explored in this study are consistent with government requirements identified in the RIS, which states that "This study will examine the case for creating an Expressway to connect the towns and cities of the 'Brain Belt'[7] together".

2.7.4 Complementary Strategies

The shortlisted Expressway options form part of a wider package of transport measures. These are shown in Table 2-4. The Expressway options have been divided into three packages with non-road elements common to each Expressway corridor option. The shortlisted options include consideration of all modes of travel across the corridor, and following the EAST sifting process both an Expressway road and East West Rail performed well against the following criteria, including:

- Fit with national and local objectives;
- Scale of impact;
- Economic Growth; and
- Expected Value for Money (VfM).

The use of technology is also included, such as integrating data and systems as well as superfast connectivity along the corridor.

Package A	Package B	Package C
Expressway Option A **Southern Corridor**	Expressway Option B **Central Corridor (following broad alignment of EWR)**	Expressway Option C **Northern Corridor**
East West Rail – maximising choice for journeys in the corridor and beyond.		
Technology – utilising current Expressway technology standards and consideration of the future role of technology for improving journeys by all modes.		
Rail Integration – maximising interchange between all modes, including road and rail.		
Local access/ mobility – complementary measures as part of existing regional transport plans, such as City Deal and devolution.		
Non-motorised users – ensuring Expressway options include measures for cycling, walking and equestrians.		

Table 2-4: Package options

2.8 Summary

The Strategic Case has demonstrated the need for intervention. It is clear that the Government agenda for growth in the Cambridge-Milton Keynes-Oxford arc is at risk of not being delivered in the absence of good connectivity in the east west arc from Oxford to Cambridge and beyond.

[7] 'Brain Belt' – defined as the broad arc to the North of London covering the Didcot – Oxford – Milton Keynes – Bedford – Cambridge corridor.

The evidence shows that there is a lack of strategic east-west transport connectivity within the Oxford-Milton Keynes-Cambridge region. The existing route, despite its strategic, regional and local importance, suffers from congestion and delays, particularly during the peak travel periods. The variable road standards negatively affect the capacity, reliability, resilience, safety and attractiveness of the existing east-west route.

The current transport conditions have resulted in low levels of interaction between the main high-performing economic areas and create a barrier to delivering ambitious housing and economic growth.

Transport problems are likely to be exacerbated by future increases in travel demand. Doing nothing in the region to improve highway linkages and existing capacity will likely suppress existing economic linkages from developing further and severely curtail housing growth in the corridor. This will make the region unattractive to businesses as employers will struggle to attract and retain skilled workers.

The proposed Expressway, along with East-West rail, is critical to overcoming existing local, regional and national infrastructure deficits. It will help connect skilled people to jobs, link employment clusters and create an efficient national transport network that enables housing and job growth to be delivered in a way that supports efficient movement of goods and people.

In addition to the ambitious plans for housing and employment already enshrined in Local Plans the NIC report sets out a vision for the region including a transformational goal of an additional one million homes by 2050. The greater aspirations of the NIC depend on strong linkages between Oxford, Milton Keynes, Cambridge and the other towns in the study area. The proposed Expressway would help to deliver on the required linkages and connectivity needed to deliver this growth.

The analysis of transport issues and economic challenges in collaboration with stakeholders has helped define the key objectives for the scheme which were used to develop and assess the long list of options.

This Strategic Case has examined the rationale for investment in the Oxford to Cambridge Expressway which includes improvements to existing A34, A421 and A428 to bring to an expressway standard and the provision of a new route between the M1 to Oxford. The latter, known as the Missing Link, has been the subject of option generation followed by an initial sifting of the options against Intervention Objectives.

The option sifting resulted in three main Expressway corridor options with some variances around Oxford scoring the highest. A proportionate cost-benefit assessment of the shortlisted corridor options has been undertaken as detailed in the Economic Case.

3. Economic Case

3.1 Introduction

This chapter sets out the analytical approach adopted to assess the impacts of the scheme and the resulting Value for Money for each of the corridor options as identified in the Strategic Case. These corridors represented the best performing options arising from the initial sifting. Each option provides the route connection between the M1 and Oxford with sub-options around Oxford to Abingdon – known as the Missing Link.

This Economic Case therefore represents the Value for Money assessment of the Missing Link section of the Expressway between Abingdon and J13 on the M1 and does not consider the cost and benefits associated with A428 Black Cat to Caxton Gibbet scheme which creates an Expressway standard route between Cambridge and Milton Keynes and is considered a committed scheme.

In line with HM Treasury's (HMT) appraisal requirements, the value for money assessment considers economic, social and environmental impacts which have been assessed using quantitative, qualitative and monetised information and consolidated to determine the extent to which the proposal's benefits outweigh its costs.

As stated in the Strategic Case there is an expectation that the Expressway will boost economic activity, making locations connected by the scheme more attractive for private sector investment and thereby provide significant productivity, agglomeration and dependent development benefits. These wider economic benefits have not been quantified as part of this Economic Case and will be subject to detailed analysis and quantification during PCF Stage 1 Study.

The value for money assessment has been tailored to reflect the stage of the scheme appraisal (PCF Stage 0) and is discussed under the following headings:

- Scheme Corridor Options;
- Transport Modelling;
- Methodology and Assumptions;
- Scheme Cost for Assessment;
- Transport Economic Efficiency Impacts;
- Reliability Impacts;
- Safety Impacts;
- Wider Economic Impacts;
- Environmental Impacts;
- Other Social Impacts;
- Public Account Impacts;
- Value for Money Statement.

3.2 Scheme Corridor Options

The Strategic Case identified and concluded three core corridor options for the Oxford to Cambridge Expressway alignment. With these core options the previous study also identified a number of variants. All routes within each corridor have been initially chosen to avoid, where possible, urban settlements, while maintaining a reasonably straight route. The options identified are discussed below and outline the area which has been tested for each option between A34 at Abingdon south of Oxford, and the M1 to the east of Milton Keynes.

Option A: Southern Corridor via Aylesbury

- The route diverges from the A34 North of Abingdon, just after the A4103 junction. The route then follows a new alignment to Junction 8A of the M40, where it then follows the existing A418 alignment until Aylesbury. The route then forms a northern Aylesbury by-pass reconnecting to the A418 between Aylesbury and Wing. A new road is proposed through the tight constraints of Woburn.

Option B: East-West Rail Corridor via Bicester there are three variations on the routes for Option B. All three alignments follow parallel to the existing east-west rail corridor, and travel along a southern Milton Keynes corridor. There are a number of sub-options around Oxford:

- Oxford sub-option 1 (S1): This route diverges from the A34 at the A415 junction at Abingdon. From there it travels offline avoiding Abingdon Airfield by passing on the west, until the route joins the existing A420. The route runs along the A420 until it re-joins the A34 and turns to the north until it intersects junction 9 of the M40. From this intersection the alignment diverges to the east where bypasses Bicester between Graven Hill and Ambrosden, passing across the A41 and then from the A41 to the east-west rail corridor.
- Oxford sub-option 2 (S2): Diverging from the A34 north of Abingdon at the same point as corridor Option A, this route follows a new alignment south of Oxford before turning northbound shortly after the A4074. It crosses the A40 and travels along the new road to the M40 where it would intersect a new junction. It then travels from this new motorway junction, across the A41 west of Bicester to the east-west rail corridor.
- Oxford sub-option 3 (S3): Beginning in a similar manner to sub-option 2, this route passes to the south of Oxford via a new road but instead of turning north it continues east to junction 8A of the M40. From this point the route utilises the M40 by turning north to a new junction, approximately 11km away, before turning north to pass the A41 west of Bicester and joining the east-west rail corridor.

Option C: Northern Corridor via Bicester and Buckingham

There are also three sub-options for corridor option C. The three variations are primarily similar to those in corridor option B and will still be referred to as corridor sub-options 1, 2 & 3. All sub-options merge to the east of Bicester, bypassing around the town to join the A4421. From here they continue north to the A421 where they travel east, passing south of Buckingham on an upgraded alignment. Once the routes reach Milton Keynes, they deviate from the existing A421 alignment to the south, utilising the same southern bypass as outlined in corridor option B.

Sub-options 2 and 3 are very similar, both being aligned to the east of Oxford and connecting to the fixed element of the route of option B and C East of Bicester. It is considered that this slight difference in alignment would not result in a significant difference when tested within the SERTM model due to the similarity in location, length and connection to the wider strategic network between the two sub-options. Therefore, only the sub-options 1 and 2 have been tested at this stage. If sub-option 2 proves to be one of the most beneficial variations, then sub-option 3 can be refined and modelled in detail at a further stage.

Therefore, the proposed list of 5 options assessed within the SERTM model at PCF stage 0 include:

- Option A
- Option B (S1)
- Option B (S2)
- Option C (S1)
- Option C (S2)

3.3 Transport Modelling

3.3.1 Overview

The section below outlines the model and modelling approach used to assess the impact of the Oxford to Cambridge (Ox-Cam) Expressway.

3.3.2 SERTM

The latest South East Regional Transport Model (SERTM) has been used to inform the economic assessment of the options.

The SERTM is one of five regional traffic models commissioned by Highways England to provide a common base for the assessment of schemes identified in the RIS (2015-2020). It covers a wide area including not only the South East region but also the East of England, Greater London and parts of the East Midlands.

The SERTM model has been reviewed to understand its suitability and fitness for purpose to appraise the Ox-Cam Expressway. The review concluded that the link and zone structure of the model was generally suitable for a high level analysis of the Ox-Cam Expressway, with enough disaggregation to enable sensible routing in the area.

3.3.3 Forecast Scenarios

The SERTM has three forecast modelled years as follows:

- 2025
- 2031
- A final year of 2041.

The forecast demand has been developed using NTEM 7.0 data for car growth and RTF15 factors for LGV and HGV. It should be noted that no development data was used for SERTM forecast model development.

The impacts of the proposed scheme are based on the differences between forecasts of the two modelled scenarios: Do Minimum and Do Something.

A consistent Do Minimum scenario has been used to appraise all options and it includes committed Local Authority and Highways England schemes. Each Do Something scenario includes the same network changes as Do Minimum as well as one of the five options described above.

3.3.4 Corridor Option Coding

Each of the corridor options has been coded within the SERTM forecast model to reflect the changes to main trunk routes and urban road network as a result of the scheme. Given that the options alignments and junction arrangements are still only in the concept stage, a simplified coding approach was taken ensuring the capacities and saturation flows were sufficient to minimise any delays along the scheme route and at scheme junctions with other roads.

It should be noted that Do Minimum scenario already includes A428 Black Cat to Caxton Gibbet scheme and which creates an Expressway standard route between Cambridge and Milton Keynes and therefore scheme coding for Do Something is limited to different options of ‘a missing link’ between Abingdon and J13 on the M1.

The entire length of the Expressway has been coded as a 2 lane dual carriageway, with no at-grade junctions and any local access roads redirected.

The Expressway has been coded with a maximum speed of 113kph and speed at capacity of 74kph. This is considered realistic for a corridor of this nature.

3.4 Methodology and Assumptions

3.4.1 Overview

The economic assessment involves the determination of costs and benefits of a scheme using travel demand, traffic flows, journey times and other inputs from a traffic model. By comparing the costs with the benefits of a scheme over a 60-year appraisal period, a Benefit Cost Ratio (BCR) can be calculated, which represents the value for money of the scheme.

3.4.2 Economic Assessment Methodology

Figure 3-1 shows the diagram which provides details of the methodology for the Value for Money assessment of the Ox-Cam scheme.

The Value for Money assessment is a staged process which includes appraisal of the scheme's economic, environmental, social, distributional and fiscal impacts using qualitative, quantitative and monetised information.

It starts with analysis of monetised costs and benefits and calculation of the Benefit Cost Ratio. The next stage is to capture and analyse those impacts which cannot be monetised but can be presented as qualitative information.

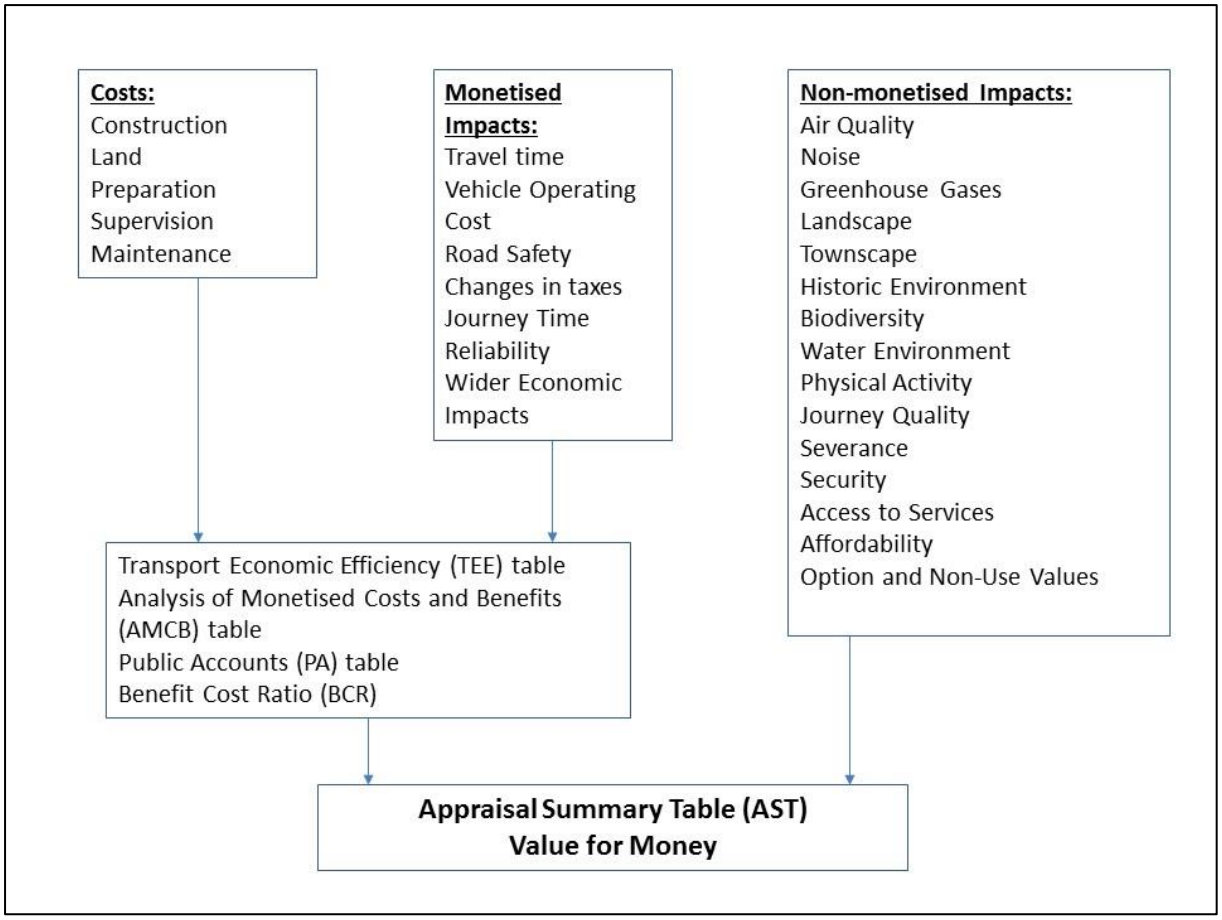


Figure 3-1: VfM Assessment Methodology

In order to ensure that time and resources spent on development of the SOBC is proportionate to the stage of appraisal and context of early stages of traffic modelling a proportionate approach has been adopted for the Stage 0 economic assessment. For example, given uncertainty about the length of online and offline improvement of each corridor option construction delays have not been considered as part of Stage 0 assessment despite having an impact on the VfM of each corridor option. The assessment is based on DfT Web-based Transport Analysis Guidance (WebTAG) guidance but only includes analysis of key impacts of the proposed Expressway.

Having considered the nature of the scheme it is prudent to conclude that the Expressway is expected to generate significant journey time savings through reduction in delays to traffic along the corridor and potentially across a wider area. Travel time benefits are therefore considered the main contributor to the scheme value for money and the comparison of the options is largely based on the results of the Transport User Benefit Appraisal (TUBA) analysis as the key element of economic assessment at Stage 0.

The other monetised impacts which have also been quantified as part of Stage 0 economic assessment include:

- Safety impacts;
- Journey Time reliability; and
- Wider Impacts (WI).

In line with the proportionate approach environmental and social impacts have been assessed qualitatively.

3.4.3 Assessment Tools

The tools that have been used to conduct the economic appraisal are:

- TUBA – Latest version 1.9.9 (July 2017) has been used to derive travel time, Vehicle Operating Cost (VOC) benefits as well as changes in Indirect Tax; and
- Cost and Benefit to Accidents – Light Touch (COBA-LT) Latest Version 2013.2 (parameter file 2017.1) has been used to derive the accident benefits for the scheme.

3.4.4 Appraisal Period

In line with WebTAG guidance, the impacts of the scheme have been assessed over the 60-year period after the scheme opens, capturing the planned period of scheme development and implementation. The 60-year appraisal period for the Ox-Cam Expressway is 2025 to 2084.

The results of the model have been interpolated and extrapolated to cover the whole appraisal period of 60 years.

In order to ensure a conservative approach to calculation of scheme benefits, it is assumed that there will be no growth in traffic flows after the final forecast year (2041).

3.4.5 Benefits Capture and Annualisation

The benefits and disbenefits captured in the assessment are not limited to those on the scheme itself. They are based on changes in levels of congestion, accidents etc. on both the new road and existing roads across the model.

The study area for each element of the appraisal has been identified individually based on the area of impact. For example, the study area for the TUBA analysis is consistent with the traffic model are of coverage and covers all Britain. The study area for the COBALT analysis only includes roads with the changes in traffic flow of more than 10% between the Do Minimum and Do Something scenario. More detail on the area of impact for each element of the appraisal can be found in subsequent sections of the Economic Case.

In accordance with the guidance the travel time and vehicle operating cost benefits generated in the modelled time periods have been extended using annualisation factors. The annualisation factors are defined as a number of times each time period occurs over a full year.

In SERTM the AM and PM modelled hours represent an average hour of the respective three-hour peak period and, therefore, the annualisation factor for AM and PM equals 3 x 253 = 759 (where 253 is the number of working days per year). The modelled IP hour is an average hour of the 6h interpeak and the annualisation factor for IP is 6 x 253 = 1518.

3.4.6 Discounting and Units of Accounts

Cost and benefits occur in different years throughout the assessment period, e.g. the construction costs occur before the scheme opens, whilst the benefits occur in the 60 years afterwards. Also, it is considered that benefits that accrue now are considered to be more valuable than those that accrue further into the future.

Given the above, in order to compare benefits and costs it is essential that they are all converted to a common base and a common value (known as the Present Value Year).

The process used is called discounting and the Present Value Year is currently 2010.

Discounting is undertaken internally within the assessment tools mentioned above, using the standard DfT discount rates of 3.5% per year for the first 30 years of appraisal and 3.0% per year thereafter.

The unit of account must also be consistent between costs and benefits in order to allow comparison between the two. There are two different units of accounts:

- Market price unit of account – this refers to the prices paid by consumers for goods and services and therefore includes indirect taxation (e.g. VAT); and
- Factor cost unit of account – this excludes indirect taxation. Prices paid by Government bodies are usually quoted in the factor cost unit of account as any tax paid is recovered by the Government and is therefore ignored.

While scheme benefits are calculated in market prices, scheme costs are usually quoted as factor costs.

The scheme costs must therefore be adjusted to market prices for economic assessment purposes – this is done within economic assessment software.

3.5 Scheme Cost for Assessment

The estimation of scheme costs is a crucial part of the scheme assessment. However, it should be noted that the level of assurance on the scheme cost is very low at this stage. The scheme costs used in the assessment are not based on any design considerations and can only be derived from the length of online upgrade and offline sections of the scheme.

The scheme costs used in scheme appraisal were prepared in 2016 Q1 prices and inflated to outturn costs using Highways England projected construction inflation. The scheme costs used in the economic assessment are the “Most Likely” cost estimate – see section 4 for further detail. These costs were then rebased to the DfT standard present value year (2010) to allow direct comparison with the monetised benefits and are in calendar years.

The scheme maintenance costs have been estimated on the basis of £44,000 per lane mile using the Measurement Template for costs of maintaining the Highways Agency’s motorway and A road network per lane mile, including renewing roads and structures[8]. It has been assumed that each new mile of a missing link section generates an additional four ‘lane miles’ to be maintained; each upgraded mile generates an additional two ‘lane miles’. Maintenance costs are assumed to occur throughout the 60-year appraisal period. Optimism bias has not been added.

The construction and maintenance cost for each option as used in TUBA are shown in

Table 3-1.

	Option A	Option B1	Option B2	Option C1	Option C2
Construction Costs (£m)	3,250	2,760	3,032	2,951	3,216

[8] https://www.gov.uk/ government/publications/cost-of-maintaining-the-highways-agency-s-motorway-and-a-road-network-per-lane-mile

Maintenance Costs (£m)	366	420	432	384	402
Total (£m)	3,616	3180	3,464	3,335	3,618

Table 3-1: Scheme costs in millions of pounds (in 2010 prices, undiscounted)

3.6 Transport Economic Efficiency Impacts

3.6.1 Methodology

The Transport Economic Efficiency (TEE) benefits consisting of travel time and VOC benefits have been calculated with the use of TUBA software. These benefits constitute by far the largest proportion of the scheme benefits used in Present Value of Benefits (PVB) and BCR calculation.

TUBA is the industry-standard software used to derive the travel time, VOC, user charges impacts as well as changes in Indirect Taxes and Public or Private sector revenue as a result of a scheme. It considers the Business and Consumer Traveller Impacts, the Private and Public Sector Revenues and Costs, and the Indirect Taxes elements of the WebTAG requirements.

TUBA assesses travel time savings over the entire modelled area and then applies monetary values (known as Values of Time (VOT)) to derive the monetary benefits of those time savings.

TUBA also calculates Vehicle Operating Cost changes which occur due to changes in costs associated with such items as fuel, maintenance, and wear and tear. These occur due to changes in speed and distance when the scheme is implemented and can include both positive and negative values depending upon the scheme's impact upon traffic flows and routing.

3.6.2 Results

The results of TUBA assessment show that it will take a shorter amount of time to travel through the study area with the scheme in place. As demonstrated in Table 3-2 all the options provide significant journey time savings. In addition, Options A, B1 and B2 will provide VOC benefits, whereas Options C1 and C2 will result in an increase to VOC over 60 years.

Description	Option A	Option B1	Option B2	Option C1	Option C2
Journey time savings (£m)	2,530.1	2,398.8	2,430.6	2,310.5	2,436.6
Vehicle Operating Costs savings (£m)	87.0	46.4	76.4	-57.8	-29.1

Table 3-2: Journey Time Savings and Vehicle Operating Cost Savings in 2010 prices, discounted to 2010

The TUBA benefits are reported in a standard table known as the TEE table. The completed TEE table for each option are presented on **Appendix A**.

3.7 Journey Time Reliability Impacts

Reliability is defined in WebTAG as variation in journey time that transport users are unable to predict.

A “stress based” method has been adopted for this stage of the appraisal which is based on the assumption that reliability is linked to the decline in flows that occur as the capacity of the road is reached.

The stress test methodology compares the changes in stress that occur as a result of the implementation of the scheme, during the year that scheme is due to be implemented.

The DfT guidance highlights that the stress method does not produce a direct quantification of the changes in reliability, and that it can only provide a broad indication of the impact of the proposal on reliability.

Reliability benefits are estimated by applying uplifts to travel time savings depending on indicative measure of reliability benefits to reflect Slight, Moderate or Large impacts which can be derived using the method described below.

In line with the guidance the difference between Do Minimum and Do Something stress should be restricted to the range of 75% - 125%. If any stress value is less than 75% or greater than 125%, the calculation should be based on values of 75% or 125% as appropriate. The impact of the assessment is the product of the flow and the difference in stress. The results of the stress test are expressed as a textual score; Table 3-3 provide the context for the results.

Portion of Benefits	Impact Score
>3 Million	Large Impact (10% uplift of time savings)
1 – 3 Million	Moderate Impact (5% uplift of time savings)
200,000 – 1 Million	Slight Impact (2.5% uplift of time savings)
<200,000	Neutral impact (No uplift)

Table 3-3: Journey Time Reliability Scores

Table 3-4 provides a summary of average stress for Do Minimum and each of the options in the opening year of the scheme.

Route	Do Minimum	Option A	Option B1	Option B2	Option C1	Option C2
Existing Route	59.9%	51.9%	50.1%	48.8%	52.0%	50.2%
New Route	N/A	46.8%	61.2%	42.7%	57.5%	42.3%

Table 3-4: Stress Analysis Results

Whilst the Do Minimum scenario average stress value is higher than in Do Something scenarios it is below 75% threshold in both Do Minimum and Do Something which indicates a neutral impact and no uplift to journey time savings.

It can be concluded that a proportionate stress-based method which has been adopted for this stage of appraisal has failed to provide any quantified evidence of reliability benefits associated with the scheme. However, given that the scheme will result in significant travel time savings and accidents

benefits it is prudent to suggest that there will a positive impact on journey time reliability which is to be captured through a more comprehensive method at the next stages of scheme appraisal.

3.8 Safety Impacts

When the scheme is built the traffic is expected to transfer from the existing lower standard roads to a modern standard Expressway which would generally result in significant accident savings.

A proportionate accident benefits assessment using COBALT has been adopted for this stage of the scheme appraisal.

COBALT compares the predicted numbers of accidents with and without the scheme, and converts them into monetary values by multiplying the numbers of accidents by their monetised costs.

The COBALT network has been identified on the basis of a significant change in traffic flow between Do Minimum and Do Something scenarios as predicted by SERTM models (taken to be a change in flow of 10% or more).

Table 3-5 and Table 3-6 summarise the results of the COBALT analysis for the corridor options.

Description	Option A	Option B1	Option B2	Option C1	Option C2
Accident savings (£m)	74.8	99.5	65.9	107.6	70.4

Table 3-5: Monetised safety benefits, in 2010 prices, discounted to 2010

Scenario	Accident Type	
Option A	Reduction in number of Accidents	1,100
	Reduction in number of casualties:	
	Fatal	21
	Serious	301
	Slight	1,100
	Total	1,422
Option B1	Reduction in number of Accidents	1,763
	Reduction in number of casualties:	
	Fatal	33
	Serious	381
	Slight	1,426
	Total	1,841
Option B2	Reduction in number of Accidents	1,313
	Reduction in number of casualties:	
	Fatal	10

Scenario	Accident Type	
	Serious	267
	Slight	1,036
	Total	1,313
Option C1	Reduction in number of Accidents	1,812
	Reduction in number of casualties:	
	Fatal	40
	Serious	414
	Slight	1,472
	Total	1,926
Option C2	Reduction in number of Accidents	1,256
	Reduction in number of casualties:	
	Fatal	17
	Serious	287
	Slight	963
	Total	1,268

Table 3-6: Reduction in Number of Casualties and Accidents

Given the proportionate approach the results of the assessment should be treated with extra caution. However, it is fair to make a conclusion that each of the options is likely to generate a considerable amount of accident savings.

3.9 Wider Economic Impacts

In line with the proportionate approach the assessment of Wider Impacts of the scheme has been limited to calculation of output change in imperfectly competitive markets.

This has been taken as 10% uplift of business user benefits calculated in the TUBA assessment as recommended by WebTAG (Unit A2-1).

The wider impact benefits are presented in Table 3-7.

Description	Option A	Option B1	Option B2	Option C1	Option C2
Change in output in Imperfectly Competitive Market (£m)	23.9	22.0	19.5	20.8	19.2

Table 3-7: Wider Economic Impacts in 2010 prices, discounted to 2010

3.10 Environmental Impacts

The environmental impacts of the scheme have been assessed qualitatively and the results are summarized in Table 3-8.

Please note that this section relates to the complete Expressway from Oxford to Cambridge and not only the Missing Link.

Option	Noise*	Air Quality*	Greenhouse Gases*	Landscape	Townscape	Historic Environment	Biodiversity	Water Environment
A	Neutral	Neutral	Neutral	Moderate Adverse	Large Adverse	Large Adverse	Moderate Adverse	Slight Adverse
B1	Neutral	Neutral	Slight adverse	Slight Adverse	Slight Adverse	Moderate Adverse	Large Adverse	Moderate Adverse
B2	Neutral	Neutral	Neutral	Slight Adverse	Slight Adverse	Moderate Adverse	Moderate Adverse	Slight Adverse
C1	Neutral	Neutral	Slight adverse	Neutral	Slight Adverse	Moderate Adverse	Large Adverse	Moderate Adverse
C2	Slight Benefit	Slight Benefit	Slight adverse	Slight Adverse	Slight Adverse	Moderate Adverse	Moderate Adverse	Slight Adverse

Table 3-8: Environmental impact summary

** WebTAG does not give scores for these topics, these are estimates only, based on a 7 point scale in order to give some proportion to the appraisal.*

More detail of each impact is accessible in the Appendix B**.**

3.11 Social Impacts

3.11.1 Physical Activity

Similar to environmental impact, social impacts have only been assessed qualitatively. The results are summarised from Table 3-9 to Table 3-14.

There is an acknowledged link between transport, the environment and levels of physical activity, however at this stage; it is not possible to determine the impact of this scheme on levels of physical activity. It is unlikely that the scheme will result in a significant mode shift to or from active modes.

Option	A	B1	B2	C1	C2
Physical Activity	Neutral	Neutral	Neutral	Neutral	Neutral

Table 3-9: Physical Activity Impact summary

** WebTAG does not give scores for these topics, these are estimates only, based on a 7 point scale in order to give some proportion to the appraisal.*

3.11.2 Journey Quality

Journey quality is a measure of the real and perceived physical and social environment experienced while travelling. Journey quality factors may be an important influence on the travel choices made by individuals. The elements of journey quality impacts can be sub-divided as follows:

- Traveller Care – The new route will be designed to the latest 'Expressway' standards, including variable messaging technology and signing. This should represent an improvement on the information provision on existing routes.
- Traveller Views – It is not anticipated that there will be a marked change to passenger views due to the Expressway.
- Traveller Stress – The reduction in traffic and congestion on the existing routes will provide some reduction in driver frustration and fear of accidents. Similarly, the Expressway itself should enable overtaking and this will reduce driver frustration and fear of accidents.

Option	A	B1	B2	C1	C2
Journey Quality	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit

Table 3-10: Journey Quality Impact summary

3.11.3 Security

A transport intervention of this scale will impact the level of security perceived by transport users. The new strategic link should provide improved surveillance and visibility, more facilities for making emergency calls and improved design and landscaping.

Option	A	B1	B2	C1	C2
Security	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit

Table 3-11: Security Impact Summary

3.11.4 Access to Services

Access to services focusses on the schemes impact on people's ability to access public transport. As the scheme is not proposing to introduce or reduce public transport services there is no direct impact, however the provision of the new route should reduce congestion on existing routes and therefore result in improved journey times for existing users.

Option	A	B1	B2	C1	C2
Access to services	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit

Table 3-12: Access to Services Impact Summary

3.11.5 Affordability

The User Benefit assessment for this scheme has captured the changes in journey times and vehicle operating costs, demonstrating a reduction in travel costs. However public transport fares, parking costs and road user charges are unlikely to change as a result of the scheme.

Option	A	B1	B2	C1	C2
Affordability	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit	Slight Benefit

Table 3-13: Affordability Impact Summary

3.11.6 Severance

It is not envisaged that the new links proposed by this scheme will cause any severance issues.

Option	A	B1	B2	C1	C2
Severance	Neutral	Neutral	Neutral	Neutral	Neutral

Table 3-14: Severance Impact Summary

3.11.7 Option and Non-use Values

At this stage the scheme scope does not include any Public Transport impacts (either additional or fewer services), the impact is therefore deemed to be neutral.

3.12 Public Accounts Impacts

The impacts of each option on Public Accounts are shown in Table 3-15.

Impact	Option A (£m)	Option B1 (£m)	Option B2 (£m)	Option C1 (£m)	Option C2 (£m)
Present Value of Cost (PVC)	2,313.7	1,999.5	2,190.9	2,116.9	2,305.0
Indirect Tax	-3.8	20.6	-2.7	54.2	38.2

Table 3-15: Summary of Public Account Impacts

The results are also reported in a standard table known as Public Accounts (PA) Table.

Public Accounts tables for each corridor option are presented in Appendix C.

3.13 Appraisal Summary Tables (AST)

The Appraisal Summary Tables (AST) tables provide a summary of the scheme appraisal results for the decision makers. The summary of impacts is provided in qualitative and monetised format where available. See Appendix D for the AST tables.

3.14 Analysis of Monetised Costs and Benefits (AMCB)

The results of analysis of Monetised Costs and Benefits for each option are reported in the AMCB tables. The two commonly known metrics used to compare the benefits and costs of a scheme are the benefit-cost ratio which represents benefits divided by the costs and the net present value (NPV) which is calculated as the sum of the benefits minus the sum of costs.

The AMCB table for each option is included in Appendix E.

3.15 Value for Money Statement

The Value for Money assessment of the corridor options has been undertaken in line with the approach adopted for Stage 0.

As part of the assessment the economic, environmental, social and fiscal impacts of the proposed scheme have been evaluated using qualitative, quantitative and monetised information.

As expected the majority of the monetised benefits are associated with travel time and VOC savings for business and non-business road users. Improvements in safety also provide contribution to the total monetised benefits in all options. Each option is also expected to provide Wider Economic Benefits through a positive output change in imperfectly competitive markets. In addition, three of the options (B1, C1 and C2) will result in an increase of indirect tax paid to the Exchequer, whilst Options A and B2 will have a negative impact on indirect tax revenue. It is also expected that each corridor option will have a positive impact on journey time reliability. However, the stress based analysis of reliability adopted at this stage of the appraisal failed to provide a monetary value of those benefits.

Impact	Option A (£m)	Option B1 (£m)	Option B2 (£m)	Option C1 (£m)	Option C2 (£m)
Transport Economic Efficiency	2,617.1	2,445.2	2,507.1	2,252.7	2,407.5
Accidents	74.8	99.5	65.9	107.6	70.4
Wider Impacts	23.9	22.0	19.5	20.8	19.2
Indirect Tax	-3.8	20.6	-2.7	54.2	38.2
Total (PVB)	2,712.1	2,587.3	2,589.8	2,414.5	2,516.0
BCR	1.2	1.3	1.2	1.1	1.1

Table 3-16: Summary of Benefits by Option in 2010 prices, discounted to 2010[9].

Option A will generate the largest monetised benefits compared to other options, whilst option C1 has the lowest PVB.

WebTAG guidance recommends Benefit Cost Ratio (BCR) metrics to define the Value for Money (VfM) category of a scheme. The categories include:

- Poor VfM If BCR is below 1.0
- Low VfM If BCR is between 1.0 and 1.5
- Medium VfM If BCR is between 1.5 and 2.0

[9] The results are based on proportionate analysis and exclude wider economic benefits in the context of aspirational growth.

- High VfM If BCR is between 2.0 and 4.0
- Very High VfM If BCR is greater than 4.0

The BCR represents the amount of benefits of the scheme being bought for every £1.00 of cost and is calculated by dividing the Present Value of Benefits (PVB) by the PVC.

Based on the Analysis of Monetised Costs and Benefits (AMCB) all the corridor options fall into Low value for money category with Option B1 performing slightly better than others. This is based on the proportionate analysis undertaken at this stage of the appraisal and excludes the wider economic impacts in the context of aspirational growth.

The non-monetised benefits have also been considered as part of the Value for Money assessment.

All corridor options are expected to have a positive impact on Journey Quality, Security, Access to Services and Affordability. Option C2 will also have a slight positive impact on Noise and Air Quality. On the other hand, it is expected that all options will negatively affect Townscape, Biodiversity, Historic Environment, Water Environment, and with the exception of option C1 Landscape.

The scheme impact on physical activity and severance will be neutral.

3.16 Change of Opening Year

Since the appraisal of the scheme was scoped it has been confirmed that the Opening Year for the Missing Link Section would change from 2025 to 2030.

Additional analysis showed that a change of Opening Year to 2030 would not affect the VfM outcomes at PCF Stage 0 work.

In Stage 1, an Opening Year of 2030 will be adopted.

3.17 Summary

The three shortlisted corridor options of the Missing Link between Milton Keynes and Oxford and the two sub-options around Oxford to Abingdon have been modelled using the South East Regional Transport Model to inform the initial value for money assessment and provide indicative Benefit-Cost Ratio of each alternative.

The value for money assessment has been undertaken in line with DfT Transport Appraisal Guidance, using a proportionate approach given the early stages of appraisal.

The scheme costs used in the assessment are not based on any design considerations and have been derived from the length of online upgrade and offline sections of the scheme.

The monetised benefits calculated as part of the value for money assessment included travel time savings, journey time reliability and accident benefits. Environmental and social impacts have been assessed qualitatively whilst wider economic benefits (with the exception of calculation of output change in imperfectly competitive markets) have been excluded from the analysis.

The Value for Money Statement concluded that all the corridor options fall into Low value for money category with Option B1 performing slightly better than others. These results should be regarded only as an initial indication of scheme value for money.

As part of PCF Stage 1 the scheme options will be reconfirmed and assessed using refined traffic models in terms of environmental impacts, safety and economic benefits including refinement of the cost estimate of each option.

It is expected wider economic impacts including those associated with that NIC aspirational growth targets will further enhance the economic case for the scheme.

4. Financial Case

4.1 Introduction

This section of the SOBC describes the Financial Case for the Missing Link between Milton Keynes and Oxford, outlining their affordability, funding arrangements, and technical accounting issues. The Missing Link includes both the Options between the M1 and M40 and the sub-option from the M40 to the A34 at Abingdon.

The Financial Case sets out the latest capital cost estimate and spend profile for each of the options, including details of the risk and inflation assumptions applied. In addition, the key financial risks to the scheme are identified together with an overview of how Highways England will ensure the efficient development and delivery of the scheme.

Capital cost estimates were prepared for the Missing Link Corridor Options in April 2018 and then inflated to outturn costs using Highways England construction related inflation.

4.2 Capital Cost Estimates

Cost estimates have been produced for each corridor option in line with Highways England's Cost Estimation Manual[10]. The manual highlights how accurate cost estimates are required throughout the project lifecycle in order to:

- Determine the economic feasibility of the scheme;
- Evaluate project alternatives; and
- Establish: budgets, costs, and benchmarking.

A consistent approach to estimates is required so that different schemes and options can be compared. The estimates for proposed schemes are governed by the requirements of the Project Control Framework (PCF) and Investment Decision Committee (IDC) process. Differing levels of detail are required depending on which phase and stage the project is at within the project lifecycle. At PCF Stage 0, (Pre-Project Stage), an 'order of magnitude' cost estimate is to be prepared.

The order of magnitude cost estimates have been developed using Highways England's Commercial Services Division parametric estimating tools. The formal outputs of the estimates have been recorded in the Cost Estimate Report Template (CERT). The cost estimation process specifically refers to the proposed designs provided by the project team, and it considers the total costs of the development and construction of the schemes. Major projects typically have long timescales and substantial uncertainty at the early stages of development. Therefore, estimates for each option are produced as a range – 'Minimum', 'Most Likely' and 'Maximum'.

Key assumptions informing the generation of capital costs include:

- ***Options and Development Costs*** – In the absence of Stage Gate Assessment Review (SGAR) date forecasts, PCF Options Stages 1 and 2 and Development Stages 3 through 5 are assumed to have a duration of 7 years and 3 months, with PCF Options Stage 1 commencing in July 2017.
- ***Land*** – Estimates of the land acquisition costs have been provided by the District Valuer. An approved Highways Agency Lands (HAL) database template has been utilized to calculate additional costs on lands estimate (legal/surveyor fees, economic risk, indexation, etc.). A range of -30 percent and +30 percent have been applied to the most likely provided costs.

[10] Highways England (April 2015) *Major Cost Estimation Manual*

- ***Construction Stage 6 Costs*** – Developed in the same manner as the PCF Options and Development Stage costs and based on a 6-year timeframe.
- ***Direct Works*** – Mainly based on first principles, "bottom-up" estimating approach. Assumes all online works lie within Highways England's boundary and scheme design and delivery are carried out as one complete works and under CIP's route.
- ***Indirect Costs*** – Estimated using an approved preliminaries model based on construction durations, value of direct works, structures, scheme length, etc.
- ***Other Costs*** – Include statutory undertakers (allowance based on percentages), contractor's fee (9 percent for construction activities), third-party costs (allowance for interaction with environmental agency, network rails, and local authority), employers agent Construction Stages 6 and 7 fees (site supervision and technical and commercial assurance teams), and Non-refundable VAT (NRVAT) (a percentage-based assessment on construction works carried out outside the highways boundary, in segment by segment basis)
- ***Project Risks and Uncertainty***– A risk register has been produced. Risk allowances have been calculated using percentages derived from other schemes since this scheme is at an 'order of magnitude' stage and the level of detail available is extremely limited. For this scheme, the percentage worked out to be around 27 percent including uncertainty items
- ***Inflation and Portfolio Risk*** – generated using an approved Range Estimating Template and included in the cost estimates.

In addition to these assumptions, a number of key engineering principles have been established to inform the generation of capital cost estimates for each road option. These include:

- Drainage
- Earthworks
- Pavement
- Road Lighting
- Structures

Table 4-1 summarises the range of outturn construction cost for each corridor option. This shows that Corridor Option B1 is the lowest cost with a range varying between £2,774 million and £7,338 million with a most likely cost of £4,101 million. The highest cost option is Corridor A with a range of £3,266 million and £8,506 million with a most likely cost of £4,827 million

Cost Estimate	Option A (£m)	Option B1 (£m)	Option B2 (£m)	Option C1 (£m)	Option C2 (£m)
Minimum Likely	3,266	2,774	3,034	2,969	3,221
Most Likely	4,827	4,101	4,497	4,388	4,774
Maximum Likely	8,506	7,338	7,879	7,875	8,406

Table 4-1: Summary of Outturn Costs by Option

Figure 4-1 depicts the most likely cost estimates for each of the options. As indicated above, the figure demonstrates that Corridor B1 is the lowest cost scheme with a 'Most Likely' estimate of £4,101 million. The 'Most Likely' cost for Corridors A, B2, C1 and C2 are 18 percent, 10 percent, 7 percent, and 16 percent, higher than that of Corridor B1 respectively.

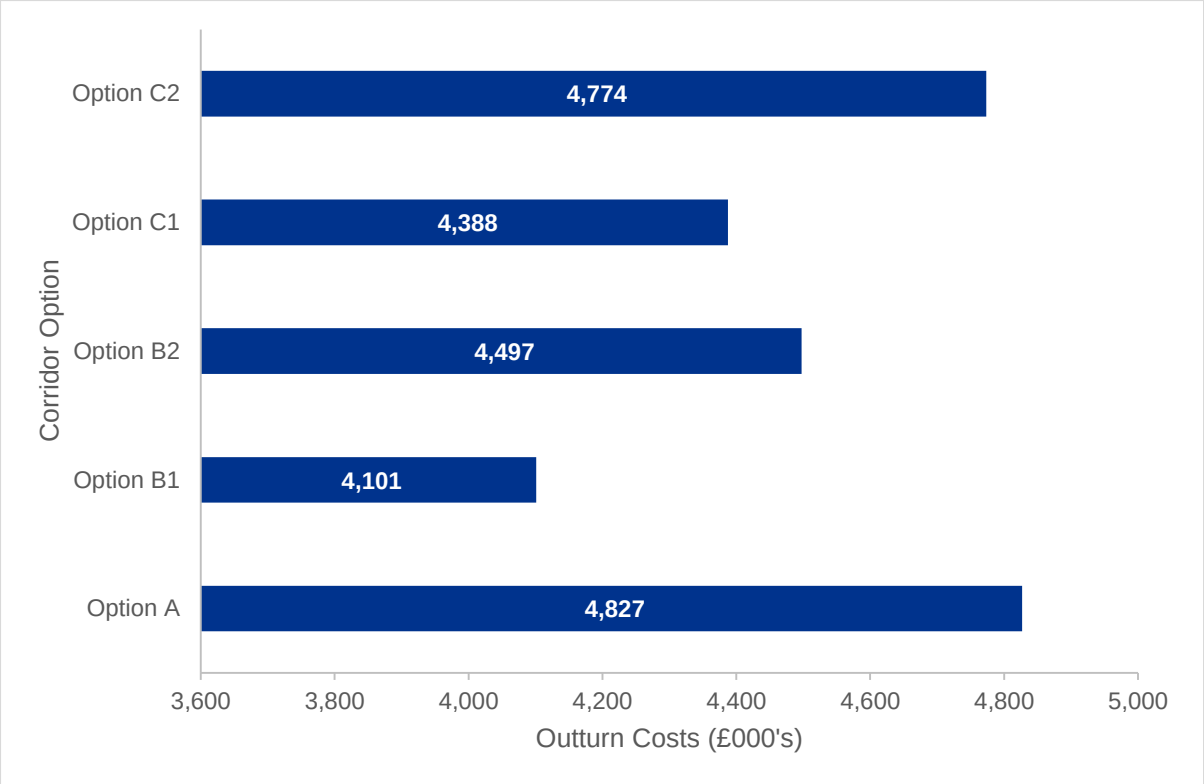


Figure 4-1: Scheme Costs by Corridor Option

It should be noted that the cost estimates presented were prepared in 2016 Q1 prices and inflated to outturn costs using former Highways England projected construction related inflation. For the purpose of economic assessment these costs have then been rebased to 2010 calendar year using the GDP deflator series as published in the WebTAG Databook. These costs exclude all recoverable VAT. Additionally, all historic costs (previous years and an approximate of this year's spend that occurs in the past) have been removed.

4.3 Spending Profile

Figure 4-2 summarizes the total capital outturn cost profile for each of the five corridor options. The figure illustrates the peaks in the cost profile which occur in Year 10, whilst also highlighting the high costs associated with Corridors A and C2.

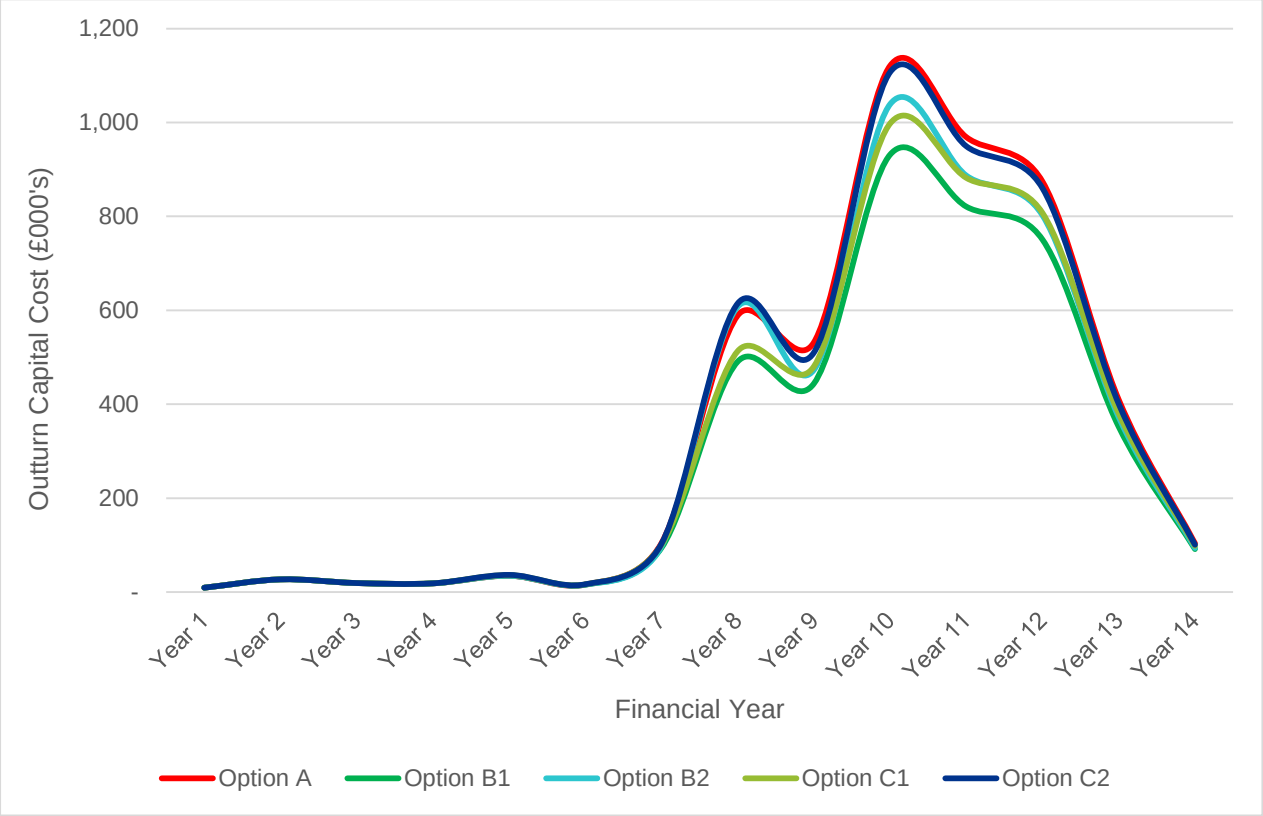


Figure 4-2: Total Capital Outturn Costs Profile (£K) – All Corridor Options

4.4 Funding Availability

Under the IDC process and PCF, investment funding is committed to projects incrementally, phase-by-phase. Therefore, only schemes in the Construction PCF phase will have funding committed through to their completion. Schemes in earlier PCF phases will have an IDC funding commitment limited to the cost of completing that phase only.

Funding opportunities are also available via the DfT's Transport Development Fund. This £300 million fund has been introduced to support development work for transformative transport infrastructure projects. £27m has been provided over financial year 17/18 and 18/19 to progress the development of this scheme. Future funding will be considered as part of the development of the second Road Investment Strategy.

At present, no third party contributions have been identified. However, should the scheme progress to the next PCF phase, it is the intention of the Highways England project team to investigate and identify opportunities for contributions of this nature. Given that there are significant plans for growth in housing and employment over the coming decade and beyond, in the absence of the expressway, it is likely the current congestion levels will be exacerbated. This provides the opportunities for securing developer contributions towards elements of the scheme package.

The accountancy and tax treatments associated with the scheme are not known at this stage as they depend, to a certain degree, on the final financial / commercial approach adopted, be that publicly financed or through a form of private-finance contract such as a public-private partnership or a design-build-finance-operate mechanism. Subject to investment approval, these factors will be investigated in detail during later stages.

The balance sheet implications are not currently known. And as previously outlined, the level of available funding has not been confirmed either. Therefore, the level of affordability cannot be assessed at this stage.

4.5 Summary

Order of magnitude cost estimates have been prepared for the Missing Link based on available estimates for the complete Arc from Oxford to Cambridge. Due to time constraints these estimates have not been verified in any way as part of the SOBC Update work.

These estimates were developed, in line with Highways England's Commercial Services Division Cost Estimation Manual, using parametric estimating tools, for each road option. Given the long timescales and level of uncertainty at this early stage of development, estimates are produced as a range – 'Minimum', 'Most Likely' and 'Maximum'.

The Financial Case demonstrated that the 'Most Likely' cost estimates for the five corridor options are:

- Corridor A - £4,827M
- Corridor B1 - £4,101M
- Corridor B2 - £4,497M
- Corridor C1 - £4,388M
- Corridor C2 - £4,774M

A robust risk management plan is in place and key risks associated with the scheme cost estimates and funding have been identified and are being monitored. Should the scheme progress to the next PCF Stage, there will be a need to revisit and refine the cost estimates and allowances for risk.

A summary of the risks surrounding the costs estimates and funding, are provided below:

- ***Scheme cost estimates*** – The forecast cost of the scheme is an order of magnitude estimate, and as such, there is a risk that the costs / construction programme is likely to change when the design of the scheme is developed in more detail (this is mitigated to a degree by the production of 'Minimum' and 'Maximum' cost estimates, in addition to 'Most Likely', which include for significant changes to the scope of the scheme).
- ***Inflation*** – Given the timescales for completion of the scheme, there is a risk of change in the rate of inflation (both up and down) which could mean that actual inflation is different to the forecast rate of inflation included within the estimates.
- ***Land cost estimates*** – Land cost estimates have been prepared as a desktop exercise and there is therefore a risk that the costs and time associated with acquiring land may change as a result of further assessment.
- ***Timescale estimates*** – Broad assumptions have been made with regard to the time required for acquiring land and following statutory planning processes, which means that there is a risk that these processes will take longer and be more costly than has been assumed.

5. Management Case

5.1 Introduction

This chapter forms the Management Case. It describes how the Missing Link between Milton Keynes and Oxford will be delivered using project management best practice, confirms the scheme is deliverable within the timescales, and demonstrates an appropriate governance structure and assurance framework to oversee the scheme.

The Management Case has been prepared in line Department for Transport guidance for preparation of transport business cases, using HM Treasury's Five Case Model and WebTAG guidance.

This case is designed to assess the deliverability of a proposal. It tests the project planning, governance structure, risk management, communications and stakeholder management, benefits realisation and assurance.

The Management Case follows a defined structure as specified by government. Following this structure ensures all the necessary information is provided and enables efficient assessment of the proposal.

5.2 Evidence of Similar Projects

Highways England has a proven track record of scheme planning and delivery. This includes major schemes such as widening and other offline improvements of a similar scale and comparable cost to those proposed in this business case.

Name	Status	Description	Cost	Notes
A14 Cambridge to Huntingdon Improvement Scheme	Planned (2016-2020)	Proposals include: - Widening carriageway - Bypass to the south of Huntingdon - New local access road - Junction improvements	£1.5 billion	The government has committed £1.5 billion of investment toward the scheme, recognising its importance in terms of relieving congestion and unlocking growth.
A453 Widening (M1 Junction 24 to A52 Nottingham)	Current (2013-2015)	Scheme comprises of: - Widening urban section of carriageway to 4-lane - Upgrading rural section to dual carriageway standard	£150 million	Main construction began in 2013 and is due to be completed in 2015. The scheme has been successfully delivered through the PCF process.
A5 – M1 Link (Dunstable Northern Bypass)	Current (2015-2016/17)	Scheme comprises of: - Construction of a dual 2-lane carriageway - New junction with the M1	£162.1 million	The finished scheme will relieve congestion through Dunstable and reduce journey times for long distance traffic. It will also unlock land for development and boost economic growth.

A421 Bedford to M1 Junction 13	Completed (2008-2010)	Scheme comprises of: - Construction of a dual 2-lane carriageway - Improvements to M1 Junction 13	£162 million	Outturn economic benefits appraised one year after opening of the scheme amount to £783.5 million in journey time benefits with a BCR of 5.9.
A1 Dishforth to Leeming Improvement Scheme (Southern Section)	Completed (2009-2012)	Scheme included provision for: - 22km of the A1 dual carriageway upgraded to three-lane motorway standard	£318 million	The scheme has helped reduce high levels of accidents and congestion whilst enhancing journey time reliability.
A3 Hindhead Improvement	Completed (2007-2012)	Scheme included provision for: - 6.5km dual carriageway upgrade to the A3 - Twin bored tunnels to carry the new road under an SSSI	£371 million	The project removed a major source of congestion whilst at the same time successfully mitigating the potential environmental impacts of the scheme.

Table 5-1: Overview of similar Highways England projects (Source: Jacobs, A428 Black Cat to Caxton Gibbett SOBC)

5.3 Programme / Project Dependencies

At this SOBC stage, the dependencies on other projects and programmes are still under investigation, and these will be clarified as the scheme progresses. A high-level summary of programme dependencies which can typically expect to be faced in a scheme of this scope and nature are summarised with the following bullet points:

- Governance issues: for example, changes in national priorities set by the DfT or Highways England, or a change in political control.
- Approvals: in terms of emerging development patterns within the A428 corridor and the respective local authority timescales for developing these.
- Preliminaries: land acquisition, relocation/ diversion of utilities, including potential Compulsory Purchase Orders (CPOs).
- Costs: changes in the costs of materials/ construction may affect the outturn costs of the scheme, although this could be adequately covered within the allowance for risk and optimism bias.
- Environmental: outcomes of future surveys and changes in environmental conditions; other constraints including loss of landscape character, cultural heritage, air quality or biodiversity.
- Consultation and engagement: potential for delays to delivery as a result of issues and objections raised during the consultation period.
- Technical: design issues, required mitigation measures.
- Statutory: for example, through issues raised when going through Environmental Impact Assessment (EIA) or other statutory processes and seeking approvals for the scheme.

5.4 Governance, Organisational Structure and Roles

The governance structure will be dependent upon the cost of the final scheme selected. For the purposes of this SOBC it can be assumed that Highways England's Project Control Framework will apply, and that the scheme will be governed by the Highways England Major Project Team and Highway England Capital Planning Team.

An appropriate Project Board will be convened and will include the Senior Responsible Officer (SRO), Senior User, and Senior Supplier. This Board will be supported by the Project Manager and various technical specialists from Highways England, DfT and the supply chain at the request of the SRO. Further details regarding this process can be found in the Project Control Framework Handbook[11].

5.5 Programme/ Project

Highways England procured consultants WSP | Parsons Brinckerhoff, CH2M, and Steer Davies Gleave for PCF Stage 0 to carry out traffic model development and detailed scheme appraisal, mobilisation of environmental surveys, and progression of the business case.

Jacobs will undertake further detailed economic and environmental appraisal at PCF Stage 1 and this will be refreshed as appropriate throughout the programme.

PCF Stages 2 and 3 and onwards will be programmed once option development is further progressed and these forecast programme dates will be included in a future iteration of the business case.

5.6 Assurance and Approvals Plan

The Highways England Investment Control Framework (ICF) sets out the assurance processes for the scheme. The Highways Investment Board (HIB) and internal Major Project procedures (for example the PCF) are also used.

5.7 Communications and Stakeholder Management

As part of any major scheme development, it is important to conduct formal consultation and stakeholder engagement. Due to the significant interest in this scheme, a Stakeholder Reference Group (SRG) has been established to provide input into the project as it develops. The SRG organisation list is maintained by the DfT and is being used to identify key organisations that will be consulted as the study progresses.

The SRG includes:

- Local Enterprise Partnerships (LEPs);
- County Councils;
- District and Unitary Planning Authorities (D/UPA);
- Transport associations; and
- Environmental groups.

Meetings between the delivery team and the SRG have been taking place since 2015, and will continue on a regular basis to establish the views of various parties and all relevant feedback has been taken into account during the preparation of this business case.

A communication strategy is in development and will be included in a future iteration of this business case. The objectives of the communication strategy are to:

- Identify communication links to avoid duplication and consultation fatigue;
- Identify key messages to provide clarity and consistency of what is said at each stage in the schemes to promote clear understanding of the scheme;
- Identify communications to take forward on schemes;

[11] Highways England (2013) *The Project Control Framework Handbook.*

- Programme communication activities in a planned and methodical way to minimise delays to the overall programme and ensure timely distribution of communication materials; and
- Minimise objections and stakeholder challenges to the schemes based on misinformation and poor consultation.

The earlier phases of project delivery can have a significant impact on the relationship with the local community and their early (and lasting) impressions of schemes. Many stakeholders will have contact with other opinion formers and influencers so it is vital to keep stakeholders informed and to be as open as possible with communications. As a result, engagement will start during the options phase of the PCF process and will continue throughout the other preparation and delivery stages of scheme development.

5.8 Programme/Project Reporting

As part of the PCF process the Highways England Major Project team has established a project board for the scheme. This Board is chaired by the SRO and attended by the Senior User and Senior Supplier and other attendees as required by the SRO.

The Project Manager is responsible for reporting progress and other matters to the Project Board. Highlight reports for the Board include updates on progress against milestones, key issues and risks, actual and forecast financial information, next steps, and items escalated to the Board for consideration and decision.

Financial reporting is carried out in accordance with the requirements of the Major Projects Portfolio Office and statutory processes.

As part of the PCF process, the scheme is subject to audits and reviews through the Independent Assurance Review (IAR) and the Office of Government Commerce Gateway Review processes. The outcomes of these reviews (when completed) will be provided to the SRO.

5.9 Risk Management Strategy

Risks associated with the overall delivery of the scheme are managed according to the overall monitoring responsibilities set out in the PCF. This requires production and maintenance of a risk register. A high level risk register and qualitative risk assessment have been completed to highlight any significant risks for scheme delivery.

The Project Board has overall responsibility for governance and risk associated with the delivery of the scheme. The Project Executive is responsible for managing and overseeing the Risk Management Strategy and where appropriate agreeing actions to mitigate key risks. The Project Manager is responsible for maintaining and updating a Quantified Risk Register and undertaking actions to mitigate the risks that do not require escalation to the project executive. The governance structure includes arrangements for decision making, approvals, roles and responsibilities such that responsibilities with regard to risk are well defined and understood.

Future risk management activity and updates to the risk register will take place as part of the PCF process through the next phases of business case development. The risk register will be maintained throughout the project as a live document and also reviewed on an on-going basis. The most significant risks will have Risk Management Plans developed for them.

5.10 Summary

The management approach that has been proposed for the Missing Link between Milton Keynes and Oxford has been developed with consideration of the overall costs, deliverability, and level of risk. It is likely to be tailored to the specific circumstances of each element in line with the development of the scheme. At this stage the key points to note are as follows:

- A Project Board has been established, comprising representation from key stakeholders, to oversee delivery of the scheme. An SRO and Project Manager have been appointed, with the Project Manager providing the interface between the Project Board and the team members
- Outline project plans are in development. At this stage, the timeline for project delivery is indicative and will be subject to change as the business case develops.
- Consultation activities will continue throughout the PCF process and the communication strategy will be continuously updated to seek views, communicate progress and create consensus during development of proposals.
- A high level risk register has been developed.
- The benefits realisation, monitoring and evaluation plan will be developed at a high level for the Outline Business Case (OBC) and as an output of the Full Business Case (FBC). This will ensure that data collection and reporting is focussed tightly on the objectives and success indicators that have been set out in the Strategic Case.

6. Commercial Case

6.1 Introduction

A number of options for the Missing Link between Milton Keynes and Oxford have been considered in the Economic and Financial cases. Whichever Option chosen will represent a significant construction project which will require a detailed procurement plan to ensure timely delivery.

This chapter of the business case considers the scheme outputs required, and the procurement strategy for delivery.

The Commercial Case is designed to provide evidence of the commercial viability of a proposal and the procurement strategy which will be used. It will clearly set out the financial implications of the proposed procurement strategy and present evidence on risk allocation and transfer.

The Commercial Case follows a defined structure as specified by government. Following this structure ensures all the necessary information is provided and enables efficient assessment of the proposal.

6.2 Approach

The scheme is currently being progressed through Highways England's Project Control Framework (PCF).

As with all construction projects there is a need for time, cost, and quality issues to be managed, and their inevitable tensions balanced. The process of contract selection and formulation will help to ensure the scope and project-specific risks are controlled through procurement.

At this stage of the business case, the Commercial Case is high level. Details on areas such as contract lengths, risk allocation and transfer, and contract management will be finalised and updated at a later stage of scheme development.

6.3 Output Specification

The PCF is a joint DfT and Highways England approach to managing major projects. It comprises a standard project lifecycle, standard deliverables, governance arrangements and project control processes, which all major projects must adhere to as part of the development and delivery of a scheme.

An interim Stage Gate Assessment Review (SGAR) will measure the success of the project at the end of each stage to ensure all outputs have been produced. It will also provide evidence for the SRO and key stakeholders on the continued viability of the project.

The PCF sets out *project management* outputs, for example a risk management plan or cost estimates. These are necessarily required to ensure successful project delivery. These should be seen as distinct from *scheme* outputs, which can be simply described as the service specification or the services to be provided. These services should be described in the context of the outputs of outcomes that the scheme must deliver.

In the case of this scheme, a required outcome is improved connectivity between the towns and cities in the 'Brain Belt' to support growth in the area. This outcome will be achieved by delivery of the Missing Link between Milton Keynes, in the form of an Expressway[12].

6.4 Procurement Strategy

The scheme will be delivered through Highways England's Collaborative Delivery Framework (CDF). The CDF provides a procurement route for projects over £15m, thus avoiding individual Official Journal of European Union (OJEU) procurement events. The principles of the CDF are to achieve continuous improvement in health and safety, sustainability, quality, time, and value for money.

The procurement strategy will be aligned with the PCF which sets out how Highways England, together with the DfT, manage and deliver major improvement projects.

Figure 6-1 sets out the major projects lifecycle and associated investment decision points. At each investment decision point, it is important for scheme promoters to demonstrate that there is a clear commercial and procurement strategy in place for commissioning suppliers to deliver subsequent PCF stages and that this will deliver the scheme outcomes and benefits.

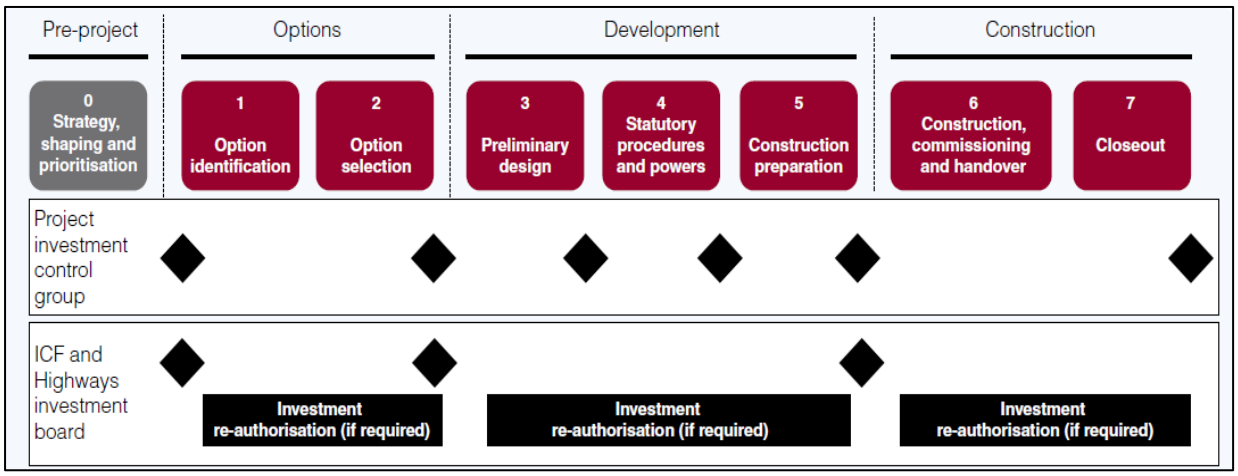


Figure 6-1: Major projects lifecycle and investment decision points (Source: Highways England PCF, 2013)

6.5 Summary

This Commercial Case demonstrates that a robust procurement framework is in place with which Highways England is able to deliver the remaining PCF phases of the project. If any changes occur to the procurement process, these will be clearly set out in future iterations of the business case.

7. Conclusion

The evidence shows that there is a lack of strategic east-west transport connectivity within the Oxford-Milton Keynes-Cambridge region. The existing route, despite its strategic, regional and local importance, suffers from congestion and delays, particularly during the peak travel periods. The variable road standards negatively affect the capacity, reliability, resilience, safety and attractiveness of the existing east-west route.

The current transport conditions have resulted in low levels of interaction between the main economic areas and creates a barrier to delivering future housing and economic growth. Transport problems are likely to be exacerbated by expected future increases in travel demand, housing supply issues are likely to worsen. This will make the region unattractive to businesses as employers will struggle to attract and retain skilled workers.

The new Expressway along with other transport interventions including improved east-west rail connectivity are critical to overcoming existing local, regional and national infrastructure deficits. They will help connect skilled people with jobs, link employment clusters and create an efficient national transport network that enables housing and job growth to be delivered in a way that supports the efficient movement of goods and people.

A new Expressway standard route can be provided within the Arc between the M4 and the M11 through the upgrade of the existing A34, A421 and A428. These would leave a gap between the M1 at Milton Keynes and the A34 at Abingdon south of Oxford. This provision of this Missing Link is the subject of this Strategic Outline Business Case.

A proportionate economic assessment of the missing link section demonstrates that the shortlisted corridor options will generate significant direct travel time savings and will have a large positive impact on safety. Indicative BCRs have been estimated and provided in Table 7-1. These should be regarded only as an initial indication of scheme value for money due to the early stage of the analysis and the high level assumptions used in the calculation of scheme costs and benefits.

	Option A	Option B1	Option B2	Option C1	Option C2
BCR	1.2	1.3	1.2	1.1	1.1

Table 7-1: Benefit Cost Ratio for the different corridor options

Wider economic benefits have not yet been assessed but are expected to be significant. The NIC aspirational growth targets for the corridor have also not been accounted for but are expected to enhance the case further.

In light of current high-level scheme cost estimates and considering expected monetised benefits based on the work undertaken to date Corridor Option B demonstrates the highest value for money. However, this will need to be confirmed through further analysis of qualitative and quantitative impacts of each corridor option including an assessment of wider economic benefits.

Recommendations and Next Steps

This SOBC has confirmed that this indicative assessment shows the benefits of the Missing Link between the M1 at Milton Keynes and the A34 at Abingdon south of Oxford are likely to provide some value for money. Thus the scheme is promising enough to take forward to the next stages of assessment which will take account of wider economic impacts, including related housing and employment delivery. This further assessment will allow robust estimates of value for money for each of the three corridors.

As part of the subsequent PCF Stage 1 the scheme options will be reconfirmed and assessed in terms of environmental impacts, traffic forecasts, safety and economic benefits including refinement of the cost estimate for each option.

It is clear that the provision of the Missing Link will allow the proposed Expressway to resolve many of the connectivity issues currently present in the East-West arc. This in turn will provide the right conditions required to achieve a transformational change and to unlock the full economic potential of the Oxford-Milton Keynes-Cambridge region as envisaged by the National Infrastructure Commission.

It will help connect skilled people to jobs, link employment clusters and create an efficient national transport network that enables housing and job growth to be delivered in a way that supports efficient movement of goods and people.

8. Glossary

AMCB – Analysis of Monetised Costs and Benefits

AST – Appraisal Summary Tables

BCR – Benefit Cost Ratio

BTVLEP – Buckinghamshire Thames Valley Enterprise Partnership

CDF – Collaborative Delivery Framework

CERT – Cost Estimate Report Template

CAMKOX Arc – Cambridge-Milton Keynes-Oxford Arc

COBA-LT – Cost and Benefit to Accidents-Light Touch

CPOs – Compulsory Purchase Orders

D/UPA – District and Unitary Planning Authorities

DfT – Department for Transport

EAST – Early Assessment and Sifting Tool

EEH – England's Economic Heartland

EIA – Environmental Impact Assessment

EWR – East West Rail

FBC – Full Business Case

GCGP – The Greater Cambridge Greater Peterborough Enterprise Partnership

HAL – Highways Agency Lands

HGV – Heavy Goods Vehicle

HIB – Highways Investment Board

HMT – HM Treasury

IAR – Independent Assurance Review

ICF – Investment Control Framework

IDC – Investment Decision Committee

LEP – Local Enterprise Partnerships

Missing Link – Options for linking Milton Keynes and Oxford via sub-options between the M1 and M40 and further sub-options between the M40 and the A34 at Abingdon

NIC – National Infrastructure Commission

NPV – Net Present Value

NRVAT – Non-refundable VAT

OBC – Outline Business Case

OJEU – Official Journal of the European Union

Ox-Cam – Oxford to Cambridge

OxLep – Oxfordshire Local Enterprise Partnership

PA – Public Account

PCF – Project Control Framework

PVB – Present Value of Benefits

PVC – Present Value of Cost

RET – Range Estimating Template

RIS - Roads Investment Strategy

SEMLep – South East Midlands Local Enterprise Partnership

SEPs – Strategic Economic Plans

SERTM – South East Regional Transport Model

SGAR – Stage Gate Assessment Review

SOBC – Strategic Outline Business Case

SRG – Stakeholder Reference Group

SRN – Strategic Road Network

SRO – Senior Responsible Officer

TEE – Transport Economic Efficiency

TEN-T – Trans-European Transport Network

TPG – Transport Planning Group

TUBA – Transport User Benefit Appraisal

TVB – Thames Valley Berkshire Enterprise Partnership

VfM – Value for Money

VOC – Vehicle Operating Cost

VOT – Value of Time

WebTAG – Web-based Transport Analysis Guidance

WI – Wider Impacts

Appendix A. Transport Economic Efficiency Tables

Economic Efficiency of the Transport System (TEE)								
Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£625,393		£625,393					
Vehicle operating costs	-£3,828		-£3,828					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: COMMUTING	£621,565	*(1a)*						
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£790,625		£790,625		£0			
Vehicle operating costs	-£11,603		-£11,603					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: OTHER	£779,022	*(1b)*						
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£1,114,085		£888,659	£225,426	£0			
Vehicle operating costs	£102,456		£89,201	£13,255	£0			
User charges	£0		£0	£0	£0			
During Construction & Maintenance	£0							
Subtotal	£1,216,541	*(2)*	£977,860	£238,681				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	£0							
Operating costs	£0							
Investment costs	£0							
Grant/subsidy	£0							
Subtotal	£0	*(3)*						
Other business impacts								
Developer contributions	£0	*(4)*	£0					
NET BUSINESS IMPACT	£1,216,541	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£2,617,128	*(6) = (1a) + (1b) + (5)*						
	Notes: Benefits appear as positive numbers, while costs appear as negative numbers.							
	All entries are discounted present values, in 2010 prices and values							

Table A-1: Transport Economic Efficiency (TEE) Table for Option A

Economic Efficiency of the Transport System (TEE)								
Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£596,990		£596,990					
Vehicle operating costs	£5,715		£5,715					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: COMMUTING	£602,705	*(1a)*						
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£787,306		£787,306		£0			
Vehicle operating costs	£12,167		£12,167					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: OTHER	£799,473	*(1b)*						
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£1,014,530		£811,135	£203,396	£0			
Vehicle operating costs	£28,535		£11,735	£16,800	£0			
User charges	£0		£0	£0	£0			
During Construction & Maintenance	£0							
Subtotal	£1,043,065	*(2)*	£822,870	£220,195				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	£0							
Operating costs	£0							
Investment costs	£0							
Grant/subsidy	£0							
Subtotal	£0	*(3)*						
Other business impacts								
Developer contributions	£0	*(4)*	£0					
NET BUSINESS IMPACT	£1,043,065	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£2,445,243	*(6) = (1a) + (1b) + (5)*						
	Notes: Benefits appear as positive numbers, while costs appear as negative numbers.							
	All entries are discounted present values, in 2010 prices and values							

Table A-2: Transport Economic Efficiency (TEE) Table for Option B1

Economic Efficiency of the Transport System (TEE)								
Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£645,925		£645,925					
Vehicle operating costs	£3,064		£3,064					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: COMMUTING	£648,989	*(1a)*						
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£760,438		£760,438		£0			
Vehicle operating costs	£13,369		£13,369					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: OTHER	£773,807	*(1b)*						
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£1,024,298		£843,174	£181,124	£0			
Vehicle operating costs	£59,989		£45,660	£14,329	£0			
User charges	£0		£0	£0	£0			
During Construction & Maintenance	£0							
Subtotal	£1,084,287	*(2)*	£888,834	£195,452				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	£0							
Operating costs	£0							
Investment costs	£0							
Grant/subsidy	£0							
Subtotal	£0	*(3)*						
Other business impacts								
Developer contributions	£0	*(4)*	£0					
NET BUSINESS IMPACT	£1,084,287	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£2,507,083	*(6) = (1a) + (1b) + (5)*						
	Notes: Benefits appear as positive numbers, while costs appear as negative numbers.							
	All entries are discounted present values, in 2010 prices and values							

Table A-3: Transport Economic Efficiency (TEE) Table for Option B2

Economic Efficiency of the Transport System (TEE)								
Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£633,076		£633,076					
Vehicle operating costs	-£9,831		-£9,831					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: COMMUTING	£623,245	*(1a)*						
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£737,098		£737,098		£0			
Vehicle operating costs	-£20,643		-£20,643					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: OTHER	£716,455	*(1b)*						
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£940,348		£744,623	£195,725	£0			
Vehicle operating costs	-£27,388		-£39,728	£12,340	£0			
User charges	£0		£0	£0	£0			
During Construction & Maintenance	£0							
Subtotal	£912,960	*(2)*	£704,896	£208,065				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	£0							
Operating costs	£0							
Investment costs	£0							
Grant/subsidy	£0							
Subtotal	£0	*(3)*						
Other business impacts								
Developer contributions	£0	*(4)*	£0					
NET BUSINESS IMPACT	£912,960	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£2,252,660	*(6) = (1a) + (1b) + (5)*						
	Notes: Benefits appear as positive numbers, while costs appear as negative numbers.							
	All entries are discounted present values, in 2010 prices and values							

Table A-4: Transport Economic Efficiency (TEE) Table for Option C1

Economic Efficiency of the Transport System (TEE)								
Non-business: Commuting	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£691,987		£691,987					
Vehicle operating costs	-£10,812		-£10,812					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: COMMUTING	£681,175	*(1a)*						
Non-business: Other	**ALL MODES**		**ROAD**		**BUS and COACH**	**RAIL**		**OTHER**
User benefits	**TOTAL**		**Private Cars and LGVs**		**Passengers**	**Passengers**		
Travel time	£720,612		£720,612		£0			
Vehicle operating costs	-£19,340		-£19,340					
User charges	£0		£0					
During Construction & Maintenance	£0							
NET NON-BUSINESS BENEFITS: OTHER	£701,272	*(1b)*						
Business								
User benefits			**Goods Vehicles**	**Business Cars & LGVs**	**Passengers**	**Freight**	**Passengers**	
Travel time	£1,023,985		£843,401	£180,584	£0			
Vehicle operating costs	£1,023		-£9,944	£10,967	£0			
User charges	£0		£0	£0	£0			
During Construction & Maintenance	£0							
Subtotal	£1,025,008	*(2)*	£833,457	£191,551				
Private sector provider impacts						**Freight**	**Passengers**	
Revenue	£0							
Operating costs	£0							
Investment costs	£0							
Grant/subsidy	£0							
Subtotal	£0	*(3)*						
Other business impacts								
Developer contributions	£0	*(4)*	£0					
NET BUSINESS IMPACT	£1,025,008	*(5) = (2) + (3) + (4)*						
TOTAL								
Present Value of Transport Economic Efficiency Benefits (TEE)	£2,407,455	*(6) = (1a) + (1b) + (5)*						
	Notes: Benefits appear as positive numbers, while costs appear as negative numbers.							
	All entries are discounted present values, in 2010 prices and values							

Table A-5: Transport Economic Efficiency (TEE) Table for Option C

Appendix B. Environmental Impacts

Note – all impacts relate to the Expressway Arc between the M4 and the M11

Noise

There are 31 Noise Important Areas (NIAs) declared along the corridors. Of these, 14 are located on existing roads proposed for improvements, and 17 on existing roads proposed for upgrade to Expressway. There are a number of existing residential properties adjacent to the scheme corridor, particularly within the larger towns and cities within the scheme corridor (notably Abingdon-on-Thames, Botley, Aylesbury, Buckingham, Milton Keynes, Bedford and St Neots), and the other towns, villages and isolated properties. Further sensitive receptors are within 300m, including six care / nursing homes, a children's nursery, seven schools, a library and seven places of worship.

Based on the initial results of transport modelling traffic numbers along the upgraded route would increase, along with the speed of traffic. Where new carriageways are identified there would also be a reduction of traffic numbers travelling through existing towns such as Aylesbury, Bicester and parts of Milton Keynes. There are likely to be properties which will experience a decrease in noise levels (as the traffic noise source is moved further away) and those which will experience an increase in noise (as the traffic noise source is moved closer).

There are potential changes to traffic flows through existing Noise Important Areas (NIAs). Where existing routes through NIAs are retained and upgraded, there is potential to exacerbate noise levels at these locations due to increased traffic numbers and speeds. In these circumstances, mitigation could be implemented to minimise increases in noise emissions, including the creation of barriers and use of earth mounding / cuttings. There is also the potential for decreases in noise levels at NIAs as traffic diverts onto the Expressway.

Air Quality

There are 12 Air Quality Management Areas (AQMA) within 5km of the proposed options, including two within or immediately adjacent to the corridor options at the A34 at Oxford and the A428/A14/M11 junction. These AQMAs have been declared for exceedances of the annual mean NO_2 objective as a result of emissions from road traffic. There are road links classified under the DEFRA Pollution Climate Modelling links within or immediately adjacent to the corridor options. Of these, two are in exceedance of the annual mean NO_2 objective as a result of emissions from road traffic: the A34 to the north of Botley (40-50ugm-3 (2014)) and A34/A40 junction (40-50ugm-3 (2014)). Several further PCM links within the scheme corridor are classified as 30-40ugm-3 (2014) annual mean below the EU limit.

There are a large number of existing residential properties adjacent to the proposed options, particularly within the larger towns and cities within the scheme corridor (notably Abingdon-on-Thames, Botley, Oxford, Aylesbury, Buckingham, Milton Keynes, Bedford and St Neots), and the other towns, villages and isolated properties.

Based on the early stages of traffic modelling traffic numbers along the upgraded route would increase, along with the speed of traffic. However, there is likely to be a mixture of potential increases in vehicle traffic speed (where the current single carriageway sections are dualled) but there is also a slight speed reduction on current dualled sections due to increased traffic flow. Therefore, there is likely to be both increases and decreases in air quality pollutant concentrations at residential properties along the scheme corridor.

Depending on the corridor option taken forwards, there is an opportunity to improve air quality in existing urban areas such as Aylesbury, Botley, Bicester, Buckingham and Milton Keynes. This also has the potential to provide corresponding improvements within AQMAs and at PCM links in exceedance, or close to exceedance. However, there are also properties that are not currently subject to poor air quality that may be subject to reduced air quality with the new route being constructed nearby, or that existing properties that are subjected to poor air quality will be subjected to further deterioration due to increased traffic numbers and speeds.

Greenhouse Gases

The proposed corridor options intersect eleven local authorities. The total Greenhouse Gas emissions for these administrative areas in 2014 were 13,277ktCO_2 for all sectors. Emissions associated with transport as a whole was estimated to be 5,574ktCO_2, with A roads accounting for 2,418ktCO_2, motorways 1,547ktCO_2, minor roads 1,316ktCO_2 and Diesel Railways / Transport Other 293ktCO_2.

Traffic flow along the upgraded route would increase. As such, it is anticipated that greenhouse gas emissions will increase. In addition, the scheme has the potential to lead to increased speeds along the sections which will be upgraded from single to dual carriageway. Increased speed would have an adverse effect on emissions due to vehicles operating at lower fuel efficiency. However due to the potential increases in traffic flow the average speeds along currently dualled sections are likely to be reduced. In addition, it is anticipated that congestion would be reduced along existing and upgraded routes, and overall journey lengths would be shorter. The reduction in stop-start traffic / queueing would have a beneficial impact on greenhouse gas emissions as vehicles are operating closer to optimum efficiency. Reducing journey lengths would have a further beneficial impact on greenhouse gas emissions as vehicles would be operating for a shorter period.

Landscape

The scheme corridor runs through the North Wessex Downs AONB. The Chilterns AONB is approximately 7km south of option A, and the Cotswolds AONB approximately 7km north-west of sub-option 1 of both B and C that run west of Oxford. There are 16 Registered Parks and Gardens within 2km of the scheme corridor, including Claydon, Woburn Abbey, Croxton Park and Madingley Hall. The scheme corridor also lies within the Thames Basin Heaths, Berkshire and Marlborough Downs, Upper Thames Clay Vales, Midvale Ridge, Bedfordshire and Cambridgeshire Claylands and Bedfordshire Greensand Ridge National Character Areas.

The landscape within the scheme study contains a variety of local landscape types: open downlands, rolling farmland and pastures, terrace farmland, alluvial lowland, river meadowlands, wooded estatelands, vale farmland, Thames Open Clay Vale, wooded rolling lowlands, shallow valleys, greensand ridge and undulating clay plateau. The landcover of the landscape is dominated by arable farming, often of an intensive nature across large fields. Semi-natural habitats are present, although often fragmented. Further from the major urban areas exist areas of agricultural tranquillity that contrast heavily with the neighbouring urban areas.

Settlement and development patterns vary along the scheme corridor, from major towns and cities such as Oxford, Bicester, Aylesbury, Milton Keynes, Bedford and Cambridge, to smaller nucleated settlements and isolated farmsteads. There are already urbanising influences, including transportation corridors and development outside of urban fringe areas.

All routes pass though the North Wessex Downs AONB; the impact on this is predicted to be minor as the road is already constructed as a dual carriageway and further construction works are minimal. The construction of Option A is likely to have the most significant potential for adverse impacts due to the views from the Chilterns AONB. Further to this, those corridor options that are not along and near to existing road corridors are likely to require more mitigation and have the most potential for adverse impacts. There is an opportunity to utilise existing routes to minimise the potential impact on the Landscape.

Townscape

The corridor options have the potential to alleviate traffic in towns along the baseline route, with associated potential beneficial impacts to appearance, cultural aspects and human interaction of these townscapes. However, where the route proposals include the upgrade of the existing route from a single carriageway to Expressway through existing settlements, the adverse impact, even with mitigation, has the potential to remain significantly detrimental.

Historic Environment

There are 115 scheduled monuments within 2km of the proposed options. For all options, the already dualled A421 at Bedford intersects a Neolithic and Bronze Age mortuary complex. 16 Registered Parks and Gardens are within 2km of the proposed options, of which corridor options run immediately adjacent to Shotover (Grade I) and Croxton Park (Grade II*). There are 3698 listed buildings within 2km of the proposed options, of which 73 are Grade I, 216 are Grade II* and 3409 are Grade II. There are 78 Conservation Areas within 2km of the proposed options. The available evidence suggests that a range of archaeological features might be present (Prehistoric to Modern), although the presence of such features has not yet been confirmed.

The quality, number and distribution of Heritage Assets across the study area indicate that all of the proposed corridor options are likely to have an impact on the Historic Environment. Where the proposed corridor option reduces traffic flows through historic town centres, there is a benefit to Listed Buildings and Conservation Areas. Of particular note is the potential diversion of the proposed route away from the western Oxford bypass where there will be a potential improvement to the setting of Port Meadows Scheduled Monument and Listed Buildings in the Wolvercote area. However, where corridor options require new road construction, there are a number of assets that are potentially impacted. Quarrendon deserted villages and Civil War earthworks Scheduled Monument will potentially be traversed by proposed new sections of road in Option A, all of the B and C Options have the potential to directly impact on Magiovinium Roman Town and Fort Scheduled Monument and sub option of both B and C have the potential to directly impact Shotover Park Grade I Listed Buildings, and Park and Garden. Beyond the potential direct impact on these assets, there are also potential adverse impacts on the setting of other Listed Buildings, Parks and Gardens such as Claydon House, Eythrope Park, Woburn Abbey and individual Listed Buildings and Conservation areas in villages such as Winslow, Newton Longville, Woburn Sands and Aspley Guise.

Biodiversity

There are two Special Areas of Conservation (SACs), two Sites of Special Scientific Interest (SSSIs) and 20 non-statutory wildlife sites may be intersected by the options. Furthermore, there are 47 SSSIs, seven Local Nature Reserves and 256 non-statutory wildlife sites within 2km of the proposed options. There are a further seven SACs, 123 SSSIs, 2 National Nature Reserves and 41 Local Nature Reserves between 2 to 10km of the proposed options. There are 383 sites of Ancient Woodland within 2km of the proposed options. There are 14 priority habitat types within 2km of the scheme corridor, including Coastal and Floodplain Grazing Marsh, Deciduous Woodland, Good Quality Semi-Improved Grassland, Lowland Calcareous Grassland, Lowland Dry Acid Grassland, Lowland Fens, Lowland Heathland, Lowland Meadows, Purple Moor Grassland and Rush Pastures, Reedbeds, Saltmarsh and Traditional Orchards. As no site specific surveys have been completed at this stage, there is currently undetermined potential for protected species.

Sub-option 1 of Corridor Options B and C bisect both Oxford Meadows and Cothill Fen SACs. The A34 Oxford Western Bypass Road already passes through the SAC and the existing road is already constructed as a dual carriageway and further construction works are potentially minimal. Any increase in traffic numbers along this section of road has the potential to negatively impact on local air and water quality. The construction of a new road across Cothill Fen SAC has the potential to affect site integrity of the designation, especially as the Fen is particularly sensitive to changes in NOx, water quality and changes to surface water flows. Further to the potential impacts on the SAC, there is potential for new road construction to sever links between neighbouring areas of habitat and each corridor option includes the removal of areas of Ancient Woodland.

Water Environment

There are 39 Main Rivers, WFD waterbodies, and minor further watercourses in close proximity to the corridor options. The waterbodies are located within Rivers Ock (Thames), Thame, Cherwell, Oxon Ray, Upper Great Ouse, Ouzel and Milton Keynes, Upper Great Ouse, Grand Union Canal, Bedford Great Ouse and Lower Great Ouse operational catchments. The scheme also has the potential to adversely affect drinking and agricultural

water supplies and the ability of the watercourses to support biodiversity. Sub-option 1 of both B and C that run west of Oxford intersect both Oxford Meadows and Cothill Fen SACs.

The majority of the Scheme corridor is located within Flood Zone 1, which indicates a low risk of flooding from fluvial sources. However, all the options have sections of proposed new road / road upgrade or road improvements within a mixture of Flood Zones 2 / 3 indicating a medium/high risk of fluvial flooding. This risk is primarily associated with fluvial flooding from the watercourses along the scheme corridor. The Environment Agency's Risk of Flooding from Surface Water Map shows the majority of the Scheme corridor is at very low and low risk of flooding. However, there are isolated areas where a medium to high risk of surface water flooding has been identified.

There are water abstraction licenses from groundwater sources, and the corridor options run through a groundwater Source Protection Zones (SPZ) in the North Wessex Downs, and option A runs through an SPZ in the Woburn area, which includes an area designated as Zone 1. Generally the underlying groundwater is classified as a mixture of Major and Minor aquifers with a mixture of Low / Intermediate / High Vulnerability.

In general terms, standard measures associated with managing the quality and flow rate of surface water will mitigate the water quality impacts across the potential corridor options. However, protecting Oxford Meadows SAC, Cothill Fen SACs and the Source Protection Zone 1 at Woburn Sands will require extra mitigation measures that may not be sufficient to fully protect their respective designations.

Appendix C. Public Accounts Tables

	ROAD INFRASTRUCTURE TOTAL	
Local Government Funding		
Operating Costs	£0	
Investment Costs	£0	
Developer and Other Contributions	£0	
NET IMPACT	£0	(7)
Central Government Funding: Transport		
Operating costs	£112,498	
Investment Costs	£2,201,217	
Developer and Other Contributions	£0	
NET IMPACT	£2,313,715	(8)
Central Government Funding: Non-Transport		
Indirect Tax Revenues	£3,767	(9)
TOTALS		
Broad Transport Budget	£2,313,715	(10) = (7) + (8)
Wider Public Finances	£3,767	(11) = (9)

Table C-1: Public accounts (PA) table for Option A

	ROAD INFRASTRUCTURE TOTAL	
Local Government Funding		
Operating Costs	£0	
Investment Costs	£0	
Developer and Other Contributions	£0	
NET IMPACT	£0	(7)
Central Government Funding: Transport		
Operating costs	£129,095	
Investment Costs	£1,870,450	
Developer and Other Contributions	£0	
NET IMPACT	£1,999,546	(8)
Central Government Funding: Non-Transport		
Indirect Tax Revenues	-£20,549	(9)
TOTALS		
Broad Transport Budget	£1,999,546	(10) = (7) + (8)
Wider Public Finances	-£20,549	(11) = (9)

Table C-2: Public accounts (PA) table for Option B1

	ROAD INFRASTRUCTURE TOTAL	
Local Government Funding		
Operating Costs	£0	
Investment Costs	£0	
Developer and Other Contributions	£0	
NET IMPACT	£0	(7)
Central Government Funding: Transport		
Operating costs	£132,784	
Investment Costs	£2,058,106	
Developer and Other Contributions	£0	
NET IMPACT	£2,190,890	(8)
Central Government Funding: Non-Transport		
Indirect Tax Revenues	£2,707	(9)
TOTALS		
Broad Transport Budget	£2,190,890	(10) = (7) + (8)
Wider Public Finances	£2,707	(11) = (9)

Table C-3: Public accounts (PA) table for Option B2

	ROAD INFRASTRUCTURE TOTAL	
Local Government Funding		
Operating Costs	£0	
Investment Costs	£0	
Developer and Other Contributions	£0	
NET IMPACT	£0	(7)
Central Government Funding: Transport		
Operating costs	£118,030	
Investment Costs	£1,998,848	
Developer and Other Contributions	£0	
NET IMPACT	£2,116,878	(8)
Central Government Funding: Non-Transport		
Indirect Tax Revenues	-£54,221	(9)
TOTALS		
Broad Transport Budget	£2,116,878	(10) = (7) + (8)
Wider Public Finances	-£54,221	(11) = (9)

Table C-4: Public accounts (PA) table for Option C1

	ROAD INFRASTRUCTURE TOTAL	
Local Government Funding		
Operating Costs	£0	
Investment Costs	£0	
Developer and Other Contributions	£0	
NET IMPACT	£0	(7)
Central Government Funding: Transport		
Operating costs	£123,563	
Investment Costs	£2,181,481	
Developer and Other Contributions	£0	
NET IMPACT	£2,305,044	(8)
Central Government Funding: Non-Transport		
Indirect Tax Revenues	-£38,203	(9)
TOTALS		
Broad Transport Budget	£2,305,044	(10) = (7) + (8)
Wider Public Finances	-£38,203	(11) = (9)

Table C-5: Public accounts (PA) table for Option C2

Appendix D. Appraisal Summary Tables

Appraisal Summary Table		Date produced:	01/05/2018	Contact:	
Name of scheme:	Option A			Name	
Description of scheme:	Construction of an Expressway via Aylesbury, utilising existing roads and including the construction of a new road from Oxford to Milton Keynes			Organisation	
				Role	Promoter/Official

Impacts		Summary of key impacts	Assessment				
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The scheme is expected to provide journey time savings for many business users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway.	Value of journey time changes(£) £1114.1m Net journey time changes (£) 0 to 2min: £345.8m; 2 to 5min: £252.2m; > 5min: £516.1m				£1216.5m	
	Reliability impact on Business users	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant resilience to incidents for East-West travel and to provide more reliable journey				Neutral	N/A	
	Regeneration	Not Assessed at this stage.				N/A	N/A	
	Wider Impacts	The Wider Impact assessment of the scheme has considered Output Change from Imperfectly Competitive Markets and represents 10% of non-freight business user benefits from TUBA.					£23.9m	
Environmental	Noise	42 NIAs within 300m. Potential reduction in the no. of properties within 300m from 13527 to approx. 6204. Potential decreases in noise levels at receptors as traffic diverts onto the Expressway at 2 NIAs. Potential mitigable increases at receptors as traffic moves closer and travels at higher speeds at 5 NIAs. Potential Neutral impact overall.				Neutral	Not Done	Not Done
	Air Quality	10 AQMAs within 5km and no PCM links are in exceedance. Potential reduction in the no. of properties within 200m from 8318 to 3365. Potential decreases in AQ pollutants as traffic moves away from receptors at 4 towns. Potential increase in AQ pollutants due to higher traffic flows and speeds at some locations and neutral at 1 AQMA. Potential Neutral impact overall.				Neutral	Not Done	Not Done
	Greenhouse gases	Increases in emissions due to increase in traffic flows and speed. However, potential decreases due to reduction in congestion and journey length. Overall potential neutral impact.	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)			Neutral	Not Done	
	Landscape	Potential views from Chilterns AONB. Minimal impact on North Wessex AONB as route already dual carriageway at this location. Potentially visually intrusive and disruption of views across the area. Proposals are likely to degrade the landscape pattern, cultural associations and tranquillity of the landscape due to the new Expressway, although mitigable in places.				Moderate Adverse	Not Done	
	Townscape	Potential severance in both Tiddington and Gibraltar due to online improvements; limited options for mitigation. Potential for severance between villages e.g. Aspley Guise, Church End, Woburn and Brickhill, due to the new road potentially being constructed between them. Alleviates traffic in 5 towns with potential beneficial impacts to appearance, cultural aspects and human interaction of these				Large Adverse	Not Done	
	Historic Environment	Direct impact on deserted Quarrendon Village SM; a potential change in form, survival and condition. Indirect impacts on the Context of assets e.g. Woburn Abbey and Gardens, and Hartwell House and Grounds. High potential for disturbance of buried known and unknown archaeology through undisturbed				Large Adverse	Not Done	
	Biodiversity	No direct impacts to national or international sites are predicted. There are 9 SACs, 132 SSSIs, two NNRs and 41 LNRs within 10km. Potential direct impacts on 8 non-statutory wildlife sites and 8 types of Priority Habitat. There are potential undetermined effects on protected species.				Moderate Adverse	Not Done	
	Water Environment	Traverses 22 Main Rivers and WFD Waterbodies, and 2 SPZs. There are both surface and groundwater abstractions for public water supply and irrigation, impacts likely mitigable. Surrounding areas are classified as a mixture of Flood Risk Zone 1, 2 and 3 and the Scheme will ensure no overall increase in flood risk.				Slight Adverse	Not Done	

Social	Commuting and Other users	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway	**Value of journey time changes(£)** £1416.0m **Net journey time changes (£)** 0 to 2min: £495.8m; 2 to 5min: £419.6m; > 5min: £500.6m		£1400.6m	
	Reliability impact on Commuting and Other	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant		Neutral	N/A	
	Physical activity	It is unlikely the scheme will result in a signifcant mode shift to or from active modes, and is therefore assessed as neutral		Neutral	N/A	
	Journey quality	The scheme is expected to improve traveller car through new VMS provision and improved signing, providing greater information for travellers. The scheme is also likely to reduce accidents and congestion, thus reducing driver frustration. As such the scheme is scored as a "Slight Beneficial".		Slight Beneficial	N/A	
	Accidents	Through moving traffic away from congested parallel routes to use the new expressway the scheme is expected to deliver significant accident benefits. These have been assessed using COBALT, overall 1,100 accidents are predicted to be prevented due to the scheme.			£74.8m	
	Security	The scheme will provide improved surveillance, lighting and visibilty as well as providing more facilities for emergency calls, all beneficial to traveller's security.		Slight Beneficial		
	Access to services	The scheme is not anticipated to introduce or reduce public transport provision along the corridor, however, the scheme should lead to faster, more consistent journey times and as such have a positive impact.		Slight Beneficial		
	Affordability	The User Benefit assessment for this scheme has captured the changes in journey times and vehicle operating costs, demonstrating a reduction in travel costs. However public transport fares, parking costs and road user charges are unlikely to change as a result of the scheme.		Slight Benefitical		
	Severance	It is not envisiaged that the scheme will cause any severance issues		Neutral		
	Option and non-use values	The scheme does not include any direct public transport provisions, as such this impact is anticipated to be neutral.		Neutral		
Public Account	Cost to Broad Transport Budget	Scheme costs have been estimated in line with the Highways England Cost Manual and will be provided by central government			£2313.7m	
	Indirect Tax Revenues	Indirect Tax revenues have been calaculated as part of the TUBA economics of the scheme.			£3.8m	

Appraisal Summary Table		Date produced:	01/05/2018	Contact:	
Name of scheme:	Option B1			Name	
Description of scheme:	Construction of an Expressway following the broad alignment of East West Rail, utilising existing roads and including the construction of a new road from Oxford to Milton Keynes. Includes sub option around the west of Oxford			Organisation	
				Role	Promoter/Official

Impacts		Summary of key impacts	Assessment				
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway.	Value of journey time changes(£) £1014.5m Net journey time changes (£) 0 to 2min: £374.2m; 2 to 5min: £194.1m; > 5min: £446.3m				£1043.1m	
	Reliability impact on Business users	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant resilience to incidents for East-West travel and to provide more reliable journey				Neutral	N/A	
	Regeneration	Not Assessed at this stage.				N/A	N/A	
	Wider Impacts	The Wider Impact assessment of the scheme has considered Output Change from Imperfectly Competitive Markets and represents 10% of non-freight business user benefits from TUBA.					£22.0m	
Environmental	Noise	29 NIAs within 300m. Potential reduction in the number of properties within 300m from 13527 to approx. 7016. Potential decreases in noise levels at receptors as traffic diverts onto the Expressway at 4 NIAs. Potential mitigable increases at receptors as traffic moves closer and travels at higher speeds at 7 NIAs. Potential Neutral impact overall.				Neutral	Not Done	Not Done
	Air Quality	9 AQMAs within 5km and one PCM link in exceedance. Potential reduction in the no. of properties within 200m from 8318 to 3924. Potential decreases in AQ pollutants as traffic moved away from receptors at 1 AQMA and 1 PCM link. Potential increase in AQ pollutants due to higher traffic flows and speeds at some locations and neutral at 1 AQMA. Potential Neutral impact overall.				Neutral	Not Done	Not Done
	Greenhouse gases	Increases in emissions due to increase in traffic flows and speed. However, potential decreases due to reduction in congestion and journey length. Overall potential neutral impact.	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)			Neutral	Not Done	
	Landscape	Minimal impact on North Wessex AONB as route already dual carriageway at this location. Potential visually intrusive and disruption of views across the area. Proposals are likely to degrade the landscape pattern and tranquillity particularly between Bicester and Newton Longville, and in the Woburn Sands area. Cultural associations may also be affected by the new Expressway.				Slight Adverse	Not Done	
	Townscape	Alleviates traffic in 2 towns with potential beneficial impacts to appearance, cultural aspects and human interaction of these townscapes. Potential for severance between villages due to the new road potentially being construction between them.				Slight Adverse	Not Done	
	Historic Environment	Indirect impact on the Magiovinium Roman Town and Fort SM; potential change in form, survival and setting. Indirect impacts on the context of assets e.g. Claydon House and Gardens, and Wolvercote / Port Meadows. High potential for disturbance of buried known and unknown archaeology through undisturbed				Moderate Adverse	Not Done	
	Biodiversity	Potential direct adverse impacts to Cothill Fen SAC and Oxford Meadows SAC, potentially difficult to fully mitigate. There are a further five SACs, 136 SSSIs, one NNR and 42 LNRs within 10km. Potential direct impact on 8 non-statutory wildlife sites and 4 types of priority habitat. There are potential undetermined effects on				Large Adverse	Not Done	
	Water Environment	The route option passes over water related Oxford Meadows and Cothill Fen Sacs. Traverses 27 Main Rivers and WFD Waterbodies, and 1 SPZ. There are both surface and groundwater abstractions for public water supply and agricultural irrigation. Surrounding areas are classified as a mixture of Flood Risk Zone 1, 2 and 3 and the Scheme will ensure no overall increase in flood risk.				Moderate Adverse	Not Done	

Social	Commuting and Other users	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway	**Value of journey time changes(£)** £1384.3m **Net journey time changes (£)** 0 to 2min: £473.4m; 2 to 5min: £320.6m; > 5min: £590.3m		£1382.2m	
	Reliability impact on Commuting and Other users	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant resilience to incidents for East-West travel and to provide more reliable journey		Neutral		
	Physical activity	It is unlikely the scheme will result in a signifcant mode shift to or from active modes, and is therefore assessed as neutral.		Neutral		
	Journey quality	The scheme is expected to improve traveller car through new VMS provision and improved signing, providing greater information for travellers. The scheme is also likely to reduce accidents and congestion, thus reducing driver frustration. As such the scheme is scored as a "Slight Beneficial".		Slight Beneficial		
	Accidents	Through moving traffic away from congested parallel routes to use the new expressway the scheme is expected to deliver significant accident benefits. These have been assessed using COBALT, overall 1,763 accidents are predicted to be			£99.5m	
	Security	The scheme will provide improved surveillance, lighting and visibilty as well as providing more facilities for emergency calls, all beneficial to traveller's security.		Slight Beneficial		
	Access to services	The scheme is not anticipated to introduce or reduce public transport provision along the corridor, however, the scheme should lead to faster, more consistent journey times and as such have a positive impact.		Slight Beneficial		
	Affordability	The User Benefit assessment for this scheme has captured the changes in journey times and vehicle operating costs, demonstrating a reduction in travel costs. However public transport fares, parking costs and road user charges are unlikely to change as a result of the scheme.		Slight Benefitical		
	Severance	It is not envisiaged that the scheme will cause any severance issues.		Neutral		
	Option and non-use values	The scheme does not include any direct public transport provisions, as such this impact is anticipated to be neutral.		Neutral		
Public Accoun	Cost to Broad Transport Budget	Scheme costs have been estimated in line with the Highways England Cost Manual and will be provided by central government.			£1999.5m	
	Indirect Tax Revenues	Indirect Tax revenues have been calaculated as part of the TUBA economics of the scheme			-£20.6m	

Appraisal Summary Table		Date produced:	01/05/2018	Contact:	
Name of scheme:	Option B2			Name	
Description of scheme:	Construction of an Expressway following the broad alignment of East West Rail, utilising existing roads and including the construction of a new road from Oxford to Milton Keynes. Includes the construction of a new road to the east of Oxford.			Organisation	
				Role	Promoter/Official

Impacts		Summary of key impacts	Assessment					
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway.	Value of journey time changes(£) £1024.3m Net journey time changes (£) 0 to 2min: £278.6m; 2 to 5min: £159.2m; > 5min: £586.5m				£1084.3m	
	Reliability impact on Business users	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant resilience to incidents for East-West travel and to provide more reliable journey				Neutral	N/A	
	Regeneration	Not Assessed at this stage.				N/A	N/A	
	Wider Impacts	The Wider Impact assessment of the scheme has considered Output Change from Imperfectly Competitive Markets and represents 10% of non-freight business user benefits from TUBA.					£19.5m	
Environmental	Noise	29 NIAs within 300m. Potential reduction in the number of properties within 300m from 13527 to approx. 6843. Potential decreases in noise levels at 4 NIAs as traffic flows divert onto the Expressway. Potentially mitigable increases at receptors as traffic moves closer and travels at higher speeds at 6 NIAs. Potential Neutral				Neutral	Not Done	Not Done
	Air Quality	7 AQMAs within 5km and no PCM links in exceedance. Potential reduction in the no. of properties within 200m from 8318 to 3792. Potential decreases in AQ pollutants as traffic moved away from receptors at 2 AQMAs and 1 PCM link. Potential increase in AQ pollutants due to higher traffic flows and speeds at some locations and neutral at 1 AQMA. Potential Neutral impact overall.				Neutral	Not Done	Not Done
	Greenhouse gases	Increases in emissions due to increase in traffic flows and speed. However, potential decreases due to reduction in congestion and journey length. Overall neutral impact.	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)			Neutral	Not Done	
	Landscape	Minimal impact on North Wessex AONB as route already dual carriageway at this location. Potential visually intrusive and disruption of views across the area, but largely mitigable. Proposals are likely to degrade the landscape pattern and tranquillity particularly between Bicester and Newton Longville, and in the Woburn Sands area. Cultural associations may also be affected by the new Expressway.				Slight Adverse	Not Done	
	Townscape	Alleviates traffic in 4 towns with potential beneficial impacts to appearance, cultural aspects and human interaction of these townscapes. Potential for severance between villages e.g. Arncott, Wheatley, Newton Longville and Woburn Sands due to the new road potentially being constructed between them.				Slight Adverse	Not Done	
	Historic Environment	Indirect impact on Shotover Park Grade I LB and P&G, and the Magiovinium Roman Town and Fort SM; potential change in form, survival and setting. Indirect impacts on the context of further assets e.g. Wheatley village and Holton House and Claydon House I LB and P&G. Potential benefits on other assets e.g. Wolvercote / Port Meadows by reducing nearby traffic numbers. High potential for disturbance of buried known and unknown archaeology through undisturbed				Moderate Adverse	Not Done	
	Biodiversity	No direct impacts to national or international sites are predicted. 7 Special Areas of Conservation, 134 SSSIs, 2 NNRs and 40 LNRs within 10km. Potential direct impact on 11 non-statutory wildlife sites and 3 types of priority habitats. There are potential undetermined effects on protected species.				Moderate Adverse	Not Done	
	Water Environment	Traverses 22 Main Rivers and WFD Waterbodies, and 1 SPZ. There are both surface and groundwater abstractions for public water supply and agricultural irrigation, impacts likely mitigable. Surrounding areas are classified as a mixture of Flood Risk Zone 1, 2 and 3 and the Scheme will ensure no overall increase in flood				Slight Adverse	Not Done	

Social	Commuting and Other users	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway.	**Value of journey time changes(£)** £1406.4m 0 to 2min £434.4m; 2 to 5min £332.9m; > 5min £639.1m		£1422.8m	
	Reliability impact on Commuting and Other	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant		Neutral		
	Physical activity	It is unlikely the scheme will result in a signifcant mode shift to or from active modes, and is therefore assessed as neutral.		Neutral		
	Journey quality	The scheme is expected to improve traveller car through new VMS provision and improved signing, providing greater information for travellers. The scheme is also likely to reduce accidents and congestion, thus reducing driver frustration. As such the scheme is scored as a "Slight Beneficial".		Slight Beneficial		
	Accidents	Through moving traffic away from congested parallel routes to use the new expressway the scheme is expected to deliver significant accident benefits. These have been assessed using COBALT, overall 1,313 accidents are predicted to be prevented due to the scheme.			£65.9m	
	Security	The scheme will provide improved surveillance, lighting and visibilty as well as providing more facilities for emergency calls, all beneficial to traveller's security.		Slight Beneficial		
	Access to services	The scheme is not anticipated to introduce or reduce public transport provision along the corridor, however, the scheme should lead to faster, more consistent journey times and as such have a positive impact.		Slight Beneficial		
	Affordability	The User Benefit assessment for this scheme has captured the changes in journey times and vehicle operating costs, demonstrating a reduction in travel costs. However public transport fares, parking costs and road user charges are unlikely to change as a result of the scheme.		Slight Benefitical		
	Severance	It is not envisiaged that the scheme will cause any severance issues.		Neutral		
	Option and non-use values	The scheme does not include any direct public transport provisions, as such this impact is anticipated to be neutral.		Neutral		
Public Accoun	Cost to Broad Transport Budget	Scheme costs have been estimated in line with the Highways England Cost Manual and will be provided by central government.			£2190.9m	
	Indirect Tax Revenues	Indirect Tax revenues have been calaculated as part of the TUBA economics of the scheme			£2.7m	

Appraisal Summary Table		Date produced:	01/05/2018	Contact:	
Name of scheme:	Option C1			Name	
Description of scheme:	Construction of an Expressway via Buckingham, utilising existing roads, particularly the A421, and including the construction of new roads. Western route around Oxford sub option			Organisation	
				Role	Promoter/Official

Impacts		Summary of key impacts	Assessment			
			Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway	Value of journey time changes(£) £940.3m Net journey time changes (£) 0 to 2min: £343.8m; 2 to 5min: £193.3m; >5min: £403.2m		£913.0m	
	Reliability impact on Business users	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant resilience to incidents for East-West travel and to provide more reliable journey		Neutral	N/A	
	Regeneration	Not Assessed at this stage		N/A	N/A	
	Wider Impacts	The Wider Impact assessment of the scheme has considered Output Change from Imperfectly Competitive Markets and represents 10% of non-freight business user benefits from TUBA			£20.8m	
Environmental	Noise	38 NIAs within 300m. Potential reduction in the no. of properties within 300m from 13527 to approx. 8107. Potential decreases in noise levels at receptors as traffic diverts onto the Expressway at 4 NIAs. Potential mitigable increases at receptors as traffic moves closer and travels at higher speeds at 7 NIAs. Potential Neutral		Neutral	Not Done	Not Done
	Air Quality	9 AQMAs within 5km and 1 PCM link in exceedance. Potential reduction in the no. of properties within 200m from 8318 to 3685. Potential decreases in AQ pollutants as traffic moves away from 1 AQMA and 1PCM link in exceedance. Potential increase in AQ pollutants due to higher traffic flows and speeds at some locations and neutral at 1 AQMA. Potential Neutral impact overall.		Neutral	Not Done	Not Done
	Greenhouse gases	Increases in emissions due to increase in traffic flows and speed. However, potential decreases due to reduction in congestion and journey length. Overall	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Neutral	Not Done	
	Landscape	Minimal impact on North Wessex AONB route already dual carriageway. Potential visually intrusive and disruption of views across the area. Proposals are likely to degrade the landscape pattern and tranquillity particularly in the Woburn Sands area. Cultural associations may also be affected by the new Expressway. Impacts largely		Neutral	Not Done	
	Townscape	Alleviates traffic in 3 towns with potential beneficial impacts to appearance, cultural aspects and human interaction of these townscapes. Potential for increases in traffic through Buckingham and for severance between villages e.g. Newton Longville and Woburn Sands.		Slight Adverse	Not Done	
	Historic Environment	Indirect impact on the Magiovinium Roman Town and Fort SM; potential change in form, survival and setting. Indirect impacts on the context of assets e.g. Wolvercote / Port Meadows. High potential for disturbance of buried known and unknown archaeology through undisturbed greenfield area.		Moderate Adverse	Not Done	
	Biodiversity	Potential direct impacts to Cothill Fen SAC and Oxford Meadows SAC that may be difficult to fully mitigate. There are a further five SACs, 136 SSSIs, one NNR and 42 LNRs within 10km. Potential direct impact on 9 non-statutory wildlife sites and 4 priority habitats. Potential undetermined effects on protected species.		Large Adverse	Not Done	
	Water Environment	The route option passes over water related Oxford Meadows and Cothill Fen Sacs. Traverses 27 Main Rivers and WFD Waterbodies, and 1 SPZ. Mitigable impacts on surface and groundwater abstractions for public water supply and agricultural irrigation. Surrounding areas are classified as a mixture of Flood Risk Zone 1, 2 and 3 and the Scheme will ensure no overall increase in flood risk.		Moderate Adverse	Not Done	

Social	Commuting and Other users	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway	**Value of journey time changes(£)** £1370.2m **Net journey time changes (£)** 0 to 2min: £467.2m; 2 to 5min: £344.1m; > 5min: £558.9m		£1339.7m
	Reliability impact on Commuting and Other	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant		Neutral	
	Physical activity	It is unlikely the scheme will result in a signifcant mode shift to or from active modes, and is therefore assessed as neutral		Neutral	
	Journey quality	The scheme is expected to improve traveller car through new VMS provision and improved signing, providing greater information for travellers. The scheme is also likely to reduce accidents and congestion, thus reducing driver frustration. As such the scheme is scored as a "Slight Beneficial".		Slight Beneficial	
	Accidents	Through moving traffic away from congested parallel routes to use the new expressway the scheme is expected to deliver significant accident benefits. These have been assessed using COBALT, overall 1,812 accidents are predicted to be prevented due to the scheme.			£107.6m
	Security	The scheme will provide improved surveillance, lighting and visibilty as well as providing more facilities for emergency calls, all beneficial to traveller's security.		Slight Beneficial	
	Access to services	The scheme is not anticipated to introduce or reduce public transport provision along the corridor, however, the scheme should lead to faster, more consistent journey times and as such have a positive impact.		Slight Beneficial	
	Affordability	The User Benefit assessment for this scheme has captured the changes in journey times and vehicle operating costs, demonstrating a reduction in travel costs. However public transport fares, parking costs and road user charges are unlikely to change as a result of the scheme.		Slight Benefitical	
	Severance	It is not envisiaged that the scheme will cause any severance issues		Neutral	
	Option and non-use values	The scheme does not include any direct public transport provisions, as such this impact is anticipated to be neutral.		Neutral	
Public Account	Cost to Broad Transport Budget	Scheme costs have been estimated in line with the Highways England Cost Manual and will be provided by central government			£2116.9m
	Indirect Tax Revenues	Indirect Tax revenues have been calaculated as part of the TUBA economics of the scheme.			-£54.2m

Appraisal Summary Table		Date produced:	01/05/2018	Contact:	
Name of scheme:	Option C2			Name	
Description of scheme:	Construction of an Expressway via Buckingham, utilising existing roads, particularly the A421, and including the construction of new roads. Construction of new road to the east of Oxford			Organisation	
				Role	Promoter/Official

Impacts		Summary of key impacts	Assessment				
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway.	Value of journey time changes(£) £1024.0m Net journey time changes (£) 0 to 2min: £252.6m; 2 to 5min: £171.7m; >5min: £599.7m				£1025.0m	
	Reliability impact on Business users	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant resilience to incidents for East-West travel and to provide more reliable journey				Neutral	N/A	
	Regeneration	Not Assessed at this stage.				N/A	N/A	
	Wider Impacts	The Wider Impact assessment of the scheme has considered Output Change from Imperfectly Competitive Markets and represents 10% of non-freight business user benefits from TUBA.					£19.2m	
Environmental	Noise	38 NIAs within 300m. Potential reduction in the number of properties within 300m from 13527 to approx. 7903. Potential decreases in noise levels at 3 NIAs and 1 town as traffic flows divert onto the Expressway. Potential mitigable increases at receptors as traffic moves closer and travels at higher speeds at 6 NIAs. Potential Slight beneficial impacts overall.				Slight Benefit	Not Done	Not Done
	Air Quality	7 AQMAs within 5km and no PCM links in exceedance. Potential reduction in the no. of properties within 200m from 8318 to 4760. Potential decreases in AQ pollutants as traffic moved away from receptors at 2 AQMAs and 1 PCM link. Potential increase in AQ pollutants due to higher traffic flows and speeds at some locations and neutral at 1 AQMA. Potential Slight beneficial impact overall.				Slight Benefit	Not Done	Not Done
	Greenhouse gases	Increases in emissions due to increase in traffic flows and speed. However, potential decreases due to reduction in congestion and journey length. Overall neutral impact	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)			Neutral	Not Done	
	Landscape	Minimal impact on North Wessex AONB route already dual carriageway. Potential mitigable visually intrusive and disruption of views across the area. Proposals are not likely to further degrade the landscape pattern and tranquillity. However, potential impacts along the Midvale Ridge and through the Woburn Sands area. Cultural associations may also be affected by the new Expressway.				Slight Adverse	Not Done	
	Townscape	Alleviates traffic in 3 towns with potential beneficial impacts to appearance, cultural aspects and human interaction of these townscapes. Potential for increases in traffic through Buckingham and for severance between villages e.g. Newton Longville and Woburn Sands.				Slight Adverse	Not Done	
	Historic Environment	Indirect impact on Shotover Park Grade I Listed Buildings, and Park and Garden, and the Magiovinium Roman Town and Fort SM; potential change in form, survival and setting. Indirect impacts on the context of assets e.g. Alchester Roman Fort. Potential benefit to context of Wolvercote / Port Meadows. High potential for disturbance of buried known and unknown archaeology through undisturbed				Moderate Adverse	Not Done	
	Biodiversity	No direct impacts to national or international sites are predicted. 7 Special Areas of Conservation, 138 SSSIs, 2 NNRs and 42 LNRs within 10km. Potential direct impact on 12 non-statutory wildlife sites and 3 types of priority habitats. There are potential undetermined effects on protected species.				Moderate Adverse	Not Done	
	Water Environment	Traverses 20 Main Rivers and WFD Waterbodies, and 1 SPZ. Potential mitigable impacts on surface and groundwater abstractions for public water supply and agricultural irrigation. Surrounding areas are classified as a mixture of Flood Risk Zone 1, 2 and 3 and the Scheme will ensure no overall increase in flood risk.				Slight Adverse	Not Done	

Social	Commuting and Other users	The scheme is expected to provide journey time savings for many users through providing a new high speed E-W link and completing the missing gap of the Oxford-Cambridge Expressway.	**Value of journey time changes(£)** £1412.6m **Net journey time changes (£)** 0 to 2min: £402.6m; 2 to 5min: £302.1m; > 5min: £707.9m		£1383.3m	
	Reliability impact on Commuting and Other	A stress based approach has been taken to Journey Time Reliability which provides a "neutral" assessment score. However, the scheme is likey to provide significant		Neutral		
	Physical activity	It is unlikely the scheme will result in a signifcant mode shift to or from active modes, and is therefore assessed as neutral.		Neutral		
	Journey quality	The scheme is expected to improve traveller car through new VMS provision and improved signing, providing greater information for travellers. The scheme is also likely to reduce accidents and congestion, thus reducing driver frustration. As such the scheme is scored as a "Slight Beneficial".		Slight Beneficial		
	Accidents	Through moving traffic away from congested parallel routes to use the new expressway the scheme is expected to deliver significant accident benefits. These have been assessed using COBALT, overall 1,256 accidents are predicted to be prevented due to the scheme.			£70.4m	
	Security	The scheme will provide improved surveillance, lighting and visibilty as well as providing more facilities for emergency calls, all beneficial to traveller's security.		Slight Beneficial		
	Access to services	The scheme is not anticipated to introduce or reduce public transport provision along the corridor, however, the scheme should lead to faster, more consistent journey times and as such have a positive impact.		Slight Beneficial		
	Affordability	The User Benefit assessment for this scheme has captured the changes in journey times and vehicle operating costs, demonstrating a reduction in travel costs. However public transport fares, parking costs and road user charges are unlikely to change as a result of the scheme.		Slight Benefitical		
	Severance	It is not envisiaged that the scheme will cause any severance issues.		Neutral		
	Option and non-use values	The scheme does not include any direct public transport provisions, as such this impact is anticipated to be neutral.		Neutral		
Public Accoun	Cost to Broad Transport Budget	Scheme costs have been estimated in line with the Highways England Cost Manual and will be provided by central government.			£2305.0m	
	Indirect Tax Revenues	Indirect Tax revenues have been calaculated as part of the TUBA economics of the scheme			-£38.2m	

Appendix E. Analysis of Monetised Costs and Benefits

Noise		*(12)*
Local Air Quality		*(13)*
Greenhouse Gases		*(14)*
Journey Ambience	£0	*(15)*
Accidents	£74,835	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£621,565	*(1a)*
Economic Efficiency: Consumer Users (Other)	£779,022	*(1b)*
Economic Efficiency: Business Users and Providers	£1,216,541	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-£3,767	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Reliabilty		*(18)*
Present Value of Benefits (see notes) (PVB)	£2,688,196	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)+(18)*
Broad Transport Budget	£2,313,715	*(10)*
Present Value of Costs (see notes) (PVC)	£2,313,715	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£374,481	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.2	BCR=PVB/PVC

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

Table E-1: AMCB Table for Option A (£ 000's)

Noise		*(12)*
Local Air Quality		*(13)*
Greenhouse Gases		*(14)*
Journey Ambience		*(15)*
Accidents	£99,485	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£602,705	*(1a)*
Economic Efficiency: Consumer Users (Other)	£799,473	*(1b)*
Economic Efficiency: Business Users and Providers	£1,043,065	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£20,549	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Reliabilty		*(18)*
Present Value of Benefits (see notes) (PVB)	£2,565,277	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)+(18)*
Broad Transport Budget	£1,999,546	*(10)*
Present Value of Costs (see notes) (PVC)	£1,999,546	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£565,731	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.3	BCR=PVB/PVC

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

Table E-2: AMCB Table for Option B1 (£ 000's)

Noise		*(12)*
Local Air Quality		*(13)*
Greenhouse Gases		*(14)*
Journey Ambience		*(15)*
Accidents	£65,935	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£648,989	*(1a)*
Economic Efficiency: Consumer Users (Other)	£773,807	*(1b)*
Economic Efficiency: Business Users and Providers	£1,084,287	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	-£2,707	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Reliabilty		*(18)*
Present Value of Benefits (see notes) (PVB)	£2,570,311	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)+(18)*
Broad Transport Budget	£2,190,890	*(10)*
Present Value of Costs (see notes) (PVC)	£2,190,890	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£379,421	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.2	BCR=PVB/PVC

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

Table E-3: AMCB Table for Option B2 (£ 000's)

Noise		*(12)*
Local Air Quality		*(13)*
Greenhouse Gases		*(14)*
Journey Ambience		*(15)*
Accidents	£107,564	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£623,245	*(1a)*
Economic Efficiency: Consumer Users (Other)	£716,455	*(1b)*
Economic Efficiency: Business Users and Providers	£912,960	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£54,221	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Reliabilty		*(18)*
Present Value of Benefits (see notes) (PVB)	£2,414,445	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)+(18)*
Broad Transport Budget	£2,116,878	*(10)*
Present Value of Costs (see notes) (PVC)	£2,116,878	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£297,567	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.1	BCR=PVB/PVC

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

Table E-4: AMCT Table for Option C1 (£ 000's)

Noise		*(12)*
Local Air Quality		*(13)*
Greenhouse Gases		*(14)*
Journey Ambience		*(15)*
Accidents	£70,404	*(16)*
Economic Efficiency: Consumer Users (Commuting)	£681,175	*(1a)*
Economic Efficiency: Consumer Users (Other)	£701,272	*(1b)*
Economic Efficiency: Business Users and Providers	£1,025,008	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£38,203	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Option Values		*(17)*
Reliabilty		*(18)*
Present Value of Benefits (see notes) (PVB)	£2,516,062	*(PVB) = (12) + (13) + (14) + (15) + (16) + (1a) + (1b) + (5) + (17) - (11)+(18)*
Broad Transport Budget	£2,305,044	*(10)*
Present Value of Costs (see notes) (PVC)	£2,305,044	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	£211,018	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	1.1	BCR=PVB/PVC

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

Table E-5: AMCB Table for Option C2 (£ 000's)

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Registered office Bridge House,
1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363