# Carterton-Witney-Oxford Rail Corridor

# Economic Appraisal

**Final Report**

West Oxfordshire District Council

26 June 2025

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## Disclaimer

This economic appraisal has been prepared based on publicly available information and information supplied by third parties. The analysis and interpretation of information and conclusions are based on current conditions, views and guidance which may be subject to change. Lichfields has relied upon the accuracy of data and other information supplied without independent verification. The analysis in this economic appraisal draws on guidance set out by the Department for Transport and HM Treasury prior to May 2025 and does not account for any emerging and published changes to the guidance since this date. Estimates of economic impacts and the underlying assumptions are illustrative and do not constitute forecasts.

# 1.0 Introduction

1.1 The reinstatement of the Carterton-Witney-Oxford Rail Corridor (CWORC) has been explored for a number of years, starting in the early 2000s with the 2001 pre-feasibility study and 2009 Rail Delivery Group study. In 2014 the Witney Oxford Transport Group (WOTG) was established to further explore the potential delivery of the CWORC. In the past five years, a number of studies have been undertaken including an engineering feasibility assessment in 2021 followed by a Strategic Outline Case (SOC) 'Lite' in 2023[1].

1.2 The scheme comprises a heavy rail connection between Oxford and Carterton with intermediate stops at Eynsham and Witney. The reinstatement of the rail line will seek to address the severe and worsening congestion on the A40, which is set to reach capacity in 2031[2]. Road improvements alone are not enough to alleviate congestion, particularly as the scope of proposed upgrades to the A40 have been reduced until further funding can be secured. Investment in a sustainable mass transit solution will not only help address growing pressures on the road network but will support West Oxfordshire District Council (WODC) meet the needs of a growing population and achieve its net zero targets.

1.3 The proposed corridor broadly follows the path of the former Oxford, Witney, Fairford Railway. The SOC Lite established six route alignment options, which have been considered within this study. A map of these alignments is provided in Figure 1.1.

Figure 1.1 Route Alignment Options


Source: Cadenza (2023). Shortlisted options outlined in green.

1.4 The purpose of this study is to reassess and broaden the assessment of economic benefits, beyond those assessed within the SOC Lite. The reappraisal of the economic analysis has been aligned to the latest Department for Transport (DfT) Transport Appraisal Guidance (TAG) and extended to provide a more robust assessment of Value for Money (VfM).

[1] Cadenza Transport Consulting (2023) Carterton-Witney-Oxford Rail Corridor Study: Strategic Outline Case Lite
[2] AECOM (2021) A40 Smart Corridor Scheme

1.5 This report is structured as follows:

- **Section 2.0:** Project narrative
- **Section 3.0:** Approach to the study
- **Section 4.0:** Appraisal approach and assumptions
- **Section 5.0:** Economic appraisal
- **Section 6.0:** Sensitivity testing
- **Section 7.0:** Summary of findings and next steps

# 2.0 Project narrative

2.1 The proposed scheme routes from Carterton, through the towns of Witney and Eynsham, and connecting onward to the main line to Oxford. Carterton, Witney and Eynsham are key population centres within this area of West Oxfordshire District, each with their own distinct characteristics:

- **Carterton** is the largest centre along the corridor, and serves a number of smaller settlements including Alvescot, Langford and Aston, which in total have a population of 25,244[3]. The establishment of RAF Brize Norton as the nation's main RAF base has been a key factor for growth in the town and is a major employer. Carterton has high levels of economic activity with key economic sectors including transport and storage, education and manufacturing.
- **Witney** is a smaller town by land area but has a larger population of over 29,600[4] people. Although there are lower levels of unemployment compared to the District average, some pockets of deprivation have been identified.
- **Eynsham** is the smallest settlement along the rail corridor, with a population of over 8,800[5] within the town and the smaller settlements it serves. The area is earmarked for significant growth through the Salt Cross Garden Village.

2.2 Carterton-Witney-Eynsham is a corridor with significant growth potential which is currently constrained by infrastructure capacity, particularly on the A40. Owing to its proximity to Oxford, the area has the potential to accommodate growth and attract further investment, however, significant levels of congestion on the A40 have in recent years stifled any growth potential.

2.3 The A40 is already close to capacity and planned growth will put the road under more pressure. Efforts have been made to secure funding for improvements to the A40, through the Housing Infrastructure Fund and Local Growth Funds. However, increased scheme costs due to inflationary pressures have meant that these improvements have been scaled back. While some pressures on the A40 will be relieved, the A40 is forecast to reach capacity by 2031, increasing journey times by as much as 30 minutes[6]. These pressures could potentially worsen with a reduced A40 scheme but would require detailed transport modelling to confirm. Once the A40 reaches capacity, additional growth would not be realised in the desired timescales, leading to sub-optimal economic outcomes. Without any wider transport interventions, demand for car usage in the corridor will only increase, putting further strain on the A40.

2.4 As a result of the existing infrastructure constraints, additional housing supply has been limited, leading to increased house prices and impacting on affordability. The corridor is located adjacent to the Oxfordshire Knowledge Spine, and should be able to attract skilled labour, particularly those working in and around Oxford. A lack of affordable housing has been a critical factor in the area being unable to retain and attract skilled labour.

[3] Based on ONS Census 2021 data for the following wards: Alvescot and Filkins, Bampton and Clanfield, Brize Norton and Shilton, Carterton North East, Carterton North West and Carterton South

[4] Based on ONS Census 2021 data for the following wards: Witney Central, Witney East, Witney North, Witney South and Witney West

[5] Based on ONS Census 2021 data for the following wards: Ducklington and Eynsham and Cassington

[6] AECOM (2021) A40 Smart Corridor Scheme

2.5 The Chancellor, in a speech outlining the Government's plans to kickstart economic growth, confirmed that Oxford and its surrounds will continue to be a priority growth area[7]. The Government has re-established the importance of the Oxford-Cambridge (OxCam) Arc, labelling it at *"the UK's Silicon Valley"*. The corridor will attract investment into innovative sectors such as AI, life sciences and semiconductors, underpinning the country's research & development industries and acting as a catalyst for growth.

2.6 The Carterton-Witney-Eynsham corridor is already home to a number of these sectors, including the Siemens Healthineers facility in Eynsham, that designs and manufactures medical technology. The corridor's proximity to major science parks including Begbroke Science Park and the Oxford Science Park, makes it attractive for future growth. The Government's policy is clear in its direction, and the Carterton-Witney-Eynsham corridor could use the latest policy position as a platform to build on its strengths and leverage growth meeting both government priorities and emerging District priorities.

2.7 The scheme presents a significant opportunity to deliver a sustainability-led transport solution, through the adoption of carbon efficient rolling stock such as battery-operated train. By reducing operational emissions and minimising the environmental footprint of new rail infrastructure, the scheme provides a platform for sustainable economic growth, enhancing regional connectivity whilst aligning with national and local commitments to Net Zero.

2.8 Investment into the CWORC will help to alleviate the significant pressure being placed on the A40 and create much needed capacity to enable housing and economic growth to come forward and allow West Oxfordshire to meet its sustainability ambitions. This scheme is an opportunity for West Oxfordshire District Council to take a corridor-based approach by delivering infrastructure interventions alongside development interventions to concentrate activity along a key transit route, thereby improving access to jobs, education and opportunities. It would also allow significant development potential to be unlocked, supporting delivery of much needed homes and jobs with easy access to public transport.

[7] HM Treasury (29 January 2025) Chancellor vows to go further and faster to kickstart economic growth: Chancellor of the Exchequer Rachel Reeves spoke at Siemens Healthineers in Oxfordshire on 29 January 2025. Available at: https://www.gov.uk/government/speeches/chancellor-vows-to-go-further-and-faster-to-kickstart-economic-growth [Accessed April 2025]

# 3.0 Approach to the study

3.1 The approach adopted for this study draws on best practice for undertaking economic analysis of infrastructure projects. The study was undertaken in three distinct stages as follows:

1 Baseline Review and Gap Assessment

2 Benefit Mapping

3 Detailed Economic Appraisal

## Baseline review and gap assessment

3.2 The study is informed by a significant amount of work already undertaken on the scheme, providing a suitable foundation that could be built on. Our first step was to undertake a detailed review of the available reports and accompanying data. The following documents were reviewed:

- Cadenza Transport Consulting and The Railway Consultancy (October 2023) Carterton-Witney-Oxford Rail Corridor study: Strategic Outline Case – Lite
- E-Rail (August 2023) Carterton-Witney-Oxford Rail Line: Stage 2 Detailed Land Value Capture Survey Report
- Cadenza Transport Consulting (October 2023) Carterton-Witney-Oxford Line SOC 'Lite' Engineering Feasibility Report

3.3 Underlying data and modelling outputs were also received from the respective report authors. This included capital cost estimates, an initial assessment of operational revenues, expenditures, passenger demand and journey time savings, in addition to further detail relating to the sites identified for Land Value Capture (LVC).

3.4 It should be noted that it was not possible for all data or detailed information from these studies to be made available to Lichfields. This has limited the extent of both the baseline review and the wider economic impacts included within the economic appraisal.

### Outcomes of the review of existing documents

3.5 As per DfT transport business case guidance[8], the Strategic Outline Case forms the first stage of business case development and (for submission to the DfT) should be compliant with the HM Treasury Green Book, business case guidance for programmes and projects, and DfT TAG. At this stage of project development, TAG[9] advises that light-touch modelling tools may be appropriate, however, it emphasises the importance of *"ensuring that the indications from such models do not give rise to unrealistic expectations of benefits that are unlikely to result from a full modelling approach"* (paragraph 3.2.2).

3.6 The purpose of the SOC Lite was, "*to establish if there is an existing need for the proposed railway line and any resulting investment required*" (p.1). Its positioning as a 'lite' version of a Strategic Outline Case is indicative of the high-level nature of the proposals – and the

[8] Department for Transport (DfT) (2022) Transport business case guidance
[9] DfT (2018) Transport Analysis Guidance: Guidance for the Technical Project Manager

work undertaken – at this stage. Appendix 1 sets out the findings of the gap assessment for these studies.

3.7 As the scheme is the early stages of development, there are several gaps in the information available, limiting the extent of economic benefits (and disbenefits) that can be appraised while maintaining compliance with DfT TAG. In particular, the assessment of some of the wider economic benefits of the scheme has not been possible due to the high-level nature of the 'GCOST' demand model underpinning the SOC Lite. As a result, detailed origin-destination data required to establish wider economic benefits was not available and prevented the monetisation of certain benefits including labour supply and agglomeration benefits.

3.8 As the GCOST demand model was not made available for the purposes of this economic analysis, it has also not been possible to independently validate the passenger demand and journey time savings that underpin the core economic impacts of the scheme. Further, in the absence of the SOC Lite demand model, several potential impacts are not monetised within this appraisal. These include employment effects[10] and productivity impacts[11], as estimation of these impacts requires full generalised cost matrices.

3.9 The economic appraisal within the SOC Lite assumes the scheme is built over a four-year period from 2027 to 2030 inclusive, opening in 2031. However, this does not fully align with the engineering feasibility considerations set out within the same report, which assumes a much longer construction period with the scheme opening in phases, and not before 2033.

3.10 Our analysis has sought to validate and update assumptions within the previous SOC Lite economic appraisal, where possible within the remit of this study. Where this has not been possible, we set out a recommended way forward to address these issues as the CWORC project progresses.

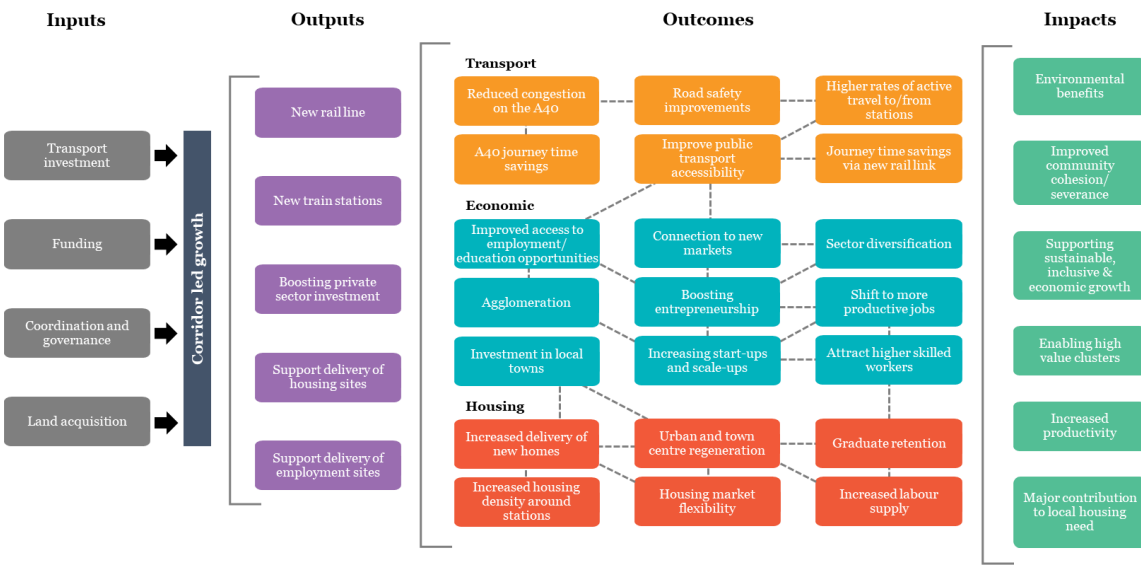
# Benefit mapping

## The Logic Model

3.11 To establish the additional benefits to be included within the updated economic appraisal, building on the gap assessment, a logic model has been developed to establish the connection between key project inputs and their anticipated outcomes and impacts. By rooting the economic analysis to a theory of change, it provides a strong foundation for creating a golden thread between the project narrative and economic analysis. The logic model developed for the scheme is presented in Figure 3.1 and in Appendix 2 at a higher resolution.

[10] DfT (2024) TAG Unit A2.3 Employment Effects
[11] DfT (2024) TAG Unit A2.4 Productivity Impacts

Figure 3.1 Project Logic Model




Source: Lichfields analysis

## Benefits register

3.12 The Logic Model provides a framework to identify the relevant and appropriate impacts and outcomes associated with the CWORC scheme and subsequently the benefits that can be included within the detailed economic analysis. A high-level benefits mapping exercise has been undertaken to identify the additional benefit categories that could be included within the economic appraisal, shown in Table 3.1.

Table 3.1 Benefits Register

| Impact Type | Impact | Monetised | Quantified | Qualitative |
|---|---|---|---|---|
| User benefits | Public transport users travel time savings | ✓ | | |
| | Public transport users journey reliability | | | ✓ |
| | Public transport users journey quality/experience | | | ✓ |
| | Public transport revenues | ✓ | | |
| | Active travel (public transport users) | ✓ | | |
| | Residual asset value | - | - | - |
| Non-user benefits | Reduction in car kms | ✓ | | |
| | Reduction in car operating costs | ✓ | | |
| Environmental | Operational carbon emissions | ✓ | | |
| Wider economic | Agglomeration | | | ✓ |
| | Land Value Uplift (LVU) | ✓ | | |
| | Jobs from construction | | ✓ | |
| | Jobs from operation | | ✓ | |
| | Labour supply | | | ✓ |
| | Move to more productive jobs | | | ✓ |
| | Imperfectly competitive markets | ✓ | | |
| Social | Noise | | | ✓ |
| | Air quality | | | ✓ |
| | Community and well-being | | | ✓ |
| | Severance | | | ✓ |
| | Option and non-use values | ✓ | | |
| | Accessibility | | | ✓ |
| | Public transport reliability | | | ✓ |
| | Journey quality | | | ✓ |
| | Affordability | | | ✓ |
| | Deprivation | | | ✓ |

Source: Lichfields analysis

# 4.0 Appraisal approach and assumptions

4.1 The previous SOC Lite report considered the scheme costs, user and provider impacts, and environmental impacts of the scheme, with more limited analysis considering potential wider economic impacts and social and distributional impacts. An earlier report considered potential funding streams from Land Value Capture (LVC), but no assessment of Land Value Uplift (LVU) in economic appraisal terms was undertaken.

4.2 Within this report, we seek to check and validate, or update, the methodologies and assumptions of the previous studies, where feasible. We also look to broaden the analysis to consider potential wider economic and social and distributional impacts, in addition to the value of LVU arising from dependent development. We present a reappraisal of the Benefit-Cost Ratio for the scheme across a range of scenarios with accompanying sensitivity tests.

4.3 To support this section, further background on the approach to economic appraisal for transport projects is provided in Appendix 3.

## Components of economic appraisal

4.4 An economic appraisal seeks to understand the economic costs and benefits of a scheme to society as a whole. It should be noted that these are not the same as the *financial* costs to the body undertaking the expenditure. The key components of an economic appraisal are outlined in Table 4.1.

Table 4.1 Components of economic appraisal

| Included | Excluded |
|---|---|
| • Uses HM Treasury Green Book and DfT Transport Appraisal Guidance<br>• Calculates the public value from the perspective of society<br>• Primarily considers UK society but includes local place-based impacts<br>• Considers all social, economic and environmental costs, and all effects on public welfare<br>• Includes quantifiable welfare costs and benefits to society, presented in real prices | • Viability and operating models<br>• Financial modelling<br>• Funding and affordability<br>• Public sector accounting rules and standing orders<br>• Sunk costs, depreciation and other capital charges |

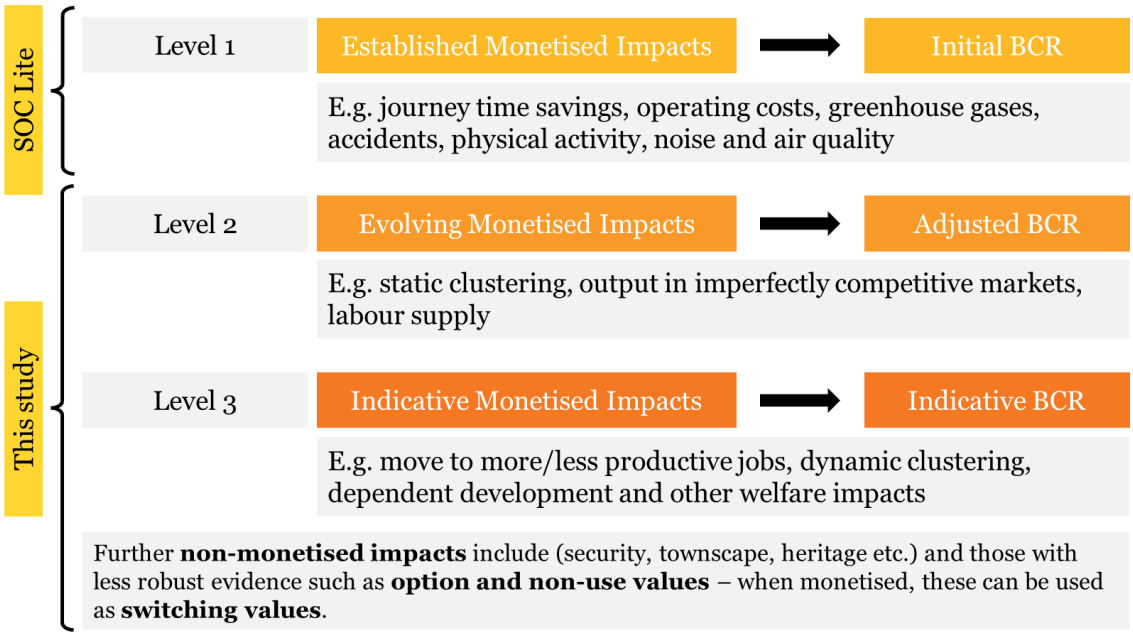
Source: Lichfields analysis

4.5 Economic appraisal is centred around the development of a benefit-cost ratio (BCR), providing a monetised measure of scheme benefits relative to costs. Some methods of identifying benefits and estimating their monetary values are more widely accepted than others, following their theoretical basis and industry testing.

4.6 On this basis, the DfT's latest guidance on Value for Money (VfM)[12] distinguishes between three different BCR metrics: initial, adjusted and indicative. Each BCR metric reflects an increasing degree of uncertainty in the type of impacts included within the analysis, wherein the initial BCR is based on 'established' monetised impacts, while the indicative BCR is based on impacts deemed to be less robust, with less prior testing. Figure 4.1 outlines the different types of BCR, and the impacts associated with each.

[12] DfT (November 2024) Value for Money framework

Figure 4.1 Types of BCR




Source: DfT Value for Money Framework and Lichfields analysis

## Value for Money

4.7 DfT guidance[13] defines achieving value for money as: *"using public resources in a way that creates and maximises public value while achieving policy objectives."* VfM covers the economic, social and environmental impacts of a proposal at a national level.

4.8 In the context of transport appraisal, VfM can be assessed using the BCR or Net Present Public Value (NPPV). The latter is appropriate where the Present Value of Costs is negative, or there are no costs to the Broad Transport Budget[14]. As such, in this analysis we consider the BCR. The DfT defines six VfM categories based on the value of the BCR, shown in Table 4.2.

Table 4.2 DfT standard VfM categories where transport cost outlays exceed revenues or cost savings

| VfM Category | Implied by… |
|---|---|
| Very High | BCR greater than or equal to 4.0 |
| High | BCR greater than or equal to 2.0 and less than 4.0 |
| Medium | BCR greater than or equal to 1.5 and less than 2.0 |
| Low | BCR greater than or equal to 1.0 and less than 1.5 |
| Poor | BCR greater than or equal to 0.0 and less than 1.0 |
| Very Poor | BCR less than 0.0 |

Source: DfT (2024) Value for Money framework

4.9 The provisional VfM category should be based upon the Adjusted BCR. Consideration of the Indicative BCR and other wider economic impacts focuses on whether the provisional VfM category would change if these impacts were included in the assessment.

[13] DfT (2024) Value for Money framework
[14] Ibid.

## Assumptions within the economic appraisal

4.10 The economic appraisal is based on the following core inputs and assumptions:

- The latest DfT appraisal values within the November 2024 (v1.24) release of the TAG Databook inform the assessment. This supersedes the previous November 2022 (v1.20.1) values used within the SOC Lite.
- A 60-year appraisal period from scheme opening in 2033 is applied, with the full period considered running from 2024 to 2092 inclusive.
- All monetary values are presented in 2024 prices[15].
- In line with DfT TAG a discount rate of 3.5% has been used for the first 30 years of the appraisal period, reducing to 3.0% for the remainder of the appraisal period. All health impacts use a discount rate of 1.5%. The trainset considered in the central scenario is a 2-car diesel trainset consistent with the assumption in the SOC Lite. This is similar to a British Rail Class 165 Diesel Multiple Unit (DMU) with an average fuel consumption of 1.06 litres per car mile. However, in an alternative scenario, a train similar to the battery-powered version of the British Rail Class 230 'D-Train', currently undergoing trials by Great Western Railway (GWR), is considered as a sensitivity test.
- Based on the SOC Lite, there will be 30 return trains per day Monday to Saturday, and 20 return trains on Sundays. On average, the rail line is operational 51 weeks of the year, and 5% of service/revenue-earning mileage is attributable to train depot mileage.
- As per the SOC Lite demand assessment, rail passenger demand for the scheme is 576,000 trips per annum in the opening year.

## The 'Do Minimum'

4.11 Economic appraisal considers the impact of the scheme (the 'Do Something' scenario) against a reference case. The reference case refers to the outcomes that would be expected if the scheme is not delivered (the 'Do Minimum' or 'Business as Usual' scenario). **Within this analysis, the Do Minimum scenario is defined as improvement works to the A40, Park and Ride and bus improvements, as defined within the SOC Lite.**

4.12 Since the development of the SOC Lite, the proposed A40 improvements have been scaled-back by removing the Duke's Cut scheme, the A40 bus lane and the dual carriageway extension. The subsequently reduced scope of the A40 improvements mean it is likely that the future level of congestion would be worse than that currently assumed in the SOC Lite. This would increase the benefits from travel time savings from the rail scheme relative to the Do Minimum scenario.

4.13 As the GCOST model outputs have been taken as given in this appraisal, and the future congestion assumptions within the GCOST model were based on the previous iteration of the A40 improvement proposals, it has not been possible to account for the recent changes to the scope of the A40 improvements. Future analysis would need to re-appraise the Do Minimum scenario to ensure consistency with current plans.

[15] While not consistent with the current DfT TAG base year (2010), prices have been presented in 2024 values in this report for ease of reference. It should be noted that forthcoming changes to DfT TAG in May 2025 will update the standard price base year to 2023, and any submission to the DfT would need to be produced on this basis.

4.14 Further, in the Do Minimum Scenario, the full extent of wider economic benefits created by the rail scheme would not be realised. While the A40 improvements could unlock limited growth and resultant land value uplift, growth would be significantly constrained in line with the capacity of the A40. The level of land value uplift achieved in the Do Minimum scenario would therefore likely be significantly lower than the Do Something as growth would be impeded by existing infrastructure constraints. Further detail on how the scheme would unlock growth and the associated land value uplift is outlined in section 5.0.

## Scheme costs

4.15 As per the SOC Lite, the length of the route alignments range between 22.1km and 23.6km. All route alignments pass through four stations (Eynsham, Witney, Carterton North and Carterton West) and all require a viaduct through Witney: this forms a significant component of the total scheme cost. The majority of the route is to be single-track with passing loops.

4.16 The construction phase (including outline design, detailed design, Transport and Works Act (TWA) orders application[16] and construction) runs from 2026 to 2036 inclusive, split into three phases:

a Phase 1: Oxford to Eynsham – Q3 2026 to Q1 2033, opening Q2 2033

b Phase 2: Eynsham to Carterton North – Q1 2028 to Q2 2036, opening Q3 2036

c Phase 3: Carterton North to Carterton West – Q3 2023 to Q2 2036, opening Q3 2036

4.17 There are six route alignment options considered: Reference Route 1, Reference Route 2, Shortest Route, Longest Route, Least Cost Route, and Greatest Cost Route. All options follow the same route alignment for the Phase 3 Carterton North to Carterton West connection. The cost breakdown by route alignment is shown in Table 4.3.

Table 4.3 Capital costs by route alignment option and phase (£m, real 2024 values, undiscounted)

| Route Alignment | Length (km) | Phase 1 | Phase 2 | Phase 3 |
|---|---|---|---|---|
| Reference Route 1 | 22.6 | 149.6 | 393.1 | 78.7 |
| Reference Route 2 | 22.8 | 202.3 | 306.1 | |
| Shortest Route | 22.1 | 189.6 | 306.1 | |
| Longest Route | 23.6 | 167.7 | 394.7 | |
| Least Cost Route | 22.4 | 149.6 | 305.6 | |
| Greatest Cost Route | 23.3 | 202.2 | 395.2 | |

Source: Cadenza Transport Consulting | Lichfields analysis

4.18 The allowance applied for Optimism Bias (OB) on the capital expenditure estimates is 56%; this is based on the OB for a scheme at pre-feasibility stage with a Strategic Outline case, in line with DfT TAG Unit A5.3[17].

4.19 The operating cost is assumed to £3.0 million per annum (in 2024 prices), based on the assessment within the SOC Lite of track access, traction, leasing, station, maintenance and staffing costs. It is assumed to grow at RPI + 0.7% per annum as per DfT TAG A5.3.

[16] See DfT (2023) Transport and Works Act orders: a brief guide

[17] DfT (2024) TAG Unit A5.3 Rail Appraisal

4.20 A detailed breakdown of the present value costs included within the economic appraisal is provided in Appendix 4.

# 5.0 Economic appraisal

## Level 1: Established monetised impacts

### User and provider impacts

5.1 The calculation of transport user benefits is based on the money and time saved when switching from one transport mode to another. User benefits are measured through the Value of Travel Time (VTT), which is based on the estimated time savings for those switching from other modes, namely car and bus, to rail.

5.2 The SOC Lite assumed the travel time savings to be in the order of 592,000 person-minutes per annum for those switching from car to rail by 2031, and 7.82 million person-minutes per annum for those switching from bus to rail. Based on appraisal benchmarks from DfT TAG Unit A5.3 and SOC Lite assumptions on distribution of trip distance, 37% of users of the rail link would be commuters, 4% business users, and 59% other (leisure) users.

5.3 Based on the VTT index from DfT TAG, and an extrapolation of user demand based on DfT TAG annual parameters on population growth, **the total net present value of user benefits (time saved) over the appraisal period is in the region of £45.2 million**.

5.4 A corresponding reduction in car usage will result in lower vehicle operating costs for private cars in terms of both fuel and non-fuel (maintenance) costs. The estimated savings are based on TAG appraisal values for fuel consumption per vehicle and corresponding fuel costs, factoring in forecasts in fuel efficiency and cost parameters over the appraisal period. The estimation of non-fuel costs is also measured using TAG appraisal values, depending on the vehicle category and distances travelled. **The net present value of the reduction in car operating costs is estimated to be in the region of £4.89 million over the appraisal period.**

5.5 The benefits to users from increased active travel (walking and cycling) to and from stations has also been considered. According to data from Sustrans, on average 9% of rail users cycle to stations and 33% walk to stations[18]. Assuming there will be an increased number of walking and cycling trips induced by the scheme, the benefits from reduced absenteeism and reduced risk of premature death are estimated using the DfT's Active Mode Appraisal Tool (AMAT)[19]. **Over the appraisal period, active travel benefits are in the region of £13.9 million in net present value.**

5.6 Provider impacts refer to changes in public transport provider revenues. In this case, we consider the changes to revenues generated from public transport, equal to the increase in revenue from passengers using the rail link less the reduction in revenue from bus trips (from individuals switching from bus to rail).

5.7 The increase in public transport provider revenues is therefore calculated by establishing the overall increase in revenues (in line with paragraph 3.30), applying a fare policy in line

[18] Sustrans (2023) An Introduction to the Sustainable Travel Stations Strategy. Available at: https://www.showcase-sustrans.org.uk/wp-content/uploads/2023/09/STTS-Webinar-29-August-Presentation-final-PDF.pdf [Accessed April 2025]
[19] DfT (November 2024) Active Mode Appraisal Toolkit

with inflation (RPI + 1%)[20] and extrapolating user demand using DfT TAG annual parameters on population growth. **It is estimated that the net present value of public transport revenues (rail revenues less the decline in bus revenues) is £52.0 million across the appraisal period.**

## Non-user impacts

5.8 The project will also impact those who do not use the rail line through externalities (i.e., indirect benefits to uninvolved third parties). In this instance, externalities are considered in terms of marginal external cost, namely the reduction in marginal external cost from a reduction in road congestion from modal shift from car to rail.

5.9 The estimation of marginal external cost is based on the SOC Lite's estimate of the total annual reduction in car mileage in 2031 (1.9 million vehicle-kilometres). This is extrapolated over the appraisal period using DfT TAG annual parameters on population growth[21]. DfT TAG appraisal values on the marginal external cost associated with car mileage include congestion (regionalised to the South East), infrastructure costs, accidents, local air quality impacts, noise emissions, greenhouse gas emissions, and indirect taxation. **In total over the appraisal period, it is estimated that the net present value of non-user benefits is £14.1 million.**

## Environmental impacts

5.10 At this stage the appraisal of environmental impacts is confined to an assessment of the operational greenhouse gas (GHG) emissions from the scheme, in the absence of detailed noise and air quality modelling. However, as detailed above, it would be expected that the railway would reduce car use on surrounding roads leading to reductions in emissions and noise and improvements in air quality on the A40. In a full appraisal model, the overall impact on noise and air quality would also be appraised, in addition to a whole life carbon (WLC) assessment.

5.11 DfT TAG appraisal values provide benchmarks of GHG emissions, measured in tonnes of carbon dioxide equivalent ($tCO_2e$), from different transport modes, and the market value of these emissions (both traded and non-traded). Based on this, the operational GHG emissions associated with the rail scheme minus the reduction in GHG emissions from reduced car mileage[22] can be estimated. This is converted into market prices using DfT TAG appraisal values for low, central and high forecast scenarios.

5.12 The assumptions from the SOC Lite were used for appraisal purposes only, due to the absence of updated, detailed transport and air quality modelling. In practice, it is expected that lower-emission alternatives such as battery-powered trains would be deployed, resulting in significantly reduced GHG emissions.

## Level 1: Initial BCR

5.13 Based on the above scheme costs and impacts, the Initial BCR is presented in Table 5.1.

[20] No real fare growth is assumed 20 years after scheme opening, in line with DfT TAG Unit A5.3.
[21] No assumption is made on any future (exogenous) modal shift away from cars to other modes, to prevent over-stating the benefits from reductions in marginal external costs and to isolate the impact of the appraisal scheme.
[22] This accounts for DfT forecasts of improvements in vehicle fuel efficiency and shares of different fuel types (petrol/diesel/electric).

Table 5.1 Initial BCR (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 |
| Non-user impacts | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| Environmental impacts (central scenario) | -17.0 | -17.1 | -16.5 | -17.7 | -16.8 | -17.5 |
| **Present value of benefits (A)** | **113.1** | **112.9** | **113.5** | **112.1** | **112.3** | **112.5** |
| Scheme cost | 740.4 | 705.7 | 689.6 | 765.3 | 638.0 | 809.9 |
| Net operating costs | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 |
| **Present value of costs (D)** | **763.8** | **729.1** | **713.0** | **788.7** | **661.5** | **833.3** |
| **Initial BCR (A/D)** | **0.15** | **0.15** | **0.16** | **0.14** | **0.17** | **0.13** |

Source: Lichfields analysis

# Level 2: Evolving monetised impacts

## Wider economic benefits

5.14 It has been possible to estimate the value of output change in imperfectly competitive markets. This refers to changes in the level of economic activity resulting from a transport investment, over and above the core business user benefits.

5.15 DfT TAG Unit A2.2[23] advises that this increase in economic activity can be estimated by applying a 13.4% uplift on business user benefits[24]. This is to be applied where it can be justified that businesses will increase output in response to the transport improvement.

5.16 The CWORC would represent a significant extension of local firms' customer base and labour catchment by providing faster and more reliable transport connections between Carterton, Witney and Eynsham to Oxford and beyond. It is therefore highly likely that businesses would increase output in response to the rail scheme, whether this be through higher demand or an improved ability to recruit and retain new staff, in an area with a high value economy. As such, the monetisation of output change in imperfectly competitive markets is deemed to be sufficiently justified and **the net present value of the output change in imperfectly competitive markets over the appraisal period is estimated to be £870,000.**

5.17 As noted previously, owing to the limitations of the existing transport model and availability of data, wider economic benefits from productivity and employment effects have not been monetised. Employment effects relate to the movement of individuals within the labour market particularly the movement of individuals to more productive jobs resulting from a change in the spatial distribution of employment. Investment to the CWORC will provide a step change in public transport accessibility across the corridor, thereby improving access between population and employment centres. The scheme will

[23] DfT (2024) TAG Unit A2.2 Appraisal of Induced Investment Impacts
[24] Hyman (2024) Final Consolidation of Uplift Factor Calculations for Imperfect Competition

provide a direct connection to Oxford, one of the largest employment centres in the country, and where there is a growing labour supply. Those living along the corridor will now have an affordable and sustainable option to access to the jobs in Oxford, allowing them to take up opportunities in more productive jobs.

5.18 Productivity effects relate to the productive advantages firms gain by being located close to employment centres and existing industrial clusters. The CWORC is located adjacent to the Oxford Knowledge Spine and with the Government's recent commitment to re-establish the OxCam Arc, the CWORC presents an optimum location for potential investment. The rail scheme will provide a direct connection to Oxford, making it an attractive location for firms to locate and invest, resulting in additional productivity benefits.

5.19 Although these benefits have not been monetised due to limited availability of origin-destination data, a sensitivity analysis has been conducted to assess the impact of these benefits on the BCR. The results of this analysis are detailed further in section 6.0.

### Adjusted BCR

5.20 Based on the Initial BCR and output change in imperfectly competitive markets, the Adjusted BCR is shown in Table 5.2.

Table 5.2 Initial and Adjusted BCR (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 |
| Non-user impacts | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| Environmental impacts (central scenario) | -17.0 | -17.1 | -16.5 | -17.7 | -16.8 | -17.5 |
| **Present value of benefits (A)** | **113.1** | **112.9** | **113.5** | **112.1** | **112.3** | **112.5** |
| Output change in imperfectly competitive markets | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| **Present value of evolving benefits (B)** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** |
| Scheme cost | 740.4 | 705.7 | 689.6 | 765.3 | 638.0 | 809.9 |
| Net operating costs | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 |
| **Present value of costs (D)** | **763.8** | **729.1** | **713.0** | **788.7** | **661.5** | **833.3** |
| **Initial BCR (A/D)** | **0.15** | **0.15** | **0.16** | **0.14** | **0.17** | **0.13** |
| **Adjusted BCR ((A+B)/D)** | **0.15** | **0.16** | **0.16** | **0.14** | **0.17** | **0.14** |

Source: Lichfields analysis

## Level 3: Indicative monetised impacts

### Land Value Uplift and dependent development

5.21 Dependent development is the term used to describe development included within Land Value Uplift calculations, and is defined by DfT TAG as:

- A site where there is clear intention for development; and
- The existing transport network cannot accommodate the additional traffic that would result.

5.22 In order to consider development as 'dependent', a scheme needs to demonstrate, with a robust evidence base, that development would not come forward in the absence of the scheme. For example, this can be evidenced through transport modelling, which would establish the point at which an intervention would be required before the existing transport network cannot operate due to the additional demand generated from development.

5.23 Land Value Capture (LVC) considers the value that can be extracted from sites with development potential unlocked by the project within a given radius to provide funding for the project's capital cost. Conversely, Land Value Uplift (LVU) considers the same sites but seeks to estimate the monetary value of the overall benefit to society associated with development, namely the benefit accruing to landowners, net of any externalities.

5.24 The previous LVC report forms the basis for sites included within the LVU calculations in this appraisal. Recent validation by WODC has confirmed that these sites have not been developed in the intervening period, and that for LVC sites that are currently promoted by developers the number of units proposed is broadly consistent with the assumptions of the LVC report. As such, all sites identified within the LVC report, regardless of their eventual inclusion or exclusion from the LVC calculation, are assumed to be dependent development and hence included within the assessment of LVU.

5.25 All sites identified within the LVC report were considered for residential development potential. As such, the existing land use for these sites is assumed to be agricultural and the future land use as residential. Site areas from the LVC report data are applied in the assessment of existing and potential future land values, using valuations per hectare from DfT TAG[25]. All dependent development is assumed to occur in the first 30 years after scheme opening (2033-2062) with a constant rate of delivery over the period[26].

5.26 A full explanation of the calculation of LVU is provided in Appendix 3. In accordance with DfT TAG, the base estimate of the uplift in land values is adjusted for additionality (displacement), marginal external costs, and land amenity value:

- The adjustment for displacement accounts for development that would have occurred elsewhere if the scheme were not delivered. Displacement is assumed to be 25% in accordance with the HCA Additionality Guide[27] 'low' ready reckoner.
- The marginal external costs generated from additional traffic created from the dependent development are calculated based on the expected car mileage of the new residents, assuming a car diversion factor of 35% as per DfT TAG.
- The adjustment for the loss of land amenity value is based on the DfT Valuing Dependent Development guidance figures for the amenity value of agricultural land used for intensive purposes (i.e. ploughed fields) per hectare. This assumption has been

[25] DfT (2024) TAG Unit A2.2 Appraisal of Induced Investment Impacts

[26] While dependent development is appraised over the full 60-year period, it is considered to be delivered within the first 30 years after scheme opening as it is deemed unlikely that development would come forward that could be characterised as truly 'dependent' on the CWORC after this point. All sites are assumed to be developable and deliverable within the 30-year timeframe.

[27] Homes & Communities Agency (2014) Additionality Guide, Fourth Edition

based on inspection of satellite imagery, which determined the land is agricultural but is not primarily used for grazing livestock (i.e. extensive agriculture).

5.27 **The net present value of LVU over the appraisal period is estimated to be £1.25 billion in 2024 prices.**

## Indicative BCR

5.28 Based on the Adjusted BCR and the Land Value Uplift associated with dependent development, the Indicative BCR is shown in Table 5.3.

Table 5.3 Initial, Adjusted and Indicative BCR (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 |
| Non-user impacts | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| Environmental impacts (central scenario) | -17.0 | -17.1 | -16.5 | -17.7 | -16.8 | -17.5 |
| **Present value of established benefits (A)** | **113.1** | **112.9** | **113.5** | **112.1** | **112.3** | **112.5** |
| Output change in imperfectly competitive markets | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| **Present value of evolving benefits (B)** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** |
| Land Value Uplift | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 |
| **Present value of indicative benefits (C)** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** |
| Scheme cost | 740.4 | 705.7 | 689.6 | 765.3 | 638.0 | 809.9 |
| Net operating costs | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 |
| **Present value of costs (D)** | **763.8** | **729.1** | **713.0** | **788.7** | **661.5** | **833.3** |
| **Initial BCR (A/D)** | **0.15** | **0.15** | **0.16** | **0.14** | **0.17** | **0.13** |
| **Adjusted BCR ((A+B)/D)** | **0.15** | **0.16** | **0.16** | **0.14** | **0.17** | **0.14** |
| **Indicative BCR ((A+B+C)/D)** | **1.78** | **1.87** | **1.91** | **1.72** | **2.06** | **1.63** |

Source: Lichfields analysis

5.29 The Indicative BCR is greater than the Adjusted BCR under all route alignment options, indicating a higher VfM category of 'medium' for all but the Least Cost Route, which has a BCR above 2 indicating ''high VfM.

### Switching values from commercial development

5.30 The potential for commercial dependent development and hence LVU from this development has also been explored. However, it should be noted that surrounding

employment allocations within the current West Oxfordshire Local Plan have since been subject to planning applications, indicating that these sites cannot be classified as dependent development. Given the early stage of development of the emerging local plan at the time of writing (April 2025), and in the absence of other evidence of the development potential or intentions for other sites, it has not been possible to ascertain the extent of any future commercial dependent development and as such this is not included within the LVU.

5.31 However, it is possible to use a 'switching values' assessment to establish what value of LVU from commercial development would be required to tip the Indicative BCR into the next VfM category (i.e., 'high' VfM in all alignments except the Least Cost Route which already achieves a 'high' VfM). The required value of LVU achieved by commercial dependent development to achieve a BCR of 2.0 (i.e., 'high' VfM) in each route alignment is shown in Table 5.4. The required LVU to change the VfM outcome ranges between £64.5 million in the Shortest Route alignment and £306.2 million in the Greatest Cost Route alignment.

Table 5.4 Switching values analysis for commercial dependent development

| | Target BCR | Required Switching Value from Commercial LVU (£m) |
|---|---|---|
| Reference Route 1 | 2.0 | 166.6 |
| Reference Route 2 | 2.0 | 97.3 |
| Shortest Route | 2.0 | 64.5 |
| Longest Route | 2.0 | 217.1 |
| *Least Cost Route* | *2.0* | *(-38.3)* |
| Greatest Cost Route | 2.0 | 306.2 |

Source: Lichfields analysis
N.B. The Least Cost Route already achieves a BCR of 2.06 in the base Indicative BCR without commercial LVU

# Non-monetised impacts

5.32 Non-monetised impacts provide a view on wider social and economic benefits that would result from an intervention but are not captured within the monetised economic appraisal. These benefits are significant but cannot be easily or accurately presented in monetary terms. It is still important to consider these impacts as they provide an insight into the wide range of benefits that result from an intervention over and above the BCR. The presentation of non-monetised impacts enables the presentation of benefits through a different lens.

## Employment impacts

5.33 The employment generated from the construction of the scheme has been considered as a non-monetised benefit. The 2022 Office for National Statistics (ONS) Input-Output Analytical Tables (IOAT) include estimates of the Full Time Equivalent (FTE) jobs per £1 million spent in each industry[28]. In the construction sector, there are 5.60 FTE per £1 million spend in 2022 prices, corresponding to approximately 5.08 FTE per £1 million spend in 2024 prices. On this basis, it is estimated that construction of the scheme would support between 4,300 and 5,500 FTE job years in construction over the assumed 11-year (phased) construction period; this is equivalent to an average of 390 to 500 FTE construction jobs per year.

[28] Office for National Statistics (ONS) (2025) Employment multipliers and effects in the UK

5.34 Construction will involve the acquisition of goods and services from a range of suppliers, who in turn purchase goods and services within their own supply chain. These impacts within the supply chain are referred to as 'indirect' impacts. The employment resulting from indirect effects within the supply chain, based on Type I multiplier values from the 2022 IOAT, are estimated to be in the region of 5,300 to 6,700 FTE job years over the construction period.

5.35 Further, the wage spending of both the direct and indirect workers will stimulate additional economic activity within the economy. This is known as the induced effect. Based on Type II multiplier values calculated from the 2022 IOAT, it is estimated that a further 1,500 to 1,900 FTE job years would be supported through induced effects.

5.36 The IOAT also provide FTE per £1 million spend, and associated employment multipliers, for the rail transport sector. During operation, it is estimated that the rail scheme would directly support an average of 21 FTE roles at any one time. A further 51 FTE roles would be supported indirectly within the supply chain, and 21 FTE roles through induced economic activity.

## Distributional impacts

5.37 Distributional Impact Appraisal (DIA) is an assessment framework designed to establish the scale and spatial distribution of benefits and impacts caused by transport interventions[29]. The framework also considers the impacts on different social groups and transport users, who will experience changes in travel as a result of the transport intervention. The categories considered within the DIA assessment include user benefits, affordability, noise, air quality, safety, severance, security and accessibility.

5.38 Due to the stage of the scheme and limited availability of technical assessments, a high-level qualitative assessment of distributional impacts has been undertaken, in line with DfT TAG Unit A4.2. The assessment has been undertaken on a seven-point scale ranging from beneficial through neutral to adverse, to differentiate the relative impacts across the categories.

- **Largely adverse:** Adverse and the population impacted is significantly greater than the proportion of the group in the total population
- **Moderately adverse:** Adverse and the population impacted is broadly in line with the proportion of the population of the group in the total population
- **Slightly adverse:** Adverse and the population impacted is smaller than the proportion of the population of the group in the total population
- **Neutral:** There are no significant benefits or disbenefits experienced by the group for the specified impact
- **Slightly beneficial:** Beneficial and the population impacted is smaller than the proportion of the group in the total population
- **Moderately beneficial:** Beneficial and the population impacted is broadly in line with the proportion of the group in the total population

[29] DfT (2024) TAG Unit A4.2 Distributional Impact Appraisal

- **Largely beneficial:** Beneficial and the population impacted is significantly greater than the proportion of the group in the total population

5.39 Findings from the DIA are presented in Table 5.5, which also provides an indication of the priority social groups that would be affected by the intervention across each assessment category.

Table 5.5 Distributional Impact Assessment findings

| Impact | Priority Groups | Assessment Outcome |
|---|---|---|
| User Benefits | Low-income households | The assessment of user benefits within the DIA focuses on analysing the spatial distribution of user benefits against the distribution of income. User benefits are assessed to have a **moderately to largely beneficial** impact as the new rail line would be expected to provide net benefits across all income groups. |
| Affordability | Low-income households | Affordability impacts are appraised as **slightly to moderately beneficial**. The introduction of a new rail line will provide a more affordable mode of transport (in comparison to car use) for low-income households due to the wider costs associated with car ownership. |
| Noise | Low-income households, children, older people | It is likely that there will be some impacts resulting from noise. There will be reduction in noise as a result of a reduction of traffic on the road network that will have a **slightly beneficial** impact on priority groups. There may be some **slightly adverse** impacts on priority groups from operational noise impacts generated from the rail line. Further noise assessments would be required to ascertain the level of impact. |
| Air quality | Low-income households, children, young adults | A reduction in car use is likely to result in reduced emissions and thus improving air quality. Although the central case uses the assumptions set out within the SOC lite, for the purposes of modelling, this will not reflect the final solution. Sensitivity testing indicates that alternative options, such as battery-operated trainsets, could result in a beneficial impact. Further work on the scheme assumptions and air quality assessments would be required to ascertain the level of impact |
| Safety | Children, older people, wheeled pedestrians, male drivers | Safety impacts are appraised as **moderately beneficial** and moderate benefits are anticipated for most priority groups. There is likely to be a reduction in accidents as a result of reduced car usage. Detailed accident analysis would be required to quantitatively assess the reduction in accidents. |
| Severance | Children, older people, people with disabilities, households without cars | A **moderately beneficial** severance impact is anticipated for all priority groups due to changes in motorised traffic. The scheme will reduce traffic while also allowing investment in improved sustainable transport measures. As the scheme progresses further thought will be given to station design and improvements to access for walkers and cyclists to reduce any existing severance. |

| Impact | Priority Groups | Assessment Outcome |
|---|---|---|
| Security | Young adults, women, older people | Transport users including women, younger and older people, will experience improved levels of personal security. Further work will be undertaken as the project progresses to ensure that proposals include improvements to lighting and CCTV which will increase the amount of formal surveillance as well as lighting/visibility for users of the rail network. This will result in **slightly beneficial impacts** for all priority groups. |
| Accessibility | Low-income households, people with disabilities, females, young adults, households without cars | The overall impact of the scheme on accessibility is considered to be **moderately to largely beneficial**, due to the introduction of a new rail line, providing an improved, lower-cost and more reliable service directly to Oxford, improving access to employment opportunities and services across the route. |

Source: Lichfields analysis

# 6.0 Sensitivity testing

6.1 This section outlines the five sensitivity tests performed on the base assumptions of the economic appraisal to assess the degree of impact on the BCR and resulting VfM category of the CWORC.

## Option and non-use values

6.2 DfT TAG Unit A4.1[30] states that option and non-use values *"should be assessed if the scheme being appraised includes measures that will substantially change the availability of transport services within the study area (e.g. the opening or closure of a rail service, or the introduction or withdrawal of buses serving a particular rural area)"* (paragraph 7.1.1). As there is no rail-based public transport service currently available along the Carterton-Witney-Oxford corridor, option and non-use values have been considered within the sensitivity testing.

6.3 Within the DfT VfM framework[31] option and non-use values are defined as non-monetised impacts to be *"considered after metrics using switching values approach"* (p.19). In this instance, the 'switching values' approach considers whether the inclusion of option and non-use values in the appraisal would alter the VfM category.

6.4 Option values are "*the willingness-to-pay to preserve the option of using a transport service for trips not yet anticipated or currently undertaken by other modes, over and above the expected value of any such future use"* (paragraph 7.2.1). In other words, it is the value an individual would be willing to pay to keep a transport option, even if they do not plan to use it: it is the value of having it as an available option.

6.5 Non-use values, conversely, refer to the value placed on the service regardless of future plans to use it. In transport appraisal, only altruistic non-use values are considered. The DfT provide the example of *"a resident in a village deriving benefit from the knowledge that the elderly can use public transport to access the facilities they need"* (paragraph 7.2.6).

6.6 The appraisal of option and non-use values applies a catchment of at least 2km from each station; this is considered appropriate for minor stations, with larger catchments for free-standing towns[32]. As the extent of existing settlements with proposed stations (Witney, Eynsham and Carterton) are contained within a 2 to 3 km radius from the future stations, the number of households considered for the option and non-use values assessment is assumed to be 22,540 based on the 2023 Oxfordshire Joint Strategic Needs Assessment (JSNA) housing-led population projections and the average household size in West Oxfordshire recorded in the 2021 Census.

6.7 Applying DfT TAG appraisal values for option and non-use values for rail schemes to the catchment households results in a net present value estimate of £161.2 million over the appraisal period. The resulting BCR under each route alignment option is presented in Table 6.1. The inclusion of option and non-use values affects the VfM category in all but the

[30] DfT (2022) TAG Unit A4.1 Social Impact Appraisal
[31] DfT (2024) Value for Money framework
[32] DfT (2022) TAG Unit A4.1 Social Impact Appraisal

Longest Route and Greatest Cost Route alignments, increasing the Indicative BCR above 2 and hence implying 'high' VfM.

Table 6.1 Switching Value BCR from option and non-use (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 |
| Non-user impacts | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| Environmental impacts (central scenario) | -17.0 | -17.1 | -16.5 | -17.7 | -16.8 | -17.5 |
| **Present value of established benefits (A)** | **113.1** | **112.9** | **113.5** | **112.1** | **112.3** | **112.5** |
| Output change in imperfectly competitive markets | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| **Present value of evolving benefits (B)** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** |
| Land Value Uplift | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 |
| **Present value of indicative benefits (C)** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** |
| **Option and non-use value (E)** | **171.0** | **171.0** | **171.0** | **171.0** | **171.0** | **171.0** |
| Scheme cost | 740.4 | 705.7 | 689.6 | 765.3 | 638.0 | 809.9 |
| Net operating costs | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 |
| **Present value of costs (D)** | **763.8** | **729.1** | **713.0** | **788.7** | **661.5** | **833.3** |
| **Initial BCR (A/D)** | **0.15** | **0.15** | **0.16** | **0.14** | **0.17** | **0.13** |
| **Adjusted BCR ((A+B)/D)** | **0.15** | **0.16** | **0.16** | **0.14** | **0.17** | **0.14** |
| **Indicative BCR ((A+B+C)/D)** | **1.78** | **1.87** | **1.91** | **1.72** | **2.06** | **1.63** |
| **Switching Value BCR ((A+B+C+E)/D)** | **2.01** | **2.10** | **2.15** | **1.94** | **2.32** | **1.84** |

Source: Lichfields analysis

## Battery-powered rolling stock

6.8 Great Western Railway (GWR) started a 12-month fast-charging battery trial of converted British Rail Class 230 trains in March 2024[33]. These trains are designed for non-electrified branch lines, such as the proposed route. This is the first such trial in the UK, and therefore information on the cost of battery-only trains, and their potential operating cost and emissions savings, is currently limited. However, a November 2024 trial of an intercity

[33] FirstGroup plc (2024) Great Western Railway's innovative fast-charge battery trial now under way. Available at: https://www.firstgroupplc.com/news-and-media/latest-news/2024/19032024.aspx [Accessed April 2025]

battery train was reported to indicate fuel cost savings of between 35% and 50% on conventional overhead AC power[34].

6.9 On this basis, we consider a sensitivity test with operational emissions equivalent to 70% of the emissions associated with a conventional overhead electric route (i.e., a 30% reduction). We estimate the energy consumption of an electric alternative using the Network Rail average for Control Period 7 (2024-2029) for Type 300-399 Electric Multiple Unit (EMU) trains[35] of 10.7 kWh per electrified train kilometre[36]. On this basis, it is assumed the battery-powered unit would require 7.5 kWh per train kilometre.

6.10 In the absence of information on costs for battery-powered trains, we assume no additional capital or operating costs associated with the battery train over levels assumed for diesel-operated stock. These assumptions would have to be revisited once further feasibility work has been undertaken.

6.11 In contrast to the central case, the emissions reduction from reduced car mileage outweighs the emissions associated with operation of the battery trains. However, this only has a marginal impact on the overall BCR and does not affect the provisional VfM assessment nor the VfM category implied by the Indicative BCR, as shown in Table 6.2.

[34] RailTech.com (2024) UK's first ever intercity battery train successfully tested. Available at: https://www.railtech.com/all/2024/11/12/uks-first-ever-intercity-battery-train-successfully-tested/ [Accessed April 2025]
[35] These train classes operate on routes with 25kV AC overhead lines, the typical standard for modern electrification in the UK.
[36] Network Rail (2023) Traction Electricity Modelled Consumption Rates List – Control Period 7

Table 6.2 Initial, Adjusted and Indicative BCR in battery-powered rolling stock scenario (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 |
| Non-user impacts | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| Environmental impacts (central scenario) | 0.78 | 0.77 | 0.78 | 0.77 | 0.78 | 0.77 |
| **Present value of established benefits (A)** | **130.8** | **130.8** | **130.8** | **130.8** | **130.8** | **130.8** |
| Output change in imperfectly competitive markets | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| **Present value of evolving benefits (B)** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** |
| Land Value Uplift | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 |
| **Present value of indicative benefits (C)** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** |
| Scheme cost | 740.4 | 705.7 | 689.6 | 765.3 | 638.0 | 809.9 |
| Net operating costs | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 |
| **Present value of costs (D)** | **763.8** | **729.1** | **713.0** | **788.7** | **661.5** | **833.3** |
| **Initial BCR (A/D)** | **0.17** | **0.18** | **0.18** | **0.17** | **0.20** | **0.16** |
| **Adjusted BCR ((A+B)/D)** | **0.17** | **0.18** | **0.18** | **0.17** | **0.20** | **0.16** |
| **Indicative BCR ((A+B+C)/D)** | **1.81** | **1.89** | **1.93** | **1.75** | **2.09** | **1.66** |

Source: Lichfields analysis

## Benchmark of wider economic benefits

6.12 In the absence of full generalised cost matrices (by origin-destination pair, mode and journey purpose) it is not possible to calculate average round-trip commuting cost and hence the monetary value of impacts from (static) agglomeration, labour supply impacts and the move to more/less productive jobs.

6.13 However, other ex-ante studies of potential wider economic benefits for transport schemes of a similar scale can provide benchmarks of the approximate scale of wider economic benefits over and above conventional user and non-user benefits, as shown in Table 6.3.

Table 6.3 Benchmarks of wider economic benefits of rail schemes

| Project | Mark-up on user and non-user benefits |
|---|---|
| Tees Valley Metro (with tram-train links) | 26% |
| Leeds urban area public transport investment | 18% |
| Plymouth rail service frequency improvements | 11% |

Source: Rognlien, L. (2010) Wider Economic Benefits of High Speed Rail

6.14 Based on the case studies shown in Table 6.3, we consider a scenario where the wider economic benefits of the scheme, including productivity impacts and employment effects, are valued at 18% of user and non-user benefits. As these studies pre-date the recent update to the imperfect competition parameter (from 10.0% to 13.4%) we include an additional uplift of 3.4% on business user benefits. The results are presented in Table 6.4.

Table 6.4 Initial, Adjusted and Indicative BCR with benchmark of wider economic benefits (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 |
| Non-user impacts | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| Environmental impacts (central scenario) | -17.0 | -17.1 | -16.5 | -17.7 | -16.8 | -17.5 |
| **Present value of established benefits (A)** | **113.1** | **112.9** | **113.5** | **112.1** | **112.3** | **112.5** |
| Benchmarked wider economic benefits | 8.38 | 8.38 | 8.38 | 8.38 | 8.38 | 8.38 |
| **Present value of evolving benefits (B)** | **8.38** | **8.38** | **8.38** | **8.38** | **8.38** | **8.38** |
| Land Value Uplift | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 |
| **Present value of indicative benefits (C)** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** |
| Scheme cost | 740.4 | 705.7 | 689.6 | 765.3 | 638.0 | 809.9 |
| Net operating costs | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 |
| **Present value of costs (D)** | **763.8** | **729.1** | **713.0** | **788.7** | **661.5** | **833.3** |
| **Initial BCR (A/D)** | **0.15** | **0.15** | **0.16** | **0.14** | **0.17** | **0.13** |
| **Adjusted BCR ((A+B)/D)** | **0.16** | **0.17** | **0.17** | **0.15** | **0.18** | **0.15** |
| **Indicative BCR ((A+B+C)/D)** | **1.79** | **1.88** | **1.92** | **1.73** | **2.07** | **1.64** |

Source: Lichfields analysis

## Risk-adjusted scheme costs

6.15 The final sensitivity scenario considers the application of quantified risk estimates to the capital cost in place of the adjustment for optimism bias applied in the central case. While we find that adjustment for optimism bias better reflects the current stage of the proposals (see Appendix 1), the SOC Lite applied a method comparable to Quantified Risk Assessment (QRA) based on the assumed complexity of cost items and various risk allowances.

6.16 On average, the 'mid' risk adjustment increases the base cost of individual route sections/options by 32.8%. This is lower than the optimism bias adjustment for rail

schemes at Network Rail PACE Stage 1[37] from DfT TAG of 56%, but comparable to the allowance for schemes at PACE Stage 3[38] of 33%.

6.17 The BCR from the risk-adjusted cost is shown in Table 6.5. While this does not alter the provisional VfM assessment from the Adjusted BCR, it does result in an Indicative BCR corresponding to the 'high' VfM category under all route alignments except the Greatest Cost Route.

Table 6.5 Initial, Adjusted and Indicative BCR with risk-adjusted scheme costs (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 | 116.0 |
| Non-user impacts | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 | 14.1 |
| Environmental impacts (central scenario) | -17.0 | -17.1 | -16.5 | -17.7 | -16.8 | -17.5 |
| **Present value of established benefits (A)** | **113.1** | **112.9** | **113.5** | **112.1** | **112.3** | **112.5** |
| Output change in imperfectly competitive markets | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| **Present value of evolving benefits (B)** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** | **0.97** |
| Land Value Uplift | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 | 1,247.0 |
| **Present value of indicative benefits (C)** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** | **1,247.0** |
| Scheme cost | 636.0 | 604.3 | 590.9 | 656.9 | 545.0 | 696.4 |
| Net operating costs | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 | 23.4 |
| **Present value of costs (D)** | **659.4** | **627.7** | **614.3** | **680.3** | **568.4** | **719.8** |
| **Initial BCR (A/D)** | **0.17** | **0.18** | **0.18** | **0.16** | **0.20** | **0.16** |
| **Adjusted BCR ((A+B)/D)** | **0.17** | **0.18** | **0.19** | **0.17** | **0.20** | **0.16** |
| **Indicative BCR ((A+B+C)/D)** | **2.06** | **2.16** | **2.21** | **2.00** | **2.39** | **1.89** |

Source: Lichfields analysis

## Phase 1 only

6.18 Following consultation with WOTG, a further sensitivity analysis that considers only Phase 1 of the scheme (Oxford to Eynsham) has been considered. This assumes no other section of the CWORC proposals are built during the 60-year appraisal period.

6.19 Phase 1 works are assumed to begin in Q3 2026 (starting with outline design) with construction ending in Q1 2033, and operating commencing in Q2 2033. The construction

[37] PACE Stage 1 corresponds to Project Definition, comparable to the current stage of the CWORC proposals (Strategic Outline Case)

[38] PACE Stage 3 corresponds to Option Selection, which is comparable to the Outline Business Case stage.

cost has been apportioned following the Phase 1 route section breakdown provided within the SOC Lite.

6.20 In the absence of detailed demand assumptions from the SOC Lite, patronage of the rail scheme has been apportioned using the population of Eynsham within the Oxfordshire JSNA projections as a proportion of the population along the full route between Oxford and Carterton. A further 50% reduction has been applied to account for trips west of Eynsham within the original transport model. This affects the estimation of user and non-user benefits and operating costs.

6.21 Environmental impacts have been calculated based on the length of the route alignments in Phase 1, assuming the same frequency of service as in the base case. The land value uplift only considers dependent development sites in Eynsham. The resulting Initial, Adjusted and Indicative BCRs are presented in Table 6.6. .

Table 6.6 Initial, Adjusted and Indicative BCR under Phase 1 only (NPV, 2024 prices, £m)

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route |
|---|---|---|---|---|---|---|
| User and provider impacts | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 | 11.8 |
| Non-user impacts | 1.43 | 1.43 | 1.43 | 1.43 | 1.43 | 1.43 |
| Environmental impacts (central scenario) | -2.15 | -2.34 | -2.06 | -2.40 | -2.15 | -2.34 |
| **Present value of established benefits (A)** | **11.1** | **10.9** | **11.2** | **10.8** | **11.1** | **10.9** |
| Output change in imperfectly competitive markets | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |
| **Present value of evolving benefits (B)** | **0.11** | **0.11** | **0.11** | **0.11** | **0.11** | **0.11** |
| Land Value Uplift | 292.8 | 292.8 | 292.8 | 292.8 | 292.8 | 292.8 |
| **Present value of indicative benefits (C)** | **292.8** | **292.8** | **292.8** | **292.8** | **292.8** | **292.8** |
| Scheme cost | 190.8 | 257.8 | 241.8 | 213.8 | 190.8 | 257.8 |
| Net operating costs | 2.49 | 2.49 | 2.49 | 2.49 | 2.49 | 2.49 |
| **Present value of costs (D)** | **193.3** | **260.3** | **244.3** | **216.3** | **193.3** | **260.3** |
| **Initial BCR (A/D)** | **0.06** | **0.04** | **0.05** | **0.05** | **0.06** | **0.04** |
| **Adjusted BCR ((A+B)/D)** | **0.06** | **0.04** | **0.05** | **0.05** | **0.06** | **0.04** |
| **Indicative BCR ((A+B+C)/D)** | **1.57** | **1.17** | **1.25** | **1.40** | **1.57** | **1.17** |

Source: Lichfields analysis

# 7.0 Summary of findings

7.1 Once initial, adjusted, and indicative benefit to cost ratios, including those relating to land value uplift, are considered in full, the scheme represents 'medium' value for money across all route alignments. The economic analysis undertaken for this study provides a good indication of the potential VfM that the scheme is capable of achieving.

7.2 The analysis has evidenced that there is a strong case for transit-oriented development across the Carterton-Witney-Oxford Rail Corridor and provides a solid foundation for the project's rationale. A growth-focussed approach to the scheme will align with the Government's current growth agenda, particularly when considering the recent announcement to kickstart growth along the OxCam Arc. Further work will be required to ensure that these benefits are integrated into further analysis as the project progresses.

7.3 The Government's ongoing review of land value uplift within economic analysis could provide an opportunity to transform the treatment of dependent development as an established impact within economic appraisal, as opposed to remaining as an indicative benefit. However, the latest VfM guidance was published under the current government, and so the timescales and applicability of any updated guidance is not yet clear. For this scheme, it is clear that the realising of additional economic development unlocked by sustainable transport capacity is fundamental to achieving overall growth objectives. The monetisation of LVU is the best measure of this and would be expected to align well with the focus of the Strategic Case for the scheme, moving forward.

7.4 While this study has sought to deepen and broaden the economic appraisal presented within the SOC Lite, a number of inconsistencies and limitations within the previous study were identified and if rectified could improve the outcome of the economic appraisal. Specifically, the lack of detailed origin-destination data has prevented the monetisation of certain Level 2 benefits, which could not be included in the BCR. Including these benefits could potentially increase the overall BCR and VfM, though the extent of this impact remains uncertain.

7.5 A key observation when calculating the BCR was the high capital costs, largely attributable to the need for a viaduct. Further feasibility work is recommended to test the requirement for a viaduct and consideration of any possible alternative low-cost options, for example be amended scheme alignments and station locations. At present, the high capital costs are not justified as the demand for the service (as assumed in the SOC Lite) does not outweigh the upfront cost of investment, making the net present public value negative.

7.6 Additionally, since the development of the SOC Lite, a number of external factors have had an impact on the reference case (Do Minimum). In particular, the improvements to the A40 have been scaled-back including the dualling of the road network. Such significant changes to the reference case would warrant undertaking more detailed transport modelling that would subsequently underpin assumptions within demand modelling for the railway. A substantial portion of patronage on the railway is expected to come from diverted car and bus mileage, and with a reduction in improvements to the A40 it is likely that there is a significant portion of latent demand that is not being captured within the demand forecasts currently available.

7.7 While a review of existing demand modelling has been undertaken, a large proportion of the detailed analysis that informed the modelling was not made available as a part of this study. Therefore, the inconsistencies identified in section 2.0 and Appendix 1, could not be fully validated and the extent of possible inconsistencies across the full suite of analysis within the SOC Lite could not be established.

## Next steps

7.8 The scope of this study was to review and update the economic analysis, utilising existing scheme information and underpinning transport modelling. The gap assessment and economic analysis highlights a number of areas where there were inconsistencies in the data or where scheme assumptions would need to be reviewed and revised.

7.9 As such, a number of actions have been identified, as suggested next steps, for WODC to consider prior to the development of a formal business case. These are outlined in further detail below:

1 **Review of scheme design and preferred options**
It is recommended that the principles of the scheme's design be reassessed. This should include a review of the scheme options, station locations, and route alignment. The optioneering process should also be re-evaluated to ensure the most suitable preferred option has been identified. This process should be conducted in accordance with DfT Transport Appraisal Guidance.

2 **Understanding scheme feasibility**
An exercise should be carried out to validate the scheme's feasibility and assess its deliverability and construction programme. This should include the development of an updated cost estimate that reflects potential changes to the scheme design and reflects current economic conditions, incorporating updated assumptions on inflation. The existing scheme includes the construction of a viaduct, which as noted above significantly increases the scheme costs.

3 **Validate transport modelling assumptions**
The underlying transport modelling analysis requires an update to reflect changes to the reference case with regard to the A40 improvements. Further, it would be valuable to consider undertaking both rail and traffic modelling in tandem, to provide a comprehensive assessment of the full extent of the potential transport user and non-user benefits resulting from the scheme.

4 **Establish the economic rationale for investment**
Expand on the existing rationale for investment, accounting for the wider economic justification for the rail scheme.

7.10 It is essential that all scheme development, analysis, and modelling adhere to the DfT's Transport Appraisal Guidance. Ensuring compliance from the outset will help secure funding and approval from relevant authorities, including Oxfordshire County Council, Network Rail, DfT, and HM Treasury. Failure to follow the guidance could delay progress at critical decision points.

7.11 Once the scheme principles have been reviewed, validated, and agreed upon, further work on a business case compliant with HM Treasury guidelines would be well placed to proceed having regard to the analysis contained within this report.

# Appendix 1 Gap assessment

A1.1 The following gaps and inconsistencies were identified within the previous studies:

- The appraisal model assumes a four-year construction period (2027 to 2030 inclusive), opening in 2031. This is not consistent with the longer, phased construction period proposed within the supplementary engineering report to the SOC Lite, which instead assumes the period from outline design to completion of construction works extends from Q3 2026 to Q2 2036, with the first phase (Oxford to Eynsham) opening in mid-2033 before phases 2 and 3 (Eynsham to Carterton West) open in late 2036.
- The high-level modelling undertaken applied The Railway Consultancy's 'GCOST' model, rather than a full transport model. While a 'light-touch' approach to transport modelling is advised at SOC stage (see section 3.0), the GCOST model takes 2011 Census data on travel to work as its primary input and therefore may not reflect changes to travel patterns in the intervening period, nor can it account for non-commuting trips (e.g., business and leisure travel). Further, the generalised cost of travel for origin-destination pair, mode and purpose have not been made available, which limits the possible assessment of wider economic impacts.
- The SOC Lite model assumes a diesel trainset within both the capital and operating cost assumptions, owing to limited existing information regarding costs for battery-operated rolling stock and associated infrastructure. The existing rail lines in the Oxfordshire area are not electrified and therefore diesel, battery or hybrid trains are the options considered qualitatively within the SOC Lite. However, it should be noted that no source has been provided for the assumed fuel consumption (litres per vehicle kilometre). Further, incorrect carbon emissions benchmarks from DfT TAG Unit A3 have been applied, resulting in a significant under-estimate of carbon emissions from the diesel trainset within the SOC Lite.
- The route distance assumed within the economic appraisal is 27km across all route alignments. However, within the SOC Lite cost model the true length of the six route alignments range between 22 and 23km. This influences the estimated environmental impacts (i.e., operational carbon emissions), and means that the economic appraisal within the SOC Lite has overestimated operational carbon emissions.
- The Benefit-Cost Ratio (BCR) scenarios within the SOC Lite are limited to do-nothing, do-minimum, least cost railway and greatest cost railway, with and without Land Value Capture and applying arbitrary assumptions on jobs created and/or safeguarded. However, there are various faults in the calculation of the BCR, including:
    - i Adding the cost of carbon emissions to the denominator of the BCR (the cost items), rather than deducting them from the numerator as a disbenefit (negative benefit);
    - ii Deducting the cost of the do-minimum scenario from the capital and operating costs of the intervention, which is not compliant with DfT TAG or the HM Treasury Green Book; and
    - iii In certain scenarios, adding estimates of the GVA generated by an arbitrary number of jobs created or enabled by the intervention (10 in a 'low' scenario

and 100 in the higher scenario) in place of a full assessment of wider economic benefits. This approach is not compliant with DfT TAG.

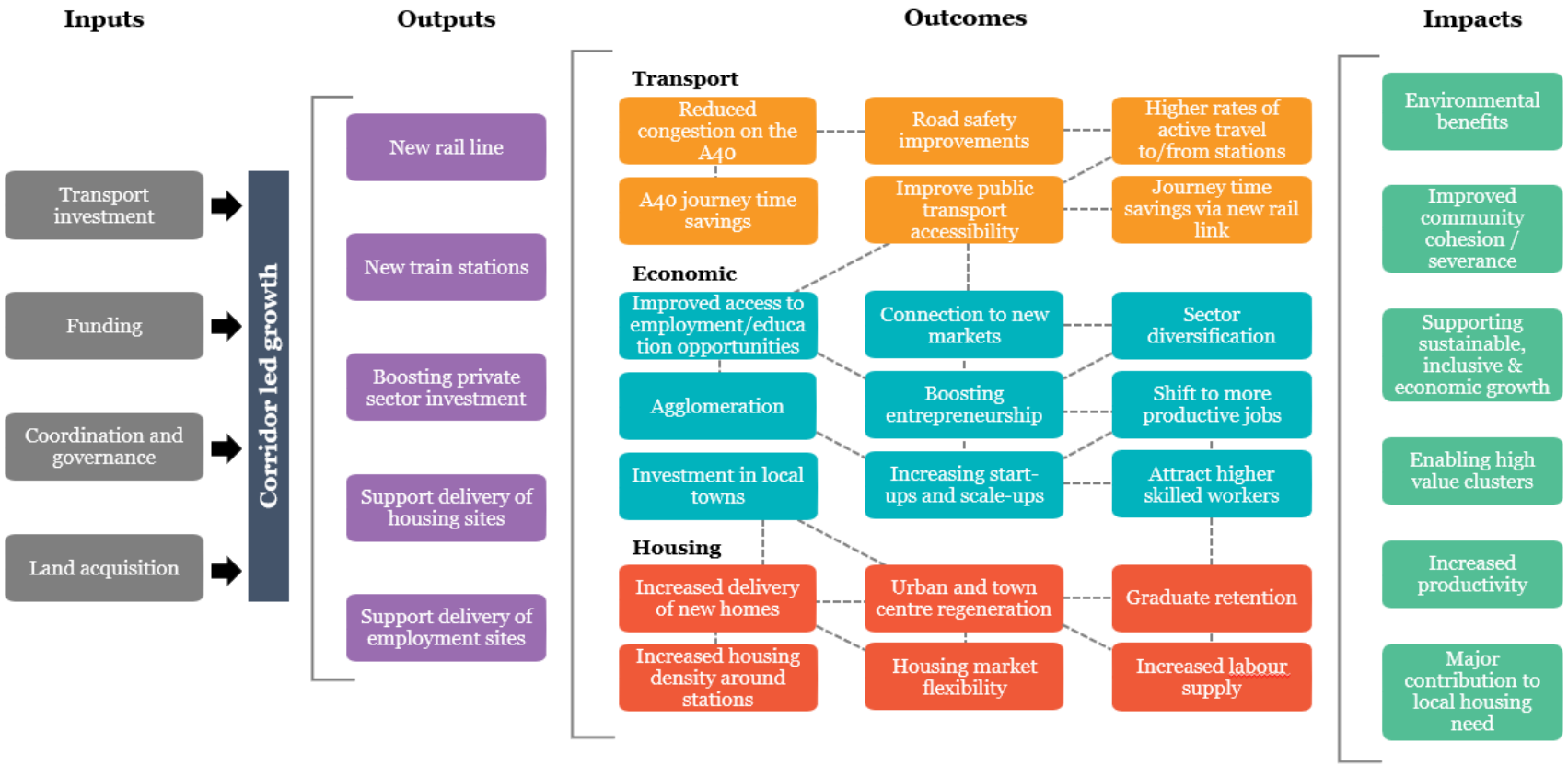
This results in estimates of the BCR that are not compliant with business case best-practice, nor DfT or HM Treasury guidance.

- The cost model applies a low, medium and high adjustment for risk. However, at this stage of appraisal the DfT advise that typically an adjustment for optimism bias should be applied, rather than an assessment of project risks[39].
- The source or methodology for the estimate of the operating cost of the scheme is not known, and the claim of an ongoing rail revenue surplus needs to be taken in this context. Further, the annual fare policy assumption of RPI + 1% is significant.
- As detailed in section 2.0, since the publication of the SOC Lite the A40 extent of proposed A40 improvements have been scaled back, and therefore the intervention case may not represent the full extent of benefits over and above the reference case.

[39] See Department for Transport (2024) TAG Unit A1.2 Scheme Costs, Section 3.0 (Treatment of cost risk and uncertainty)

# Appendix 2 Project Logic Model

Figure 1 Logic Model for the CWORC project




Source: Lichfields analysis

# Appendix 3 Economic appraisal principles

## The economic case and cost-benefit analysis

A3.1 The HM Treasury Green Book[40] sets out the 'Five Case Model' for business case appraisal. This is the *"required framework for considering the use of public resources to be used proportionately to the costs and risks involved and taking account of the context in which a decision is to be taken"* (paragraph 3.22). The five cases (or 'dimensions') are five different ways of viewing the same proposal; the Five Case Model is shown in Table 1.

Table 1 The Five Case Model

| Dimension | Description |
|---|---|
| Strategic | **What is the case for change, including the rationale for intervention?** What is the current situation? What is to be done? What outcomes are expected? How do these fit with wider government policies and objectives? |
| Economic | **What is the net value to society (the social value) of the intervention compared to continuing with Business As Usual?** What are the risks and their costs, and how are they best managed? Which option reflects the optimal net value to society? |
| Commercial | **Can a realistic and credible commercial deal be struck?** Who will manage which risks? |
| Financial | **What is the impact of the proposal on the public sector budget in terms of the total cost of both capital and revenue?** |
| Management | **Are there realistic and robust delivery plans?** How can the proposal be delivered? |

Source: HM Treasury (2022)

A3.2 An initial overview of each of the five cases is provided within the SOC Lite. The purpose of this report is to focus upon the economic appraisal, the analysis relating to the costs and benefits of the scheme through Cost-Benefit Analysis (CBA). This is included within the Economic Case.

A3.3 To be able to consider the different costs and benefits and compare them against each other, they are converted into monetary terms as a common unit of measurement. If the cost or benefit under consideration does not have a market price, that is, it is intangible and cannot be bought or sold, non-market valuation techniques and 'shadow prices' are used. In particular, this applies to environmental, social and health effects, for which the DfT provide shadow prices within Transport Appraisal Guidance (TAG).

A3.4 The use of non-market valuation and shadow prices distinguishes the economic case from the financial case. The economic case considers a full suite of costs and benefits resulting from an intervention, and while some of these will feature in the financial case – such as the capital and operating costs and operating revenues – the economic case seeks to establish under what circumstances would the project present the greatest net value to society, rather than its financial viability. Some impacts, however, cannot be monetised as it would be either infeasible or impractical to do so; these are instead assessed in quantitative or qualitative terms and can still form an important part of cost-benefit considerations.

A3.5 Within CBA, the monetised results are typically presented using the Benefit-Cost Ratio (BCR). This is the ratio of the present value of benefits (PVB) divided by the present value

[40] HM Treasury (2022) The Green Book: Central Government Guidance on Appraisal and Evaluation

of costs (PVC). It indicates how much benefit is obtained for each unit of cost; a BCR greater than 1 implies that the benefits outweigh the costs.

A3.6 In this analysis, all economic values are expressed in real, 2024 prices[41], meaning inflation is removed. Future values are 'discounted' to 'present values' using discount factors from the Green Book. The discount factor reflects society's preference for now over its preference for the future, meaning costs or benefits that occur further in the future are valued less than those occurring sooner. Within the BCR, all costs and benefits are presented in (net) present values.

A3.7 As the BCR informs Value for Money (VfM) decisions, the PVC should only account for public accounts impacts (costs borne by public bodies) while any costs on other parties or non-market costs, such as environmental or social costs, are instead included within the numerator as a negative benefit (a 'disbenefit'). The DfT (2024) Value for Money framework groups possible BCRs into six VfM categories, as set out in Table 4.2.

A3.8 It should be noted that other monetised and/or non-monetised impacts should also be considered alongside the BCR and may result in a VfM category which differs to that solely implied by the BCR. In particular, some monetised impacts may be considered in terms of 'switching values', wherein it is considered whether the inclusion of a particular impact within the BCR analysis would alter the VfM category.

## Economic appraisal for transport projects

A3.9 The components of economic appraisal for transport projects, set out within DfT TAG can be broadly divided as follows:

- **Scheme costs:** the capital and operating costs of the project
- **User and provider impacts:** the impacts on users and non-users of the scheme and the revenue accruing to the provider
- **Wider economic impacts:** wider economic impacts stemming from the change in generalised travel costs and/or changes in journeys resulting from the scheme
- **Environmental impacts:** operational carbon emissions
- **Social and distributional impacts:** impacts on social and distributional outcomes including those resulting from changes in air quality, noise, severance, option and non-use, journey quality and deprivation.

A3.10 Scheme costs, user and provider impacts, and environmental impacts were appraised within the SOC Lite. More detail on these elements and any amendments made is provided in section 5.0. This study additionally considers wider economic impacts and social and distributional impacts; the conceptual background and methodology applied for assessing these impacts is set out below.

[41] It is noted that the standard price base year for DfT TAG (until May 2025) is 2010, however, they are presented in the most recent full price year available (2024) in this analysis to aid easier interpretation of the costs and benefits of the scheme. In May 2025, the DfT will be changing the standard price base year to 2023 and any appraisal prepared for submission to the DfT will need to be prepared at this base.

## Wider Economic Benefits

A3.11 Wider economic benefits arise from changes in economic geography attributable to the transport project. Improved transport links can reduce the distance – in time terms – between economic agents including businesses, workers and households (static effects) or even encourage relocation as agents respond to new opportunities (dynamic effects)[42].

### Induced investment

A3.12 Induced investment impacts include output change in imperfectly competitive markets and dependent development.

A3.13 The former refers to changes in the level of economic activity resulting from a transport investment, over and above the core business user benefits. This additional economic activity results from the imperfect nature of markets. In a theoretical 'perfectly competitive' market, the value of output is equal to the cost of production, meaning reducing costs (for example, generalised travel costs) would increase industry output and reduce the price, bringing the market back into equilibrium.

A3.14 However, in imperfect competition – the market structures we observe in reality – the value of output can exceed the cost of production. This is because firms have a degree of market power, allowing them to raise their prices above marginal cost (the cost of producing the final unit of a good). As such, the reduction in cost is not fully passed on to consumers in through lower prices as firms retain some of the surplus, leading to economic output over and above the reduction in cost (the business user benefit). In DfT TAG, this is referred to as 'output change in imperfectly competitive markets'.

### Land Value Uplift and dependent development

A3.15 The DfT formula for valuing dependent development using Land Value Uplift is shown in Table 2.

Table 2 Valuing the benefits of dependent development

| ***Total Benefits = $LVU_D$ + Other – TEC – LAV – NTCI*** | |
|---|---|
| *$LVU_D$* | Land Value Uplift adjusted for displacement |
| *Other* | This includes Environmental Impacts, and Social and Distributional Impacts – TAG units A3 and A4 respectively |
| *TEC* | Transport External Costs |
| *LAV* | Land Amenity Value |
| *NTCI* | This refers to the costs associated with Non-Transport Complementary Interventions – the benefits are assumed to be captured by the land value uplift. |

Source: DfT (2024) TAG Unit A2.2 Appraisal of Induced Investment Impacts

### Categorisation of impacts

A3.16 These elements all feed into the BCR and VfM assessment, whether in monetary, quantitative or qualitative terms. As per the DfT Value for Money Framework (November 2024 update), impacts are split into four categories: established, evolving, indicative, and

[42] International Transport Forum (ITF) (2017) Quantifying the Socio-economic Benefits of Transport, ITF Roundtable Reports, OECD Publishing, Paris

non-monetised. Table 3 sets out DfT guidance on the types of impact and their use in the VfM assessment.

Table 3 Types of impact and their use in the VfM assessment

| Type | Description |
|---|---|
| Established Monetised Impacts | The method used for estimating the impact and its monetary value is accepted, well-researched, and tried-and-tested.<br>Values can be derived from current and predicted future market prices (e.g. fuel prices) or monetary values derived from research (e.g. values of travel time saved). |
| Evolving Monetised Impacts | Some evidence exists to support the estimation of a monetary value but this is less widely accepted, well-researched or tried-and-tested. |
| Indicative Monetised Impacts | Monetary valuation methods are considered less widely-accepted, well-researched or tried-and-tested to be definitive.<br>The methodologies are generally developing and a high degree of uncertainty in the magnitude of impact exists. |
| Non-monetised Impacts | Estimated magnitude of the impact is assessed on a seven-point scale.<br>Approach to the assessment can vary; can be informed by a variety of evidence sources and analytical judgement. |

Source: DfT (2024) Value for Money framework

A3.17 The three categories of monetised impacts correspond to which BCR calculation they are included within. Established impacts are included in the Initial BCR, evolving impacts in the Adjusted BCR, and indicative impacts within the Indicative BCR. The Adjusted BCR informs the provisional VfM assessment. Table 4 provides the description and categorisation of the impacts considered within this study.

Table 4 Impact categorisation

| Impact Type | Impact | Description | Category | Notes |
|---|---|---|---|---|
| User | Travel time savings | Benefit of a reduction in travel time for rail users (commuting, business and other users) compared to existing transport modes. | Established | Initial BCR |
| | Public transport revenues | Net revenue generated from additional rail users and reduced bus patronage. | Established | Initial BCR |
| | Increase in active travel | Health and well-being benefits of increased walking and cycling (e.g., to and from stations). | Established | Initial BCR |
| Non-user | Marginal external costs of car mileage | Reduction in external costs from car mileage including congestion, infrastructure, accidents, local air quality, noise, greenhouse gases, and indirect taxation. | Established | Initial BCR |
| | Reduction in car operating costs | Reduction in car operating costs from modal shift reducing car usage. | Established | Initial BCR |
| Environmental | Operational carbon | Carbon emissions associated with the operation of the railway. | Established | Initial BCR |
| Social and distributional | Option and non-use values | Option values represent the value placed upon having the transport mode as an option. Non-use values refer to the value derived from the existence of the transport scheme regardless of the possibility of future use. | Non-monetised | Used in switching values analysis |
| | User benefits | Distributional impacts of user benefits of the transport scheme. | Non-monetised | Assessed qualitatively |
| | Noise | Distributional impacts of noise emissions on during construction and operation. | Non-monetised | Assessed qualitatively |

| Impact Type | Impact | Description | Category | Notes |
|---|---|---|---|---|
| | Air quality | Distributional air quality impacts during construction and operation. | Non-monetised | Assessed qualitatively |
| | Community and well-being | Distributional impacts on the local community and individual well-being during construction and operation. | Non-monetised | Assessed qualitatively |
| | Severance | Impact, and distributional impact, of substantial changes in transport infrastructure or traffic flows causing separation of residents from facilities and services within their community. | Non-monetised | Assessed qualitatively |
| | Accessibility | Impact of the transport scheme on the ability of people to travel and access services they require. | Non-monetised | Assessed qualitatively |
| | Journey quality | Impact on the real and perceived physical and social environment when travelling. | Non-monetised | Assessed qualitatively |
| | Affordability | Change in the monetary costs of travel affecting the ability of certain groups to access key destinations. | Non-monetised | Assessed qualitatively |
| | Deprivation | Impact of the transport scheme on local (multiple) deprivation outcomes. | Non-monetised | Assessed qualitatively |
| Wider economic | Employment effects | Labour supply impacts: increased supply of labour from economically inactive individuals entering the labour market. | Evolving | Not monetised due to absence of generalised cost data |
| | | Move to more/less productive jobs from the relocation of employment and spatial inequality of productivity (i.e., place-based effects). | Indicative | Not monetised due to absence of generalised cost data |
| | Productivity impacts | Increased productivity from agglomeration economies, attributable to static clustering (the transport scheme reduces travel time between businesses). | Evolving | Not monetised due to absence of generalised cost data |
| | Output change in imperfectly competitive markets | Changes in the level of economic activity resulting from the transport investment over and above business user benefits. | Evolving | Adjusted BCR |
| | Dependent development (Land Value Uplift) | The value of sites 'unlocked' for (residential or non-residential) development by the transport scheme, i.e., those sites for which, in the absence of the transport scheme, would not be provided a 'reasonable level' of service by the existing transport network. | Indicative | Indicative BCR |

Source: Lichfields

A3.18 Each of the above metrics, where included within the appraisal, have been assessed using the latest DfT TAG as of April 2025. User, non-user and environmental impacts, where previously included in the SOC Lite, have been based on the methodology previously employed in the SOC Lite unless otherwise stated to ensure compliance with DfT TAG.

A3.19 Non-monetised impacts, where monetisable, can be used for 'switching values' analysis. This is applied to the assessment of option and non-use values within this study, wherein it is considered whether inclusion of a monetary estimate of the value of derived from option and/or non-use would change the VfM category.

# Appendix 4 Appraisal tables

## Analysis of Monetised Costs and Benefits (AMCB)

Table 1 Analysis of Monetised Costs and Benefits (AMCB) (NPV, 2024 prices, £m)

**Analysis of Monetised Costs and Benefits**

| | Reference Route 1 | Reference Route 2 | Shortest Route | Longest Route | Least Cost Route | Greatest Cost Route | |
|---|---|---|---|---|---|---|---|
| Noise | £99,159 | £99,159 | £99,159 | £99,159 | £99,159 | £99,159 | *(12)* |
| Local Air Quality | £72,385 | £72,385 | £72,385 | £72,385 | £72,385 | £72,385 | *(13)* |
| Greenhouse Gases | £850,273 | £850,273 | £850,273 | £850,273 | £850,273 | £850,273 | *(14)* |
| Journey Quality | | | | | | | *(15)* |
| Physical Activity | 13,852,559 | 13,852,559 | 13,852,559 | 13,852,559 | 13,852,559 | 13,852,559 | *(16)* |
| Accidents | £1,402,649 | £1,402,649 | £1,402,649 | £1,402,649 | £1,402,649 | £1,402,649 | *(17)* |
| Economic Efficiency: Consumer Users (Commuting) | £23,758,704 | £23,758,704 | £23,758,704 | £23,758,704 | £23,758,704 | £23,758,704 | *(1a)* |
| Economic Efficiency: Consumer Users (Other) | £19,083,609 | £19,083,609 | £19,083,609 | £19,083,609 | £19,083,609 | £19,083,609 | *(1b)* |
| Economic Efficiency: Business Users and Providers | £34,808,107 | £34,808,107 | £34,808,107 | £34,808,107 | £34,808,107 | £34,808,107 | *(5)* |
| Wider Public Finances (Indirect Taxation Revenues) | £344,295 | £344,295 | £344,295 | £344,295 | £344,295 | £344,295 | *- (11) - sign changed from PA table, as PA table represents costs, not benefits* |
| Present Value of Benefits (see notes) (PVB) | £94,271,741 | £94,271,741 | £94,271,741 | £94,271,741 | £94,271,741 | £94,271,741 | *(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)* |
| Broad Transport Budget | £740,436,033 | £705,666,443 | £689,585,517 | £765,293,733 | £638,039,959 | £809,905,620 | *(10)* |
| Present Value of Costs (see notes) (PVC) | £740,436,033 | £705,666,443 | £689,585,517 | £765,293,733 | £638,039,959 | £809,905,620 | *(PVC) = (10)* |
| OVERALL IMPACTS | | | | | | | |
| **Net Present Value (NPV)** | -£646,164,293 | -£611,394,702 | -£595,313,776 | -£671,021,993 | -£543,768,218 | -£715,633,879 | NPV=PVB-PVC |
| **Benefit to Cost Ratio (BCR)** | 0.13 | 0.13 | 0.14 | 0.12 | 0.15 | 0.12 | 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.

Source: Lichfields analysis

# Economic Efficiency of the Transport System (TEE)

Table 2 Economic Efficiency of the Transport System (TEE) (NPV, 2024 prices)

**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 | £21,882,764 | | | | £21,882,764 | |
| Vehicle operating costs | £1,875,940 | | £1,875,940 | | | |
| User charges | £0 | | | | | |
| During Construction & Maintenance | £0 | | | | | |
| **COMMUTING** | £23,758,704 | *(1a)* | £1,875,940 | £0 | £21,882,764 | £0 |

| **Non-business: Other** | **ALL MODES** | | **ROAD** | **BUS and COACH** | **RAIL** | **OTHER** |
|---|---|---|---|---|---|---|
| ***User benefits*** | **TOTAL** | | **Private Cars and LGVs** | **Passengers** | **Passengers** | |
| Travel time | £16,066,073 | | | | £16,066,073 | |
| Vehicle operating costs | £3,017,535 | | £3,017,535 | | | |
| User charges | £0 | | | | | |
| During Construction & Maintenance | £0 | | | | | |
| **NET NON-BUSINESS BENEFITS: OTHER** | £19,083,609 | *(1b)* | £3,017,535 | £0 | £16,066,073 | £0 |

| **Business** | | | **Goods Vehicles** | **Business Cars & LGVs** | **Passengers** | **Freight** | **Passengers** | |
|---|---|---|---|---|---|---|---|---|
| ***User benefits*** | | | | | | | | |
| Travel time | £7,221,898 | | | | | | £7,221,898 | |
| Vehicle operating costs | £0 | | | | | | | |
| User charges | £0 | | | | | | | |
| During Construction & Maintenance | £0 | | | | | | | |
| **Subtotal** | £7,221,898 | *(2)* | | | | | | |
| ***Private sector provider impacts*** | | | | | | **Freight** | **Passengers** | |
| Revenue | £52,038,950 | | | | -£32,591,699 | | £84,630,649 | |
| Operating costs | -£24,452,742 | | | | | | -£24,452,742 | |
| Investment costs | £0 | | | | | | | |
| Grant/subsidy | £0 | | | | | | | |
| **Subtotal** | £27,586,208 | *(3)* | | | | | | |
| ***Other business impacts*** | | | | | | | | |
| Developer contributions | | *(4)* | | | | | | |
| **NET BUSINESS IMPACT** | £34,808,107 | *(5) = (2) + (3) + (4)* | | | | | | |

| **TOTAL** | | |
|---|---|---|
| Benefits (TEE) | £70,428,521 | *(6) = (1a) + (1b) + (5)* |

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2024 prices and values

Source: Lichfields analysis

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