



A428 Black Cat to Caxton Gibbet Improvements Scheme

Full Business Case



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Ministerial Foreword



Our nation's strategic road network is essential to the growth of the economy, and our future growth and prosperity depends on our ability to upgrade the network and improve connectivity between our towns and cities.

In the first Roads Investment Strategy (2015), the Government identified and committed to the

A428 as an important section of the strategic road network that required upgrade due to its longstanding problems of congestion, poor journey time reliability, and resilience. The second Roads Investment Strategy (2020) maintained our commitment to the delivery of the A428 Black Cat to Caxton Gibbet Improvements scheme, which is planned to open for traffic in 2027.

To enhance this section of the network, National Highways will be upgrading the route between the Black Cat roundabout and Caxton Gibbet roundabout with a new 10-mile (16 km) dual carriageway, bridges, and a number of junction improvements to improve traffic flow and safety for all road users on one of the East of England's busiest road links.

This Full Business Case sets out the rationale for the A428 Black Cat to Caxton Gibbet Improvements Scheme and describes how National Highways will deliver it.

The scheme will enhance journey times, support local and regional economic growth, create jobs, and improve employment and the environment for the communities between Milton Keynes, Bedford and Cambridge, leaving a lasting positive impact. It also aligns with the Department for Transport's strategic aims to improve transport for the user and grow and level up the economy.

Guy Opperman MP Minister for Roads and Local Transport Department for Transport



Executive Summary

Introduction

This document is the Executive Summary of the updated Full Business Case (uFBC) for the A428 Black Cat to Caxton Gibbet Improvement Scheme (the Scheme). It sets out the case, in line with His Majesty's Treasury (HMT) Green Book and the Department for Transport (DfT) guidance, to progress the Scheme main works in accordance with the Secretary of State's (SoS) approval of the Development Consent Order (DCO) which was received in August 2022.

The schedule in the Full Business Case (FBC) was constructed on the assumption there would be no delay in approval of the DCO, no onerous legal conditions and no Judicial Review (JR) with a Start of Works in December 2022. Following due Tier 1 Governance including NH, DfT and SoS approval, the FBC was ultimately approved by Chief Secretary to The Treasury (CST) in November 2022 subject to there being no JR and it be affordable within DfT SR21 funding settlement.

In August 2022, the SoS granted the DCO, however this was swiftly followed by the commencement of legal action by Transport Action Network (TAN) to seek a JR. This proved to be ultimately unsuccessful; on 18 May 2023 after the High Court had twice rejected TAN's claim for a JR, the Court of Appeal denied TAN the right to appeal against these decisions which has effectively extinguished all legal avenues.

Whilst the risk of the DCO being quashed was low, DfT and NH made the decision to wait until the legal process concluded prior to issuing Notice to Proceed (NtP) to the contractor and as such the Start of Works date (SoW) of December 2022 was missed. This means the 2023 earthworks season has been lost and a full year's delay incurred.

The uFBC builds on the approved FBC in November 2022 and reflects this delay, the five dimensions have each been updated accordingly as has this Executive Summary.

The FBC used the then National Highways approved inflation rates. It was recognised in the FBC that higher inflation represented a tangible risk to the outturn cost of the scheme. The uFBC now includes the cost impact of both the twelve-month delay and the ongoing exceptional inflation rates.

The uFBC has been developed in four stages: Strategic, Outline, Full and this updated Full version. It incorporates five separate but related dimensions: strategic; economic; financial; commercial; and management.

Strategic Dimension

The A428 provides an important east west link connecting Oxford, Milton Keynes, Bedford, and Cambridge and allows for onward journeys to the Haven Ports of Felixstowe and Harwich.

The A428 corridor sits in the Oxford-Cambridge Arc, a globally significant area which is home to 3.3 million people, supports over 2 million jobs, adds over £110 billion to the UK economy annually, and is earmarked for an ambitious additional 1.1 million jobs by 2050.



The sub-region performs well in both economic and social terms relative to the England average, however, the Scheme does serve pockets of deprivation for example, in Bedford, Cambridge and Peterborough.

The need for improvement at the A1 Black Cat roundabout has been recognised since the 1970s. The section of the A428 between the A1 at Wyboston and Caxton Gibbet is the only remaining single carriageway section of the Strategic Road Network between the M1 at Milton Keynes and Cambridge. Several sections of the Scheme's route are congested with the worst performing sections equating to approximately two thirds of the existing route between the Black Cat roundabout and Caxton Gibbet roundabout (both directions).

In 2016, the A428 Route Strategies Options Appraisal Report identified a number of problems faced by the A428 on all or parts of the route: it carries twice the traffic for which it was designed; between Wyboston and Caxton Gibbet has peak hour speeds of less than 40mph, with link delays in the top 20% nationally; is top 25% of highway links nationally for casualties; some of the least reliable journey times nationally; safety and maintenance impact issues; and Black Cat roundabout was identified as having a safety problem (69th highest accidents nationally).

Transport modelling forecasts show that without the Scheme, congestion and delays will worsen over time, and the inability of the route to accommodate trip growth will stifle economic growth. With the Scheme congestion reduces and the route will continue to operate within its capacity to the 2040s.

Upgrading this section of the A428 would create a continuous dual carriageway between M1 J13 and the Port of Felixstowe connecting the key economic centres of Milton Keynes, Bedford, and Cambridge. This, in turn, would stimulate the local and regional economy delivering planned housing and employment growth. Furthermore, it will help support the delivery of ambitious housing growth targets within the Oxford-Cambridge Arc.

The Scheme addresses the problems of congestion, poor journey time reliability and poor resilience against incidents between the Black Cat and Caxton Gibbet roundabouts.

It has a very good fit with key government policy and strategy including Decarbonising Transport: A Better, Greener Britain (2021), Union Connectivity Review 2021, and Build Back Better 2021; DfT's Transport Investment Strategy 2017; and National Highways' Road Investment Strategy 2020.

The Scheme-specific Client Scheme Requirements ("CSRs") shown below have guided the development of the Scheme and the detailed Scheme objectives.



Theme	Objective
Economic growth	To support significant levels of planned economic growth in Cambridge and the surrounding sub-region, which is one of the fastest growing areas of the UK.
Transport	To reduce traffic congestion, provide adequate capacity to support future growth forecasts, improve journey time reliability and increase resilience against accidents and incidents.
Environment	To protect the built and natural environment by mitigating the potentially adverse impact of adding additional capacity where technically feasible and economic to do so.
Community	To enhance accessibility and reduce severance for non- motorised road users where technically feasible and economic to do so.

Table 0-1 Client Scheme Requirements

The Scheme (illustrated below) is a Tier 1 highways improvement scheme in National Highways' Complex Infrastructure Programme (CIP). It is a new ten-mile dual two-lane carriageway between Black Cat Junction and the A428/A1198 junction at Caxton Gibbet, with a new three tier grade separated junction at Black Cat roundabout that will allow traffic to flow freely, and grade separated new junctions at Caxton Gibbet and Cambridge Road that will connect the new dual carriageway to the existing A428, increasing the road network's ability to cope with unforeseen incidents. The Scheme will also provide a new Roxton Road link that will connect Wyboston and Chawston; new bridges crossing over the new dual carriageway at Roxton Road, Barford Road and Toseland Road; and new bridges over the River Great Ouse flood plain and East Coast Main Line railway.





Figure 0-1 The Scheme (Preferred Route Announcement)

Economic Dimension

The analysis and assessment of value for money (VfM) has been carried out in accordance with the Department for Transport's (DfT's) Transport Analysis Guidance (TAG). Based on the TAG, the Scheme has an Adjusted Benefit:Cost ratio (BCR) of 1.63 - Medium VfM.

This assessment has been updated to reflect the delay in the scheme caused by the unsuccessful legal challenge. The updates made included changes to the opening year, scheme costs and revised economic and growth assumptions.

In addition, since the preparation and submission of the FBC the DfT issued new guidance to TAG (Unit M4) and introduced the Common Analytical Scenarios to deal with the increasing uncertainty related to forecasts of future demand for travel. A proportionate approach was adopted and agreed with DfT for the re-assessment focussing on; low and high growth sensitivity test undertaken in line with the updated guidance and an updated assessment of the scheme's benefits with a new opening year of 2027.

The following table summarises the benefits and costs that make up the initial BCR and the wider impacts that make up the adjusted BCR.



ltem	Description	2010 Prices discounted to 2010 (£000s)
	Journey time savings	633,667
	Vehicle operating costs	-81,453
	Delays During Construction	-39,223
	Total Economic Efficiency Benefits	512,992
	Carbon Benefits, of which:	-182,016
	Greenhouse Gas	(-156,100)
	Construction Carbon Benefits	(-20,311)
Benefits	Construction Impacts on Traffic	(-7,061)
	O & M Carbon Benefits	(-646)
	Natural Capital	(2,102)
	Monetised Noise Benefits	3,211
	Monetised Air Quality Benefits	-118
	Accident Benefits	28,645
	Indirect Tax Revenue	44,774
	Present Value of Benefits (PVB)	407,487
	Construction Cost	
Costs	Operating and Maintenance	
	Present Value of Cost (PVC)	
Net Present Value	Net Present Value (NPV)	282,092
Benefit Cost Ratio	Initial Benefit to Cost Ratio (BCR)	0.92
	Wider Impacts	282,312
	Reliability	36,716
	Adjusted PVB	726,515
	Adjusted BCR	1.63

Table 0-2 Breakdown of benefits and costs



Financial Dimension

The Scheme is publicly funded, primarily in Roads Periods (RP) 2 and 3 with a small amount having been funded in RP1 and has no off-balance sheet implications.

The uFBC has been updated to account for the increase in costs due to the twelvemonths delay caused by the legal challenge (and exceptional levels of inflation currently being experienced.

The anticipated final cost is estimated at **second**, **descend** core costs and a portfolio risk provision of **second**. These figures are derived from a revised and assured cost estimate produced in March 2023.

At contract award, the Delivery Integration Partner (DIP) budget was which was increased by to account for design changes resulting from the DCO approval. The updated contract figure has yet to be finalised for inflation and delay costs, but the cost estimate shown in Table 0-4 provides the expected position.

The key schedule milestone assumptions are in the table below:

Table 0-3 Key schedule assumptions

Milestone	Date
Updated FBC and Full Funding Approval by	October 2023
Notice to Proceed by	November 2023
Start of Works by	December 2023
Open for Traffic by	2027

Now that the legal action seeking to quash the DCO has been extinguished, there is very limited risk to not achieving SoW by December.

A further assumption is the current inflation factors used in the cost estimate and set out in the Financial Dimension are sufficient.

The Scheme will be accounted for using the Generally Accepted Accounting Principles (GAAP) adopted by National Highways.



Table 0-4 Expenditure profile

Outturn Capital Cost (£m)		Roads Period 2		Roads Period 3				Total			
	RP1	22- 23	23-24	24-25	Total	25-26	26-27	27-28	28-29	Total	Outturn
Options											
Development and early works											
Delivery											
Land											
Total DIP Budget*											
Non- DIP Core Costs											
Total Core Costs											
Portfolio Risk Provision											
Anticipated Final Cost											

*Note: DIP Budget includes provision for inflation and delay

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The capital cost estimate for the Scheme was updated in March 2023 following the National Highways Cost Estimation Manual using the standard cost estimating approach. This estimate considered the Scheme scope and design; topography and ground conditions; and included sunk costs.

The estimate used a three-point estimating technique, giving an outturn P2.5 to P97.5 range of **Example** to **Example** with the most likely **Example** (p44.6).

Estimates for future operations, maintenance, and renewals costs over a 60 year time horizon of **Constant** Opex; **Constant** capex) outturn have been made.

The project has **Constant** of released funding to date. The project is seeking of funding in June 2023 which will provide financial cover until to December 2023, at which point full final funding of **Constant** is expected to have been secured through a request to the CST alongside the approval of the FBC. **Constant** of this funding will be delegated to the SRO and the remaining **Constant** would require NH IDC release.

Commercial Dimension

The Scheme Contract, let under the Regional Delivery Partnership (RDP) arrangements, is for the DIP to undertake Project Contract Framework (PCF) Stages 5 to 7 inclusive (detailed design, construction, and handover) and any Early Orders let by National Highways, supported by other parties (technical advisor, outline design to DCO submission, integrated project controls, and non-contestable utility works).

The Scheme Contract is based on the New Engineering Contract (NEC) 4 Engineering & Construction Contract (ECC) form with standard National Highways amendments. The fixed price Option A (priced contract with activity schedule) is used for PCF Stage 5 and any Early Orders, and the target price Option C (target contract with activity schedule) is used for the main works.

Optional X clauses are used with X20 (Key Performance Indicators) and X22 (Early Supplier Involvement) together providing the Scheme-specific incentivisation of the DIP against the Scheme Contract budget.

Design responsibility was passed from AECOM (as client designer) to Skanska at Design Fix 3d (through clause Z8). Three specific risks associated with this design responsibility transfer were retained by National Highways as Strategic Assumptions (Design, DCO, and Fitness for Purpose). The design responsibility is an absolute Fitness for Purpose obligation rather than a 'professional skill and care' design obligation.

National Highways has various termination rights including the notice to proceed to Stage Two (anticipated to be given in November 2023) which is a sole discretion termination right (clause X22.5(4) not to proceed to main works construction.

For gain share, Skanska (as DIP) is incentivised to deliver against the Scheme Contract budget; schedule milestones; quality; and value for money as follows:



- Cost (20% of budget saving). To achieve Budget Savings below the Outturn Cost of **Contract** (Capped at 30% of Scheme Contract budget).
- Schedule (10% of budget saving). Delivery of Additional Opportunities 1 (Start of Works) and 3 (Open for Traffic). (Capped at 30% of Scheme Contract budget).
- Function (10% of budget saving). Achievement of Additional Opportunity 2 (Journey Time Reliability). (Capped at 30% of Scheme Contract budget).
- Value for money (50% of gain share). Maintenance of and improvement to the Investment Baseline Benefit Cost Ratio (BCR) of [1.63:1].

For pain share, up to 50% of the sum of the Fee and Development Phase OHP can be clawed back.

The risk allocation of the DIP scope is in line with the RDP arrangements and provision has been made for DIP risk of **Sector** and Employer risk of **Sector** within the Scheme Contract budget. Portfolio risk of **Sector** and Strategic Assumptions (of **Sector** for specific risk events) sit outside the general provisions of the main works Option C contract and the Scheme Contract budget incentives.

The contract management approach follows the RDP Operational Guidance Note and National Highways' Commercial and Procurement Contract Control Framework, which provides the opportunity to facilitate best practice by transferring key resources and experience from the recently completed successful A14 Scheme. It is described further in the Management Dimension Section 15, Contract Management.

Management Dimension

Management operating model

This section demonstrates that there are robust arrangements in place for the delivery, governance, and how the Scheme will deliver:

- Successful organisational transition between phases.
- Effective stakeholder engagement; and
- Discharge of the DCO requirement.

The Scheme follows the Major Projects Project Control Framework (PCF) process which sets out how National Highways, together with DfT, manages and delivers projects of over £10m capital value.



The PCF Stage 4/5 (DCO and construction preparation) operating model draws resources from both National Highways and Skanska, led and managed by a specific functional owner to ensure continuity and that delivery expectations for the workstream are met. PCF Stages 4 and 5 have been run in parallel to allow Start of Works by the contract and revised milestone date of December 2023, and to maximise the opportunity for National Highways and Skanska to achieve the Open for Traffic milestone. During this period, the Strategic Leadership Team (SLT) role is to define and communicate the strategic vision for the Scheme and the Operational Leadership Team (OLT) role is a functional leadership team sharing key information on a workstream basis and cascading consistent key messages.

For PCF Stage 6 (construction and commissioning), the SLT role will continue but the OLT role will transition to be more focused on construction delivery and will be led by Skanska. The operating model for PCF Stage 7 (closeout) will be finalised towards the end of the construction, to ensure there is continuity of personnel to effectively support activity such as final accounts and defect rectification.

For PCF Stage 7, on completion of the Scheme, the DIP will develop a Detailed Local Operating Agreement ("DLOA") to agree operational requirements of the road between parties.

In common with all National Highways projects, the operating model includes supporting services from a comprehensive network of National Highways Business Partners and Advisors (including technical and commercial assurance) responsible for providing support and advice to the scheme across a range of specialisms such as Sponsorship, Finance, Legal, Commercial, Procurement and Operations.

Governance and assurance

As a Nationally Significant Infrastructure Project (NSIP), the scheme is part of the Government's Major Project Portfolio (GMPP). The Infrastructure and Projects Authority (IPA) classifies the project as a Tier 1B scheme. Its assurance reviews since this date have therefore been undertaken by DfT (who have delegated these to National Highways Corporate Assurance), and Business Cases are reviewed through a Treasury Approval Point (TAP) rather than a full Major Project's Review Group session.

The governance and assurance model for the Scheme is illustrated in Figure 5-1.

As the legal proceedings against the award of the DCO have now been exhausted, the next stage in the governance process is approval of this updated uFBC to obtain full funding approval from DfT and HMT which will support the NtP and SoW milestones.

As the Scheme is developed, at the end of each PCF Stage a Stage Gate Assessment Review (SGAR) is undertaken to provide assurance that the PCF Stage is complete, that the PCF process has been followed, and that the Scheme is ready to proceed to the next PCF Stage.

This uFBC will be assured via an independent review and a Treasury Assurance Point (TAP) prior to final approval by HMT.



Development Consent Order

The DCO was awarded by the Secretary of State in August 2022 with no significant amendments.

Following the unsuccessful attempt by TAN to challenge the DCO via a JR, the DCO can now be discharged in line with its content.

In discharging the DCO, National Highways has to formally consult stakeholders on relevant documentation and, where appropriate, amended the documentation in accordance with stakeholder comments prior to submitting a discharge application.

No DCO amendments are currently being considered, however, should this change National Highways will consider Non-Material Change Order (NMCO); Material Amendment Order (MAO); a Town & Country Planning Act (TCPA) application; or in extremis, a new DCO application.

Customers and other stakeholders

A Stakeholder Engagement and Communications Strategy (SECS) has been developed with objectives: to gain further key stakeholder support and advocacy for the Scheme; gain interest from stakeholders who have not yet engaged on the Scheme; ensure public understanding and acceptance of the design and decisionmaking processes; illustrate the benefits of the Scheme in the wider regional context; and to understand stakeholder and local community views on Scheme legacy benefits.

Four Scheme-specific customer principles have been developed for the construction phase:

- Keep traffic moving safely, with minimal disruption;
- Provide timely, reliable, and accurate information to National Highways' customers;
- Be a good neighbour to communities; and
- Help walkers, cyclists, horse-riders, and vulnerable network users; and deliver better environmental outcomes.

Benefits realisation

The Scheme delivers benefits beyond traffic-related economic benefits, so National Highways has adopted a benefits realisation management (BRM) approach that captures this wider scope.

The DIP is directly incentivised to deliver the key Scheme traffic-related benefits – Open for Traffic and Start of Works milestone dates (Additional Opportunities 1 and 3) and Journey Time Reliability fitness for purpose (Additional Opportunity 2). The most significant non-traffic related benefits are wider economic benefits; customer experience; and community and social impacts.



In addition to the BRM approach, a Strategic Stakeholder Board (SSB) has been established with membership from National Highways and key stakeholders to provide strategic guidance, coordination, and to oversee delivery from a number of technical working groups (Skills and Employment; Local economy legacy; Environment legacy; and Connected Communities legacy) supported by the £2m Scheme Legacy Funds.

Schedule

Table 0-5 Key schedule milestones

Key Milestone	Date
HMT Approval of FBC and Full Release of Funding	Sept 2022
SGAR 5	Sept 2023
Notice to Proceed	Oct 2023
Start of Works Stretch Forecast	Oct 2023
Start of Works proposed RIS Milestone	Dec 2023
Open for Traffic proposed RIS Milestone	2027

Carbon management

The Scheme has developed a Sustainability Strategy and will implement its Carbon Management Plan to support National Highways and government's commitments on net zero by 2050.

Digital IT and innovation

Building Information Modelling (BIM) will be used to provide comprehensive monitoring and transfer of information throughout the project lifecycle.

Integrated Project Management Organisation

National Highways has developed robust and integrated set of processes for risk, change, opportunity management and contract and commercial management.

Risk management

A Risk Management Plan (RMP) has been developed designed to set out an overall structure for the management of risk and a 'live' risk register is maintained for the Scheme to ensure that risk management is an ongoing activity that is embedded within daily business processes.

Individual workstream and overall Scheme risk reviews will be undertaken each month to keep the risk register current and highlight items for escalation and/or actions and decisions, using Quantitative Cost Risk Analysis (QCRA) and Quantitative Schedule Risk Analysis (QSRA).



Change management

The Scheme will operate three change control processes within the agreed levels of Delegation of Authority (DoA):

- DfT level change control and any change requiring approval by the IDC follows the CPM change control process.
- The Major Projects (MP) level change control, primarily for the drawdown of project and project risk allowance, following the processes defined in the National Highways MP; and
- Project level change control for approval of changes of a certain impact level based on the DoA of the Project Director who is the chair of the Project Change Group.

Contract management

Management of PCF Stage 5 onwards by the DIP is being delivered under the RDP Scheme Contract drawing on the Operational Guidance Note. DIP performance management will be through the incentivisation arrangements described in the commercial dimension and the RDP performance indicators.

Continuous improvement and innovation opportunities can be identified by the National Centre of Excellence, Regional Centres of Excellence, and Sustainable Improvement Hub RDP arrangements.

Integration of lessons learned

Throughout the project lifecycle lessons learnt are identified, reviewed, and appropriately recorded. These lessons are recorded using the National Highways PCF manual for Major Projects Lessons Learned template. The log is used to enable effective knowledge sharing and analysis that can be applied to benefit other projects and programmes and inform future improvements to standards and processes.

Executive Summary conclusion

The A428 Scheme is a key project in the National Highways Complex Infrastructure Programme. It contributes to national and regional planning in the Oxford-Cambridge Arc and addresses the significant congestion and accident issues identified.

This uFBC supports the further funding release of **Control** to account for the cost of delay caused by legal proceedings and exceptional inflation. The CST previously approved the FBC, which requested full funding of **Control** subject to there being no JR (which is now the outcome of the legal process). This takes the total funding request for the scheme to **Control** which is the anticipated final outturn cost (including Portfolio Risk).

The adjusted BCR is 1.63 and the scheme has a VfM category of Medium.

Forecast expenditure in Roads Period 2 is **an experiment** with **a set of** cost in Roads Period 1. In seeking full funding release, we are seeking commitment to the Roads Period 3 as part of the RIS3 settlement.



1. Strategic Dimension

1.1. Introduction

- 1.1.1. This section of the Full Business Case ("FBC") sets out the strategic dimension for the A428 Black Cat to Caxton Gibbet improvements scheme ("the Scheme") and is structured as follows:
 - Context
 - The existing route
 - The Client Scheme Requirements and Scheme objectives
 - Measures of success
 - Problems and Opportunities
 - Economic Growth
 - Environment and Communities
 - Scheme development
 - The scope of the Scheme
 - Strategic Fit
 - Constraints
 - Dependencies
 - The Theory of change and the Golden Thread
 - Conclusions

1.2. Context

- 1.2.1. The A428 provides an important east west link connecting Oxford, Milton Keynes, Bedford, and Cambridge and allows for onward journeys to the Haven Ports of Felixstowe and Harwich.
- 1.2.2. The A428 corridor sits in the Oxford-Cambridge Arc (the Arc), a globally significant area home to 3.7 million people, supporting over 2 million jobs, adding over £110 billion to the UK economy annually, and earmarked for an ambitious additional 1.1 million jobs by 2050.
- 1.2.3. The need for improvement at the A1 Black Cat roundabout has been recognised since the 1970s while the section of the A428 between the A1 at Wyboston and Caxton Gibbet is now the only remaining single carriageway section between the M1 at Milton Keynes and A14 / M11 at Cambridge. Both the A1 Black Cat roundabout and the single carriageway section of the A428 suffer from severe congestion and do not offer network resilience even though the A428 is a designated Emergency Diversionary Route ("EDR") for the Strategic Road Network ("SRN").



- 1.2.4. Many years of development work has culminated in the design of the Scheme which will address the current and future transport problems in the area and support the ambitious growth aspirations.
- 1.2.5. Statutory Public Consultation has shown that the Scheme has robust support, with 88% of respondents supporting or strongly supporting it.
- 1.3. The existing route
- 1.3.1. The A428 extends approximately 27 km (17 miles) between the A1 at St. Neots and the A14 / M11 to the northwest of Cambridge. It is a single carriageway for approximately 14 km (9 miles) between the A1 at St. Neots and the A1198 at Caxton Gibbet, see Figure 1-1, with a number of at grade junctions comprising of roundabouts, give way junctions and direct access to private properties, all of which impact on route performance.



Figure 1-1 A428 Black Cat to Caxton Gibbet - the Scheme



- 1.3.2. The sub-region encompasses the local authorities of Bedford Borough, Cambridgeshire, and Central Bedfordshire which is characterised by high skills levels, economic activity, and employment levels, particularly in high value professionals, scientific and technical jobs The key characteristic of the sub-region is the high levels of planned housing and employment growth.
- 1.3.3. The Arc is home to 3.7 million residents and has seen 17% growth in population since 2000. However, housing delivery rates are below the level needed to accommodate current needs and future job creation rates. Without a joined-up plan for housing, jobs and infrastructure, the corridor will fall behind its international competitors. The Government's ambition is therefore to deliver up to 1 million new homes and 1.1 million new jobs in the Arc by 2050. The local authorities in the Arc are playing their part by setting the following ambitious growth targets for 2035 and 2050, as shown in Table 1-1.
- 1.3.4. The A428 single carriageway between the A1 at St Neots and Caxton Gibbet provides onward links to Cambourne and the A14 north of Cambridge, but in doing so cuts through a number of small communities and villages. Beyond local towns and cities, the A428 also provides an important east-west link connecting Oxford, Milton Keynes, Bedford, and Cambridge, see Figure 1-2. Onward journeys are then possible to the Haven Ports of Felixstowe and Harwich on the A14, which were recently made designated freeports in the 2021 Budget

Local Authority	Housing	Growth	Job Growth		
Local Authonity	2035	2050	2035	2050	
Bedford Borough	9,026	9,026	28,095	31,197	
Central Bedfordshire Local	28,912	31,908	23,668	24,420	
Huntingdonshire	13,738	15,011	14,044	14,836	
South Cambridgeshire	32,551	38,606	21,912	25,070	
Totals	84,227	94,551	87,719	95,523	

Table 1-1 Summary of housing and job growth





Figure 1-2 The Scheme link between the east-west regions

1.4. Client Scheme Requirements

1.4.1. Scheme-specific Client Scheme Requirements ("CSR") have been set in four key areas, as shown in Table 1-2. These have guided the development of the scheme, are reflected in the Scheme's detailed objectives, and are aligned to Department for Transport ("DfT")'s Strategic Priorities.

CSR Areas	Scheme CSR	DfT Strategic Priorities
Economic growth	To support significant levels of planned economic growth in Cambridge and the surrounding sub- region, which is one of the fastest growing areas of the UK.	 Boosting economic growth and opportunity Building a One Nation Britain

Table 1-2 Client Scheme Requirements – Summary



CSR Areas	Scheme CSR	DfT Strategic Priorities
Transport	To reduce traffic congestion, provide adequate capacity to support future growth forecasts, improve journey time reliability and increase resilience against accidents and incidents.	 Improving journeys Safe, secure, and sustainable transport Building a One Nation Britain
Environment	To protect the built and natural environment by mitigating the potentially adverse impact of adding additional capacity where technically feasible and economic to do so.	 Climate change and Carbon net zero by 2050 Safe, secure, and sustainable transport
Community	To enhance accessibility and reduce severance for non-motorised road users where technically feasible and economic to do so.	 Building a One Nation Britain Improving journeys Safe, secure, and sustainable transport



1.5. Detailed Scheme Objectives

- 1.5.1. The Scheme's CSRs are broken down in the Scheme detailed objectives and how these objectives will be delivered, as shown in Table 1-3.
- 1.5.2. Approximately 24,400 (2015) vehicles use the A428 west of the B1040 every day, which is more than twice its design capacity and forecast to significantly increase. The single carriageway is already significantly over capacity. There is a well-established principle that a lack of suitable transport infrastructure is an inhibitor for both local economic growth and housing development. Without the scheme, not only will congestion worsen but economic and housing growth will both become constrained.
- 1.5.3. The knock-on effect will be economic growth will become constrained and businesses and developers will avoid the area.
- 1.5.4. The A428 is a key part of the SRN providing east-west connectivity that is vitally important to the running of the local, regional, and national economy, by offering the most efficient movement of people and goods for work, trade, tourism, and leisure. Within the Arc it supports over 2 million jobs, provides over £110 billion of income to the economy every year, houses one of the fastest growing economies in England and across five counties: Oxfordshire, Bedfordshire, Buckinghamshire, Northamptonshire, and Cambridgeshire.
- 1.5.5. The Government's ambition to support the long-term sustainable economic growth within the Arc by developing a more integrated approach to new transport infrastructure was facilitated by announcing in the 2020 Budget the development of a new spatial framework for the Arc, working with local partners. This aims to support the planning of new infrastructure for economic growth in the Arc and the 'Levelling up' of any remaining inequalities.
- 1.5.6. Compared to England as a whole, the sub-region performs average and above average in both economic and social terms with only small pockets of deprivation in the Bedford Borough. However, in addition to improving east-west links, the Scheme will also improve the north-south links by removing the A1 Black Cat roundabout which experiences many delays. This will create 'Levelling up' opportunities as far afield as Peterborough, which continues to contain higher than UK average areas of deprivation.



Scheme Objectives	Detailed Scheme Objective	How / what the Scheme will deliver	Aligned to Economic Dimension
Connectivity	 Reduce congestion, increase capacity, and journey time reliability between Milton Keynes and Cambridge, including by providing a free-flowing network. The Scheme will provide a free-flowing dual carriageway which will improve connectivity between the M1 and the Haven ports of Felixstowe and Harwich. 	 Creating capacity for free-flowing traffic at peak times. Separating local and regional traffic to reduce the volume of traffic on the existing network. Journey times forecast to reduce by 45-50% with the Scheme in place. Between A421 Renhold junction and Cambourne junction, peak journey time forecast to reduce from 30 to 15 minutes. 	<u>VfM Levels</u> <u>1 and 2:</u> Journey Time Savings Reliability
Safety	 Improve safety at junctions, side roads and private accesses by reducing traffic flows on the existing A428. Improve safety on the A1 by removing existing side road junctions and private accesses onto carriageway. 	 583 accidents will be saved over the 60-year assessment period In terms of casualties, modelling results show a saving of 7 fatalities, 123 serious casualties and 782 slight casualties. 	<u>VfM Level 1:</u> Accident Benefits
Economic growth	 Improving connections between people and jobs and supporting new development projects. 	• £513.0m of transport efficiency benefits.	<u>VfM Levels</u> <u>1 and 2:</u>

Table 1-3 Summary of the Detailed Scheme Objectives how they will be delivered



Scheme Objectives	Detailed Scheme Objective	How / what the Scheme will deliver	Aligned to Economic Dimension
	• The Scheme will be an essential component of the infrastructure needed to support the growth ambition for the Arc.	 £319.0m of wider economic benefits, including journey time reliability. Supporting development of 95,000 new homes and 117,000 new jobs in the wider scheme corridor and surrounding districts - by 2050. 	Economic Efficiency Benefits
			Wider Impacts
	Maintain existing levels of	Noise and vibration - Predicted decrease in road	<u>VfM Level 1:</u>
•	 biodiversity Provide a beneficial impact on air quality and noise levels in the surrounding area. Scheme delivery and operation will use mitigation measures to minimise its impact on the environment and carbon emissions. 	traffic noise in the short and long term.	Noise Benefits
		• Air quality - Once operational no significant adverse air quality effects. Adverse effects will largely be due to increased NO2 emissions across the road network as a whole.	Air Quality Benefits
Environmental		 Biodiversity: - 20.5% net gain as a result of increases in woodland and grassland. 	Carbon Benefits
Improvements		 Climate change - Scheme impact to be mitigated through the creation of new woodlands and grasslands, and a tree planting programme. 	VfM Level 3:
		• The Scheme will contribute less than 0.012% of the total carbon emissions in any 5-year carbon budget. It will therefore not have a material impact on Government meeting its legally binding carbon reduction targets. (Note: The Scheme has consulted	Biodiversity Water Environment



Scheme Objectives	Detailed Scheme Objective	How / what the Scheme will deliver	Aligned to Economic Dimension
		recent available guidance which may change over time. This ignores the positive impacts of more efficient engine technology, more Electric Vehicles, and decarbonisation of the UK's electricity production impacting operational carbon emissions.)	
		 This assessment is therefore expected to be an overestimate of the Scheme's carbon impact. 	
	Ensure the safety of cyclists, walkers, horse riders and public transport users by improving the	• The Scheme will provide 10 new crossings and 3.75 km (2.3 miles) of additional cycleway.	<u>VfM Level 3:</u>
Accessibility	routes and connections between communities.	 This will ensure severance caused by the current route is mitigated 	Physical activity
	Removing strategic traffic from the single carriageway to provide opportunities for non-motorised	• This will provide a more cohesive network for travel using active modes, improving accessibility and connectivity, to help support behaviour change to	Severance
	users and enhanced public transport services.	alternative modes of travel, particularly for new housing developments.	Access to services
Resilience	Improve the reliability of the road network to cope with major	 A new off-line route will be constructed and meet DMRB standards. Additional lanes will improve 	VfM Level 2:
	 accidents. The Scheme will provide a dual carriageway which will offer greater 	clear-up rates and allow regional traffic to continue moving.	<u>Reliability</u>



Scheme Objectives	Detailed Scheme Objective	How / what the Scheme will deliver	Aligned to Economic Dimension
	resilience to incidents and a better functioning emergency diversion route for the SRN.	 The route will operate as a more effective EDR for the SRN. Methodologies for operation and working arrangements with operators will ensure rapid clearance of incidents. Incident clearance targets are included in the RDP contract. 	
Customer satisfaction	 Listen to what is important to our customers - to deliver a better road for everyone and improve customer satisfaction. The Scheme design has been updated since the preferred route announcement to take account of feedback from consultation and to mitigate potentially adverse impacts. 	 The project will implement the 'Roadworks - A Customer View' and use feedback from Roadworks Customer audits to measure performance. The project will participate in a diversion route trial which could further improve customer satisfaction for road users and communities. The Scheme will continue to work with the Customer Relations Team to ensure user satisfaction from the Strategic Roads User Survey ("SRUS") remains at least 82%. The Scheme will work with the road space team to ensure road bookings are managed efficiently and achieve 90% accuracy of information by 2024-2025. 	All of the above + Level 3 Journey Quality

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1.6. Measures of Success

- 1.6.1. The RIS states the Key Performance Indicators ("KPIs") and Performance Indicators ("PIs") that National Highways is measured against and must deliver. The Scheme and all other National Highways projects will contribute to meeting these KPIs and PIs. National Highways will measure the success of the Scheme in meeting the outcomes set against it, broken down by each KPI area.
- 1.6.2. Details of National Highways' KPIs and the Scheme's contribution to them can be found in the Client Scheme requirement but are summarised in the management dimension.
- 1.6.3. The successful delivery of the Scheme will depend upon its ability to meet the scheme objectives after completion which will be monitored as part of the post-opening scheme evaluation ("POPE") also summarised in the management dimension.
- 1.6.4. Section 1.17 The Theory of Change uses a logic map to demonstrate how the specific objectives and outcomes will be achieved.

1.7. Problems and Opportunities

- 1.7.1. The A428 Route Strategies Options Appraisal Report ("OAR") identified the following problems faced by the A428:
 - It carries twice the traffic for which it was designed.
 - Between Wyboston and Caxton Gibbet:
 - has peak hour speeds of less than 40mph, with link delays in the top 20% nationally.
 - is within the top 25% of highway links nationally for casualties (per billion vehicle miles).
 - Journey times were identified as some of the least reliable nationally.
 - The route as a whole has safety and maintenance impact issues.
 - Black Cat roundabout was identified as having a safety problem (69th highest number of accidents nationally).
- 1.7.2. The overriding impacts driving the need for the Scheme to provide a dualled route is therefore:
 - Congestion due to junctions operating close to or at capacity and links having to accommodate traffic volumes double the capacity for which they were designed. Forecast growth 2015 to 2051 shows an increase of 18% Heavy Goods Vehicles (HGV), 50% Light Goods Vehicles (LGV), 34% cars.
 - Traffic speed average peak speed can be as low as one third of average free flow speed.
 - Delays journeys can take up to 65% longer during peak hours.



- Reliability the above leads to journey times being unreliable, impacting on productivity.
- Resilience to incidents which is low on the single carriageway section.
- 1.7.3. The existing capacity issues on the route were readily supported by the views of local residents, businesses, and users of the road, who in 2017 overwhelmingly confirmed support for the Scheme on the basis that it would relieve existing capacity and congestion problems; particularly at Black Cat where lengthy delays occur frequently.
- 1.7.4. There is a need for the Scheme to cope with the forecast growth in traffic by 2040. The additional capacity will support local and regional economic growth by improving east-west connectivity and enhanced north-south traffic flow.
- 1.7.5. The following sections describe the problems and opportunities aligned to the four areas of the CSR; Economic Growth, Transport, Environment and Communities.

1.8. Economic Growth

Traffic problems constrain government growth plans for housing and jobs

- 1.8.1. The Arc supports over 2 million jobs, adds over £110 billion to the economy every year and houses one of the fastest growing economies in England. It is home to 3.7 million residents and has seen 17% growth in population since 2000.
- 1.8.2. However, housing delivery rates are below the level needed to accommodate current housing needs and future job creation rates. Without a joined-up plan for housing, jobs and infrastructure, the corridor will fall behind its international competitors.
- 1.8.3. The Government has therefore set an ambitious plan to further unleash the economic and cultural potential of the Arc, to transform it into one of the world's premier growth corridors and a world-leader in sustainability. The Government's ambition is to deliver up to 1 million new homes and 1.1 million new jobs in the Arc by 2050 with local authorities playing their part by setting ambitious growth targets as shown in Table 1-4 job growth and Table 1-5 housing growth.
- 1.8.4. This will be achieved by developing a spatial framework plan to create thousands of jobs, drive investment, protect and enhance the environment, and provide the infrastructure that will make the Arc a better place to live and work. With the right interventions and investment, analysis suggests that economic output could double by 2050.



- 1.8.5. However, traffic congestion, delays and unreliable journey times has resulted in road users avoiding the route and business productivity being negatively impacted. These factors are also impacting on businesses making further investments in the area and investing elsewhere. This has led to reduced productivity, higher prices, and poor access to labour markets, constraining economic growth.
- 1.8.6. The demand for housing in this region is high because of the availability of high value employment, however transport problems could lead to highly qualified professional moving homes and work to other less congested locations.
- 1.8.7. The Scheme will provide additional capacity from a dual carriageway with free-flowing links and junctions that can accommodate the current and forecast need for further housing (both locally and in the Arc) to support the current and forecast increase in employment levels.

	Bedford Borough	Central Bedfordshire Local	Huntingdon shire	South Cambridge Shire	Totals
		2035			
Core	28,095	23,668	14,044	21,912	87,719
High Growth Scenario	34,609	35,240	15,548	24,079	109,476
		2050			
Core	31,197	24,420	14,836	25,070	95,523
High Growth Scenario	37,711	35,993	16,340	27,236	117,280

Table1-4 Job growth



	Bedford Borough	Central Bedfordshire Local	Huntingdon shire	South Cambridge Shire	Totals
		2035			
Core	9,026	28,912	13,738	32,551	84,227
High Growth Scenario	13,713	38,036	18,282	33,991	104,022
		2050			
Core	9,026	31,908	15,011	38,606	94,551
High Growth Scenario	13,713	41,432	20,336	40,046	115,527

Table 1-5 Housing growth

Freight and Commuters

- 1.8.8. The ability of logistics / freight and hauliers to link to the Haven Ports of Felixstowe and Harwich on the A14, recently made designated freeports in the 2021 Budget, is restricted by congestion, delays, and unreliable journey times on the A428.
- 1.8.9. In 2019 approximately 12% of traffic on the A428 near Barford was freight compared to 10.5% for the SRN, which shows that it is a key route for access to the Haven Gateway from Milton Keynes and beyond.
- 1.8.10. The Scheme is expected to result in some strategic re-routing, most notably taking some traffic off the A14 and onto the improved A428. This is mostly expected to benefit business users (freight connections to Felixstowe), as well as commuters.
- 1.8.11. The Scheme also improves transport connectivity from Cambridgeshire to other key economic centres such as Bedford, Northampton, Milton Keynes and beyond towards Oxford.
- 1.8.12. The Scheme is located on the edge of the Cambridge Functional Urban Area (FUR). FURs contain a high density of businesses that would benefit from clustering, through achieving agglomeration (productivity) benefits such as learning, networking and coordination. There would also be agglomeration benefits to competition, outputs, price and access to labour.
- 1.8.13. Agglomeration effects decay over distance. Empirical evidence suggests that for agglomeration to occur the relative travel times must be within 45 minutes. Some example pre-scheme travel times for the scheme are as follows:



- Cambridge to St Neots 30 to 45 minutes.
- St Neots to Milton Keynes 35 to 50 minutes.
- Cambridge to Bedford 45 minutes to 1 hour.
- Huntingdon to Milton Keynes 45 minutes to 1 hour.
- Cambridge to Milton Keynes 1 hour to 1 hour 20 minutes.
- 1.8.14. Given that the scheme is expected to reduce peak travel times by around 8 to 10 minutes, there is potential for some of these typical journeys to within the 45-minute cut-off threshold for agglomeration benefits. Therefore, there is the potential that the agglomeration benefits could be significant, such as from St Neots to Cambridge and Milton Keynes, and between Cambridge and Bedford, in particular.
- 1.8.15. Of the £321m wider economic impacts calculated for the scheme agglomeration accounts for 91% of these benefits.
- 1.8.16. The relative sector mix in Western Cambridgeshire shows an above average concentration of knowledge-based industries versus the UK and also compared to Bedfordshire. (These include information and communication, and professional and administrative services; and public sector, health, and education). These are the types of service sectors from which agglomeration benefits are seen as most likely to occur.
- 1.8.17. As the scheme will increase business connectivity, this may increase levels of competition, thereby increasing levels of output, reducing prices, and leading to economic benefits, although the magnitude of this impact may be quite small.
- 1.8.18. The greatest economic impact of the Scheme will be in South Cambridgeshire. But the Scheme will contribute to growth over a wider area by reducing congestion, delays, and journey times the Scheme will increase productivity.
- 1.8.19. The economic dimension also shows that as well as journey time savings from additional capacity, there will also be benefits that arise from businesses being clustered (i.e., agglomeration) which will attract more suppliers and customers and improve access to additional labour.

Residual regional inequality within the Arc

- 1.8.20. Table 1-6 shows that compared to England as a whole, the sub-region performs average or above average in both economic and social terms with only pockets of deprivation in areas such as Bedford Borough.
- 1.8.21. In addition to improving east-west links, the Scheme will also improve the north-south links by removing the A1 Black Cat roundabout which experiences many delays. This will create 'Levelling up' opportunities as far afield as Peterborough, which continues to contain higher than UK average areas of deprivation.



	Bedford Borough	Central Bedfordshire Local	Huntingdon shire	South Cambridge shire	England
Economic activity rate - aged 16- 64 (ES) 2019	79.6%	81.8%	82.3%	84.5%	79.2%
Employment rate - aged 16-64 (ES) 2029	76.9%	80.8%	79.3%	82.4%	76%
IMD- Proportion of LSOAs in most deprived 10% nationally 2019 (ES)	3.9%	0.0%	0.0%	0.0%	-
Health deprivation - Proportion of LSOAs in most deprived 10% nationally 2019 (ES)	6.8%	0.0%	0.0%	0.0%	-
Largest Employment sector 2019 (NOMIS)	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles: 17.1%	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles: 18.3%	Manufacturing: 14.5%	Professional, Scientific, and technical activities: 26.4%	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles: 14.1%
Gross Weekly Pay (by residence) 2020 (NOMIS)	£619.40	£647.5	£593.0	£720.4	£589.8
Qualifications (NVQ4 And Above of those between 16-64) 2020 (NOMIS)	51.4%	43.3%	42.1%	56.2%	42.8

Table 1-6 Socio-economic metrics



COVID 19 and economic recovery

- 1.8.22. The COVID-19 pandemic has significantly affected the whole of the country, with economic growth being stifled in every region since the beginning of the restrictions in March 2020.
- 1.8.23. In April 2020, UK GDP fell by over 20%, relative to the previous year. This record contraction was followed by a record increase of 16% in the third quarter of 2020. This represented encouraging economic recovery, but GDP in the UK remained 7.8% below levels at the end of 2019, forecast to fully recovery by the second or third quarter of 2022.
- 1.8.24. As with other regions of the country, some sectors were more significantly affected by lockdown than others; primarily those based in retail and consumer services which tend to be lower paid compared to other sectors.
- 1.8.25. The various lockdown restrictions that have been implemented by the government since March 2020, have resulted in significant periods of subdued traffic levels at times.
- 1.8.26. Analysis of traffic data shows that traffic levels have almost recovered to prepandemic levels.
- 1.8.27. A national emphasis on targeted infrastructure delivery was confirmed in the Chancellor's 2021 Budget. The Office for Budget Responsibility (OBR) also recognises growing confidence about medium term prospects as businesses recover from the economic downturn associated with the COVID-19 pandemic and the temporary uplift in capital allowances announced in the Budget will bring forward investment plans.
- 1.8.28. Infrastructure development has a strong track record of stimulating post-crisis economies. The Scheme represents an opportunity to drive growth not only in the region but also more widely in the Arc, in a way that both meets genuine local, regional, and national needs and delivers against the government's wider Levelling Up agenda post-pandemic.
- 1.8.29. The COVID-19 pandemic has significantly hampered growth, therefore, the need for quality transport infrastructure not only remains important but is now pivotal to deliver growth and make up for lost time.

1.9. **Transport**

Junctions and links along the corridor operate close to, or at, capacity.

- 1.9.1. Sections of the A428 are congested in both directions, with the worst performing sections being:
 - Between Barford Road and Wyboston; and
 - Cambridge Road Roundabout to Caxton Gibbet.
- 1.9.2. This equates to approximately two third of the existing route between the Black Cat roundabout and Caxton Gibbet roundabout.



- 1.9.3. Transport modelling forecasts show that without improvement, congestion and delays will worsen over time, and the inability of the route to accommodate trip growth will stifle economic growth.
- 1.9.4. Table 1-7 shows that in 2026 many sections of the route are operating at close to capacity, with those within 90% of their maximum capacity highlighted in yellow. Without design improvements this congestion will worsen. The table (which assumes a 2026 opening date, see 2.16) shows that 'with the Scheme', congestion will reduce. This will have a positive impact on reducing delays and journey times. Modelling also shows the route will continue to operate within its capacity into the 2040s.
- 1.9.5. Traffic flows between A428 Wyboston and the Caxton Gibbet roundabout are shown in Table 1-7. This shows that between 2015-2026 traffic is forecast to grow by up to 43% in some sections. This will mean road-users will seek alternative routes that will impact negatively local communities or journeys will be reduced on not be made, constraining economic growth.
- 1.9.6. With the Scheme (Table 1-8), the volume of traffic on the single carriageway A428 is shown to fall as longer distance traffic is transferred to the new free flowing dual carriageway. This will leave the existing single carriageway free for more localised journeys and provide relief for the communities living along the route.
- 1.9.7. Furthermore, modelling forecasts indicate flows on minor east-west routes without the Scheme will increase by 80-100% by 2041, compared to around 30% on major routes. This reflects an increase in rat running, and traffic avoiding the more congested A428, which would adversely impact on the communities with increased congestion, noise and worsening of air quality, health, and wellbeing.



	V/C Ratio 'Without the Scheme'		V/C Ratio 'With the Scheme'		
Section	АМ	РМ	АМ	РМ	
Eastbound					
A1: Black Cat Roundabout to Wyboston Junction	0.62	0.67	0.52	0.66	
A428: Wyboston Junction to Barford Road Roundabout	0.99	0.96	0.61	0.70	
A428: Barford Road Roundabout to Cambridge Road Roundabout	0.79	0.60	0.37	0.23	
A428: Cambridge Road Roundabout to Caxton Gibbet	0.94	0.70	0.12	0.16	
Westbound					
A428: Caxton Gibbet Roundabout to Cambridge Road Roundabout	0.79	0.95	0.12	0.09	
A428: Cambridge Road Roundabout to Barford Road Roundabout	0.66	0.69	0.26	0.33	
A428: Barford Road Roundabout to Wyboston Junction	0.90	0.96	0.59	0.60	
A1: Wyboston Junction to Black Cat Roundabout	0.66	0.63	0.61	0.51	

Table 1-7 A428 Volumes/Capacity (V/C) Ratios withoutand with the Scheme (2026)



A428 Link	Direction	2015	2026	Difference	% Difference
West of Barford Road	Two-Way	29,100	34,000	4,900	17%
East of Barford Road	Two-Way	18,900	27,100	8,200	43%
West of B1040	Two-Way	24,400	29,000	4,600	19%
West of Caxton Gibbet	Two-Way	25,300	28,700	3,400	13%

Table 1-8 A428 Traffic Flows (AADT) Without Scheme 2015-2026

Table 1-9 A428 Traffic Growth (AADT) with Scheme 2015-2026, (2026
opening)

A428 Link	Direction	2026 Without Scheme	2026 With Scheme	Difference	% Difference
West of Barford Road	Two-Way	34,000	20,800	-13,200	-39%
East of Barford Road	Two-Way	27,100	12,300	-14,800	-55%
West of B1040	Two-Way	29,000	3,500	-25,500	-88%
West of Caxton Gibbet	Two-Way	28,700	2,000	-26,700	-93%


Journey Times

- 1.9.8. On the A421/A428 between 2015 and 2041, journey times are forecast to increase by between 25-40% without the Scheme (between Renhold junction and Cambourne junction) with the higher increase occurring during the interpeak ("IP") period. Over the whole route between the M1 and M11, the forecast increase in journey times is 20-25%. On the A1 between Letchworth and Huntingdon the increase in journey times is forecast to be 20-30%.
- 1.9.9. With the Scheme in place, journey times are forecast to reduce significantly, by about 45-50% along the A421/A428, between Renhold junction and Cambourne junction. This will be from around 30 minutes to 15 minutes at the peak time and direction, as per Table 1-10. The time saving from the M1 to the M11 will be around 11 minutes at the peak times.
- 1.9.10. This will have the benefit of making the area more attractive for businesses and developers and will support the growth proposals for the area and more widely in the Arc.

			2015	2041					
Route	Time Perio d	Directio n	Modelle d (mm:ss)	DM Time (mm:s s)	Change from 2015 (mm:ss)	Change from 2015 (%)	DS Time (mm:ss)	Change from DM (mm:ss)	Change from DM (%)
A421 / A428 (Renhold Junction to Cambourne Junction)	АМ	EB	22:49	29:02	06:13	27%	15:21	-13:41	-47%
		WB	22:36	28:10	05:34	25%	15:26	-12:44	-45%
	IP	EB	19:30	27:30	08:00	41%	14:47	-12:44	-46%
		WB	20:39	27:41	07:02	34%	15:31	-12:10	-44%
	PM	EB	22:38	28:31	05:53	26%	14:41	-13:50	-49%
		WB	23:57	29:33	05:36	23%	15:59	-13:34	-46%

Table 1-10 Comparison of journey time changes 2015-2041



Journey Time Reliability

- 1.9.11. There is currently a high degree of journey time variability along the corridor, making it difficult for users to plan their journeys with confidence. Journey times on the single carriageway section of the A428 are unreliable, for example, travelling east from the A1 at Wyboston to the A1198 Caxton Gibbet can take between 16 and 35 minutes during the AM Peak. This is equivalent to vehicle speeds ranging between 26-52 kmph (16-32 mph) on a road with a 97 kph (60mph) speed limit.
- 1.9.12. The consequence of such unreliable journey times is that current journey planning needs to include a sufficiently wide time allowance to account for potential congestion on the route. This is impacting businesses, just-in-time deliveries as well as commuters. Road-users will also seek alternative less suitable routes for their journeys which will result in rat running through villages. Overall, journey time uncertainty and the responses taken by drivers to avoid the problem will impact on the attractiveness of the area to businesses and local homeowners.

Resilience

- 1.9.13. This section of the A428 is designated an Emergency Diversionary Route ("EDR") to be used when other sections of the SRN are closed due to major incidents or maintenance. However, its currently sub-standard capacity now means it is not ideally suited to be an EDR with even small incidents closing it.
- 1.9.14. The frequency of carriageway closures on this section of the A428 between 2017 and 2019 is shown in Table 1-11. This shows that on average in non-COVID years, there were 17 lane closures a year on the single carriageway of the A428 with a year-on-year increase in the average duration of closures.

Year	Number of incidents	Duration of carriageway closure (min)	Average duration of closure per incident (min)
2017	18	1,400	78
2018	17	833	126
2019	15	3,738	249
2020	11	1,018	92

Table 1-11 Carriageway closure	durations	between	2017	- 2019
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- 1.9.15. Delays during incidents or maintenance periods would be expected to be lower with the Scheme since the dual carriageway would provide more capacity to manage traffic more effectively in the event that closures are required. Figure 1-3 shows the location and severity of incidents on the A428 for years 2015 to 2019 (yellow showing slight, amber showing serious, red showing fatalities).
- 1.9.16. There were no fatalities on the route in the years presented, however the data shows that incidents were dominated by slight incidents at or near junctions, which is unsurprising as these locations are the most likely to see low speed shunts because of driver error.



Figure 1-3 Accident Data (2015-2019)



Accidents/Incidents

- 1.9.17. Transport modelling has shown that 583 accidents will be saved over the 60year assessment period of the Scheme. In terms of casualties, the results show a saving of 7 fatalities, 123 serious casualties and 782 slight casualties.
- 1.9.18. Due to the single carriageway of the existing A428, this has meant that when collisions and incidents occur or major maintenance are needed, the only option available to the emergency services and maintenance teams has been to close the carriageway rather than individual lanes, resulting in long diversions and delays.
- 1.9.19. This would impact businesses reliant on the transport links and local communities suffering the increases in rat running.

Post COVID recovery

- 1.9.20. It should be noted that traffic levels have been shown by August 2021 to have returned to pre-COVID levels in February 2020. As a result, the case for the scheme still remains valid and strong.
- 1.9.21. The impact of the COVID-19 pandemic on the Strategic Road Network, in the vicinity of the proposed A428 Black Cat to Caxton Gibbet Improvements, was assessed using data from National Highways' WebTRIS service.
- 1.9.22. Given the availability of long-term count data in the area, traffic flows at four locations were assessed and are shown in Figure 1-4 (the two 1-way sites on the A421 and A1 were grouped together).



Figure 1-4 WebTRIS A428 Traffic count sites



- 1.9.23. Figure 1-5 shows the observed daily weekday (Monday to Friday) traffic flows at these four locations, from 01 January 2020 to 30 June 2021. Daily traffic flows observed at each of the four sites reduced to 60% below the February 2020 average daily traffic flow following the introduction of the first UK lockdown. There was then a strong recovery in daily traffic flows over the summer of 2020, with most sites returning to between the February 2020 average or a 20% reduction in flow.
- 1.9.24. Further modest reductions in traffic volumes were observed after the second and third national lockdowns (and over the Christmas period), with flows at each site approaching the February 2020 average daily flow in the latest available data.
- 1.9.25. A hypothesis regarding how strongly highway travel has recovered after lockdown restrictions were relaxed, despite the reductions in commuting and business travel, was that these commuting and business trips were replaced by trips which used public transport pre-COVID but were now choosing to drive by car. There is evidence to show that travel by rail and bus has been slower to recover than highway travel, suggesting a reluctance to return to public transport.



Figure 1-5 Impact of COVID-19 lockdowns on traffic flows



Lack of driver information along the corridor

- 1.9.26. There are no permanent variable message signs providing driver information along the single carriageway, making it substandard as part of the SRN.
- 1.9.27. The Scheme will provide National Highways with the opportunity to deliver driver information signs that comply with current design standards. This would contribute to the National Highways digital roads objective of using connectivity data to improve the way the SRN is designed, built, operated, and used.

1.10. Environment

Rat running causes air quality and noise problems in local communities

- 1.10.1. Congestion on the A428's links and junctions has resulted in drivers taking alternative routes for their journeys. Furthermore, the lack of capacity on the A428, the route's subsequent lack of resilience to incidents, and its role as an EDR, means that rat running has become commonplace, adversely impacting on local communities.
- 1.10.2. The rat running has results in poorer air quality and excessive noise in the communities along the route from excessive traffic.
- 1.10.3. By delivering a dual carriageway with free-flowing links and junctions, the Scheme will provide a higher resilience to the SRN in this area, reducing rat running and reduce the adverse impacts it has on the local communities

Natural capital improvements

- 1.10.4. A natural capital assessment for the scheme has been undertaken which identified a biodiversity net:
 - gain of 16.48% for habitat units and 9.96% for river units; but
 - loss of 31.66% for hedgerow units.
- 1.10.5. Figure 1-6 presents a comparison of the broad habitats present within the Scheme area in the baseline compared to the post-construction scenario. It shows that 33% of the Scheme area post-construction will become grassland (previously 10%) and associated habitat mosaic which was previously mostly cropland, with increased benefits for wildlife including more species diversity and better-connected habitats.
- 1.10.6. Woodland habitat will also increase to 13% post-construction (previously only 1.7%) which is intended to provide a better ecological network. This is offset by Urban area habitats (buildings and areas of hardstanding) increasing from 7.1% to 21% (previously mostly cropland) due to the construction of the new road and associated infrastructure.





Figure 1-6 Breakdown of habitats in Scheme Area (approximately 668 hectares)

- 1.10.7. A high proportion of the Scheme area is currently used for crop production and is regularly cultivated, a known source of greenhouse gas emissions. Post-construction, the replacement of cropland with woodland and grassland habitats will change the carbon balance for the site.
- 1.10.8. It is expected that a material change in carbon storage would occur over a longer time period once the created woodland habitat had matured. The longer-term potential benefits (over 60 years) relating to the reduction in carbon storage / emissions from the land has been assessed through the calculation of carbon sequestration volumes and monetised in the Economic Dimension.

Whole life carbon reduction opportunities

- 1.10.9. The Transport Decarbonisation Plan (TDP) sets out the commitments that the transport sector needs to take to decarbonise in order to meet the governments net zero by 2050 goal. This includes a fleet of fully zero emission road vehicles, alongside a comprehensive network of charging and refuelling infrastructure, which will remove the source of greater than 90% of today's domestic transport GHG emissions.
- 1.10.10. Separately the DfT has initiated a Carbon Management Programme which will reduce Embodied Carbon emissions associated with construction on the SRN through the greater reuse of materials, substitution of materials with local sources, the use of lower carbon energy sources for diesel and electricity, and the use of alternative or less materials for steel, concrete, and asphalt.



- 1.10.11. Figure 1-7 shows a forecast of the additional construction, maintenance and tailpipe emissions created by the Scheme from 2022 to 2051, based on a modest uptake of electric vehicles. Following the completion of the construction, it is seen to be relatively steady from 2026. However, an increase in the pace of the transition to a zero emissions fleet of highway vehicles, such as to the Government's TDP, and a more carbon neutral use of electricity production could see significant further reductions in carbon emissions over time due to the Scheme.
- 1.10.12. National Highways and the contractor (the DIP) acknowledge the need to reduce carbon emissions during the construction of the Scheme and will address this by working proactively together to identify carbon reduction opportunities throughout the detailed design stage. The 75 hectares of woodland habitat being planting by the Scheme will also provide significant carbon sequestration for many years after the Scheme has opened for traffic.



Figure 1-7 Profile of CO2e emissions 2022 - 2051



1.11. Communities

Rat running causes community severance

- 1.11.1. Congestion, delays, and unreliable journey times on the A428 results in drivers finding alternative routes for their journeys by rat running through local communities on routes that were not designed for those traffic levels. In addition to the poor air quality and excessive noise, this causes local severance due to traffic flow, adversely impacting road safety.
- 1.11.2. The Scheme is predicted to reduce traffic for the majority of the east-west routes between Bedford and Cambridge, leading to a reduction in traffic on the surrounding minor and secondary roads through the smaller towns and villages in the area.
- 1.11.3. The forecast impact of the Scheme on traffic flows on the smaller roads around the A428 is shown by the thin green and yellow lines in Figure 1-8.



Figure 1-8 Forecast Impact of the Scheme on Traffic Flows



Inadequate public transport options along the corridor

- 1.11.4. There is limited bus service provision along the A428. The X5 service operated by Stagecoach runs between Cambridge and Oxford via St Neots, Bedford and Milton Keynes and can take up to 4 hours to complete the journey. The car journey time from Cambridge to Oxford, with no delays, is of the order of just 2 hours.
- 1.11.5. Two National Express coach services also operate along the A428 at a frequency of once per day and stopping in Bedford, St Neots, Cambourne and Cambridge. However, there are no local bus services connecting Cambridge and St Neots, despite the close economic ties and strong commuter flows between them. The low journey time reliability prohibits the provision of reliable public transport options between St Neots and Cambridge.
- 1.11.6. The Scheme would remove traffic from the single carriageway which would allow public transport operators to consider implementing new and more reliable services, connecting Bedford, St Neots, Cambourne and Cambridge. This would greatly improve accessibility and connectivity in the area.
- 1.11.7. There is also currently no east-west rail service operating in the area. However, East West Rail (EWR) linking Bedford and Cambridge, plan to create a new strategic rail link between Oxford and Cambridge, as well as joining up key town and cities in the region to provide fast, inter-regional connectivity.
- 1.11.8. The EWR Bedford to Cambourne section has designated the new A428 dual carriageway as its preferred route for a new service, with new stations proposed around St Neots / Sandy and Cambourne.
- 1.11.9. Together the Scheme, EWR and National Express could provide an integrated transport solution to significantly improving east-west connectivity.
- 1.11.10. A Statement of Common Ground ("SoCG") between National Highways and the East-West Railway Company Limited stated that a road and rail based multi-modal transport corridor would improve access to jobs and services and provide wider national connections. The Scheme could also facilitate access to the new EWR stations.
- 1.11.11. The SoCG confirms that the two schemes are complementary and there is a need for both, rather than just one, because each will serve the other, with different purposes and markets.

Provision for walkers, cyclists and horse riders is historically poor along the corridor

- 1.11.12. The busy A428 causes severance between communities north and south of the route with limited crossing options.
- 1.11.13. There are some facilities for non-motorised users ("NMUs") which covers walkers, cyclists, and horse riders. These include various footways, crossing facilities and underpasses. Part of the Sustrans National Cycle Network route 12 runs on Roxton Road parallel to the A1 section between Black Cat and Wyboston.



- 1.11.14. The Varsity Way Cycle Route connecting Oxford and Cambridge heads north from St Neots to Huntingdon before connecting with Cambridge and does not provide a link along the A428. The Black Cat, Cambridge Road, and Caxton Gibbet roundabouts, and the A428 link between Wyboston and Caxton Gibbet have limited provision for cyclists and pedestrians. Plus, the busy nature of the route creates severance between communities located either side of it.
- 1.11.15. The Scheme plans to provide 10 new crossings and 3.75 km (2.3 miles) of additional cycleway. It will also provide new opportunities for local authorities in the area to provide a more cohesive network for active travel options, improving accessibility and connectivity. As housing delivery takes place, local authorities can use these active mode options to promote behaviour changes from the outset as new communities are to be established.
- 1.11.16. The Scheme will free up local roads from congestion, allowing existing and potentially future public transport options to operate more efficiently. Without the Scheme, there will be growing pressure on this network which will result in drivers making alternative, potentially unsuitable route choices which will then impact on local communities.
- 1.11.17. The Scheme will also provide improved route facilities to support walkers, cyclists, and horse riders.
- 1.11.18. National Highways has made available £936m of Designated Funds from 2020 to 2025 to support opportunities beyond the traditional road investment. These Funds are managed centrally within National Highways and outside of the Scheme. The funds are available to National Highways and external organisations which include public, third and private sectors. This will provide opportunities for parties to apply for funding with a National Highways Sponsor for initiatives that are outside of the scope of schemes. The Fund will not cover risk mitigation that is identified as being needed for the Scheme and therefore should be delivered by the Scheme.
- 1.11.19. National Highways' approach is to use the Designated Funds working in partnership with its stakeholders to provide added value to the local communities by addressing local priorities and issues in addition to delivering the core benefits of the Scheme.

1.12. Scheme development

Historical development

1.12.1. Since 1971 the requirement for a grade separated junction at Black Cat had been identified by the government to relieve congestion at this location. Since then, several improvements have been delivered (see Table 1-12) to improve the Black Cat roundabout, but both the Black Cat and the A428 single carriageway continue to be impacted by congestion and delays which have worsened over time with strategic growth.



Table 1-12 Historical improvements

Year	Improvement
1971	A1 Black Cat grade separated junction first raised as an issue in the 1971 Roads England Report for the Secretary of State for the Environment.
1985	A45 St Neots Bypass A1 to Cambridge Road opened.
2003	Highways Agency was tasked with carrying out further work on the A428 A1 to Caxton Gibbet scheme which, subject to completion of all statutory processes, could be completed by the middle of the next decade.
2006	A421 Great Barford Bypass and enlarged A1 Black Cat roundabout opened.
2007	A428 Caxton Common to Hardwick dual carriageway opened.
2010	A421 M1 J13 to Bedford dual carriageway opened.
2015	A1 Black Cat roundabout enlarged and signalised as part of a Pinch Point Scheme.
2020	A421 M1 J13 to Magna Park Milton Keynes dualling opened.

Options Generation

1.12.2. Development of a Scheme for the A428 was identified in RIS1 in 2014. Table 1-13 shows the main development stages for the Scheme.

Table 1-13 Options Generation

Stage	Date	
Initial options identification, assessment, and sifting		
Consultation and Option Selection	2017	
Statutory Consultation		
Preferred Route Announcement (PRA)	2019	
Supplementary Non-Statutory Consultation		
DCO Submission		



Consultation

- 1.12.3. National Highways undertook statutory consultation in June and July 2019 to seek the views of statutory consultees, the local community and other interested groups and individuals on the scheme proposals which had been developed in further detail following the preferred route announcement.
- 1.12.4. As a result of the consultation, National Highways received 925 responses. The responses showed 88% of respondents either supported or strongly supported the alignment of the Scheme.
- 1.12.5. The Scheme was further refined to take account of consultation feedback. This included amendments for the introduction of borrow pits, a key lesson learned from the A14 scheme, additional noise bunds, alignment and provision of footways / cycleways and bridleways, and reductions in temporary land take. Further refinements were made following a non-statutory supplementary consultation in June – July 2020.

1.13. Scope

1.13.1. The purpose of the Scheme is to address the problems of congestion, poor journey time reliability and poor resilience against incidents between the Black Cat and Caxton Gibbet roundabouts.



Figure 1-9 The Scheme



- 1.13.2. The Scheme comprises the construction of a new 16-kilometre (10 mile) dual-2 lane carriageway from the existing Black Cat roundabout to the existing Caxton Gibbet roundabout, and in addition approximately 3 kilometre (1.8 miles) of tie-in works (Figure 1-9). The Scheme includes the following components:
 - A new three-level grade separated junction at Black Cat roundabout, with the A1 at the lower level, the new dual carriageway on the upper level and a roundabout between the two at approximately existing ground level. In addition to slip roads a new free flowing link between the A421 eastbound carriageway and the A1 northbound carriageway will also be provided.
 - A new grade separated all movements junction will be constructed to the east of the existing Cambridge Road roundabout to provide access to the new dual carriageway and maintain a continuous link for the existing A428.
 - At the Caxton Gibbet roundabout, a new grade separated all movements junction will be constructed, incorporating the existing roundabout on the south side of the new dual carriageway and a new roundabout on the north side. The new dual carriageway will then tie-in to the existing A428 dual carriageway to the east of the new Caxton Gibbet junction.
 - In the vicinity of the new Black Cat junction, direct access onto the A1 from some local side roads and private premises will be closed for safety reasons.
 - New local road will provide an alternative route. The existing Roxton Road bridge will be demolished and replaced with a new, taller structure to the west.
 - New crossings will be constructed to enable the new dual carriageway to cross the River Great Ouse, East Coast Main Line railway, Barford Road, the B1046 / Potton Road, Toseland Road and the existing A428 at Eltisley.
 - The existing A428 between St Neots and Caxton Gibbet will be detrunked and retained for local traffic and public transport with maintenance responsibility transferred to the local highway authorities.
 - An alternative access will be provided to side roads at Chawston, Wyboston and Eltisley.
 - There will be safer routes for walkers, cyclists, and horse riders and improved connections to St Neots town centre and train station.
- 1.13.3. On completion, the route will be renumbered as the A421, which will then run as a dual carriageway between the M1 at Milton Keynes and Caxton Gibbet.



1.14. Strategic fit

- 1.14.1. The Scheme has a strong strategic fit with current government national policy objectives and plans and National Highways' business strategy as well as regional policy objectives and local planning objectives.
- 1.14.2. This section explains how the Scheme is has a strong strategic fit with current plans and policies and how it contributes to and aligns with each.

Strategic fit with national policies

- 1.14.3. Decarbonising Transport: A Better, Greener Britain (2021)
 - 1.14.3.1. DfT's Decarbonising Transport: A Better, Greener Britain (2021) sets out the government's commitments, and the actions needed to decarbonise the entire UK transport system.
 - 1.14.3.2. It includes DfT's Pathways framework to net zero transport, the wider benefits net zero transport can deliver and the principles that underpin DfT's approach. One of the government's commitments is ensuring that transport planning moves away from predicting demand (from 'predict and provide') to achieving community desired outcomes with transport solutions to deliver them ('to vision and validate').
 - 1.14.3.3. The plan also emphasises the importance of place-based approaches to "supporting Levelling-Up and reducing congestion in areas where it is a barrier to productivity".
 - 1.14.3.4. Section 1.7 (Problems and Opportunities) describes how the scheme will mitigate its carbon impact and how it will deliver an overall net gain in biodiversity.
- 1.14.4. Build Back Better (2021)
 - 1.14.4.1. The government's Build Back Better strategy sets out its plans to restart UK growth following recovery from the COVID-19 pandemic through significant investment in infrastructure services, skills and lessons learned while Levelling Up across all of the UK. The focus is to also support the transition to net zero and ensure the UK remains a leading destination for global investment. High-quality infrastructure is at the heart of Build Back Better to support the access to other initiatives being delivered to create economic growth, productivity, and global competitiveness. The scheme is strongly aligned to the aims of Build Back Better.
 - 1.14.4.2. Greater investment in infrastructure will help the region retain and enhance its position of being home to a wide range of high valueadded businesses allowing them to improve their productivity, extend supply chains, deepen labour markets, and attract inward investment.
 - 1.14.4.3. The scheme is aligned to carbon net zero to reduce carbon emissions during its construction and during operation.



- 1.14.5. Road Investment Strategy 2020-2025 (2020)
 - 1.14.5.1. The Road Investment Strategy ("RIS") was launched by government in 2014 and set out an ambitious programme of investment by National Highways to improve motorways and major trunk roads and reduce congestion.
 - 1.14.5.2. The second phase of the Road Investment Strategy ("RIS2") was announced in 2020. The strategy outlines the vision for the SRN in 2050 and how the network will fulfil its purpose.
 - 1.14.5.3. The scheme will make a direct contribution to the SRN vision, addressing a major pinch point for road users between the M1 and the Haven Gateway Ports to create a high-quality transport connection which will support future economic growth, not only in the immediate area but also in the Arc.
- 1.14.6. Transport Investment Strategy (2017)
 - 1.14.6.1. DfT's Transport Investment Strategy, set out the government's priorities and approach for future transport investment decisions and explained how transport investment would help to deliver a stronger and fairer Britain.
 - 1.14.6.2. The Transport Investment Strategy set out four main objectives for DfT investment decisions:
 - To create a more reliable, less congested, better-connected transport network That works for the users who rely on it
 - To build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities
 - To enhance Britain's global competitiveness by making it a more attractive place to trade and invest
 - To support the creation of new housing
 - 1.14.6.3. The scheme will contribute to all four of these objectives by introducing a higher-quality route between Milton Keynes and Cambridge that will enable economic growth and attract new investment in businesses and housing.

Strategic Fit with Regional Policies

1.14.7. Connecting People, Transforming Journeys: Regional Transport Strategy (2021):



- 1.14.7.1. England's Economic Heartland's transport strategy sets out the growth ambition for the region and its contribution to the national economy and transport's role in achieving that ambition. It cites a current lack of capacity in the transport system, which constrains growth and reduces resilience and reliability, which impacts on productivity. It also highlights the impact of transport on the environment and a growth in carbon emission.
- 1.14.7.2. The strategy highlights the Scheme as an investment that will support all road users and future proof the network.
- 1.14.8. Strategic Economic Plans:
 - 1.14.8.1. The South East Midlands Local Enterprise Partnership (2017) focuses on three clear priorities: Growing Business, Growing People and Growing Places. The SEP "has productivity-led growth at its core" and highlights the importance of strategic pieces of east-west transport infrastructure to achieve growth.
 - 1.14.8.2. The Cambridgeshire and Peterborough Combined Authority recognises the constraints placed upon the A428 as it is single carriageway between A1 and A1198, and that this leads to congestion around St Neots and Caxton Gibbet. The report also highlights the role of the Black Cat to Caxton Gibbet scheme, although it must be noted this document was produced prior to the Preferred Route Announcement (PRA).
 - 1.14.8.3. The Scheme supports the objective of delivering economic growth in the area and in the Arc by removing a constraint in the SRN which will resolve congestion and provide improved resilience to the network.

Strategic Fit with Local Policies

- 1.14.9. Bedford Borough Council Local Plan (2018) outlines the proposed growth of the borough until 2030. It highlights that improving east-west transport infrastructure between Oxford and Cambridge will delivery economic growth in Bedford. The Plan highlights the importance of improvements on the SRN, such as the Black Cat roundabout improvements, which can improve the overall transport network and reduce congestion.
- 1.14.10. Huntingdonshire's Local Plan to 2036 (2019) highlights improvements to key transport infrastructure, of which the A428 is part, are critical to support economic growth, such as Wintringham Park (2,800 dwellings) and Loves Farm East (1,020 dwellings), and over 4,000 new jobs at St Neots.
- 1.14.11. The A428 Black Cat to Caxton Gibbet improvement is referred to explicitly, as part of planning further strategic transport infrastructure improvements that will provide additional road capacity, reduce congestion and delays, and facilitate more reliable journey times.



- 1.14.12. South Cambridgeshire Local Plan (2018) notes the need to provide appropriate levels of growth so that the Cambridge area can continue to develop as one of the largest clusters of research and development activity in Europe.
- 1.14.13. The Plan shows development being focused to the south of the A428 east of Caxton Gibbet, including Bourn Airfield (3,500 dwellings), Cambourne West (2,350 dwellings), Northstowe (9,226 dwellings) and Waterbeach (11,000 dwellings), and over 8,000 new jobs.
- 1.14.14. Cambridge Local Plan (2018) places an emphasis on the need to provide strategic transport infrastructure, primarily sustainable modes, as well as securing modal shift to more sustainable forms of transport.
- 1.14.15. Central Bedfordshire Pre-submission Local Plan (2018) sets targets of 20,000 homes and 24,000 jobs by 2035. The Plan recognises the role of the Oxford to Cambridge corridor in supporting delivery of strategic growth.
- 1.14.16. In each case local authorities in the area support the Scheme as being a critical element in supporting the delivery of ambitious growth targets.

1.15. Constraints

- 1.15.1. There are a number of constraints and opportunities associated with the Scheme that are presented here. It should be noted that these are likely to change as the Scheme design develops and also potentially as a consequence of the outcome of DCO.
- 1.15.2. There are several potential constraints in relation to the scheme; these will continue to be considered and addressed throughout the next stage of scheme development, and include the following:
 - Housing and other development close to the A1 alignment between Black Cat roundabout and Wyboston junction.
 - Bridge crossing between Wyboston junction roundabout and Barford Road roundabout.
 - Bridge crossovers of the A428 between Barford Road roundabout and Cambridge Road roundabout including a railway line.
 - Housing within close proximity to the current alignment between the Cambridge Road roundabout and Caxton Gibbet roundabout.
 - A petrol garage and service area within close proximity to the West of Caxton Gibbet roundabout.
 - Croxton Park, which is a Grade II Registered Park and Garden and a Conservation Area.
 - A number of Statutory Undertakers apparatus, notably a gas main that serves the nearby Power Station at Little Barford.



Physical Constraints

- 1.15.3. The A421 / A1 / A428 roads currently run through an area of primarily agricultural land, with some areas of leisure use. The A428 runs to the south of St Neots, and as such there are more dense land uses in this area (such as residential and commercial). The new alignment of the A428 would no longer border the south of St Neots, and rather route through what is currently open space, primarily used as agricultural land. There are several villages which are spotted around the countryside in this area; however, the new alignment bypasses these settlements.
- 1.15.4. The East Coast Main Line (ECML) runs north south to the east of the Black Cat junction.
- 1.15.5. There are numerous Public Rights of Way (PRoW) alongside and crossing the proposed route, including footbaths, bridleways, and byways. As part of the scheme these Rights of Way will need to be maintained and accommodated for, to enable users to have continued access.
- 1.15.6. As noted above, there are also physical constraints of some housing, heritage properties (Brook Cottage) and utilities infrastructure in the A428 area. The Scheme design has actively considered these constraints and has sought to reduce the Scheme's impact on them.
- 1.15.7. These land uses can therefore constrain any potential transport intervention which can be developed, as the local character of the area is to be conserved. However, as this is mainly agricultural, land this will not place a significant constraint on the Black Cat to Caxton Gibbet Improvements.

Environmental constraints

- 1.15.8. The key environmental constraints are summarised below:
 - River Great Ouse which flows south to north, east of the Black Cat junction, and its flood plain.
 - There are three Noise Impact Areas (NIAs) long the A1 between the Black Cat Roundabout and Wyboston. There is also a NIA on the A428 just east of Cambridge Road.
 - A large part of the A428 is in a high priority area for the Countryside Stewardship Water Quality.
 - There are several Scheduled Monuments along the A428, just south of the current alignment.
 - There are several Countryside Stewardship Areas either side of the A428: and
 - There are many priority habitats and important species within the A428 area, but there are no Sites of Special Scientific Interest (SSSI) within the area.



Financial constraints

- 1.15.9. The Scheme will be fully publicly funded from National Highways' RIS settlement commencing with RIS2 (2020-2025) with completion during RIS3 (2025-2030).
- 1.15.10. The financial dimension sets out in detail the costs of developing and constructing the Scheme.

Contractual constraints

1.15.11. Any contractual constraints are covered in the commercial dimension.

Public acceptability constraints

1.15.12. Throughout the development and selection of a proposed scheme, National Highways has frequently consulted local people and stakeholders about the proposed A428 Black Cat to Caxton Gibbet Improvements, presenting a range of alternatives and routes.

1.16. Dependencies

- 1.16.1. The successful delivery of the Scheme is not dependent on the prior delivery of any other scheme nor is any other scheme dependent upon it.
- 1.16.2. EWR, linking Oxford and Cambridge via Bedford, has designated the area as its preferred corridor for a new service with new stations proposed for the area around St Neots / Sandy and Cambourne. Both the Scheme and EWR will provide an integrated transport solution to east west connectivity.
- 1.16.3. A SoCG between National Highways and East West Railway Company Limited states that a road and rail based multi-modal transport corridor can improve access to jobs and services and provide wider national connections. The Scheme's Project Team is engaging with EWR and a Co-Operation Agreement is in place to understand the potential for interaction.

1.17. The Theory of Change

1.17.1. This section summarises the Outcomes and strategic Impacts the Scheme will deliver to achieve the Detailed Objectives of the Scheme, using a Theory of Change Logic Map as a visual aid.

The Theory of Change logic map

- 1.17.2. The Theory of Change shows the logical flow of materials and resources from the key 'Inputs' to the key 'Activities' required to be carried out to construct the scheme. It then describes the key physical 'Outputs' from the completed asset, and the short and long term 'Outcomes' the asset will deliver or contribute towards in the short and long term that align to the CSRs agreed at the start of the project between DfT and National Highways.
- 1.17.3. The logic map starts by summarising the Inputs and Outputs required to take the scheme from Inception to Open to Traffic. The Outputs shows the physical assets that will be delivered as a result of this intervention.



- 1.17.4. The immediate, short-term, and long-term Outcomes expected are then identified following the successful completion of the Outputs. Their timing is listed as First Order, Second Order and Third Order. The Theory of Change concludes by showing these various Outcomes will provide the intended Impact of the Scheme (the Detailed Scheme Objectives) that make up the CSRs feeding into DfT's Strategic Priorities (see CSR and Detailed Scheme Objectives section for more information).
- 1.17.5. Alongside the Benefits Realisation and Evaluation Plan described in the management dimension, which aligns with the CSR and Detailed Scheme Objectives section, this provides the framework in which the success of the Scheme will be measured.

Inputs

1.17.6. The **Matrix investment** in human resources from government and National Highways (supported by consultants, stakeholders, and contractor deliverables), along with the procurement of land, will provide the inputs required for the scheme. These inputs will be employed to undertake the subsequent list of activities presented in Figure 1-11 which will take the scheme through design, assessment, planning, procurement, and construction, to delivery of the Output scope, which are the physical infrastructure, and environmental improvements planned.



Figure 1-11 Theory of Change logic map for the Scheme





Outputs

1.17.7. The Outputs will include:

- A new 16-kilometre (10 mile) dual-2 lane carriageway from the existing Black Cat roundabout to the existing Caxton Gibbet roundabout.
- 3 kilometre (1.8 miles) of tie-in works.
- A new three-level grade separated junction at Black Cat roundabout.
- A new grade separated all movements junction east of the existing Cambridge Road roundabout.
- A new grade separated all movements junction at Caxton Gibbet roundabout.
- Closure of direct access to the A1 from some private premises for safety reasons.
- New bridge crossings.
- NMU network enhancements.

Outcomes and Impacts

1.17.8. The Outputs support the delivery of the short-, medium- and long-term Outcomes that the Scheme intends to deliver. These directly address the problems described earlier with the opportunities identified, which aggregate to address the breakdown of Detailed Scheme Objectives that support the realisation of the CSRs.

Economic Growth

- 1.17.9. Current capacity problems which constrain planned housing and employment growth in the region will be removed by the Scheme. The Scheme will improve certainty around reliability and journey times, factors which can impact on business investment decisions in the area and reduce agglomeration impacting on productivity.
- 1.17.10. The Scheme will improve connections between people and jobs and will support new development projects. It will also be an essential component of the infrastructure needed to support the growth ambition for the Arc.

Transport

- 1.17.11. The new dual carriageway will cut congestion, increase capacity, and improve journey time reliability between Milton Keynes and Cambridge by providing a free-flowing network.
- 1.17.12. The Scheme will provide a free-flowing dual carriageway which will improve 'Connectivity' between the M1 and the Haven ports of Felixstowe and Harwich facilitating, in particular, the freight and logistics sector.
- 1.17.13. The provision of a new dual carriageway will improve the 'Resilience' of the route manage maintenance and incidents that may require the closure of a carriageway. It will enhance the A428's role as an Emergency Diversionary Route on the SRN.



1.17.14. It will also improve the 'Safety' at junctions, side roads and private accesses by reducing traffic flows on the existing A428 and improve safety on the A1 by removing existing side road junctions and private accesses onto the carriageway.

Environment

- 1.17.15. The creation of a new dual carriageway has been shown to increase existing levels of 'biodiversity' and provide a beneficial impact on 'noise levels' and a slight adverse impact on 'air quality' in the surrounding area.
- 1.17.16. In terms of 'natural capital', it has been shown that post-construction, the replacement of cropland with woodland and grassland habitats will change the carbon balance for the site. It is expected that a material change in carbon storage would occur over a longer time period once the created woodland habitat had matured.
- 1.17.17. Scheme delivery and operation will use mitigation measures to minimise its impact on the 'environment' and 'carbon emissions'. The Scheme will contribute less than 0.012% of the total carbon emissions in any 5-year carbon budget. It will therefore not have a material impact on Government meeting its legally binding carbon reduction targets. This ignores the positive impacts of more efficient engine technology, more Electric Vehicles and decarbonisation of the UK's electricity production impacting operational carbon emissions.
- 1.17.18. This assessment is therefore expected to be an overestimate of the Scheme's carbon impact.

Community

- 1.17.19. By providing new 'Accessibility' links for NMUs, the Scheme will ensure the 'Safety' of cyclists, walkers, horse riders and public transport users by improving the routes and connections between communities.
- 1.17.20. It will also complement the proposals for the EWR and could support the provision of accesses to proposed new stations at St Neots / Sandy and Cambourne.

1.18. Conclusions

- 1.18.1. The Scheme offers an effective solution to each of the CSRs set by DfT. It will:
 - Support economic growth by delivering a free-flowing dual carriageway which will increase agglomeration and improve productivity as well as supporting growth in housing and employment.
 - Provide additional capacity which will reduce congestion, improve journey times and their reliability.
 - Deliver measures alongside the Scheme to protect the environment and mitigate the impact of carbon emissions during construction and operation.



- Enhance accessibility, reduce severance for non-motorised users and improve the quality of life for the residents of the communities affected by rat- running.
- 1.18.2. The Scheme is a strong fit with national, regional, and local policies and plans. It supports the government's objectives to continue to grow the economy in the Arc, particularly in response to post-COVID-19 recovery requirements, but also in terms of providing connectivity between the large economic centres in this area that currently have a number of weak links between them.
- 1.18.3. At the regional level, the Scheme will provide the infrastructure needed to support the ambitions for growth proposed for the Arc and enhance the high value of sectors such as those based in the regional science parks that are reliant on transport connectivity and agglomeration benefits in order to grow.
- 1.18.4. At a local level, the scheme will improve a local standing bottleneck with congestion and delay that has impacted businesses and commuters for many years. It will also support the ambitious jobs and housing growth Local Plans proposed.



2. Economic Dimension

2.1. Introduction

- 2.1.1. This section comprises the Economic Dimension, providing the supporting economic evidence aligned to the Scheme's strategic objectives, as set out in Client Scheme Requirements, to inform decision makers on the case to fund the Scheme.
- 2.1.2. The Economic Dimension considers the economic costs and benefits of the Scheme to society as a whole. The analysis and assessment of value for money (VfM) has been carried out in accordance with the Department for Transport's (DfT's) Transport Analysis Guidance (TAG), and takes into account transport, economic, environmental, and social impacts, as well as impacts on Public Accounts (the costs borne by public bodies). The assessment includes benefits that can be monetised, as well as quantitative and qualitative impacts that cannot be monetised, and sensitivity testing.
- 2.1.3. The Economic Dimension compares the assessed benefits and costs over the whole life of the scheme (assumed to be 60 years after Scheme opening for the purposes of this appraisal). Monetised costs and benefits are used to calculate a Benefit to Cost Ratio (BCR), whilst both monetised and non-monetised impacts are used to determine the Scheme's overall value for money.
- 2.1.4. The assessment in this Economic Dimension includes both direct impacts on transport users and wider economic, social, and environmental impacts, and can be broken down into:
 - Present Value of Benefits (PVB) the monetised value of the benefits.
 - Present Value of Costs (PVC) the net cost to the public sector.
 - Net Present Value (NPV, based on PVB PVC) and BCR (the ratio of PVB to the PVC), indicating the likely return to the public of investment in the project.
 - Sensitivity testing of both the benefits and costs to calculate the potential range of the PVB and the PVC and hence the likely range of the BCR.
 - Value for Money (VfM), which considers both the BCR and nonmonetised or qualitatively assessed impacts, to determine whether the project represents a valuable use of public resources that creates and maximises public value.
 - The Economic Dimension sets out the results of the above assessment steps



2.2. Core Appraisal and Sensitivity Tests

- 2.2.1. The assessment includes a consideration of key sensitivities around the benefits and uncertainties relating to economic growth, economic and environmental parameters, and costs. The core traffic forecasts and economic appraisal were completed using the July 2020 DfT TAG Data Book v1.14 (sensitivity), which was the version available at the time of undertaking the core assessment. Sensitivity testing was undertaken using the November 2021 Data Book (v1.17). These fed into the Full Business Case (FBC) submitted to DfT in July 2022, and assumed a Scheme opening year of 2026.
- 2.2.2. Since the preparation and submission of the FBC in Summer 2022, planning permission (a Development Consent Order DCO) was granted by the Secretary of State for Transport (August 2022). However, an application by the Transport Action Network to the High Court for permission for a judicial review of the decision to grant the DCO has led to a delay to the start of construction works.
- 2.2.3. As a result of this delay, this Economic Dimension has been updated with a new section (Section 2.16) that includes the updated and reprofiled Scheme costs, that takes into account new DfT guidance reflecting the higher levels of uncertainty in forecasting future traffic growth, and an updated Data Book (January 2023, v1.20.2). This updated assessment was required to determine whether updating the economic parameters and growth assumptions and also the scheme costs, would materially affect the BCR that supported the FBC submitted to DfT in 2022.

2.3. The Case for Change

- 2.3.1. The Strategic Dimension sets out the case for change and the need for the Scheme, and only a summary is provided here. The A428 enables people to travel to work, make business trips and travel for tourism and other leisure purposes. The road is also on the important freight (HGV) transport route between the Haven ports and the Midlands.
- 2.3.2. The 8.5-mile section of the A428 between the A1 at St. Neots and the A1198 at Caxton Gibbet (see Figure 2-1) is the only section of single carriageway on the 108 miles of the Strategic Road Network (SRN) between M1 J13 and the Port of Felixstowe via Cambridge and the A14. It has a range of at grade-junctions and direct accesses to private properties. The corridor provides an alternative route choice for east-west movements between the Midlands and Haven Ports using the A14 and is also at the eastern end of the Oxford to Cambridge arc of innovation and entrepreneurial growth.



Figure 2-1 Strategic and local context of the A428 Black Cat to Caxton Gibbet route



- 2.3.3. Junctions on the A428 operate at or close to capacity, and traffic volumes are double the design capacity of the links. Key issues include:
 - Forecast growth 2015 to 2051: 18% for Heavy Goods Vehicles (HGV), 50% for Light Goods Vehicles (LGV), and 34% for car traffic. This will exacerbate existing problems, and constrain ambitious development proposals for housing and employment, both locally and in the wider area.
 - Average peak speed can be as low as one third of average free flow speed.
 - Delays: journeys can take up to 65% longer during peak hours.
 - Reliability: congestion, low traffic speeds and delays mean that journey times are unreliable, impacting on productivity, and there is low resilience to incidents on the single carriageway section of the A428.
- 2.3.4. The requirements and objectives for the Scheme were formulated both to address identified problems and to take advantage of the opportunities that new infrastructure will provide.



2.4. Assessing Value for Money

- 2.4.1. The process for assessing Value for Money is based on the DfT 'Value for Money Framework' and 'Value for Money Supplementary Guidance on Categories' (July 2017). The latter identifies three categories of impacts:
 - Established: where the method for estimating the impact and the monetary value is tried-and-tested (used to calculate an 'initial' BCR).
 - Evolving: where some evidence exists to support the estimation of a monetary value but is less widely accepted and researched (used to calculate an 'adjusted' BCR); and
 - Indicative and non-monetised: where monetary valuation methods are not considered widely accepted or researched to be definitive, with a high degree of uncertainty on the magnitude of the impact; or where impacts can be quantified but there is no current, agreed, or established method to monetise these; or qualitative impacts based on analytical judgement and in some cases scored based on an ordinal scale.
- 2.4.2. Sensitivity testing was undertaken to determine the extent to which the Scheme BCR and VfM depends upon key input assumptions such as local planning data, economic growth and costs.
- 2.4.3. The sensitivity of the Scheme to growth assumptions was tested in line with DfT TAG Unit M4 (Forecasting and Uncertainty, May 2019), to assess the uncertainty of national trends such as GDP growth and fuel price trends, and how effective the Scheme is under high or low demand assumptions compared to the core assumptions.
- 2.4.4. A sensitivity test was undertaken using low and high carbon values. A sensitivity test was also undertaken using the DfT's November 2021 Data Book, which was not available at the time of the main analysis (which is based on Data Book v1.14 (sensitivity), issued in July 2020).
- 2.4.5. Sensitivity tests were undertaken on the Scheme costs in order to understand how sensitive the BCR is to changes in forecast costs. Estimates were also made to assess by how much the benefits or costs would need to increase/ decrease to change the BCR to a higher or lower VfM category.
- 2.4.6. These sensitivity tests helped inform the view on the robustness of the initial VfM assessment, and hence the decision on the Scheme's final VfM category. The results of the sensitivity tests were included in the July 2022 FBC.
- 2.4.7. The legal challenge to the DCO decision and subsequent delay to the Scheme opening year have led to an additional set of sensitivity tests. These take into account the revised Scheme costs, updates to TAG Unit M4 (November 2022), the introduction of the Common Analytical Scenarios (CAS) for sensitivity testing, and updated growth assumptions, reflected in the January 2023 Data Book. These assessments are set out in a new section in this updated Economic Dimension (Section 2.16).



2.4.8. An overview of the appraisal process is presented in Figure 2-2.

Figure 2-2 Process to derive the BCR and VfM





2.5. Structure

- 2.5.1. The remainder of the Economic Dimension is structured as follows:
 - A description of the Scheme
 - The traffic modelling used to forecast impacts
 - Key assumptions and approach in the economic assessment
 - The Scheme's core monetised impacts (used in the initial BCR)
 - The Scheme's capital, operating, and maintenance costs
 - Analysis of the Monetised Costs and Benefits (AMCB) for the initial BCR
 - The Scheme's journey time reliability and wider economic impacts
 - AMCB for the adjusted BCR
 - Indicative and qualitative impacts
 - Distributional impact assessment
 - Sensitivity testing 2021/22: informed the July 2022 FBC
 - Sensitivity testing 2023: updated Scheme costs and economic appraisal and growth assumptions
 - Overall value for money and concluding statement

2.6. The Scheme

Scheme Description and Purpose

2.6.1. The purpose of the Scheme is to address the problems of congestion and poor journey time reliability and to reduce incidents between the Black Cat and Caxton Gibbet roundabouts. The Scheme seeks to address these problems through construction of a new 10 mile (16km) dual 2-lane carriageway from the Black Cat roundabout to Caxton Gibbet roundabout, to be known as the A421 (hereafter referred to as the 'new dual carriageway'), and in addition approximately 1.8 miles (3km) of tie-in works shown in schematic form in Figure 2-3.









- 2.6.2. The Scheme includes the following components:
 - A new three-level grade separated junction at Black Cat roundabout, connecting the existing A421, the A1 and the new Scheme link.
 - A new grade separated junction to the east of the existing Cambridge Road roundabout connecting the new dual carriageway and the existing A428.
 - A new grade separated junction at the Caxton Gibbet roundabout, incorporating the existing roundabout on the south side of the new dual carriageway and a new roundabout on the north side. The new dual carriageway will tie-in to the existing A428 dual carriageway, to the east of the new Caxton Gibbet junction.
 - In the vicinity of the new Black Cat junction, closure of some local direct access onto the A1 for safety reasons. A new local road will provide an alternative route.
 - New crossings will enable the new dual carriageway to cross the River Great Ouse, East Coast Main Line railway, Barford Road, the B1046/Potton Road, Toseland Road and the existing A428 at Eltisley.
 - The existing A428 between St Neots and Caxton Gibbet will be detrunked.
 - An alternative access will be provided to side roads at Chawston, Wyboston and Eltisley.
 - There will be safer routes for walkers, cyclists, and horse riders.
- 2.6.3. There is no dependent development associated with the Scheme, but as the Economic Dimension will demonstrate, the Scheme is viable in its own right. It will support significant levels of planned economic growth in the region, including but not limited to Cambridge which is one of the fastest growing areas in the UK.
- 2.6.4. The Scheme will provide much needed additional capacity and allow faster journeys reducing travel times along the route. Travel time savings make up a significant part of the economic assessment. By grade-separating Black Cat, the Scheme will significantly reduce delays experienced by all users of the junction, especially for the traffic to/ from the west using the A421 and traffic on the A1.
- 2.6.5. Additional benefits will be provided by the improved journey time reliability and improved ability to keep traffic moving when incidents occur, for example by keeping one lane open to traffic rather than having to close the road, or by making use of the de-trunked A428 (Cambridge Road) as an alternative route. The better connectivity due to the scheme generates further productivity (agglomeration) benefits by effectively bringing businesses closer together.



- 2.6.6. The Scheme will make travel safer by removing many conflicts at at-grade junctions and by providing a higher standard dual carriageway rather than single carriageway, with concomitant impacts on journey time reliability.
- 2.6.7. Environmental impacts are assessed as part of the Economic Dimension, including greenhouse gases, air quality, noise, and landscape. The assessment reflects any mitigation put in place as part of the Scheme to minimise adverse impacts.

2.7. Traffic Modelling

A428 Strategic Traffic Model

- 2.7.1. The modelling for the Scheme was undertaken using the A428 Strategic Traffic Model. The primary use of the model is to assess the traffic impacts of the Scheme and to provide inputs into transport, economic, social, and environmental appraisals, as well as informing the buildability (construction traffic management) of the Scheme, and operation and design of its junctions.
- 2.7.2. The A428 Strategic Traffic Model is the highway assignment component of the wider Regional Traffic Model (RTM) suite. National Highways developed the RTM model suite to provide an evidence base for the future development of schemes on its SRN as part of the Road Investment Strategy (RIS) process.
- 2.7.3. The model has been used to produce forecasts in line with TAG. The forecasts were based on:
 - An Uncertainty Log that takes into account information on planned growth (housing and employment) and committed transport infrastructure.
 - Economic parameters based on TAG Data Book v1.14 (July 2020 Sensitivity Test), which was the latest available at the time of this assessment.
 - A Scheme opening year of 2026, and additional forecasts for 2041 and 2051.

Spatial Coverage

2.7.4. The spatial coverage of the model is shown in Figure 2-4. The model covers the major routes in Great Britain, and more detailed coverage of junctions and local and major routes within the purple boundary shown in the figure.





Figure 2-4 Network Coding Level of Detail

Forecast Traffic Flows and Journey Times

2.7.5. The new Scheme link is expected to carry up to 66,000 vehicles per day in 2041, with a reduction of up to 28,000 vehicles per day on the existing A428. The Scheme is predicted to reduce traffic for the majority of east-west routes between Bedford and Cambridge, leading to less rat running and a reduction in traffic on the surrounding minor and secondary roads through smaller towns and villages in the area. The forecast impact of the Scheme on traffic flows is shown in Figure 2-5.





Figure 2-5 Forecast impact of Scheme on Traffic Flows

Forecast Traffic Flows and Journey Times

- 2.7.6. With the Scheme in place, journey times are forecast to reduce by almost 50% along the A421/A428 between Renhold junction and Cambourne junction, from nearly 30 minutes to around 15 minutes at peak times in the peak direction in 2041. As the Scheme results in additional traffic to the west and east, the time saving from the M1 to the A14 is marginally less, at around 11 minutes at peak times.
- 2.7.7. Along the A1, from Letchworth to the A1 (M) / A1307 junction, the Scheme results in travel time savings of between 1 and 3 minutes compared to the Without Scheme scenario in 2041.


2.8. Key Assumptions and Approach

Key Impacts Considered

2.8.1. Table 2-1 lists the key impacts that have been appraised in this FBC, and the software programs and TAG Data Book versions used where applicable. A number of sensitivity tests were carried out and are also set out in this table. It was not considered proportionate to undertake sensitivity tests for all impacts, for example where the scale of impact is small or would have a negligible impact on the Scheme's value for money, and as such these were not separately assessed.



Table 2-1 Impacts and Form of Measurement for the Initial and AdjustedBCRs

Demofit / Coot	FBC 2022	FBC 2023	
Benefit / Cost	Core Assessment	Sensitivity Tests	Sensitivity Tests
Main Parameters			
Appraisal year	2021	2021	2023
Scheme opening year	2026	2026	2027
60 year appraisal period	2026-2085	2026-2085	2027-2086
Initial BCR			
Travel time Vehicle operating costs Indirect taxation	TUBA v1.9.14 + Jul 2020 Sensitivity Test Data Book	TUBA v1.9.17 + Nov 2021 Data Book	TUBA v1.9.17 + Jan 2023 Data Book
Delays during construction & maintenance	As above	Not separately assessed	Not separately assessed
Accident impacts	COBALT v2013.2 + Jul 2020 Sensitivity Test Data Book	COBALT v2.1 + Nov 2021 Data Book	Not separately assessed
Greenhouse gas impacts – tailpipe	Central carbon values, using: DMRB v9 (EFTv11)	As per Core Assessment but using low and high carbon values.	Not separately assessed
Greenhouse gas impacts - other	Central carbon values, using: National Highways Carbon Tool v2.3; Woodland Carbon Code (WCC) workbook v2.4	As per Core Assessment but using low and high carbon values.	Not separately assessed
Air quality	EFTv11 DMRB LA 105	Not separately assessed	Not separately assessed
Noise	DMRB LA 111 Calculation of Road Traffic Noise	Not separately assessed	Not separately assessed
Adjusted BCR			
Wider economic impacts	WITA v2.0 Beta	WITA v2.2	WITA v2.3
Journey time reliability	MyRIAD v1.11.2	Not separately assessed	Not separately assessed
Scheme costs			
Construction	Dec 2021 NH estimate of most likely cost	Dec 2021 NH estimates of minimum and maximum costs	Analytical Assurance Statement cost estimate 24 Mar 2023
Operation and maintenance	Jan 2022 NH estimate – central cost estimate	Jan 2022 NH estimate – minimum and maximum cost estimates	Not separately assessed



Appraisal Period and Assessment Years

- 2.8.2. All traffic model outputs relate to a 12-hour weekday average, derived from the AM, PM and interpeak models. Relevant model results were converted to a yearly output using an annualisation factor, based on observed traffic data.
- 2.8.3. In line with TAG Unit A1.1, the economic assessment was conducted over a 60-year appraisal period from the opening year of the Scheme. The opening year was expected to be 2026; therefore, the appraisal period extends to the year 2085 for the core assessment and associated sensitivity tests.
- 2.8.4. In order to assess the economic benefits arising over the life cycle of the Scheme, a series of forecast years were developed in the traffic model. These forecast years are used to interpolate and extrapolate impacts over the 60-year appraisal period. For this study, the forecast years used are shown in Table 2-2.

Description	Year
Opening year*	2026
Design year	2041
Last modelled year	2051
Appraisal horizon year	2085

Table 2-2 Modelling Year

* 2026 traffic forecasts were used for the sensitivity test with a 2027 opening year, but the economic appraisal was updated to be based on a 2027 opening year (see Section 2.16 for further details).

2.8.5. The impacts of the Scheme are based on the difference between forecasts of the Without Scheme (DM) and With Scheme (DS) scenarios. The benefits arising due to these changes are interpolated between each of the forecast years and extrapolated from the last modelled year to cover the whole appraisal period. The extrapolation of the last modelled year's benefits up to the year 2085 assumes zero growth in the magnitude of impacts after the last modelled year (although growth is applied to the value of impacts, for example to reflect forecast changes in values of time, as set out in DfT's July 2020 Sensitivity Test Data Book).

Price Base and Discounting

2.8.6. In line with TAG, and unless otherwise stated, all monetised impacts and Scheme costs in the Economic Dimension are presented in discounted 2010 market prices.



2.8.7. Appraisal parameters were taken from the relevant DfT Data Book, either the July 2020 Sensitivity Test Data Book v1.14 for the core scenario, or the November 2021 Data Book v1.17 for some of the sensitivity tests. The January 2023 Data Book (v1.20.2) was used in the updated assessment undertaken in 2023 following the delay to the start of construction works.

2.9. The Scheme's Core Monetised Impacts

2.9.1. This section sets out the core Scheme impacts in terms of transport user benefits, construction impacts, accidents, air quality, noise, and greenhouse gases. When compared to the Scheme costs (Section 2.10) these are used to calculate the initial BCR. All results set out in this section are based on the analysis undertaken for the 2022 FBC.

User Benefits

- 2.9.2. The Transport Economic Efficiency (TEE) benefits consist of travel time benefits and vehicle operating costs (VOC) expected to be realised as a result of the Scheme.
- 2.9.3. The calculation of TEE benefits to road users was undertaken using the DfT's TUBA V.1.9.14 (Transport Users Benefit Appraisal) program released in August 2020. The economic parameters for this version of the TUBA software correspond to TAG Data Book (v1.14) published in July 2020.
- 2.9.4. TUBA compares journey times/ costs between the Without Scheme scenario (Do Minimum) and the With Scheme scenario (Do Something) to establish the value of the savings in road user travel times and vehicle operating costs.
- 2.9.5. The results are set out in Table 2-3 together with the Scheme's impact on indirect tax revenue. There is a total of £514.2 million in user benefits once the Scheme is operational over the 60-year appraisal period, and £75.7 million in indirect tax revenue that accrues to central Government.



Net Business Impact	235,951	1,475	15,705	17,180	253,132	6,934	260,066
Present Value of TEE Benefits (PVB)	628,085	4,053	-117,906	-113,854	514,231	75,653	589,885

- 2.9.6. Overall, 77% of benefits accrue to car trips (21% Business, 20% Commute, and 35% Other), and 23% accrue to LGVs and HGVs.
- 2.9.7. Table 2-4 provides a breakdown of the discounted road user benefits from TUBA for each time period. This shows that the Interpeak accounts for about 35% of the total benefits, the AM and PM peak periods contribute around 20 to 21% each, and the Off-Peak and Weekend account for about 8% and 17% respectively. Benefits per hour are higher in the AM and PM peak periods than in the Inter-peak, due to lower congestion levels in the Inter-peak.

Time Period	User Time	VOC (Fuel)	VOC (Non- Fuel)	Total VOC	Total User Benefits	Indirect Tax Revenue	Total	% of Total Benefits	Benefits per Hour
AM peak	119,620	2,593	-17,907	-15,314	104,306	12,033	116,339	19.70%	153
PM peak	127,476	2,805	-20,244	-17,438	110,037	11,910	121,947	20.70%	160
Inter- peak	216,205	1,654	-33,065	-31,411	184,794	23,621	208,415	35.30%	137
Off-Peak	54,983	-3,847	-18,224	-22,071	32,912	12,365	45,278	7.70%	15
Weekend	109,801	848	-28,467	-27,619	82,182	15,724	97,906	16.60%	118
Total	628,085	4,053	- 117,906	- 113,854	514,231	75,653	589,885	100.00%	n/a

Table 2-4 TEE and Indirect Tax by Time Period (£000s discounted and deflated to 2010)

2.9.8. Figure 2-6 shows the profile of user benefits over the 60-year appraisal period. Scheme benefits increase each year from 2026 but start to decrease after 2041 and decrease at a slightly steeper rate after 2051. The decline post 2051 is largely due to discounting, which is higher than the forecast increases in values of time (actual journey times do not change post 2051, as these are assumed to be constant after the final modelled year).





Figure 2-6 Profile of Benefits 2026 to 2085 (£000s discounted and deflated to 2010)

2.9.9. As expected, the sectors closest to the scheme produce the highest per person benefits. Sectors further afield with large populations such as London and South Herts, and East Midlands, North and Scotland, have per person benefits far lower than those sectors closest to the A428, as would be expected. The sector with the highest benefits, St Neots, gives a benefit per person of £1,886.



Origin Sector	Benefits Per Sector Origin (£000)	2015 Population Estimate	Benefits Per Person (£s)
Cambridge	49,433	164,717	300
East of A1198	53,142	84,741	627
West of A1198	25,940	73,223	354
St Neots	64,453	34,169	1,886
Huntingdon	19,839	82,051	242
West of A1	26,629	49,339	540
North Herts	17,775	257,405	69
Milton Keynes & SW Beds	91,642	656,951	139
Southern Cambridgeshire	4,296	26,269	164
Ely	7,479	151,459	49
Peterborough & NE Northants	20,615	572,194	36
Other sectors	86,265	60,977,999	1
Total	514,231	63,258,413	8

Table 2-5 Benefits per Person by Sector

Construction Impacts on Traffic

- 2.9.10. The construction for the scheme is proposed to be carried out in four phases:
 - Phase 1 Sep 2022 to Feb 2023 (6 months)
 - Phase 2 Mar 2023 to Jun 2024 (16 months)
 - Phase 3 Jul 2024 to Jun 2025 (12 months)
 - Phase 4 Jul 2025 to May 2026 (11 months)
- 2.9.11. The A428 Scheme is predominantly an offline improvement; however, changes are proposed to existing junctions on the A428 and A421.
 - Improvements to A421/A1 Black Cat Junction and A428 Cambridge Road Roundabout will be carried out in all four phases.
 - Access to Wintringham will be completed in first two phases.
 - Improvements to A428 junctions near Eltisley and Caxton Gibbet will be carried out in the first three phases.



- 2.9.12. The impact of construction on general traffic was assessed by modelling the proposed traffic management measures. The outputs from the model were then used to undertake a user benefit (TUBA) assessment.
- 2.9.13. The resultant construction-related user disbenefits have been summarised in Table 2-6 by construction phase. There is a total disbenefit of £39.1 million in discounted 2010 prices, of which £22.6 million relates to Commuting and Other trip purposes, and £16.5 million relates to Business trips.

Construction Phase	User Time	VOC (Fuel)	VOC (Non- Fuel)	Total VOC	Total User Benefit s	Indirect Tax Revenu e	Total
1	-2,995	95	-128	-32	-3,027	-53	-3,080
2	-13,111	230	-388	-159	-13,269	-125	-13,395
3	-11,116	-355	-822	-1,177	-12,293	199	-12,094
4	-9,700	-273	-660	-933	-10,633	152	-10,481
Total	-36,921	-303	-1,998	-2,301	-39,223	172	-39,051
Of which:						Of which:	
Commuting and Other -22						-22,556	
Business						-16,494	

Table 2-6 Scheme Construction – Benefits by Construction Phase (£000s discounted and deflated to 2010)

Accident Impacts

- 2.9.14. The impact of the scheme on accidents was calculated using the DfT's Cost and Benefits to Accidents Light Touch (COBALT) software (v2013.2, along with the associated economic parameters file (2020.2), was used). The assessment was undertaken on the highways network within the AoDM. COBALT calculates the number of accidents on each link in each year of the appraisal period using AADT, link lengths and accident rates per million vehicle kilometres. In line with TAG Unit A4.1 Social Impact Appraisal (July 2021) national average accident rates were used.
- 2.9.15. The scheme is forecast to reduce the number of accidents by 689. The economic value of the accident savings is presented in Table 2-7 with the benefits totalling £28.6 million in discounted 2010 prices. These benefits arise as a result of traffic moving to the higher standard dual carriageway from the existing single carriageway and local road network and traveling through the improved Scheme junctions.



Table 2-7 Accident and	Casualty Savings	over the 60-year	Appraisal Period
	ousually ouvings	over the ov-year	Appraisari criou

	Number of Accidents	Number of Casualties		
Scenario	(Total 60 years)	(60 Years)		
	(Total ou years)	Fatal	Serious	Slight
Do Minimum	61,246	1,062	9,192	75,974
Do Something	60,557	1,053	9,055	75,057
Accidents Saved by the Scheme	689	9	137	917

Table 2-8 Present Value of Accident Costs and Benefits(£000s discounted and deflated to 2010)

Scenario	Existing A428 and Scheme Links	Existing A428 and Scheme Junctions	Other AoDM Links	Total
Without Scheme (DM)	51,984	48,227	2,318,402	2,418,613
With Scheme (DS)	57,306	27,177	2,305,486	2,389,969
Total accident benefits	-5,322	21,050	12,916	28,645

Air Quality Impacts

- 2.9.16. Guidance in TAG Unit A3 Environmental Impact Appraisal was followed to assess the Scheme's impacts on local air quality, based on forecast traffic flows, the proportion of heavy goods vehicles, and speed banded emission factors.
- 2.9.17. Road links where a potentially significant change in traffic was predicted were included in the assessment of air quality. Emissions over a 60-year period commencing in the opening year were calculated with emissions interpolated for intervening years and assumed to remain constant after the final modelled year.



- 2.9.18. The air quality impact was monetised by considering the damage costs associated with the change in emissions of each pollutant. Emissions of nitrogen dioxide (NO2) and particulate matter (PM2.5), were calculated for the opening year of the Scheme (2026), 2041, and 2051. The assessment takes into account the number of properties within defined distance bands from the affected road network. The air quality impact was monetised by considering the damage costs associated with the change in emissions. This accounts for impacts in terms of changes in human exposure to ambient concentrations of air pollutants, and other impacts that do not directly affect households such as ecosystem damage which is determined in terms of changes in emissions.
- 2.9.19. The results are summarised in Table 2-9. There is an overall disbenefit of -£1.79 million related to NO2 and an overall benefit of £1.67 million related to PM2.5, resulting in an overall air quality net disbenefit of -£0.18 million.
- 2.9.20. There is an increase in regional emissions of NO2 and PM2.5. However, effects on individual receptors ('concentration costs') show a small overall benefit due to improvements at receptors on the affected road network outweighing a worsening at other receptors. Overall, there is a disbenefit largely due to increased NO2 emissions ('other costs') across the road network as a whole.

Air Quality	Monetised Impact
Overall impact of change in air quality	-£118
Individual impacts:	
Change in NO ₂ concentrations, of which:	-£1,790
Concentration costs	£190
Other costs	-£1,980
Change in PM _{2.5} concentrations of which:	£1,670
Concentration costs	£1,850
Other costs	-£180

Table 2-9 Air quality Impacts (DMRB v9, EFTv11) (£000s discounted and deflated to 2010)



Noise Impacts

- 2.9.21. Noise impacts were assessed in line with Chapter 2 of TAG Unit A3 Environmental Impact Appraisal and the DMRB noise guidance (LA111 Revision 2) for Noise and Vibration.
- 2.9.22. Noise increases are predicted at receptors near to the proposed alignment and around existing roads where vehicle numbers increase as a result of the Scheme. However, this impact is small and outweighed by noise decreases at receptors adjacent to roads bypassed by the Scheme, particularly those along the existing A428 in Wintringham close to the Cambridge Road junction, Croxton and Eltisley. There is an overall benefit of £3.21 million in discounted 2010 prices. A summary of these impacts is provided in Table 2-10.

Noise	Monetised Impact
Overall NPV of change in noise	3,211
Individual NPV elements	
Impact on sleep disturbance	1,488
Impact on amenity	1,136
Impact on AMI	300
Impact on stroke	114
Impact on dementia	172

Table 2-10 Summary of Noise Impacts(£000s discounted and deflated to 2010)

Greenhouse Gas Assessment

2.9.23. Greenhouse gas impacts were assessed for tailpipe emissions from traffic, the Scheme construction works themselves, and land use changes associated with the Scheme. These are dealt with in turn below.

Tailpipe emissions

2.9.24. Guidance in TAG Unit A3 Environmental Impact Appraisal was followed to assess the impacts of the Scheme on tailpipe emissions of greenhouse gases and calculated using the Emissions Factor Toolkit (EFT v11 and National Highways' DMRB v9 spreadsheet). These were calculated for both the impacts during the 60-year appraisal period post-Scheme opening and the impacts on general traffic (such as re-routing) arising from traffic management measures implemented during each phase of the construction works.



- 2.9.25. The greenhouse gas impact was monetised by considering the marginal abatement costs (based on Department for Business, Energy, and Industrial Strategy (BEIS) 2021 carbon values) for the change in emissions from petrol and diesel engines, which are wholly within the non-traded carbon sector. Emissions from the generation of electricity (for electric vehicles) fall within the traded sector, and were calculated based on the difference between BEIS carbon values and forecast carbon permit prices). 'Tailpipe' emissions here therefore reflect both emissions from petrol and diesel vehicles, and emissions associated with the generation of electricity used for electric vehicles.
- 2.9.26. It is predicted there would be an increase of 2,063,290 tonnes in emissions of carbon dioxide equivalent (CO2e) associated with the affected road network over the 60-year appraisal period (of which 34,777 tonnes is traded carbon). This equates to a present value of -£156.2 million in discounted 2010 prices (Table 2-11). This consists of -£154.3 million non-traded and -£1.9 million traded carbon. Emissions increase to the design year of 2041, and then decrease to 2050 with the forecast increase in the proportion of electric vehicles. After 2050 emissions remain flat, as no assumptions have been made on how the vehicle fleet mix might change beyond 2050.

	Tailpipe emissions post- opening
Change in traded CO ₂ e *	-£1,835
Change in non-traded CO ₂ e	-£154,265
Overall change in total CO ₂ e	-£156,100
60-year appraisal period (tonnes traded CO ₂ e)	34,777
60-year appraisal period (tonnes non-traded CO ₂ e)	2,028,513
60-year appraisal period (tonnes total CO ₂ e)	2,063,290
Opening year (tonnes total CO ₂ e)	34,567
* Traded carbon price based on difference between BEIS central car	bon values and forecast carbon permit prices

Table 2-11 Traffic tailpipe emissions post-Scheme opening
(£000s discounted and deflated to 2010)

2.9.27. Impacts on tailpipe emissions during construction were also assessed, and it is predicted there would be an increase of 55,625 tonnes in CO2e emissions. This equates to a present value of -£7.1 million in discounted 2010 prices, which is largely based on non-traded carbon emissions (Table 2-12).

Table 2-12 Traffic tailpipe emissions during construction (DMRB v9, EFTv11)(£000s discounted and deflated to 2010)

	Tailpipe emissions post-opening
Change in traded CO ₂ e *	-£20
Change in non-traded CO ₂ e	-£7,042
Overall change in total CO ₂ e	-£7,062
Construction period: tonnes traded CO ₂ e	0.2



	Tailpipe emissions post-opening	
Construction period: tonnes non-traded CO ₂ e	55.4	
Construction period: tonnes total CO ₂ e	55.6	
* Traded carbon price based on difference between BEIS central carbon values and forecast carbon permit prices		

Greenhouse gases arising during construction, maintenance, and operations

- 2.9.28. The greenhouse gas impacts of the construction work themselves, such as embedded within the construction materials, were calculated based on National Highways Carbon Tool v2.3, as well as impacts associated with the Scheme's maintenance and operation over the 60-year post-opening appraisal period.
- 2.9.29. Just under 79% of Scheme construction emissions are attributable to embodied carbon in materials such as emissions from the extraction, transportation, and processing of raw materials, as well as from the transportation of the materials to the construction site.
- 2.9.30. The next largest contributor is electricity and fuel used on site during the construction process, accounting for almost 21% of emissions. The remaining emissions, totalling less than 1%, arise from the transportation and treatment of waste, as well as the transportation of the workforce to the construction site.
- 2.9.31. It was assumed that 90% of emissions are in traded carbon, based on the impact categories used to assess construction carbon, mainly materials and electricity (traded) and fuel (non-traded).
- 2.9.32. It is predicted there would be an increase of 211,711 tonnes in emissions (of which 190,540 tonnes is traded carbon). This equates to a present value of £20.3 million in discounted 2010 prices, consisting of -£2.7 million non-traded and -£17.6 million traded carbon. The results are summarised in Table 2-13.
- 2.9.33. There may be scope for the Scheme to reduce forecast emissions arising from construction, maintenance, and operations through engineering, design optimisation, procurement decisions, and construction methods.



Construction	2022	2023	2024	2025	2026	Total
Emissions (tonne	s CO₂e)					
90% traded*	11,062	48,446	68,663	53,595	8,774	190,540
10% non- traded	1,229	5,383	7,629	5,955	975	21,171
Total	12,292	53,828	76,292	59,550	9,748	211,711
£000s discounted	and defla	ted to 201	0			
90% traded*	-£1,067	-£4,574	-£6,342	-£4,855	-£781	- £17,619
10% non- traded	-£162	-£698	-£970	-£743	-£119	-£2,691
Total	-£1,230	-£5,272	-£7,312	-£5,598	-£900	- £20,311
* Traded carbon price based on difference between BEIS central carbon values and forecast carbon permit prices						

Table 2-13 Construction related emissions and monetised impacts CO₂e

- 2.9.34. Emissions from maintenance and operations were calculated for both traded and untraded carbon. Traded carbon consists of embodied carbon in materials used for renewals (64% of total emissions), and grid electricity used for road signs and lights (1% of total emissions). Untraded carbon consists of emissions arising from energy (fuel) use from plant (33% of total emissions) and vehicles (2% of total emissions) used for maintenance activities.
- 2.9.35. It is predicted there would be an increase of 10,352 tonnes in emissions (of which 6,772 tonnes is traded carbon). This equates to a present value of £0.65 million in discounted 2010 prices. This consists of -£0.27 million non-traded and -£0.38 million traded carbon. The results are summarised in Table 2-14.

Table 2-14 Maintenance related emissions and monetised impacts CO₂e

Maintenance	2026-2085	
Emissions (tonnes CO ₂ e)		
Traded*	6,772	
Non-traded	3,579	
Total	10,352	
£000s discounted and deflated to 2010		
Traded*	-£377	
Non-traded	-£269	
Total	-£646	
* Traded carbon price based on difference between BEIS central carbon values and forecast carbon permit prices		



Greenhouse gases arising from land use change

- 2.9.36. Changes in carbon emissions arising from the change in land use through carbon sequestration over the 60-year appraisal period were calculated by undertaking a natural capital assessment, making use of the Woodland Carbon Code workbook for woodland habitats, with Natural England/ Defra Enabling a Natural Capital Approach (ENCA) carbon factors for other habitat types.
- 2.9.37. The change in carbon sequestration associated with the Scheme is considered to be potentially material over a time period of 60 years, given the change in habitats and land use that is expected to occur post-construction. This was assessed by undertaking a natural capital assessment.
- 2.9.38. The most significant change in absolute terms is the decrease in cropland from 499 hectares to 198 hectares, the increase in neutral grassland from 29 hectares to 199 hectares, and the increase in broadleaved plantation woodland from 2 hectares to 76 hectares. The latter is particularly important in terms of carbon capture and sequestration.
- 2.9.39. The changes to land use proposed as part of the Scheme will result in an increase in carbon sequestration of 28,683 tonnes, with a net present value of £2.1 million in discounted 2010 prices using BEIS Central carbon values. The positive carbon impact is largely driven by the increase in woodland (broadleaved plantation).

Greenhouse gases - summary of impact

- 2.9.40. Table 2-15 summarises the results of the greenhouse gas assessments. It should be noted that most transport business cases have tended to only include the non-traded carbon impacts of tailpipe emissions during the post-opening appraisal period (-£154.3 million for this Scheme). This appraisal has also included traded carbon (-£1.8 million), and in addition assessed impacts on tailpipe emissions during construction (-£7.1 million).
- 2.9.41. This assessment has also gone a step further and included impacts during construction, maintenance, and operations (-£20.3 million), and the impacts arising from land use change, in this case largely arising from the sequestration of carbon due to the increase in broadleaved plantation woodland (£2.1 million). Overall, there is a net increase in carbon of 2.3 million tonnes with a monetised impact of £182.0 million in discounted 2010 prices.
- 2.9.42. Table 2-16 summarises carbon emissions by carbon budget reporting period up to 2037, whilst shows the profile of emissions between 2022 and 2051 (emissions are relatively steady after that as although there is an increase in sequestration, as set out in the natural capital assessment, the overall impact is dominated by road traffic tailpipe emissions, and both traffic levels and vehicle fleet mix and emissions factors are assumed to not change after 2050 for the purposes of this appraisal).



Table 2-15 Summary of greenhouse gas impacts(Central carbon price, £000s discounted and deflated to 2010)

	Tailpipe Emissions	Construction & Maintenance Emissions	Operating Emissions **	Total
Value of traded * emissions over 60 years (£2010 present values)	£1,853,914	£17,996,036	£0	£19,849,950
Value of non-traded emissions over 60 years (£2010 present values)	£161,307,111	£2,960,856	_ £2,101,938	£162,166,028
Total Value of emissions over 60 years (£2010 present values)	£163,161,025	£20,956,891	- £2,101,938	£182,015,978
* Traded carbon price based on difference between BEIS central carbon values and forecast carbon permit prices				
** Emissions from the Scheme promoter's corporate activities. Here, these include only land use changes associated with the Scheme, as assessed using the natural capital approach.				





Figure 2-7 Profile of CO2e emissions 2022 – 2051



Table 2-16 Greenhouse Gas Emissions by Carbon Budget Reporting Period

Source of Emissions	Type of emissions	Total	CB3 (2018- 2022)	CB4 (2023- 2027)	CB5 (2028- 2032)	CB6 (2033- 2037)
	Change in traded emissions (tCO ₂ e)	34,982.74	12.07	700.78	1,689.71	2,291.27
Road User Emissions	Change in non-traded emissions (tCO ₂ e)	2,083,931.85	5,696.37	118,559.09	175,349.35	180,004.47
	Total change in emissions (tCO2e)	2,118,914.59	5,708.44	119,259.87	177,039.06	182,295.74
	Change in traded emissions (tCO ₂ e)	190,540.17	11,062.39	179,477.78	-	-
Construction Emissions	Change in non-traded emissions (tCO ₂ e)	21,171.13	1,229.15	19,941.98	-	-
	Total change in emissions (tCO2e)	211,711.30	12,291.55	199,419.75	-	-
	Change in traded emissions (tCO ₂ e)	6,772.38	-	242.67	587.53	569.93
Renewals and Maintonanaa Emiasiana	Change in non-traded emissions (tCO ₂ e)	3,579.31	-	119.31	298.28	298.28
Maintenance Emissions	Total change in emissions (tCO2e)	10,351.68	-	361.98	885.8	868.2
	Change in traded emissions (tCO ₂ e)	-	-	-	-	-
Operational Emissions	Change in non-traded emissions (tCO ₂ e)	-28,683.05	-	48.88	-267.17	-1,335.14
	Total change in emissions (tCO ₂ e)	-28,683.05	-	48.88	-267.17	-1,335.14
Total across all sources	Total change in emissions (tCO ₂ e)	2,312,294.52	17,999.99	319,090.48	177,657.69	181,828.80



2.10. Scheme Costs

- 2.10.1. Scheme construction costs were provided by National Highways in April 2022, which informed the July 2022 FBC; and in March 2023, which has informed the update of the economic appraisal in this uFBC.
- 2.10.2. Operating and Maintenance (O&M) costs have not been updated since the estimates provided by National Highways in January 2022. Since these costs are significantly less than construction costs, their impact on the overall economic appraisal is marginal.

Construction costs - April 2022 estimate (for July 2022 FBC)

- 2.10.3. The April 2022 cost estimate was based on an RDP procurement route, with an expected assured most likely outturn cost of **Example 1** including project risk and portfolio risk .
- 2.10.4. The expenditure profiles were based upon cost estimates for each financial year prepared at a base date and then inflated to outturn costs using National Highways' projected construction related inflation. These costs were then rebased to real 2010 prices, using the Gross Domestic Product (GDP) deflator series as published in DfT's July 2020 Sensitivity Test Data Book v1.14.
- 2.10.5. For the purposes of the appraisal and comparison to scheme benefits and disbenefits, the 2010 factor costs were discounted in line with HM Treasury Green Book Guidance and converted from factor costs to market prices (using the indirect tax correction factor of 1.19, in line with the July 2020 Sensitivity Test Data Book v1.14). These results are shown in Table 2-17, indicating that the Present Value of Investment Costs is the purposes of the economic appraisal, all sunk costs (2019-2021 inclusive) were removed.



Table 2-17 Present Value of Scheme Investment Costs, April 2022 Estimate(£000s market prices discounted and deflated to 2010)

Voor	Capital Investment, by Year and Expenditure Type (£000s)				
Tear	Preparation	Supervision	Construction	Land	Total
2019					
2020	Sunk costs, e	excluded from	the economic a	ppraisal	
2021					
2022					
2023					
2024					
2025					
2026					
2027					
2028					
2029					
2030					
2031					
2032					
Total					

Construction costs – 24th March 2023 estimate

- 2.10.6. In March 2023 National Highways produced an updated Pre-Construction Cost Estimate. The Technical Assurance and Regional Project Controls suppliers to National Highways - East undertook their assurance activities on the information forming the basis of this estimate. The assurance activities were approved, with the budget information signed off as fit for use in the Pre-Construction Cost Estimate by the project team.
- 2.10.7. The revised cost estimate, compared to the April 2022 estimate, is shown in Table 2-18. This shows costs are estimated to increase by a further £46.4 million (12.5%) to £416 million in discounted 2010 market prices. This increase reflects the impact of inflation on costs for all major schemes.

Table 2-18 Present Value of Scheme Investment Costs, March 2023 compared to April 2022 Estimate (£000s market prices discounted and deflated to 2010)

Estimate	Construction Costs
April 2022 (July 2022 FBC)	370,212
March 2023 Update	416,614
Difference	46,402
% Difference	12.5%



Operating and maintenance costs

- 2.10.8. Operating and Maintenance (O&M) costs were provided by National Highways in January 2022. As well as annual operating activities, these costs include an allowance for larger periodic maintenance and renewal activities. In addition to the O&M costs for the new dual carriageway, O&M costs for the existing section of the A428 to be de-trunked were also included in the With Scheme estimate, but with an allowance for the reduction in traffic flow forecast on that section. Only net costs have been provided, rather than separate With Scheme and Without Scheme costs.
- 2.10.9. The expenditure profile was based upon the O&M cost estimates prepared in 2019 Q1 prices. This gave an O&M cost excluding inflation of £135.9 million for a 60-year period. Following National Highways guidance, the costs were then rebased to 2010 calendar year profiles for economic calculations using the GDP deflator series in the July 2020 Sensitivity Test Data Book.
- 2.10.10. After converting from 2010 Factor to Market prices and discounting to 2010, the O&M costs result in a net operating and maintenance cost of £27.8 million over the 60-year appraisal period. These costs are summarised in Table 2-19.

	Operating	Maintenance	Total O&M
	Costs	Costs	Costs
	(£000s)	(£000s)	(£000s)
Net Scheme Costs			

Table 2-19 Operating and Maintenance Costs (£000s market prices discounted and deflated to 2010)

Public Accounts (PA)

- 2.10.11. The full PA table is presented in Table 2-20, which shows the discounted value of the operating and maintenance costs as £27.8 million and the investment cost of the Scheme as £370.2 million (based on the April 2022 estimate) and £416.6 million (based on the March 2023 estimate).
- 2.10.12. This results in a total PVC of £398.0 million, as used in the July 2022 FBC, and £444.4 million (an increase of 11.7%), as used in the revised economic assessment undertaken in 2023 and reported in this Economic Dimension.
- 2.10.13. The Scheme results in indirect tax revenues accruing to government, although this has decreased from a projected £75.8 million (July 2022 FBC) to £44.8 million (revised 2023 assessment).



Table 2-20 Public Accounts Table

Public Accounts Central Government Funding (Transport)	July 2022 FBC	March 2023 Update
Operating costs		
Investment costs		
Present Value of Costs (PVC)	398,021	444,423
Central Government Fund	ling (Non-Transport)	
Indirect Tax Revenues (Operation)		
Indirect Tax Revenues (Construction)		
Wider Public Finances		
*In this table costs are shown as positive numbers and revenues are shown as negative numbers. The revenues are treated as		

*In this table costs are shown as positive numbers and revenues are shown as negative numbers. The revenues are treated as positive benefits in the AMCB table.

2.11. Analysis of Initial Monetised Costs and Benefits

Summary of Transport User, Accident and Environmental Benefits

- 2.11.1. The benefits set out in the preceding sections are based on established methodologies.
- 2.11.2. The results in this section are as per the analysis undertaken for the 2022 FBC.
- 2.11.3. Based on this, Table 2-21 summarises the costs and benefits that form the 'initial' BCR. The Scheme has a PVB of £401 million, compared to a PVC of £398 million, resulting in a NPV of £2.5 million and an initial BCR of 1.01. This excludes wider economic and journey time reliability impacts, which are used to calculate an adjusted BCR, and are covered in the following sections.



Item	Description	2010 Prices discounted to 2010 (£000s)
	Journey time savings	628,085
	Vehicle operating costs	-113,854
	Delays During Construction	-39,223
	Total Economic Efficiency Benefits	475,009
	Carbon Benefits, of which:	-182,016
	Tailpipe emissions	(-163,161)
Benefits	Construction, maintenance, and operations (-20,957)	
	Land use change	-2,102
	Monetised Noise Benefits	3,211
	Monetised Air Quality Benefits	-118
	Accident Benefits	28,645
	Indirect Tax Revenue	75,826
	Present Value of Benefits (PVB)	400,556
	Construction Cost	
Costs	Operating and Maintenance	
	Present Value of Cost (PVC)	
Net Present Value	Net Present Value (NPV)	2,535
Benefit Cost Ratio	Initial Benefit to Cost Ratio (BCR)	1.01

Table 2-21 Initial Benefit Cost Ratio (£000s discounted and deflated to 2010)



2.12. The Scheme's Reliability and Wider Economic Impacts

- 2.12.1. The Scheme is likely to result in wider economic impacts that are additional to the transport user benefits set out in the preceding sections. It is also likely to improve journey time reliability by providing an additional lane and an additional and alternative link improving routing and detour options in the event these are needed.
- 2.12.2. As set out in section 2.4, the methodology to quantify and monetise such benefits is based on an evolving approach and is less widely accepted and researched. When combined with the benefits summarised in section 2.11 to calculate the initial BCR, an adjusted BCR can be calculated.
- 2.12.3. The results in this section are as per the analysis undertaken for the 2022 FBC.

Wider Economic Impacts

- 2.12.4. Wider economic impacts arise because market failures in secondary (nontransport) markets, such as the product, labour, and land markets, mean that the full welfare impact of a transport investment may not be reflected in the transport market. The underlying assumption is that improved connectivity and accessibility between areas will effectively reduce the 'economic distance' between enterprises, increasing business productivity and competition.
- 2.12.5. The wider economic impacts are described in TAG Unit A2 and can be divided into three distinct groups on the basis of land use change: fixed land use, implicit land use change; and explicit land use change.
- 2.12.6. As none of the housing or employment developments assumed in the forecasting are specifically dependent upon the Scheme (although the Scheme will be one of the enablers for this growth), wider economic impacts were assessed based on the assumption of fixed land use and calculated using the DfT's Wider Impacts in Transport Analysis (WITA v2.0 Beta) software.

Potential for Wider Economic Impacts

2.12.7. One approach to assessing the potential scale of wider economic impacts is to determine the extent to which the scheme is located within or sufficiently close to a 'Functional Urban Area' (FUR). FURs contain a high density of businesses that are able to benefit from clustering, through achieving agglomeration (productivity) benefits such as learning, networking and coordination. The FURs in relation to the Scheme are shown in Figure 2-8. The Scheme is located on the edge of the Cambridge FUR and will form part of the east-west route connecting to other FURs, most notably to Milton Keynes.



- 2.12.8. Agglomeration effects decay over distance. Empirical evidence suggests that for agglomeration to occur the relative travel times must be within 45 minutes. Some example pre-scheme travel times are: Cambridge to St Neots 30 to 45 minutes; St Neots to Milton Keynes 35 to 50 minutes; St Neots to Peterborough 40 to 50 minutes; St Neots to Stevenage 40 to 45 minutes; Cambridge to Bedford 45 minutes to 1 hour; Huntingdon to Milton Keynes 45 minutes to 1 hour; Cambridge to Milton Keynes 1 hour to 1 hour 20 minutes.
- 2.12.9. Given that the Scheme is expected to reduce peak travel times by around 8 to 10 minutes, there is potential for some of these to fall within 45 minutes and result in significant agglomeration benefits, such as from St Neots to Cambridge and Milton Keynes, and between Cambridge and Bedford, in particular.



Figure 2-8 Scheme Location Relative to Local Functional Urban Areas (FURs)



2.12.10. There is an above average concentration of knowledge-based industries (from which agglomeration benefits are most likely to arise) in Western Cambridgeshire compared to the UK.

Wider Impacts in Transport Analysis (WITA)

2.12.11. WITA was used to assess the Scheme's impacts on productivity, outputs in imperfectly competitive markets, and labour supply.

Agglomeration (Productivity)

- 2.12.12. WITA was used to assess static clustering, the impact on productivity of the decrease in generalised travel costs that in effect brings firms and employees closer together and assumes no change in land use. As set out above, it was not considered justifiable to assess productivity impacts on the basis of land use change brought about by the Scheme (dynamic clustering), given there are a number of drivers and factors behind forecast increases in employment and dwellings, not all of which can be attributed to the Scheme.
- 2.12.13. Benefits were calculated for the districts closest to the scheme, these being: Huntingdonshire; Cambridge; South Cambridgeshire; Bedford; Milton Keynes; Central Bedfordshire; Peterborough; and Luton and part of Hertfordshire.

Increased output in imperfectly competitive markets

2.12.14. As detailed in TAG, the impact of increases or decreases in output in imperfectly competitive markets is calculated as a factor of the total business user benefits derived from TUBA. The estimate of the factor of benefits to take is specified in TAG Unit A2.2 paragraph 4.3.1 as 10%. In addition, as suggested by National Highways' Transport Planning Group (TPG), 10% of business user benefits from the journey time reliability (MyRIAD) assessment (see the following section on journey time reliability) were also included.

Labour supply impacts

- 2.12.15. WITA was used to assess labour supply impacts. Transport costs are likely to affect the overall costs and benefits to an individual from working. In deciding whether to work, an individual will weigh travel costs against the wage rate of the job travelled to. A change in transport costs is therefore likely to affect the incentive to work and hence the overall level of labour supplied in the economy.
- 2.12.16. As the Scheme reduces the generalised cost of travel, mainly through improved travel times rather than a reduction in vehicle operating costs, there will be a higher level of labour supplied in the economy as a result of its implementation. It should be noted that only the tax revenues from changes in the labour supply are counted as additional benefits.



<u>Results</u>

2.12.17. A summary of the WITA assessment results is presented in Table 2-22, showing that wider economic impacts provide total benefits of £320.9 million. As expected, and as set out in the preceding sections, agglomeration dominates the overall impacts (91%), with increased output in imperfectly competitive markets and labour supply impacts contributing 8% and 1% respectively.

Table 2-22 Wider Economic Impacts(£000s discounted and deflated to 2010)

Category	Monetised Impacts
Agglomeration – Manufacturing	10,876
Agglomeration – Construction	13,697
Agglomeration - Consumer Services	61,217
Agglomeration - Producer Services	205,047
Agglomeration – Total	290,837
Increased output in imperfectly competitive markets	26,892
Labour supply impact	3,204
Total	320,933

- 2.12.18. The agglomeration benefits by WITA sector are shown in Table 2-23. South Cambridgeshire will have the highest benefits (£62.7 million), followed by Huntingdonshire and Cambridge, at £47.7 million and £41.6 million respectively.
- 2.12.19. The average benefits per person are £150 for the study area. Again, South Cambridgeshire will have the highest value with an estimated £405 of benefits per person. Figure 2-9 shows a map of these benefits by sector.



Sector	Benefits over 60- year appraisal period	Population by district, 2015	Total benefits per Person
Huntingdonshire	£47,730	174,966	£273
Cambridge	£41,585	130,907	£318
South Cambridgeshire	£62,693	154,888	£405
Bedford	£38,241	166,252	£230
Milton Keynes	£37,624	261,762	£144
Central Bedfordshire	£21,970	274,022	£80
Peterborough	£28,048	193,980	£145
Luton and Herts (Part of)	£12,946	577,594	£22
Total	£290,837	1,934,371	150

Table 2-23 Agglomeration Benefits per Person by WITA Area (£000s,discounted and deflated to 2010)

Figure 2-9 Agglomeration Benefits per Person by WITA Area





Journey Time Reliability

- 2.12.20. As set out in the Strategic Dimension, one of the Scheme requirements is reducing traffic congestion and improving journey time reliability and resilience
- 2.12.21. To assess the journey time reliability National Highways' MyRIAD software was used. MyRIAD calculates the benefits for an improvement scheme due to the change in incidents and travel time variation between the Without Scheme and With Scheme scenarios. The incidents included are accidents, vehicle breakdown and other types of incidents. The travel time variation is related to day-to-day variability, unrelated to incidents but related to fluctuations in demand and weather.
- 2.12.22. The network for the assessment includes the A1 between the A421 and A428, the A428 between Wyboston Roundabout and Caxton Gibbet Roundabout in the Without Scheme scenario, and the Scheme links between Black Cat Roundabout and Caxton Gibbet Roundabout in the With Scheme scenario.
- 2.12.23. The analysis was carried out for all three forecast years (2026, 2041 and 2051), four time periods (AM, IP, PM and outside these peaks (OP)).
- 2.12.24. Diversion routes were identified as plausible alternative local routes which are parallel to the links specified. The link volume over capacity ratio for the diversion routes was identified as the maximum value along the route and the capacity available was identified as the minimum link capacity.
- 2.12.25. The present value of the reliability benefits for the Scheme over the 60-year appraisal period was calculated as £36.7 million (discounted 2010 prices) and are shown in Table 2-24.

Benefit Type	Business Benefits	Commuting & Other Benefits	Total
Total Incident Delay Benefit, Scheme Links	£6,635	£9,275	£15,909
Total Incident Delay Benefit, Diversion Area	£2,085	£3,071	£5,155
Total Travel Time Variability Benefit	£7,066	£8,585	£15,651
Total Benefits	£15,785	£20,931	£36,716

Table 2-24 Journey Time Reliability Benefits (£000s, discounted and deflated to 2010)



2.13. Analysis of Adjusted Monetised Costs and Benefits

- 2.13.1. The adjusted BCR builds on the initial monetised costs and benefits summarised in Section 2.11. The overall appraisal of the Scheme includes an assessment of wider economic impacts and an assessment of the benefits resulting from more reliable journeys.
- 2.13.2. Table 2-25 shows the BCR for the Core scenario. All the values shown in this table are in 2010 prices discounted to 2010.
- 2.13.3. The results in this section are as per the analysis undertaken for the 2022 FBC.
- 2.13.4. The initial BCR for the scheme is 1.01 and the adjusted BCR that includes wider benefits and journey time reliability is 1.90.
- 2.13.5. With wider economic impacts and journey time reliability included, the Scheme's benefits increase from £401 million to £758 million.
- 2.13.6. Overall, the benefits are largely as a result of travel time savings due to increased capacity and also agglomeration impacts as a result of the Scheme. There are smaller scale savings resulting from a reduction in accidents and improvements in journey time reliability. There are monetised disbenefits due to an increase in greenhouses gases, increased vehicle operating costs, largely due to the increased travel distances, and delays due to construction impacts.



Item	Description	2010 Prices discounted to 2010 (£000s)
	Journey time savings	628,085
	Vehicle operating costs	-113,854
	Delays During Construction	-39,223
	Total Economic Efficiency Benefits	475,009
	Carbon Benefits, of which:	-182,016
	Tailpipe emissions	(-163,161)
Benefits	Construction, maintenance, and operations	(-20,957)
	Land use change	-2,102
	Monetised Noise Benefits	3,211
	Monetised Air Quality Benefits	-118
	Accident Benefits	28,645
	Indirect Tax Revenue	75,826
	Present Value of Benefits (PVB)	400,556
	Construction Cost	
Costs	Operating and Maintenance	
	Present Value of Cost (PVC)	
Net Present Value	Net Present Value (NPV)	2,535
Benefit Cost Ratio	Initial Benefit to Cost Ratio (BCR)	1.01
	Wider Economic Impacts	320,933
	Journey Time Reliability	36,716
	Adjusted PVB	758,205
	Adjusted BCR	1.90

Table 2-25 Initial and Adjusted Benefit Cost Ratios (£000s, discounted and deflated to 2010)



2.14. Indicative and Qualitative Impacts

- 2.14.1. As set out above, there are indicative and non-monetised impacts which are not included in the initial and adjusted BCRs, but which do inform the overall value for money assessment.
- 2.14.2. This section of the Economic Dimension sets out the results of the assessment of landscape impacts, the natural capital assessment, and an array of other impacts as set out in Table 2-26.
- 2.14.3. The results in this section are as per the analysis undertaken for the 2022 FBC.

Landscape Monetisation

- 2.14.4. The landscape assessment includes an element of monetisation, whereby the value of the landscape lost is assessed, as well as the benefits arising from mitigating these impacts. The assessment for landscape monetisation was undertaken in accordance with the eight-step approach outlined in the DfT's Value for Money (VfM) Supplementary Guidance on Landscape (2021).
- 2.14.5. The initial footprint of the Scheme was established to be 250m either side of the main route. Mitigation measures were considered to reduce the footprint to 125m either side of the main route, where:
 - the footprint of the existing and proposed developments overlaps; and
 - landscape effects at year 15 were assessed as not significant due to the existing planting, engineering solutions and proposed mitigation
- 2.14.6. Two landscape monetisation scenarios undertaken:
 - Scenario 1: Land valuation without mitigation.
 - Scenario 2: Land valuation including mitigation.
- 2.14.7. Land values are negative for the existing land types (scenario 1) and positive for the areas of mitigation planting (included in scenario 2). The mitigation includes an increase in broadleaved plantation woodland from 2 hectares to 76 hectares, and more details are set out in the following section on natural capital.
- 2.14.8. In scenario 1, the main land type is Agricultural (intensive), with the lowest land value. This scenario results in a provisional disbenefit of -£25.82m over a 100-year appraisal period (the assumed appraisal period for the central set of landscape values).
- 2.14.9. In scenario 2, an Agricultural (intensive) land type remains predominant, but there is an increase in more valuable land value types such as rural forested land. The mitigation measures include 75 hectares of tree planting. The benefit of the Scheme including mitigation is £52.26 million using the central set of landscape values but varies between £36.62 million (lower bound) and £152.4 million (upper bound), based on the values in the Supplementary Guidance on Landscape.



2.14.10. The monetisation of landscape impacts is based on a widely used methodology, but in line with the guidance in the DfT's Value for Money Framework (2015) is not yet considered robust enough to include in the assessment of the Scheme's overall benefits or in the BCR.

Natural Capital Assessment

- 2.14.11. An assessment of impacts on natural capital and ecosystem services was undertaken based on the approach set out in National Highways' Appraisal Manual 'Piloting a Natural Capital Approach , and the use of Natural England's The Environmental Benefits from Nature (EBN) screening tool.
- 2.14.12. The assessment identified a range of ecosystem services considered material to decision-making. The assessment took into account the condition of different habitat types, based on the biodiversity net gain (BNG) assessment conducted for the scheme using Natural England's Biodiversity Metric Beta Version 2.0. This identified a biodiversity net gain of 16.48% for habitat units and 9.96% of river units, but a net loss of 31.66% for hedgerow units.
- 2.14.13. Figure 2-10 presents a comparison of the broad habitats present within the Scheme area in the baseline compared to the post-construction scenario. It shows that 33% of the Scheme area post-construction will be grassland and associated habitat mosaic (previously mostly cropland), with benefits for wildlife including more species diversity and better-connected habitats. Woodland habitat will increase from around 1.7% in the baseline to 13% post-construction (previously mostly cropland) which is intended to provide a better ecological network. Urban area habitats (buildings and areas of hardstanding) will increase from 7.1% in the baseline to 21% post-construction (previously mostly cropland) due to the construction of the new road and associated infrastructure.





Figure 2-10 Breakdown of habitats in Scheme Area (approximately 668 hectares)

2.14.14. Overall, it is expected that the replacement of large areas of arable cropland with a more diverse range of habitats including woodland and grassland, will lead to an increase in the supply of most of these services, with the exception of food production and water supply which are expected to decrease. Table 2-26 summarises the key expected impacts for the ecosystem services which were identified to be potentially material to the decision-making process. As quantitative and monetary evidence is limited for the majority of ecosystem services, the value of net benefits delivered by habitat creation associated with the Scheme is likely to be underestimated.



Service Type	Facewater Convice	Potential impacts at:		
	Ecosystem Service	1 yr	10 yrs	30 yrs
	Food production	2	7	2
Brovicioning	Wood production	→	→	7
Provisioning	Fish production	→	→	→
	Water supply	3	2	8
	Flood regulation	→	→	7
	Erosion protection	7	7	7
	Water quality regulation	7	7	7
	Carbon storage	→	→	→
Regulating	Air quality regulation	→	→	→
	Cooling and shading	N	→	→
	Noise reduction	→	→	→
	Pollination	2	7	7
	Pest control	3	7	7
	Recreation	→	→	→
Cultural	Aesthetic value	2	7	7
	Education	→	→	→
	Interaction with nature	→	7	7
	Sense of place	2	7	7

Table 2-26 Potential changes in ecosystem services

Qualitative Assessment and Non-monetised Impacts

- 2.14.15. A detailed assessment was carried out by relevant specialists of other impacts as set out in Table 2-26, the results of which are presented in Table 2-27. This qualitative assessment of non-monetised benefits was undertaken against TAG criteria.
- 2.14.16. The options would result in some beneficial effects along existing roads (for example, the existing A428) due to a reduction in traffic. The reduction would reduce visual, air and noise effects along receptors on these routes.



Table 2-27 Summary of High-Level Assessment of Non-monetised Impacts

Qualitative Assessment	Impact	Comment
Townscape	Slight adverse	The townscape of most settlements in proximity to the Scheme will not be affected. Wyboston and Chawston will experience some adverse effects related to the widening of the existing A1, the introduction of noise fences, and the construction of a new link road which will divide part of the settlement and alter circulation patterns. The increased size and scale of the Black Cat junction will indirectly impact the perceptual characteristics of the townscape, although this will be limited to areas with intervisibility. At Croxton the Scheme will be located approximately 700m further north than the existing A428, enhancing tranquillity. At Eltisley the effects on the perceptual characteristics of townscape will be limited to the edges the Scheme There will be no perceptible changes to the townscape character of the other settlements in proximity to the Scheme.
Historic environment	Moderate to Large adverse	There will be impacts on a number of archaeological sites, but these can be mitigated. There will be impacts on the setting of some assets. While most are adverse, there are some beneficial effects to the setting of Croxton Park and assets within it.
		The Scheme may result in the demolition of the Grade II Brook Cottages. Within the Environmental Statement there is a commitment to the archaeological recording of the cottages, which would offset the impact slightly. More importantly, through the DCO the Scheme is required to explore options to relocation the cottages subject to surveys, however there are no requirements to relocate the cottages. If the building can be relocated, it will retain some of the historic significance.
		The overall assessment score is therefore moderate to large adverse, with the latter based on the worst-case impact on Brook Cottages.
		Due to the addition of new links and associated highways improvements there would be an adverse impact on biodiversity, but mitigation in the form of screening planting and habitat creation would mean biodiversity would be maintained or improved.
Biodiversity	Slight beneficial	Based on an assessment and calculation undertaken using Natural England's Biodiversity Metric 2.0, net gains in biodiversity would be achieved within the area-based habitats (+16.48%) and river habitats (+9.96%). For hedgerow habitats, a net loss in biodiversity would occur (-31.66%).
		Overall, the impact is considered slight beneficial with mitigation.
Water Environment	Neutral	No significant effects on the water environment are predicted with mitigation. A moderate adverse impact is predicted for new culverts and realignments, but the impact is insignificant with mitigation. The River Great Ouse is of very high importance, but negligible impacts are predicted from highway runoff and spillage risk associated with the proposed viaduct. Sustainable measures have been proposed to treat highway runoff with ponds, swales, and ditches. Improvements to the existing road drainage network have also been provided. There would be no significant increase in flood risk to the adjacent land uses or an increase in surface water runoff.


Qualitative Assessment	Impact	Comment
Physical activity	Neutral	The Scheme is likely to impact a number of Walkers, Cyclists and Horse Riders (WCHR) routes, but is expected to maintain or improve current access to Public Rights of Way (PRoW). More formal crossing points will be introduced to maintain PRoWs; in some instances, existing PRoWs will be curtailed or diverted, such as at Wintringham Park. At Black Cat, new WCHR links will help improve connections with existing routes. Traffic on most of the existing A428 is expected to significantly reduce making it more appealing to cyclists.
Journey quality	Moderate beneficial	The Scheme is expected to have a moderate beneficial impact on traveller frustration through providing a better free flowing standard and a greatly reduced flow at existing junctions making turning more straightforward. The Scheme is likely to have a slight beneficial impact on route uncertainty by providing more consistent east-west and north- south routes. The Scheme is expected to have a slight beneficial impact on fear of potential accidents as the road standard for the A428 is significantly improved, although some travellers will have more potential conflict points.
Security	Neutral	Negligible impact expected on WCHR, and on rail users.
Access to services	Neutral	The scheme is unlikely to impact availability and cost of public transport.
Affordability	Moderate adverse	Commuting and Other purpose uses will have higher vehicle operating costs, therefore impacting on affordability of travel.
Severance	Slight Beneficial	Numerous villages would benefit slightly from reductions in traffic as through traffic is transferred onto the new dual carriageway, reducing the hindrance to foot journeys.
Option and non- use values	Neutral	There are no changes to existing public transport services associated with the Scheme.

2.14.17. The above affordability assessment refers to the affordability analysis which is a distributional impact rather than one about the Scheme's financial affordability. The balance of non-monetised impacts are broadly neutral for VfM, however the analysis indicates that higher income groups will benefit more from the introduction of the Scheme than lower income groups.



- 2.14.18. There are other benefits that have not been assessed but which are likely to have a positive impact as a result of the Scheme:
 - Resilience. Reliability has been assessed, but the Scheme is also likely to have resilience benefits (mitigating longer term delays and issues on the network) by providing an additional lane and an additional and alternative link providing increased routing and detour options in the event these are needed.
 - Benefits post-2051. The economic appraisal assumes no growth in the magnitude of benefits after the final modelled year. However, with the Scheme having spare capacity in 2051 and population and employment likely to increase beyond 2051, there are likely to be increases in benefits post-2051 compared to the Without Scheme scenario.
 - Maintenance delays. By providing additional lanes and a new link, delays to traffic caused by maintenance will decrease compared to the Without Scheme scenario

2.15. Distributional Impact Assessment

Distributional Impact Assessment Results

- 2.15.1. A distributional impact assessment was undertaken for the indicators described in the DfT's TAG unit on Distributional Impact Appraisal (Unit A4.2, May 2020).
- 2.15.2. The results in this section are as per the analysis undertaken for the 2022 FBC.
- 2.15.3. The assessment presented here includes reference to Indices of Deprivation (ID) income groups (Figure 2-11), which categorises the population into five equal groups, from Group 1 (the 20% most deprived) through to Group 5 (the 20% least deprived).



Figure 2-11 Income Quintiles near the Scheme



NOTE: Map contains Ordnance Survey data © Crown copyright and database right 2022

2.15.4. The distributional impacts appraisal matrix (Table 2-28) contains an overall summary for the indicators assessed against the income domain of the Indices of Deprivation (user benefits, noise, air quality, and affordability). All the indicators have an uneven distribution of impacts, but the absolute numbers affected are generally small. The results for the other indicators (accidents, severance, security, and accessibility) are described after the table, showing neutral, positive, or no distributional impact.



	Distribut	ional impa	ict of inco	me depriva	ation	Are	
	0-20%	20-40%	40-60%	60-80%	80- 100%	impacts distribute d evenly?	Key impacts - Qualitative statements
User benefits	√√	√√	√ √ √	√√	√√	No	Beneficial impacts are forecast for all income groups. Benefits are concentrated close to the Scheme. Using the existing population for the appraisal, benefits are forecast to be higher than expected for the middle- income group. Including the development population as a higher income group moves the excess benefits into higher income groups.
Noise	neutral	neutral	***	~~~	$\checkmark\checkmark$	No	Beneficial impacts are forecast for the two highest income groups and adverse for the middle group. The noise model covers an area close to the Scheme, covering 12 LSOAs. None of these are assigned to the two lowest income groups which are therefore assigned a neutral impact. Most benefits are forecast for the large fourth income group (82% of the population). Benefits are more variable for the smaller third- and fifth-income groups. The Wintringham, Loves Farm Phase 2 and Cambourne West developments are adjacent to the scheme and the qualitative assessment shows that the appraisal would be significantly more adverse with those developments included

Table 2-28 Summary of Distributional Impacts by Income Distribution



	Distribut	ional impa	ct of inco	me depriva	ation	Are	
	0-20%	20-40%	40-60%	60-80%	80- 100%	impacts distribute d evenly?	Key impacts - Qualitative statements
Air Quality	××	***	***	$\checkmark\checkmark\checkmark$	×	No	Beneficial impacts are forecast for the second highest income group only. It includes a group of mainly rural LSOAs close to the scheme which have significant forecast changes in NO ₂ and PM _{2.5} , both in terms of numbers, and the proportion, of receptors with decreased pollutants. The four other income groups are all forecast to have adverse impacts. This is primarily due to being located further from the scheme and increases in traffic in Bedford, St Neots, on the A1 and on the A428 East of Caxton Gibbet. The Wintringham and Cambourne West developments are adjacent to the scheme and representative forecasts have been identified or added to the models. These indicate a mixture of beneficial and adverse impact with no overall impact on the appraisal likely.
Affordability	××	**	**	××	x x x	No	Adverse impacts are forecast for all income groups. There are excess impacts for the highest income group. The magnitude of the disbenefits is small and the lowest income group, which is sensitive to the baseline cost of travel, is not impacted in that respect.



Accidents

- 2.15.5. The accident distributional impacts appraisal considered the change in casualties amongst vulnerable groups. A large proportion of accidents involving vulnerable groups are in the urban areas away from the scheme accidents involving pedestrians, children, older people, and cyclists. Other groups assessed include vulnerable drivers motorcyclists and young male drivers.
- 2.15.6. Because of the concentration away from the scheme, the change in forecast vulnerable group casualties is small and the accident assessment is neutral.

Severance

2.15.7. The Scheme follows a fairly similar route to the existing A428 but bisects fewer communities. As such, the existing A428 between St Neots and Caxton Gibbet will have significantly reduced flows once the Scheme is implemented. This should overall help return the existing A428 back to local communities in St. Neots, Eltisley and Cambourne, resulting in a slight positive impact.

Security

2.15.8. A full security assessment was not undertaken as, at screening, the impacts were expected to be neutral.

Accessibility

2.15.9. There are no accessibility issues related to the scheme and assessment is not required.

2.16. Sensitivity Tests 2021/22 (for the July 2022 FBC)

- 2.16.1. A range of sensitivity tests were undertaken for the Scheme to enable further scrutiny of its economic performance based on a range of different assumptions. These tests also addressed the TAG requirement to consider what the impacts would be if growth does not occur in line with expectations and was either lower or higher than the 'Core' growth scenario.
- 2.16.2. All the sensitivity tests described and presented in this section are based on the analysis undertaken for the 2022 FBC.
- 2.16.3. The sensitivity tests undertaken in 2023 based on updated Data Book and growth assumptions and revised DfT guidance.

High and low growth BCR

- 2.16.4. In accordance with TAG Unit M4, traffic forecasts and economic sensitivities have been prepared to represent High and Low traffic growth scenarios.
- 2.16.5. For the High growth scenario, a proportion of the Base Year demand is added to the demand from the Core scenario. For the Low growth scenario, the same proportion of demand is removed from the Core scenario. Planning assumptions (infrastructure and developments) remained unchanged.



- 2.16.6. This high and low growth economic assessment was limited to TUBA, WITA and CoBALT, due to the relative proportionally of other impacts. Wider economic impacts were calculated for the Low and High growth scenarios using the same methodology as used for the Core scenario.
- 2.16.7. The variation in the benefits leading to the adjusted BCR between Core, High and Low growth scenarios is presented in Table 2-29.
- 2.16.8. This shows that the adjusted BCR remains robust to changes in the assumed level of growth, ranging from 1.76 (low growth) to 2.08 (high growth) compared to the core growth assumption of 1.90.

Itom	Description	Scenario					
item	Description	Low Growth	Core Growth	High Growth			
	Journey time savings	576,870	628,085	656,765			
	Vehicle operating costs	-110,815	-113,854	-115,730			
	Delays During Construction	-39,223	-39,223	-39,223			
	Total Economic Efficiency Benefits	426,833	475,009	501,812			
	Carbon Benefits	-182,016	-182,016	-182,016			
Benefits	Monetised Noise Benefits	3,211	3,211	3,211			
	Monetised Air Quality Benefits	-118	-118	-118			
	Accident Benefits	29,585	28,645	28,455			
	Indirect Tax Revenue	72,235	75,826	78,485			
	Present Value of Benefits (PVB)	349,730	400,556	454,525			
Costs	Present Value of Costs (PVC)						
NPV	Net Present Value (NPV)	-48,291	2,535	56,504			
BCR	Initial Benefit to Cost Ratio (BCR)	0.88	1.01	1.14			
	Wider Economic Impacts	312,183	320,933	338,125			
	Journey Time Reliability	36,716	36,716	36,716			
	Adjusted PVB	698,629	758,205	829,366			
	Adjusted BCR	1.76	1.90	2.08			

Table 2-29 Adjusted BCR by Growth Scenario (£000s, discounted and deflated to 2010)

Low and High Carbon Values

2.16.9. The Scheme has a monetised greenhouse gas impact of -£182.0 million using central carbon values. Using the same assessment but with low and high carbon values, the impact is expected to be -£86.8 million and -£274.7 million respectively. As shown in Table 2-30, the adjusted BCR ranges from 2.14 to 1.67 with low and high carbon values respectively.



Table 2-30 Greenhouse Gas Impacts using Low, (Central and High Carbon
Values	

Description	Scenario						
Description	Low	Central	High				
Present Value of (Adjusted) Benefits (PVB)	853,425	758,205	665,570				
Of which greenhouse gases	(-86,769)	(-182,016)	(-274,651)				
Present Value of Costs (PVC)							
Adjusted BCR	2.14	1.90	1.67				

Sensitivity Test for November 2021 TAG Data Book Update

- 2.16.10. Further analysis has been undertaken for a sensitivity test using updated national economic values extracted from the November 2021 version of the TAG Data Book (v1.17).
- 2.16.11. Journey time user benefits (TUBA), wider economic impacts (WITA) and a safety benefit (COBALT) assessment were included in this sensitivity test. Although both user benefits and safety benefits increase, there is a decrease in wider economic impacts (this decrease is due to lower GDP per worker estimates post 2020 and a change to making use of economic data at a district rather than national level). Overall, there is a small decrease in benefits compared to the Core scenario.
- 2.16.12. Table 2-31 shows the results. The initial BCR increases from 1.01 to 1.08, driven by the increase in journey time and accident benefits. However, the adjusted BCR remains the same, due to the decrease in wider economic impacts.
- 2.16.13. The results show that the BCR remains robust to changes in Data Book assumptions between July 2020 and November 2021.



Table 2-31 Adjusted BCR using the November 2021 TAG Data Book Update(£000s, discounted and deflated to 2010)

		Scenario				
ltem	Description	Core Growth	Core - November 2021 Sensitivity Test			
	Journey time savings	628,085	654,619			
	Vehicle operating costs	-113,854	-113,714			
	Delays During Construction	-39,223	-39,223			
	Total Economic Efficiency Benefits	475,009	501,682			
	Carbon Benefits	-182,016	-182,016			
Benefits	Monetised Noise Benefits	3,211	3,211			
	Monetised Air Quality Benefits	-118	-118			
	Accident Benefits	28,645	34,183			
	Indirect Tax Revenue	75,826	72,100			
	Present Value of Benefits (PVB)	400,556	429,043			
Costs	Present Value of Cost (PVC)					
Net Present Value	Net Present Value (NPV)	2,535	31,022			
Benefit Cost Ratio	Initial Benefit to Cost Ratio (BCR)	1.01	1.08			
	Wider Economic Impacts	320,933	288,748			
	Journey Time Reliability	36,716	36,716			
	Adjusted PVB	758,205	754,507			
	Adjusted BCR	1.90	1.90			



Scheme Cost Sensitivity

- 2.16.14. The scheme construction costs were provided for four different scenarios: minimum, most likely, P70 and maximum values. These costs, in 2010 discounted prices, vary from and maintenance costs.
- 2.16.15. Table 2-32 shows the resulting initial and adjusted BCR with this range of costs. The adjusted BCR ranges between 1.53 for the maximum cost and 2.51 for the minimum cost.

Table 2-32 Cost Sensitivity and BCR impacts (£000s, discounted and deflatedto 2010)

	Minimum (P2.5) Cost	Most Likely Cost	Maximum Cost (P70)	Maximum Cost (P97.5)
Present Value of Benefits (PVB)	400,556	400,556	400,556	400,556
Adjusted Present Value of Benefits	758,205	758,205	758,205	758,205
Present Value Costs				
Initial BCR	1.33	1.01	0.94	0.81
Adjusted BCR	2.51	1.90	1.79	1.53

Sensitivity Tests 2023 (updated assumptions and costs)

- 2.16.16. An update to the analysis presented in the Full Business Case from July 2022 was discussed with DfT in Spring 2023. It was not considered proportionate to update the core scenario to NTEM8 and to undertake Common Analytical Scenario (CAS) forecasts. Instead, low and high growth sensitivity tests would be carried out around the previous core results using the latest TAG Unit M4 guidance from November 2022. This guidance promotes a 'p' value of 4% (rather than the previous value of 2.5%) to reflect the wider range of values around the core which can be expected when running the CAS.
- 2.16.17. There are seven scenarios considered in the CAS: high; low; technology; regional; behavioural; vehicle-led decarbonisation; and mode-balanced decarbonisation. In general, the expectation is that the high, vehicle-led decarbonisation and technology CAS will produce increased benefits and running these scenarios will produce scheme benefit cost ratios (BCR) greater than the core scenario. In contrast, the low, behavioural and mode-balanced decarbonisation scenarios will produce decreased benefits and lower BCRs than the core scenario. The regional scenario can be higher or lower than the core depending on where in the country the scheme being considered is located. For example, schemes in the south-east and east of England will generally produce regional scenario benefits lower than the core whilst those in the north will produce regional scenario benefits greater than the core.



- 2.16.18. It should also be borne in mind that whilst CAS can increase or reduce scheme benefits (for example journey time benefits), they can also reduce or increase scheme disbenefits (for example greenhouse gas emissions), so BCRs may not change by as much as perhaps expected in any examined scenario.
- 2.16.19. National Highways has now examined the impact of all CAS on two Tier 1 schemes (A66 Trans-Pennine and the A12 in Essex). Interestingly the results on both schemes confirmed the expectation that the high, technology and vehicle-led scenarios did indeed produce results above the core, whilst low, behavioural and mode-balanced decarbonisation scenarios produced results below the core. The regional scenario increased benefits above the core for the A66 scheme and decreased benefits below the core for the A12 scheme. Crucially, however, both schemes demonstrated that the results produced from running the CAS all lay within the envelope generated by the low and high CAS scenarios, with the single exception of the behavioural CAS on the A12 which was marginally lower than the low CAS.
- 2.16.20. Given the expectations and findings set out above it can be concluded that running the revised low and high growth tests, with the new TAG guidance which reflects the wider envelope now generated by the CAS, was a proportionate approach for this FBC update as this should proxy for the envelope within which the CAS would lie.

Low and High Growth Assumptions

- 2.16.21. Following guidance set out in TAG Unit M4, for the High growth scenario, a proportion of the Base Year demand is added to the demand from the Core scenario. For the Low growth scenario, the same proportion of demand is removed from the Core scenario. Planning assumptions (infrastructure and developments) remained unchanged.
- 2.16.22. The proportion of base year demand added or subtracted is based on a parameter, p (or multiple of p depending on number of years after the Base Year). This value reflects uncertainty around the annual forecasts from the DfT's National Transport Model (NTM), based on the macro-economic variables that influence the main drivers of travel demand. The value of p has changed from 2.5% (as used in the July 2022 FBC) to 4.0% (as used in this section), based on the DfT updating this value in the TAG Unit M4.
- 2.16.23. Forecast matrices were prepared for low and high growth to reflect the wider range of outcomes as a result of adopting the higher p value. Revised assignments were carried out based upon the same highways network as adopted for the 2022 FBC assessment.
- 2.16.24. Compared to the previous low and high growth forecasts prepared for the FBC the impact of the revised sensitivity tests are:
 - Low growth scenario: reduction in the majority of traffic flows on key routes by a further 2% to 3% compared to the previous Low Growth scenario; and



- High growth scenario: increase in the majority of traffic flows on key routes by a further 1% to 3% compared to the previous High growth scenario.
- 2.16.25. It should be noted that the Core growth scenario (in terms of modelling and forecast flows) remains unchanged.

Updated Assessment of Scheme Benefits

- 2.16.26. The assessment of economic benefits was updated to take into account the new Scheme opening year of 2027, the updated economic paraments within TAG, and the new Low and High growth forecasts. The assessment of the Core scenario was based on the modelling forecasts prepared for the July 2022 FBC.
- 2.16.27. The economic appraisal was limited to an update of Transport Economic Efficiency (journey times, vehicle operating costs, and indirect tax) and wider economic impacts, utilising TUBA and WITA respectively.
- 2.16.28. Other elements of the appraisal (e.g. accidents, noise, air quality, greenhouse gases, reliability) remain unchanged from the core assessment used in the July 2022 FBC. This was justified on the basis that the overwhelming majority of benefits were from TEE and wider economic impacts.
- 2.16.29. Table 2-33 compares the results of the revised economic assessment with the July 2022 results as set out in the earlier sections of this Economic Dimension. The revised assessment results in reductions of -8% and -4% in the adjusted Present Value of Benefits (PVB) for low and core growth respectively with an increase of 5% for high growth compared to the July 2022 FBC. This results in a slight reduction to the Adjusted BCR to 1.62 for low growth (from 1.76) and 1.83 for core growth (from 1.90). The high growth BCR increases to 2.18 (from 2.08).
- 2.16.30. Use of the updated economic parameters, as reflected in the January 2023 Data Book, results in a small increase in user time benefits and a small decrease in vehicle operating cost disbenefits (but also in indirect taxation revenue). The net impact on the PVB for the Core scenario is small (+2%, from £401 million to £407 million).
- 2.16.31. The decrease in demand in the revised Low growth scenario compared to the July 2022 FBC Low growth scenario results in a decrease in the PVB (-5%, from £350 million to £332 million). Conversely, the increase in demand in the revised High growth scenario results in an increase in PVB (+14%, from £455 million to £517 million).
- 2.16.32. Overall, the revised assessment produces a wider range to the BCR of between -0.13 and +0.10 compared to the July 2022 FBC assessment.



Table 2-33 Revised Assessment (TUBA and WITA Benefits Only) compared with the July 2022 FBC Values (£000s, discounted
and deflated to 2010)

	July 2022 Fi	BC Values		Revised Ass	sessment Val	ues	Differences	;		Percentage Differences		
Costs and Benefits	Low Growth	Core	High Growth	Low Growth	Core	High Growth	Low Growth	Core	High Growth	Low Growth	Core	High Growth
TEE Benefits												
Combined User Benefits:												
Travel Time	576,870	628,085	681,129	557,997	633,667	740,898	-18,873	5,582	59,769	-3%	1%	9%
Vehicle Operating Costs	-110,815	-113,854	-116,583	-78,187	-81,453	-82,586	32,628	32,401	33,997	29%	28%	29%
Construction	-39,223	-39,223	-39,223	-39,223	-39,223	-39,223	-	-	-	-	-	-
Total TEE Benefits	426,833	475,009	525,323	440,587	512,992	619,089	13,754	37,983	93,766	3%	8%	18%
Carbon Benefits, of which:	-182,016	-182,016	-182,016	-182,016	-182,016	-182,016	-	-	-	-	-	-
(Greenhouse Gas)	(-156,100)	(-156,100)	(-156,100)	(-156,100)	(-156,100)	(-156,100)	-	-	-	-	-	-
(Construction Carbon Benefits)	(-20,311)	(-20,311)	(-20,311)	(-20,311)	(-20,311)	(-20,311)	-	-	-	-	-	-
(Construction impacts on traffic)	(-7,061)	(-7,061)	(-7,061)	(-7,061)	(-7,061)	(-7,061)	-	-	-	-	-	-
(O&M Carbon Benefits)	(-646)	(-646)	(-646)	(-646)	(-646)	(-646)	-	-	-	-	-	-
(Natural Capital)	(2,102)	(2,102)	(2,102)	(2,102)	(2,102)	(2,102)	-	-	-	-	-	-
Accident Benefits	29,585	28,645	28,455	29,585	28,645	28,455	-	-	-	-	-	-
Monetised Noise Benefits	3,211	3,211	3,211	3,211	3,211	3,211	-	-	-	-	-	-
Monetised Air Quality Benefits	-118	-118	-118	-118	-118	-118	-	-	-	-	-	-
Indirect Tax Revenue	72,235	75,826	79,669	40,817	44,774	47,938	-31,418	-31,052	-31,731	-43%	-41%	-40%
Present Value of Benefits (PVB)	349,730	400,556	454,525	332,066	407,487	516,560	-17,664	6,931	62,035	-5%	2%	14%
Wider Economic Impacts – Agglomeration	284,932	290,837	304,649	250,319	252,077	279,057	-34,613	-38,760	-25,592	-12%	-13%	-8%
Wider Economic Impacts – Increased Output	24,128	26,892	30,104	22,847	27,083	32,648	-1,281	191	2,543	-5%	1%	8%
Wider Economic Impacts – Labour Supply	3,124	3,204	3,372	3,207	3,152	3,579	83	-52	207	3%	-2%	6%
Journey Time Reliability Benefits	36,716	36,716	36,716	36,716	36,716	36,716	-	-	-	-	-	-
Adjusted Present Value of Benefits (PVB)	698,629	758,205	829,366	645,155	726,515	868,560	-53,475	-31,690	39,194	-8%	-4%	5%
Present Value of Costs (PVC) - July 2022 FBC	398,021	398,021	398,021	398,021	398,021	398,021	-	-	-	-	-	-
Net Present Value (NPV)	300,608	360,184	431,345	247,134	328,494	470,539	-53,475	-31,690	39,194	-18%	-9%	9%
Initial Benefit to Cost Ratio (BCR)	0.88	1.01	1.14	0.83	1.02	1.30	-0.04	0.02	0.16	-5%	2%	14%
Adjusted BCR	1.76	1.90	2.08	1.62	1.83	2.18	-0.13	-0.08	0.10	-8%	-4%	5%

Note: Purple text and figures cover those results that have not been reassessed since the July 2022 FBC.

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Table 2-34 Impact of Revised Scheme Costs on the BCRs (£000s, discounted and deflated to 2010)

Costs and	July 2022 FBC Benefits			Revised Assessment Benefits			Differences			% Difference		
Benefits	Low Growth	Core	High Growth	Low Growth	Core	High Growth	Low Growth	Core	High Growth	Low Growth	Core	High Growth
PVB	349,730	400,556	454,525	332,066	407,487	516,560	-17,664	6,931	62,035	-5%	2%	14%
Adjusted PVB	698,629	758,205	829,366	645,155	726,515	868,560	-53,475	-31,690	39,194	-8%	-4%	5%
PVC – <u>March</u> 2023 estimate	444,423	444,423	444,423	444,423	444,423	444,423	0	0	0	0%	0%	0%
NPV	254,206	313,782	384,943	200,732	282,092	424,137	-53,475	-31,690	39,194	-21%	-10%	10%
Initial BCR	0.79	0.90	1.02	0.75	0.92	1.16	-0.04	0.02	0.14	-5%	2%	14%
Adjusted BCR	1.57	1.71	1.87	1.45	1.63	1.95	-0.12	-0.07	0.09	-8%	-4%	5%



Updated Assessment with March 2023 Scheme Cost Estimate

- 2.16.33. Updated construction costs were provided by National Highways in March 2023. These reflected the delay to the Scheme, as well as inflationary pressures affecting all schemes.
- 2.16.34. The impact on the BCR of the increase in construction costs from £370 million to £417 million (an increase of 13%).
- 2.16.35. This shows that the impact of the updated costs to the both the July 2022 FBC and the revised assessment is a reduction of the BCR as follows:
 - July 2022 FBC
 - i. Low adjusted BCR reduces from 1.76 to 1.57
 - ii. Core adjusted BCR reduces from 1.90 to 1.71
 - iii. High adjusted BCR reduces from 2.08 to 1.87
 - Revised assessment
 - i. Low adjusted BCR reduces from 1.62 to 1.45
 - ii. Core adjusted BCR reduces from 1.83 to 1.63
 - iii. High adjusted BCR reduces from 2.18 to 1.95
- 2.16.36. The impact on the BCR resulting from the increase in scheme costs is therefore more significant than the changes in scheme benefits. The primary driver for the reduction in the BCR is therefore the increase in cost.

Traffic Forecast

2.16.37. The core traffic forecasts have not been updated so do not account for CAS or the potential impacts of COVID, however a wider fan of low and high growth, in line with the latest TAG guidance, has been produced and the revised opening year of 2027 incorporated. However overall traffic on the SRN in region around the A428 are back to or close to pre COVID levels. In addition, the post opening traffic data on the A14 shows that the take up and use of the new road is higher than predicted in the traffic modelling.

Sensitivity for freight and electric vehicle take up

2.16.38. An ongoing NH and DfT study aims to estimate values of travel time and reliability for road freight using the latest evidence and approaches. Currently, DfT freight values of time are based on the cost of the employment of the driver. However, previous research has shown freight managers have wider cost considerations, such as value of commodities, vehicle costs, and delivery time/reliability constraints. Draft results from the study are available however further work is required before these could be included in TAG. This is likely to include benchmarking, consultation and further testing to ensure a robust mandate for the change. The earliest timetable for publication is Autumn 2023 but the exact timetable will vary with the amount of additional work required before these changes are deemed appropriate for inclusion in TAG.



- 2.16.39. An appraisal only freight value of time sensitivity test has therefore been undertaken for A428 to show the impacts of increased values on the schemes VfM. With a 20% uplift of appraisal freight values of time, the scheme BCR rises from 1.63 to 1.69, with the VfM remaining as Medium. Emerging results from the NH/DfT study show that the current TAG values of time for freight trips may be underestimating the value of freight with updated values potentially around double those currently used in appraisal. Based on the current sensitivity test, this could result in the BCR increasing to around 1.91 and the scheme having Medium VfM, albeit at the higher end of the category. It should be noted that these increased freight values of time have not been included in the traffic modelling of the scheme which could impact the indicative results.
- 2.16.40. Table 2-35 compares the adjusted BCRs based upon the benefits from the July 2022 FBC and revised assessment with the original and updated capital scheme cost estimates.
- 2.16.41. This shows the impact of the revised scheme benefits (user benefits, indirect tax, and wider economic impacts) on the BCRs is small compared to the updated Scheme costs.
- 2.16.42. The Core scenario BCR decreases from 1.90 to 1.83 with the revised assessment of benefits only, but decreases to 1.71 with the revised costs only. Once both the revised benefits and costs are included the impact on the BCR is greater, decreasing to 1.63 for the Core scenario.
- 2.16.43. The updated low and high growth sensitivity testing resulted in a wider range to the BCR reflecting the greater uncertainty in forecast traffic demand.
- 2.16.44. The most significant change to impact the BCR is the updated March 2023 construction costs. This is a reflection of the impact of inflation on costs for all major schemes.



Table 2-35 Comparison of Scheme Adjusted BCRs between the July 2022FBC and the 2023 Revised Assessments

	Low Growt	h	Core		High Growth		
	July 2022 FBC Costs	2022MarchJuly 20222023FBCSCostsCostsCosts		March 2023 Costs	July 2022 FBC Costs	March 2023 Costs	
July 2022 FBC Benefits	1.76	1.57	1.90	1.71	2.08	1.87	
Revised Benefits 2023	1.62	1.45	1.83	1.63	2.18	1.95	

2.17. Economic Dimension Conclusion

Value for Money

2.17.1. Figure 2-12 shows the benefits for the Core scenario and Table 2-36 provides a summary of the VfM assessment, as set out in the 2022 FBC. The revised assessment undertaken in 2023 had little impact on the overall PVB, resulting in a decrease of 4%.

Figure 2-12 Core Scenario Benefits





Table 2-36 Summary of Value for Money Assessment for Core Scenario (July2022 FBC)

Item	Core Scenario	Comment
BCR – Initial	1.01	Includes only the monetised benefits of travel time savings, vehicle operating costs, accidents, indirect tax, noise, air quality, and greenhouse gases.
BCR – Adjusted	1.90	As above but includes wider economic impacts and journey time reliability.
VfM category	Medium	Including the monetised, indicative, and qualitative assessments as a whole suggests that the VfM category for the Scheme is Medium.

- 2.17.2. The initial and adjusted BCRs could be impacted by changes in costs and benefits. Table 2-37 summarises these impacts, including the results from sensitivity testing undertaken for the July 2022 FBC and the revised assessments based on the January 2023 Data Book, updated low and high growth sensitivity testing, and revised Scheme costs.
- 2.17.3. Taking into account both the January 2023 TAG Data Book and the March 2023 cost estimates, and assuming an opening year of 2027, the adjusted BCR ranges from 1.45 for the Low growth scenario, 1.63 for the Core scenario and 1.95 for the High growth scenario. This compares to the main results in the July 2022 FBC of 1.76, 1.90 and 2.08 for Low, Core, and High growth scenarios respectively, (assuming an opening year of 2026).

Test		Low	Core	High
	Initial BCR	0.88	1.01	1.14
July 2022 FDC	Adjusted BCR	1.76	1.90	2.08
Nov 2021 TAG	Initial BCR	Not assessed	1.08	Not assessed
Data Book	Adjusted BCR	Not assessed	1.9	Not assessed
Jan 23 TAG Data	Initial BCR	0.83	1.02	1.30
Book	Adjusted BCR	1.62	1.83	2.18
March 23 Scheme	Initial BCR	0.79	0.90	1.02
Cost Estimate	Adjusted BCR	1.57	1.71	1.87
Jan 23 TAG Data	Initial BCR	0.75	0.92	1.16
Book and Mar 23 Cost Estimate	Adjusted BCR	1.45	1.63	1.95

Table 2-37 Summary of key BCRs

2.17.4. Table 2-38 provides a summary of the VfM assessment based on the revised economic assessment undertaken in 2023 and March 2023 Scheme costs. The VfM category remains medium.



Table 2-38 Summary of Value for Money Assessment for Core Scenario (2023revised assessment including updated scheme costs and an assumed 2027opening year)

ltem	Core Scenario	Comment
BCR – Initial	0.92	Includes only the monetised benefits of: travel time savings, vehicle operating costs, indirect tax (all these were updated in 2023); accidents, noise, air quality, and greenhouse gases (not updated from the July 2022 FBC).
BCR – Adjusted	1.63	As above but includes wider economic impacts (updated in 2023) and journey time reliability (not updated from the July 2022 FBC).
VfM category	Medium	Including the monetised, indicative, and qualitative assessments as a whole suggests that the VfM category for the Scheme is Medium.

- 2.17.5. Table 2-39 sets out the extent to which the costs or benefits would need to change that would result in the adjusted BCR for the core scenario for the revised 2023 assessment to fall from its forecast of 1.63 to 1.5 or increase to 2.0.
- 2.17.6. For the adjusted BCR to fall to 1.5:
 - benefits would need to decrease by 8.2% (£60m); or
 - Scheme costs would need to increase by 8.9% (£40m).
- 2.17.7. For the adjusted BCR to increase to 2.0:
 - benefits would need to increase by 22.3% (£162m); or
 - Scheme costs would need to decrease by 18.3% (£81m).

Table 2-39 Value for Money Switching Values (2023 revised assessment including updated scheme costs and an assumed 2027 opening year)

Value for Money	For Adjusted BCR to Drop to Low VfM (<1.5)	Central Case Medium VfM	For Adjusted BCR to Rise to High VfM (>2.0)
Benefits	Benefits fall by	PVB £727m	Benefits rise by
Costs	Costs rise by	PVC £444m	Costs fall by



Concluding Statement

- 2.17.8. The results of the economic assessment for the Full Business Case of this Scheme are presented in this Economic Dimension.
- 2.17.9. The Scheme had an initial BCR 1.01 and an adjusted BCR of 1.90 in the July 2022 FBC, based on an opening year of 2026. The updated sensitivity testing in 2023 using revised economic and Scheme cost assumptions, and an assumed opening year of 2027, demonstrates that the Scheme has an initial BCR of 0.92 and an adjusted BCR of 1.63.
- 2.17.10. The adjusted BCR and the array of assessed indicative and qualitative impacts demonstrate that the Scheme would represent medium value for money in accordance with the DfT VfM criteria. This was independently assessed and assured by the National Highways subject matter advisor (SMA) for the A428 Black Cat to Caxton Gibbet Improvements Full Business Case in 2022, and again in 2023 for this updated FBC. The revised assessment in 2023 has not changed the value for money category.
- 2.17.11. Sensitivity tests were undertaken and demonstrate that the Scheme's overall value for money remains relatively robust to changes in key assumptions, including levels of demand growth, economic growth assumptions, cost changes, and carbon values.
- 2.17.12. The updated sensitivity testing undertaken in 2023 based on revised DfT guidance indicates that there is a greater potential range in the BCR that reflects the increased uncertainty in the forecasts of future demand for travel.



3. Financial Dimension

3.1. Introduction

- 3.1.1. A428 Black Cat to Caxton Gibbet Improvement Scheme (the Scheme) is part of the National Highways Road Investment Strategy (RIS). It is primarily funded from Roads Period 2 and 3 Government Grant, with a small amount having been funded in Road investment strategy: 2015 to 2020 (RP1). Table 1 1 Financial Position below summarises the phased capital requirement.
- 3.1.2. This section of the Full Business Case ("FBC") sets out the Financial Dimension for the Scheme. The purpose of the Financial Dimension is to set out the basis of the capital costs, present the funding requirements of the proposed option and to demonstrate that the Scheme is affordable.
- 3.1.3. The Financial Dimension is structured as follows:
 - Background,
 - DIP contract budget and strategic assumptions risk
 - Assumptions
 - Capital cost (including cost estimating methodology and benchmarking)
 - Accounting treatment and balance sheet implications
 - Operational maintenance and renewal costs
 - Efficiencies and opportunities
 - Financial risk
 - Affordability and funding and cost development
 - Revenue and third-party contributions
 - Financial dimension conclusions



Outturn Conital		Roads Period 2			Roads Period 3					Tatal	
Cost (£m)	RP1	То 22-23	23-24	24-25	Total	25-26	26-27	27-28	28-29	Total	Outturn
Options											
Development and early works											
Delivery											
Land											
Total DIP Budget*											
Non- DIP Core Costs											
Total Core Costs											
Portfolio Risk Provision											
Anticipated Final Cost											

Table 3-1 Financial Position

*Note: DIP budget includes provision for inflation and delay



3.2. Background

- 3.2.1. The anticipated final costs of the scheme at outturn price is **Exercise** This is an assured estimate released in March 2023. It is based on information supplied by the DIP in May 2022 and updated to uplift the costs to out-turn based on the latest inflation rates as shown in Para 5.4 below.
- 3.2.2. As detailed in the Commercial Dimension, National Highways appointed Skanska as the Delivery Integration Partner (DIP) under a Regional Delivery Partnership (RDP) contract in March 2021 for construction of the OBC recommended route as detailed in the Strategic Dimension.
- 3.2.3. Under this contract there is an agreed project budget, which covers options, development, delivery, and handover phases including land purchases and utility diversion work and not just the primary contractor costs.
- 3.2.4. This budget is currently However, over the duration of the contract, the agreed budget will increase for the impact of the delay caused by TAN's legal action, the current high levels of inflation and the crystallisation of risks that are outside the contract budget. Further details are provided in Para 3 below. When provisions for these are included a total DIP budget of is included in the forecast.
- 3.2.5. Outside of this budget there is a provision of **Constant** to provide headroom for the SRO in contract negotiations, given current provisions are based on best estimates.
- 3.2.6. There is also a small amount **sector** to cover expenditure which sits outside the DIP budget namely a legacy fund, ancillary land costs and central National Highways costs.
- 3.2.7. Core costs which are released to the SRO total **Control** and portfolio risk provision of **Control** which requires National Highways Executive Committee (via IDC) release give a total anticipated final cost of **Control**
- 3.3. DIP contract budget and strategic assumption risks
- 3.3.1. At contract, the DIP budget was set at **Exercise** In agreeing this, the implications of the delayed DCO submission, as a result of incorporating lessons learnt from LTC's DCO application withdrawal, had been factored in.
- 3.3.2. This was increased by **Example** to account for the additional costs of the scheme based on design 3d (post DCO powers) compared to the design at contract letting, design 3c.
- 3.3.3. As with other RDP contracts, there were a number of areas of uncertainty that National Highways did not reach agreement with the DIP on the valuation to be included in the budget and are therefore excluded. As part of the contract agreement process, the SRO wrote separately to the DIP on each of these seven areas, setting out the criteria that would allow the DIP to seek an increase in the budget and any financial cap to the increase. These are referred to as Strategic Risks.
- 3.3.4. The breakdown of the strategic risk provision is shown in Table 3-2 below.



Risk	Сар	£M
Scheme Budget overspend		I
Ground Improvements & Archaeology scope		
Land Value (Section 17)		
Delivery phase NR VAT		
Statutory Undertakers		
Costs associated with moving from Design Fix 3c to 3d (note now settled at		
DCO commitment impacts and design changes		
Total Strategic Assumptions Risk Provision		

Table 3-2 Project Central and Portfolio Risk Provisions

3.3.5. In addition, the budget can be increased for extraordinary items that could not have been reasonably foreseen. The budget therefore does not include the impact of the delays caused by Transport Action Network making a legal claim against the granting of DCO powers for which a provision of former of the effects of the high levels of inflation experienced at the end of 2022 and start of 2023, a provision of former is held against this which includes the inflationary effects of the costs of delay and reprofiling of expenditure by a year. Land cost increase due to the delay, which is calculated separately, is and also outside the contract budget. When inclusive of these, the total value becomes

3.4. Assumptions

3.4.1. The phased outturn capital forecast for the Scheme is constructed on the Scheme's integrated plan including the DIP's construction schedule; key milestones are shown below.

Milestone	Date
Updated FBC and Full Funding Approval by	October 2023
Notice to Proceed by	November 2023
Start of Works by	December 2023
Open for Traffic	2027

Table 3-3 Key Milestones



- 3.4.2. Now that the legal action seeking to quash the DCO has been extinguished, there is very limited risk to not achieving SoW by December 2023.
- 3.4.3. A further assumption is the current inflation factors used in the cost estimate and set out below are sufficient

3.5. Capital Cost

Estimating Methodology and Benchmarking

- 3.5.1. The phased central estimate is based on the contracted budget, with a provision against the crystallisation of strategic risks. A general Portfolio Risk Provision has been added. There is a small allowance for costs which the project will incur which are excluded from the contract budget.
- 3.5.2. A capital cost estimate of the Scheme was estimated in March 2023 following the National Highways Cost Estimation Manual using the standard cost estimating approach for all major projects within the National Highways Road Investment Strategy portfolio.
- 3.5.3. In calculating this estimate, consideration has been considered of the project scope and design as set out in the Strategic Dimension, on the knowledge of the land required, topography and ground conditions as well as the costs incurred to date. A comparison is then made between National Highways' overall estimate and the contractual value, and the results fed into to the calculation of the level of each of the strategic risks, which ensures the resultant anticipated final cost aligns to National Highways estimate.
- 3.5.4. In calculating the estimate, a three-point estimating technique is used; cost, risk and uncertainties are estimated at three points Minimum, Maximum and Most Likely point. The three-point estimates are then converted into a probability distribution using Monte Carlo simulation to give a P10 to P90 range.
- 3.5.5. The capital cost ranges of the recommended option are summarised in Table 3-4 below.



£M	Core including Portfolio Risk Provision)	Total excluding Portfolio Risk Provision
Most Likely (P44.6)		
Minimum (P2.5)		
P10		
P20		
P30		
P40		
P50		
P60		
P70		
P80		
P90		
Maximum (P97.5)		
Mean (P51.7)		

Table 3-4 Cost Estimate

Base Cost

- 3.5.6. Cost estimates have been calculated using rates from historic National Highways schemes. National Highways' standard estimating process has been developed over a period of over 10 years and considered to be best in class. The DfT's Transport Infrastructure Efficiency Taskforce carried out a Cost Planning & Estimating Capability & Maturity Assessment across HS2, Highways England (as was), Network Rail, TfL, and Thames Tideway. This assessment reported that 'Highways England has the most mature and effective all-round capability in cost planning & estimating against its peers.
- 3.5.7. National Highways Commercial Cost Intelligence data shows Major Projects actual cost is 5% lower than associated Developing Estimates. This result was derived from thirteen recent Target Cost contracts, with a total value £2,000 million.



Land

- 3.5.8. Land costs, both for permanent and temporary, is based on an independent District Valuation Service estimate.
- 3.5.9. Whilst the majority of land costs are included in the core budget, where land prices have been impacted by East West Rail or due to a potential change in use,

Inflation

- 3.5.10. All costs have been estimated at 2019 prices and inflation applied using National Highways' standard inflation profile forecast. This inflation profile is applied to all Major Projects and has been derived in conjunction with National Highways Capital Planning with the aim of achieving consistent capital forecasts.
- 3.5.11.



3.5.12. The forecast has been updated using historic rates based IOPI and future rates based on CPI plus 200 base points (2%). These rates are shown below in Table 3-5 below;

Financial Year	Inflation rate (%)	Inflation from base year (%)
2019/2020	0.03	1.02
2020/2021	0.03	1.06
2021/2022	0.04	1.10
2022/2023	0.12	1.19
2023/2024	0.09	1.31
2024/2025	0.02	1.38
2025/2026	0.01	1.40

Table 3-5 Inflation Rates



Financial Year	Inflation rate (%)	Inflation from base year (%)
2026/2027	0.03	1.42
2027/2028	0.04	1.47
2028/2029	0.04	1.53
2029/2030	0.04	1.59
2030/2031	0.04	1.65

- 3.5.13. Based on this a provision of has been included in the forecast.
- 3.5.14. The impact of Deed of Variation will not be fully calculable until after the scheme has opened for traffic. However, at NtP the impact of the current inflation spike will be understood.

VAT

- 3.5.15. National Highways is subject to HMRC's Contracted Out Services regulations. Under these regulations for new road schemes, the amount of VAT that can be recovered for construction and detailed design is limited to the road works within the existing highway boundary.
- 3.5.16. The element of Non-Recoverable VAT (NRVAT) for the construction work, is based on the Scheme design and the proportion of the construction works that will take place outside the current Highways England boundary.
- 3.5.17. The standard VAT rate of 20% has been used. It is included in the contract budget. Only should the of Delivery Stage NR VAT be above would NH be liable for any increase.

3.6. Accounting treatment and balance sheet implications.

- 3.6.1. The scheme will be accounted using the Generally Accepted Accounting Principles (GAAP) adopted by National Highways including.
 - Accruals: National Highways account for their projects on a work completed basis, accruals will align with this approach:
 - Land Expenditure: Lands expenditure is forecasted for the point the expenditure is expected to occur
 - Prepayments: any payments made in advance of work being completed will be treated as a prepayment and charged to the project as the work is completed.
- 3.6.2. The scheme is fully publicly funded through Government grant and there are no off-balance sheet implications.



3.7. Operations, Maintenance and Renewals cost

- 3.7.1. The scheme will deliver a number of changes to the National Highways estate and as such impact on future operational, maintenance and renewals budget. These changes include:
 - A new three tier junction at the Black Cat Roundabout including new structures.
 - A new 10-mile section of dual carriageway including two junctions in addition to the Black cat junction), new bridges over the River Great Ouse and the East Coast mainline railway and four new bridges over the new road for local roads
 - De-trunking the 9-mile section of the existing A428
- 3.7.2. The Operations Directorate's plans and budgets for financial year 2027/28 onwards will need to reflect these changes to the estate. In particular:
 - Opex costs covering the operation of the new road e.g., gritting, drainage clearance, lighting, inspections. The new road will not be subject to traffic safety officer patrols.
 - Capex costs for lifecycle renewals work covering pavement resurfacing and structure renewals.
- 3.7.3. The estimated cost changes were last updated in 2021. These have been updated to reflect the year's delay and the higher rates of inflation. They are shown below in Table 3-6 compared to the "do nothing" scenario.

Outturn £m	Roads Period 3 Fut						ire Yea	ars	60 Year Total		
	26-27	27-28	28-29	29-30	Total	30-35	35-40	40-45	At 2019 Prices	Outturn	
Opex	-										
Capex	-										
Total	-										

 Table 3-6 estimated future operations, maintenance, and renewal cost



3.8. Efficiencies and Opportunities

- 3.8.1. One of NH's key performance indictors is to demonstrate continued efficiency. Efficiency is achieved through better design and delivery, including through our supply chain where our procurement process and contractual mechanisms aim to align and incentivise out performance of the cost estimate and efficiency.
- 3.8.2. Efficiencies are built into the contract budget and the pain/gain mechanism of the contract encourages both parties, National Highways and DIP to be as efficient as possible whilst delivering the scope to the required quality.



3.9.4. There is also a central portfolio risk provision to provide cover for specific areas where the DIP can seek to increase the contract and for other areas of unforeseen change since the contract was signed such as NI increases and use of red diesel as well as future unknowns and uncertainties.

3.10. Affordability, Funding and Cost Development

Affordability and Funding

3.10.1. Previously the project secured **Constant** of funding approval by the CST to cover costs to the end of the development stage. In February 2022 a requested for an additional **Cover** an historic cost increase due to changes in assumptions on NRVAT and **Cover** to cover project activities should there be delays caused by the DCO process was made.



- 3.10.2. Alongside the approval of the FBC, a request for full and final funding, a further **sector** to take cumulative from **sector** to **sector**. This was endorsed by IC and DfT IPDC.
- 3.10.3. The CST subsequently conditionally approved either **accesses** if a JR was granted. Given that we have experienced a scenario not envisaged in the CST letter, namely a delay experienced due to a claim against the DCO but ultimately no JR, there is a lack of clarity as to the funding currently released.
- 3.10.4. NH are working with DfT to agree that with Treasury to draw down and in June 2023 which will provide financial cover until to December 2023, at which point full final funding of **Control** is expected to have been secured through a request to the CST alongside the approval of the FBC. **Control** of this funding will be delegated to the SRO and the remaining **Control** would require NH IDC release.
- 3.10.5. and is all core expenditure with no portfolio risk.
- 3.10.6. The forecast includes an RP3 requirement of core and the full portfolio risk.
- 3.10.7. This is an increase of **and the position in FBC**. In seeking National Highways Exec and Board, DfT IPDC and ultimately the SoS and CST approval of the FBC, we are effectively seeking commitment to this funding as part of the RP3 settlement (expected to be announced in late 2024).
- 3.10.8.

However, should the project not be provided with this commitment by the end of October, it risks missing the 2023 SoW and a further year's delay, £75- £100m cost increase and a further increase in its RP3 funding requirements.

3.10.9. The Operation Plan (which is for core costs) currently has **and the second** allocated to A428 Black Cat in RP2 including the allocation from the Central Risk Reserve of **and the second** in March 2023 against increased inflation. A change request is being submitted to release the monies no longer required in RP2 and increase RP3 as detailed below.



Table 3-7 Funding Requirement (£m)

Outturn Capital	554	Roads Period 2			Roads Period 3				Total		
Cost (£m)	RP1	22-23	23-24	24-25	Total	25-26	26-27	27-28	28-29	Total	Outturn
Actual Expenditure (to 30 March 2023)											
Released Funding											
Awaiting Approval											
Funding sought											
Anticipated Final Cost											
As at FBC											
Change											
Operating Plan at FBC											
Addition- March 2023 for inflation											
Current Operating Plan											
Change sought											
Revised Operational Plan											



Cost Development

- 3.10.10. In August 2018, following a major rescoping of the project the anticipated final cost was
- 3.10.11. The OBC was approved by National Highways and DfT in September/October 2019. At this point the anticipated final cost using RDP was against a cost of the using OJEU.
- 3.10.12. In June/July 2021, NH and DfT were updated following the agreement of contract budget (and an increase to reflect the delay in DCO submission). At costs remained close to the OBC figure of
- 3.10.13. A number of cost pressures were recognised, and an update presented to NH and DfT in February/March 2022 with the costs having by and increased to as an interim position.
- 3.10.14. In April 2022, an updated set of assured costs confirmed to costs as
- 3.10.15. Extraordinary provisions for hyperinflation and delays caused by TANs legal action were only marginally offset by savings in risk. The total anticipated final cost as at March 2023 was

		Control	Extrord'y	ΝЦ	Project	Portfoli		
Date	Est	Budget	Provis'ns	Costs	Central Risk	Specific Provis'ns.	General	Total
Aug 2018								
Oct 2019 RDP								
Oct 2019 OJEU								
July 2021								
February 2022								
June 2022								
March 2023								

Table 3-8 Cost Development (£m)



Table 3-9 Changes in cost estimates from OBC (October 2019) to updated FBC (April 2023)

Change in Cost (£m)	Total (£m)
OBC (October 2019)	
Core savings following contract signature	
Ancillary NH costs	
Ground Improvements	
Design Changes and DCO Commitments	
Increase in land values	
Inflation increase	
Development phase increase in NR VAT	
General Portfolio Risk Change	
Total Changes	
Overall Total Cost at original FBC	
Increase in the provision for inflation	
Provision for cost delays due to TANs legal action exc inflation	
Increase in land costs	
Decrease in strategic risk provisions	
Other NH provision	
Increase in portfolio risk provision	
Total Changes	
Overall Total Cost at original FBC	



3.11. Revenue and Third-Party Contributions

- 3.11.1. The scheme will generate no revenue.
- 3.11.2. There is no housing or other development dependent on the Scheme and therefore little opportunity for third party contributions. Accordingly, no income or contributions have been included in the Financial Dimension

3.12. Trigger Points

3.12.1. As a Tier 1 project, there are a number of trigger points which are intended to act as an early warning that the project is not likely to deliver within its agreed parameters, including a financial trigger point based on the forecast anticipated final cost. This was set in July 2022 at 10% (

3.13. Conclusions

- 3.13.1. There is an assured cost estimate which has been updated to reflect the contract position and an updated review of strategic risk costs to date.
- 3.13.2. The costs at **an example are above those presented at the OBC**. The vast majority of the increase **are the set of** is due to inflation, the revised rates reflecting the current high levels and an ongoing impact. A further **are for additional DIP costs**, **are the impact of the delay on land costs and the remaining area due to changes in other risk and contingency reserves**.
- 3.13.3. As a result of the delay, RP2 core requirements have fallen by **and** and a release of this funding will be made via Change Control.
- 3.13.4. RP3 core requirement now stands at **second stands** higher than the previous FBC, which will be a substantial part of the final RP3 settlement.
- 3.13.5. The forecast assumes that there will be no further delay due to legal action and construction will commence in 2023 enabling a full use of the 2024 earth working season.



4. Commercial Dimension

4.1. Introduction

- 4.1.1. This Commercial Dimension follows the Transport Business Case document for preparation of a FBC and other relevant government guidance. The Commercial Dimension is structured as follows:
- 4.1.2. Background section sets out the key elements of the Scheme, the Client Scheme Requirements (CSRs), and how the CSRs are aligned to the wider National Highways strategy, and summarises the procurement approach set out at Outline Business Case (OBC) stage, in particular the selection of the Regional Delivery Partnership (RDP) sourcing option to appoint Skanska Construction UK Limited as the Delivery Integration Partner (DIP), to undertake Project Contract Framework (PCF) Stages 5 to 7 inclusive and any Early Orders let by National Highways.
- 4.1.3. Packaging the Works describes all the services and works scope requirements carried out by the DIP (advanced works, detailed design, and main works) and other parties (technical advisor, outline design to DCO submission, integrated project controls, and non-contestable utility works):
- 4.1.4. Commercial Delivery describes the key elements of the commercial approach contract model; optional X clauses; and key commercial amendments.
 - Contract model: The Scheme Contract is based on the New Engineering Contract (NEC) 4 Engineering & Construction Contract (ECC) form with standard National Highways amendments. The fixed price Option A (priced contract with activity schedule) is used for PCF Stage 5 and any Early Orders, and the target price Option C (target contract with activity schedule) is used for the main works. The contract duration is until Completion of the whole of the works. The original Open for Traffic contract date was 2026 following delays resulting from the judicial challenge to the development consent decision, this is now 2027.
 - Optional X clauses: (X2,7,8,10,11,15,18,20,22). The key clauses adopted are X20 and X22 which taken together provide the basis for the incentivisation of the DIP against the Scheme Contract budget; and
 - Key commercial amendments:
 - i. Scheme Contract budget. The RDP budget setting process has been used to set a Scheme Contract budget and Total Project Funding amount.


- ii. Payment. Payment for Early Orders and PCF Stage 5 (detailed design) scope is made on a lump sum basis against the applicable Option A activity schedule. Payment for the main works scope is made on an as incurred basis (defined cost) against the Option C activity schedule. The Supplier's share mechanism in section 5 of the Contract is switched off and replaced with the incentivisation in X20/X22 described later.
- iii. Design responsibility. Through clause Z8 the Scheme Contract design responsibility was passed from AECOM (as client designer) to Skanska at Design Fix 3d. Three specific risks associated with this design responsibility transfer were retained by National Highways under certain conditions – these are three of the Strategic Assumptions (Design, DCO, and Fitness for Purpose) detailed in Section 6; and
- iv. Termination rights. National Highways has other termination rights for poor performance, failure to obtain consents (clauses 91.9 to 91.13 inclusive). In addition, the notice to proceed to Stage Two (PCF Stage 6&7) mechanism anticipated to be November 2023 serves as a National Highways sole discretion termination right not to proceed to main works construction (clause X22.5(4)).
- 4.1.5. Incentivisation Strategy describes in more detail the operation of the X20 (Key Performance Indicators) and X22 (Early Supplier Involvement) Optional Clauses for payment additions or reductions, in sharing pain and gain for overspending and underspending the Scheme Contract budget respectively, against the following parameters:
 - Cost. To achieve Budget Savings below the Scheme Contract budget.
 - Schedule. Delivery of Additional Opportunities 1 (Start of Works) and 3 (Open for Traffic).
 - Function. Achievement of Additional Opportunity 2 (Journey Time Reliability); and
 - Value for money. Maintenance of and improvement to the Investment Baseline Benefit Cost Ratio (BCR) of 1.63.



Figure 4-1 DIP incentivisation



Note: The Scheme is a single Scheme Package in the RDP Framework-Package-Scheme Contract arrangements.

- 4.1.6. Section 5 (Risk and Opportunity Management) summarises the commercial risks. The risk allocation of the DIP scope is in line with the RDP arrangements and provision has been made for Supplier risk and Client risk within the Scheme Contract budget. Portfolio risk and Strategic Assumptions (which are provisions for specific risk events) sit outside the general provisions of the main works Option C contract and the Scheme Contract budget incentives.
- 4.1.7. Section 6 (Procurement Schedule) summarises the timeline through to a planned Open for Traffic date of 2026.
- 4.1.8. Section 7 (Contract Management) sets out the contract management approach following the RDP Operational Guidance Note and National Highways' Commercial and Procurement Contract Control Framework, which provides the opportunity to facilitate best practice by transferring key resources and experience from the recently completed successful A14 Scheme.



4.2. Background

Scheme description

- 4.2.1. The A428 Black Cat to Caxton Gibbet Improvement Scheme (the Scheme) is a Tier 1 highways improvement scheme in National Highways' Complex Infrastructure Programme (CIP). The key elements of the Scheme are:
 - A new ten-mile dual two-lane carriageway between Black Cat Junction and the A428/A1198 junction at Caxton Gibbet.
 - A new three tier grade separated junction at Black Cat roundabout that will allow traffic to flow freely.
 - Grade separated new junctions at Caxton Gibbet and Cambridge Road that will connect the new dual carriageway to the existing A428 increasing the road network's ability to cope with unforeseen incidents.
 - New Roxton Road link that will connect Wyboston and Chawston.
 - New bridges crossing over the new dual carriageway at Roxton Road, Barford Road and Toseland Road; and
 - New bridges over the River Great Ouse flood plain and East Coast Main Line railway.

Scheme Objectives

4.2.2. The Scheme objectives stated in the Client Scheme Requirements are:

Economic growth	To support significant levels of planned economic growth in Cambridge and the surrounding sub-region, which is one of the fastest growing areas of the UK.
Transport	To reduce traffic congestion, provide adequate capacity to support future growth forecasts, improve journey time reliability and increase resilience against accidents and incidents.
Environment	To protect the built and natural environment by mitigating the potentially adverse impact of adding additional capacity where technically feasible and economic to do so.
Community	To enhance accessibility and reduce severance for non- motorised road users where technically feasible and economic to do so.



- 4.2.3. These are reflected as key objectives in the Scheme Consultation booklet.
 - Connectivity cut congestion, increase capacity, and journey time reliability between Milton Keynes and Cambridge.
 - Safety improve safety at junctions, side roads and private accesses by reducing traffic flows on the existing A428. Improve safety on the A1 by removing existing substandard side road junctions and private accesses onto the carriageway.
 - Economic growth enable growth by improving connections between people and jobs and supporting new development projects.
 - Environmental improvements maintain existing levels of biodiversity and have a beneficial impact on air quality and noise levels in the surrounding area.
 - Accessibility ensure the safety of cyclists, walkers, horse riders and those who use public transport by improving the routes and connections between communities.
 - Resilience improve the reliability of the road network so that it can cope better when accidents occur, without local roads being used as diversion routes; and
 - Customer Satisfaction listen to what is important to our customers to deliver a better road for everyone and improve customer satisfaction.
- 4.2.4. The CSRs and Scheme objectives set out above are aligned with the wider National Highways' strategy and policies (refer to the Strategic Dimension).
- 4.2.5. As part of its DIP delivery, Skanska has developed a carbon management plan that is described in the Management dimension. Although the RDP arrangements pre-date the formal introduction of government's social value policy, the RDP makes provision for social value in the DIP Commitments Register, that is aligned to the principles of the Construction Playbook.

Commercial background

- 4.2.6. National Highways operates in accordance with the Public Contract Regulations (PCR 2015). The Scheme was included in the Delivery Integration Partner competition (reference Contract Notice 2018/S 010-017461) Tranche 1 contracts as Package B8 (value greater than £100m) in the East region.
- 4.2.7. As approved at Outline Business Case (OBC) stage, the Scheme Contract has now been executed with Skanska as Delivery Integration Partner (DIP) under the Regional Delivery Partnership (RDP) arrangements, with the aim of delivering an affordable and value for money Scheme.
- 4.2.8. The RDP arrangements support National Highways' very strong commercial ambition to:
 - Drive towards National Highways being an intelligent capable owner that is easy to do business with.



- Develop relationships that allow businesses and people to thrive.
- Set industry standards to exceed investor expectations.
- Deliver RIS2 efficiency for the Scheme.
- Best deliver a viable and robust procurement.
- Deliver a highly competitive tendered solution that removes the inherent productivity shortfalls and optimises the capacity and utilisation of scale across a region.
- Optimise risk allocation between the public and private sector which will deliver the Scheme's Client Scheme Requirements (CSRs).
- Meet the criteria for affordability and value for money; and
- Align with National Highways and Scheme CSRs and objectives.
- 4.2.9. Following its Project Control Framework approach, National Highways (with its designer AECOM) developed Design Fix 3d that was included in the application for a Development Consent Order (DCO) accepted for examination by the Planning Inspectorate in March 2021 with a Secretary of State approval received in August 2022.
- 4.2.10. AECOM continued to support National Highways with the Scheme design through the DCO process (to conclude PCF Stage 4) while Skanska commenced the detailed design (PCF Stage 5) in parallel. Design responsibility transferred from AECOM to Skanska at Design Fix 3d.
- 4.2.11. A Scheme Change Board has been established to ensure that design change emerging from the DCO process is communicated to and coordinated with the ongoing detailed design.
- 4.2.12. Subject to the granting of DCO powers, the DIP will take the Scheme through the remaining PCF stages:
 - Construction preparation (PCF Stage 5) including further development of the detailed design (from Design Fix 3d) and Technical Advisor assurance on behalf of National Highways.
 - Construction, commissioning, and handover (PCF Stage 6) including Technical Advisor assurance on behalf of National Highways; and
 - Closeout (PCF Stage 7).

Structure of this document

- 4.2.13. This Commercial Dimension has been developed in accordance with prevailing governmental guidance and with reference to learning outcomes from National Highways' CIP and wider project portfolio, and other large-scale infrastructure projects carried out in the UK.
- 4.2.14. The remainder of the Commercial Dimension is structured as follows:



- Packaging the works describes how the works required to deliver the Scheme will be packaged Development Consent Order (DCO); enabling works; and other contracts in addition to the main works.
- Commercial delivery describes the key features of the commercial proposition (price setting and budget negotiation closure; incentivisation; and cost and schedule benefits.
- Incentivisation strategy describes the incentivisation arrangements in gain and pain.
- Risk and Opportunity management describes Strategic Assumptions and Change Management.
- Procurement schedule describes the Scheme's key milestones and interface between the DCO, governance, and commercial delivery (for tier 1 and tier 2 supply chain) and delivery activities to achieve Open for Traffic by 31 March 2026.
- Contract Management) describes the proposed contract management arrangements.

4.3. Packaging the work

- 4.3.1. The packaging for the Scheme consists of a core main works target price Scheme Contract package let with the DIP through the RDP arrangements supported by several other contracts with the DIP or third parties:
 - National Highways Technical Advisor (Atkins).
 - Design development up to completion of PCF Stage 4 (AECOM).
 - Integrated Project Controls (Mace, previously Arcadis to June 2022).
 - Non-contestable utility works (Statutory Undertakers).
 - Early Orders for trial trenches and ground integration (Skanska as DIP); and
 - Other contracts and arrangements.

Scheme Contract scope – Main Works

- 4.3.2. The scope of the main works to be undertaken by Skanska as the DIP is detailed in the Scheme Contract (Parts 2A and 2B of the Scheme Contract Scope) and includes:
 - Adoption of AECOM Design Fix 3d.
 - Detailed design based on Design Fix 3d as submitted as part of the Development Consent Order application.
 - Temporary Works.
 - Utility works.
 - Railway interface works.
 - Highway construction works.



- Highway testing and commissioning; and
- Handover to National Highways maintenance.

Technical Advisor

4.3.3. National Highways appointed Atkins January 2021 as its Technical Advisor for the Scheme to represent and provide technical assurance to National Highways in its role as Asset Owner, and as part of the approved RDP procurement strategy in respect of standards compliance, quality assurance, assessment of the fitness for purpose, and Opening for Traffic.

Design Development and DCO

- 4.3.4. AECOM was appointed in April 2017 under National Highways' Collaborative Design Framework (CDF) to support National Highways to develop the design (Design Fix 3d), complete the DCO application process, and undertake surveys.
- 4.3.5. Skanska was appointed as the DIP under an RDP Early Order to undertake a buildability review of the Design Fix 3c design for Supplementary Consultation, provide input in advance of the DCO submission (Design Fix 3d), and to take on design responsibility from Design Fix 3d, and to take the Scheme to completion from PCF Stage 5
- 4.3.6. National Highways, AECOM, and Skanska as DIP have worked together to process changes arising in the DCO process through the Project Change Group arrangements set up for the Scheme.

Integrated Project Controls

4.3.7. Mace was appointed in March 2022 to provide cost management, commercial assurance, and NEC4 Project Manager commercial services to the Scheme integrated commercial team, procured under National Highways' Commercial and Project Management Services (CPMS) framework.

Non-contestable utility works

- 4.3.8. Three critical utility diversions have been let prior to the expected DCO decision to be undertaken by the respective Statutory Undertaker. Contract terms are bespoke, and the scope falls outside the New Roads and Street Works (NRSW) Act 1991 provisions:
- 4.3.9. Exolum (previously CLH) Pipeline System diversion. Oil pipeline diversion east of Black Cat junction to enable River Great Ouse viaduct construction. Design feasibility is under way and is expected to complete in 2023.
- 4.3.10. National Grid 450 NB High Pressure Gas Main Lowering. The diversion was planned by National Grid, Skanska Utilities, and the project team, with work completed in August 2021; and



- 4.3.11. Cadent High-Pressure gas main. Diversion to enable a bridge structure over Network Rail East Coast Main Line infrastructure. Design work underway and critical materials secured, with work planned to be complete in 2023.
- 4.3.12. Under the Overseeing Organisational Agreement (OOA) let as an RDP Early Order to Skanska as DIP, Skanska manages delivery of these works, however, National Highways makes contractual payments directly to the Statutory Undertaker.

Early Orders

- 4.3.13. Taking a key lesson learnt from the A14 Scheme, National Highways has commissioned a number of Early Orders to be undertaken by the DIP (utilising the provisions in the RDP framework) including extensive PCF Stage 3 ground investigation surveys, archaeological trial trenching, and undertaking buildability review.
- 4.3.14. This supports the DCO focusing the Archaeological Mitigation Strategy on specific areas rather than whole scale mitigation, and gives greater confidence on the amount of cost, resource and time required for archaeology to improve delivery and carry out early enabling works to facilitate utility diversions.

Other contracts and agreements

- 4.3.15. Network Rail: The Scheme includes a crossing of the East Coast Main Line (ECML). A Basic Asset Protection Agreement (BAPA) has been put in place and it is intended to make an Asset Protection Agreement for the construction phase in due course. These arrangements de-risk the delivery programme for the works which interface with Network Rail's operational railway.
- 4.3.16. East West Railway Company: A Co-operation Agreement relating to the A428 Black Cat to Caxton Gibbet Development Consent Order has been made for National Highways and East West Railway Company to cooperate with reference to design, construction methods, schedule, and communication with project sponsors.
- 4.3.17. Legal services: Specialist legal services are required to support the DCO process. A budget has been approved by the Cabinet Office to secure necessary advice from National Highways' Legal Services providers; and specialist services (ecological surveys, archaeology, security, health, and welfare, etc).



4.4. Commercial delivery

Contract Model

- 4.4.1. Skanska has been contracted as the DIP for the detailed design and construction phases (PCF Stages 5 to 7) to achieve the stated CSRs and objectives.
- 4.4.2. The Scheme will use the RDP NEC4 ECC form using:
 - Option A (priced contract with activity schedule) for the detailed design phase (PCF Stage 5).
 - Option A for Early Orders; and
 - Option C (target contract with activity schedule) for the construction and commissioning and close out phases (PCF Stages 6 and 7) with Option X22.

Optional clauses

- 4.4.3. The following optional X clauses have been included in the contract:
 - X2 (Changes in the Law).
 - X7 (Delay damages),
 - X8 (Undertakings).
 - X10 (Information modelling).
 - X11 (Termination).
 - X15 (Contractor's design). The period of retention following Completion of the works or earlier termination is 12 years.
 - X18 (Limitation of liability). The limitation of liability is two times the Estimated Capital Value. The end of liability date is 12 years after Completion of the whole of the works.
 - X20 (Key Performance Indicators). The Key Performance Indicators include the Start of Works, Journey Time Reliability, and Open for Traffic incentives (Additional Opportunities 1, 2, and 3 respectively); and
 - X22 (Early Contractor Involvement). The DIP takes on design responsibility from Design Fix 3d subject to the Strategic Assumptions (for Design, DCO, and fitness for purpose) that are triggered under certain limited circumstances.
- 4.4.4. National Highways has also added a number of additional conditions of contract under Option Z in the document Delivery Integration Partner Scheme Contract including the Client right to terminate if a notice to proceed to Stage Two is not instructed by National Highways.



Scheme Contract budget

- 4.4.5. The RDP budget setting process has been used to set the Scheme Contract budget and the Total Project Funding as detailed below. The Scheme Contract budget includes all historic costs and/or estimated DCO costs (PCF Stages 1 to 4); a Contract Sum amount (Option A fixed price for PCF Stage 5); and an estimate for the Option C price for PCF Stages 6 and 7, including National Highways Employer and Supplier risk.
- 4.4.6. Additional budget amounts are held outside this Scheme Contract budget amount for CIP legacy, provision for Strategic Assumptions, and portfolio risk, as part of the Total Project Funding.
- 4.4.7. A breakdown of Total Project Funding is included in the Financial Dimension.
- 4.4.8. As intended in the RDP strategy, the Scheme Contract budget breakdown focuses the DIP away from managing the narrow Contract Sum costs and Supplier risks, and towards the 'total project' Scheme Contract budget cost challenge.
- 4.4.9. The DIP will undertake the PCF Stage 5 detailed design of the Scheme that will need to include any revisions driven by the DCO examination process. Detailed design commenced in March 2021 and, as it becomes settled, the DIP will procure the construction work packages to be let should the notice to proceed to Stage Two be given.
- 4.4.10. The Scheme Contract budget is in essence the DIP target price, changes to the Scheme Contract budget and Fee are only permitted if the Scheme Project Manager changes the Scheme High Level Requirements (refer to X22.6(4)) that themselves require National Highways and DfT (where applicable) approval or there is a Judicial Review challenge to the Development Consent Order.
- 4.4.11. There was provision for the seven Strategic Assumptions agreed as part of the RDP budget setting discussed in Section 6. Strategic Assumptions have been agreed by National Highways and Skanska to clarify the cost and/or schedule risk share for specific events. Determination of a Strategic Assumption and/or changes to the High Level requirements, or delays to Start of Works due to a Judicial Review challenge to the Development Consent Order, are the only ways the Scheme Contract budget can be changed.

Payment

- 4.4.12. Payment for PCF Stage 5 design and Early Order services will be made under the NEC4 Professional Service Contract (PSC) Option A form.
- 4.4.13. Payment for PCF Stage 5 Early Order works will be made under the NEC4 ECC Option A form.



4.4.14. The main works (PCF Stage 6 and 7) are contracted under NEC4 ECC Option C with the Supplier share percentage set to 0% over the whole share range (i.e., switched off).

Incentivisation

4.4.15. Contract incentivisation is made through the X20 (Key Performance Indicators) and X22 (Early Supplier involvement) arrangements detailed in Section 5.

Single point design responsibility

- 4.4.16. The 'fitness for purpose' provisions (clause X22 and Z8) oblige the Supplier to achieve the Scheme outcomes in the High-Level Requirements as a whole, rather than having to demonstrate an appropriate level of professional care for its own services and works. Under 'fitness for purpose' National Highways is not required to demonstrate Supplier negligence in relation to any defects, incentivising achieving the outcomes 'right first time' unless the fitness for purpose Strategic Assumption is triggered.
- 4.4.17. The DIP takes responsibility for the design included in the Development Consent Order application (Design Fix 3d) and is contracted to deliver this under the RDP fitness for purpose (FFP) obligation. This means that the delivered outcome must achieve the defined purpose as set out in the High-Level Requirements and that the DIP is responsible for corrective works necessary to achieve these defined outcomes. This provision for both design and construction phases offer considerable risk protection for National Highways, in terms of indemnities and liabilities, ensuring the delivered outcome is completely aligned to the defined outcomes.

Termination rights

- 4.4.18. The contract duration is until Completion of the whole of the works (planned for 27 July 2028) and the liability period is for 12 years from Completion of the whole of the works.
- 4.4.19. As well as the general termination right in the Framework Contract there are specific termination mechanisms aligned to Scheme development and delivery:
 - Breach of Framework Contract conditions.
 - Poor performance under the Performance Metric or Quality Management Points regime.
 - If the statutory and other consents needed for the works on terms that will enable the works to be delivered within the Budget and in accordance with the Accepted Programme are not obtained; and
 - A notice to proceed to Stage Two is not instructed by National Highways.



- 4.4.20. The consents and notice to proceed to Stage Two provisions (c and d above) allow National Highways to benefit from the early suppler involvement arrangements to flow from design development through to construction and for the DIP to deliver against the fitness for purpose obligation, whilst having the backstop of a sole right not to fully commit to the main works construction phase by not issuing a notice to proceed to Stage Two.
- 4.4.21. Where the notice to proceed to Stage Two is not given, National Highway's payment obligation is limited to reasonably incurred costs in Stage One.

Commitments

- 4.4.22. The Scheme will benefit from the tender commitments by the DIP as part of the RDP procurement, including the committed tendered rates. These commitments are intended to look beyond a transaction-by-transaction relationship and offer DIP opportunities for programme level efficiencies, focused on improving value and market change in support of National Highway's longer-term aspirations.
- 4.4.23. As part of the RDP procurement, the DIP made Strategic Alignment, Quality Management, and Regional Delivery Commitments that align with National Highways' objectives.
- 4.4.24. Costs incurred because of failure to deliver a commitment are a DIP risk and can be assessed by the Project Manager as disallowed costs.

Project Bank Accounts

4.4.25. It is a Scheme requirement to apply the Project Bank Accounts (PBAs) option (clause Z10).

4.5. Incentivisation strategy

- 4.5.1. The DIP is incentivised through the Scheme Contract provisions in X20 and X22 as follows:
 - Cost. To achieve outturn costs below the Scheme Contract budget (Budget Underspend).
 - Schedule. Delivery of Additional Opportunities 1 (Start of Works) and 3 (Open for Traffic).
 - Function. Achievement of Additional Opportunity 2 (Journey Time Reliability); and
 - Value for money. Maintenance and improvement of the Investment Baseline Benefits:Cost Ratio (BCR) of 1.63.
- 4.5.2. Although adopting the RDP for the Scheme means that the DIP is only fully engaged from PCF Stage 5, where detailed design runs in parallel with finalising the DCO submission (PCF Stage 4) the incentivisation elements in the RDP arrangements illustrated below still apply.



Incentivisation - gain share

4.5.3. Budget Savings (underspend on the Total Scheme Contract budget) are used to incentivise the DIP to achieve the stated project parameters as set out below. The Schedule incentivisation has been updated to reflect the current impact of the judicial review challenge to the Development Consent Order.

Project parameter (Gain share)	Allocation	Project parameter (Gain share)
Cost	20% of Budget Saving	Saving on Scheme Contract budget (Capped at 30% of the Scheme Contract budget)
Schedule	10% of Budget Saving	Additional Opportunity 1 Achievement of Start of Works date (2023) (Capped at 30% of the Scheme Contract budget)
Journey Time Reliability	10% of Budget Saving	Additional Opportunity 2 Achievement of Journey Time Reliability (To be confirmed by the Client prior to the notice to proceed to Stage Two being issued) (Capped at 30% of the Scheme Contract budget)
Schedule	10% of Budget Saving	Additional Opportunity 3 Achievement of Open for Traffic date (Capped at 30% of the Scheme Contract budget)
BCR	10% of Budget Saving	Maintaining the BCR at the Investment Baseline BCR 20% of Package Pot = 10% of Budget Saving
BCR	40% (max) of Budget Saving	4% for every 0.1:1 improvement in the Investment Baseline BCR Up to 80% of Package Pot = up to 40% of Budget Saving
Total	100%	

Table 4-2 Breakdown of gainshare



- 4.5.4. The gainshare incentivisation regime has a total maximum value of 30% of the Budget Savings for the cost and Additional Opportunities incentives.
- 4.5.5. The Scheme has a layered approach to incentivisation to be funded from budget gains against the agreed Scheme Contract budget agreed upfront with the DIP as illustrated below.



Figure 4-2 DIP incentivisation

Incentivisation - pain share

- 4.5.6. Where there is an overspend against the Scheme Contract budget, the overspend is funded from sources in a contractually defined order. Note that the Option C pain share on the construction costs must be accommodated within the Scheme Contract budget amount and is only included in the overall pain share when the Scheme Contract budget is exceeded (including the extent to which the Strategic Assumption pain holiday is triggered).
- 4.5.7. Pain share can be partially clawed back by the DIP if it achieves any or all of the three Additional Opportunities. This claw back provision ensures that the DIP continues to be incentivised to deliver to schedule and function with minimum disruption, even where the Scheme Contract outturn cost is in pain.



Additional Opportunities achieved	Payment to Supplier (values rounded)	
0	£0m	
1	1/6 th clawback (
2	2/6 th clawback (
3	3/6 th clawback (

Table 4-3 Additional Opportunities pain share clawback

4.6. Risk and Opportunity Management

Risk provision

- 4.6.1. At contract award, National Highways included **Contract** in the Scheme Contract budget for Supplier risk and **Contract** for Employer risk.
- 4.6.2. In addition, **Detector** for Strategic Assumptions and **Detector** for portfolio risk was included in the Total Project Funding.
- 4.6.3. Each of the Strategic Assumptions is defined with risk allocated between National Highways and the DIP; a duration; and (in some cases) that they will only be triggered in the event the Scheme Contract budget is exceeded (i.e., is in pain) that is established at the Final Assessment of costs.
- 4.6.4. National Highways and the DIP are working together through the RDP arrangements to identify and capture opportunities to set off against this risk provision.
- 4.6.5. The DCO Strategic Assumption provision has been made for the cost impact of delays on the basis of an August 2022 DCO determination. More significant 'extraordinary' DCO delay scenarios of 12 and 24 months have been modelled separately to this Strategic Assumption. These cost impacts are not included in the Scheme Contract budget or Strategic Assumptions but are provided for in an extraordinary delay Deed of Variation executed by the wider RDP framework covering all RDP contracts.
- 4.6.6. In addition, the RDP Deed of Variation (Dec 2022) provides the Delivery Integration Partner protection from inflationary pressures through providing a mechanism to add or deduct inflationary risk provision from the Scheme Budget in line with the BCIS Implied Output Price Indicator for New Construction indices.
- 4.6.7. The non-recoverable VAT Strategic Assumption excludes a provision in portfolio risk for the Development Phase.



- 4.6.8. Portfolio risk will need to be drawn on for the impact of East West Rail contemporaneous construction (sharing and coordination of works and logistics sites by multiple contractors), excess inflation beyond the provision made, recent fiscal changes (red diesel rebate removal and national insurance increase for the Health and Social Care levies), the impact of Brexit and COVID-19, and for general VAT rule changes.
- 4.6.9. Drawdown of portfolio risk is subject to National Highway's delegated authority and internal governance.



Strategic Assumption	Summary description	Risk pot
Pain Holiday (for archaeology and ground remediation)	Exposure – actual costs in excess of the Budget of (archaeology) and/or (ground remediation) up to cap in aggregate Duration – determination of archaeology and ground remediation costs Only applies if the Scheme Contract budget is exceeded	Strategic Assumptions
DCO	Exposure – costs of delay caused by DCO decision up to cap Duration – within 2 weeks from DCO determination Incremental delay costs triggered by DCO process	Strategic Assumptions
Design	Exposure – budget implications of scope differences between Design Fix 3c and 3d Duration – within 5 weeks from receipt of the Design Fix 3d documents Mitigation or change the Scheme Budget	Strategic Assumptions
Fitness for Purpose (FFP)	Exposure – nil. Final model meets fitness for purpose performance metrics	Closed
Change in land use	Exposure – increase in land value (S17) Duration – Contract Completion Increase excluded from Scheme Budget	Portfolio risk
Non-Recoverable VAT	Exposure – non-recoverable VAT in excess of the provision Duration – determined at Final Assessment Only applies if the Scheme Contract budget is exceeded	Strategic Assumptions (except Dev Phase)
Statutory Undertaking (SU) costs	Exposure – 50% of the excess of the C4 estimate over Duration – determination of Statutory Undertaking direct actual costs Only applies if the Scheme Contract budget is exceeded and the C4 estimate exceeds	Strategic Assumptions

Table 4-4 Strategic Assumptions summary



Risk management approach

- 4.6.10. Throughout the development of the Scheme, risks and opportunities will continue to be recorded and actively managed by National Highways and the DIP in compliance with National Highways' Risk Management Policy and through the Scheme risk register.
- 4.6.11. An analysis of the key commercial risks and the key opportunities extracted from the Scheme risk register and opportunity register respectively, are included in Management Dimension.
- 4.6.12. Risks are formally identified and monitored regularly, with mitigating actions developed and implemented where possible, and crystallised risks logged. Escalation and reporting routes are in place for risk governance (see Management Dimension Section 13).
- 4.6.13. Contingency plans have been developed to handle supplier failure (temporary or long-term failure/default) and exit strategies are developed and updated through the life of the contract.
- 4.6.14. There are more rigorous processes to handle major contractual changes, including clear approval mechanisms and accountabilities through the use of a digital assurance tracker, and controls to demonstrate that changes offer value for money.
- 4.6.15. The Scheme has adopted an integrated approach to the management of risk, whereby both opportunities and threats are assessed using the same processes, systems, and methodologies, so that they can be understood and measured, like-for-like, and their impact (be it positive or negative) fully understood and anticipated.
- 4.6.16. This approach enables opportunities to be prioritised according to the likelihood of a successful outcome. Opportunities can be measured against and alongside any corresponding threat, and a sense check taken as to whether they represent a genuine "opportunity" (a saving against the base) or rather a risk mitigation, with the benefit either way being captured.
- 4.6.17. Opportunity management, as with any project risk management, is concerned primarily, although not exclusively, with cost, time, and quality implications.
- 4.6.18. All opportunities are captured on Xactium (National Highway's risk management software) using the same conventions as adopted for threats, and progress is reviewed on a monthly basis. Forecasting is linked to Xactium outputs on a monthly basis.
- 4.6.19. It is acknowledged that there are limitations and constraints in the management of opportunity as part of an integrated risk framework, including those opportunities require a different, more proactive, response. To facilitate an opportunity-aware culture, opportunities are reported separately to PEG and dedicated opportunity sessions / workshops held.



4.7. Commercial delivery schedule

- 4.7.1. The Scheme schedule originally forecast Open for Traffic by 2026 with an 18-month close out (PCF Stage 7) period, due to the impacts of the legal challenge to the decision to grant development consent this date is now 2027, with the close out period remaining 18 months.
- 4.7.2. The procurement schedule has been integrated into the overall programme such that:
 - Up to 20 months parallel running of the DIP with the DCO process.
 - Any DCO related changes can be fed into the Main Works contract before the notice to proceed to Stage Two is given.
 - All Early Order works have been completed by the DIP before any notice to proceed to Stage Two is instructed; and
 - The DIP will need to undertake design and procurement prior to mobilising to site.
- 4.7.3. The Scheme schedule pivots around the granting of the DCO. If granted, and subject to any Secretary of State conditions and/or commitments given by National Highways, this allows for securing access to site and commencing works. Should the DCO be granted, and the Scheme remains within the Scheme Contract budget and schedule envelope the notice to proceed to Stage Two will be given to the DIP subject to the agreed delegated approval level.
- 4.7.4. DIP procurement processes ran in parallel to the DCO process so that notice to proceed to Stage Two could be awarded as soon as practicable after DCO, however Notice to Proceed is now awaiting confirmation of FBC approval and full funding. With an emerging detailed design in parallel with DCO determination, a pricing exercise and quantum update will feed into notice to proceed ahead of the detailed design being fully complete.
- 4.7.5. Through PCF Stage 5 the DIP is developing the design using Building Information Management (BIM) that is accessible by the National Highways' central estimating team so they can assure that forecast costs being used as a basis for agreeing the Total of the Prices to be taken into PCF stage 6 have been competitively tendered in accordance with the Scheme Contract.

4.8. Contract Management

Scheme Contract Management

- 4.8.1. The Scheme will follow the RDP Operational Guidance Note (OGN) and National Highways' Commercial and Procurement Contract Control Framework (CCF) which describes management, procurement, and delivery processes that will be followed, for example:
 - Budget setting.
 - Placing of Early Orders.



- DIP performance management and the opportunity for DIP to secure additional work.
- Working of the regional and national Centres of Excellence and Sustainable Improvement Hubs; and
- Governance of contract change including PM delegation.
- 4.8.2. Further detail of the Scheme contract management approach is included in the Management dimension at Section 15, Contract Management.
- 4.8.3. National Highways proposes to deploy the framework management team from the soon to expire CDF on to the RDP framework and this will be integrated with the contract management organisation from the A14 Scheme, with some of the National Highways and Skanska resource transitioning. The CIP team will develop a strong alignment with the overall RDP delivery team to ensure consistent contract management approaches are adopted.
- 4.8.4. The projects Commercial Mobilisation Plan has been executed since contract award and will continue into the construction phase.

Procurement Strategic Sourcing Plan

- 4.8.5. In response to a key lesson learned from the A14 Scheme, National Highways has identified that the Scheme has significant supply chain demands of itself, that are more significant than other RDP schemes, and that other significant schemes such as HS2 will also be looking to draw on the same supply chain. In addition, Skanska has the largest procurement related risk for the Scheme as failing to secure resource to deliver in line with the delivery programme, resulting in a significant scheme exposure to sporadic market influences and reduced confidence in being able to deliver the scheme safely, to time and within budget.
- 4.8.6. National Highways and Skanska has developed a Procurement Strategic Sourcing Plan (PSSP) that sets out the rationale for adopting a less traditional procurement approach that balances securing the particular resource needs of the Scheme with the overall RDP requirement to demonstrate value for money in subcontracting.
- 4.8.7. In order to achieve the quantum and timing of critical resources, it is proposed in the PSSP that an exception is made to the requirement for three quotations and that single source or limited competitive tenders are permitted where this can be justified. 12 strategic packages have been identified by the DIP for this exception.

National Highways Capability and Tools

4.8.8. The RDP framework is designed so DIPs are aligned to deliver programme and Scheme objectives. However, there is an inherent risk if National Highways does not have the capabilities required to manage the new contractual relationships that could affect the delivery success for the Scheme as one of the early projects to be awarded.



- 4.8.9. National Highways has undertaken to further improve its programme and project management capability. Over the last three years, it has engaged an IPC provider to support the formation of robust systems and processes which will support all future delivery. This programme has established robust processes and continually reviewed procedures to ensure they reflect industry standard practice. This ensures contracts are effectively managed, removing the potential risks (cost increases, time over-runs and loss of quality) that arise through failure to properly administer contracts.
- 4.8.10. National Highways will also be able to access its professional services frameworks to secure necessary advisory support.
- 4.8.11. National Highways has also implemented several systems to support contract management, such as CEMAR (contract administration), PRISM (cost management), P6 (schedule) and Xactium (risk management), to be used in the management of contracts. In addition, outturn forecasting techniques, used to assess performance against the cost and schedule forecasts have been embedded. Leading indicator data from these systems and processes will enable proactive interventions to enable accurate and predicable outcomes.
- 4.8.12. Lessons learned and experience from the A14 scheme have been drawn, procured under the now exhausted CDF, which is also a complex scheme of national importance but is also geographically adjacent to the Scheme so shares many common procurement and commercial aspects.
- 4.8.13. To this end, rather than simply carry out reviews and try to translate them from the A14 scheme, National Highways has drawn on the A14 scheme project team and its best practice processes and embedded these in the development of the Scheme. This will drive significant benefits, not only around the stakeholder engagement and planning but also around the resource requirements and securing sufficient internal resources to ensure delivery. As such we will take and enhance the A14 scheme operating model and drive full integration, managing risks and opportunities as one team, and managing to the single outcome of delivering below the Scheme Contract budget.

4.9. Commercial Dimension Conclusions

4.9.1. The A428 Outline Business Case (OBC) set out the projects intended approach to commercially set up and manage the Scheme. Since the OBC the project has executed the RDP contract with the DIP which set a budget for the projects delivery and allowed for commencement of the detailed design phase. The commercial platform is set for the construction phase. A detailed commercial mobilisation plan has been launched along with onboarding training modules for existing and new project team members, this has included and Understanding the Deal module explaining the commercial elements of the Scheme.



- 4.9.2. The contract which will enable detailed design and construction phases is in place and commercials agreed. This allows the project to transition into PCF stage 6 subject to DCO determination by the Secretary of State. In addition to this, our reporting structure and digital platform is in place and is actively used on a monthly basis and will add a great deal of value in the construction phase.
- 4.9.3. Contract and commercial management resource (Mace) has been procured and is embedded as part of the integrated project team ahead of the construction phase as well as key systems such as Cemar and PRISM already being proactively used and embedded on the project.
- 4.9.4. The DIP are proactive in their plans to engage with the supply chain and are challenging standard process to get the best outcomes for the project in a challenging and changing market. Parallel running PCF stage 4 and 5 has meant our approach to market engagement needs to be more flexible and dynamic whilst we mature cost and quantum from an emerging design.
- 4.9.5. The commercial tools, systems, contracts and people are in place and the strategies and plans were finalised for the original planned start of works December 2022.



5. Management Dimension

5.1. Introduction

- 5.1.1. This section of the Full Business Case (FBC) presents the management dimension for the A428 Black Cat to Caxton Gibbet scheme (the Scheme).
- 5.1.2. This management dimension sets out how the Scheme will be controlled and governed through the conclusion of the development phase, and the forthcoming construction phase of the of the Project Control Framework (PCF). It shows the project has the right organisational structure, capability, and governance processes in place to be able to transition to and successfully deliver the PCF Stage 6 construction, commissioning and handover phase, and PCF Stage 7 closeout of the project.
- 5.1.3. This management dimension sets out how the Scheme will be successfully delivered through management of:
 - The transition between the required organisational structures needed in each PCF Stage.
 - Design and construction delivery performance.
 - Governance and assurance arrangements.
 - Stakeholder engagement and communications.
 - Arrangements for monitoring of progress.
 - Regional Deliver Partnership (RDP) management.
 - Changes, risk, and opportunity management.
 - The approach to benefits management and realisation.
 - The approach to carbon management.
 - Discharge of the Development Consent Order (DCO) requirements prior to the start of works; and
 - Project closure.
- 5.1.4. The management dimension also describes National Highways' delivery of the DCO application and how it will manage the outcomes of the DCO on receipt of the Secretary of State's (SoS) decision in 2022.
- 5.1.5. Consistent with DfT and HMT Green book guidelines, the management dimension is structured as follows:
 - Introduction.
 - Dependencies, interdependencies, and constraints.
 - Organisation and transition between project stages.
 - Governance and assurance.
 - Managing the delivery and implementation of the DCO.



- Stakeholder engagement and communication.
- Benefits realisation management.
- Carbon management.
- Digital IT and innovation management.
- Project plan .
- Integrated project management organisation.
- Risk management.
- Change management.
- Contract management .
- Lessons learnt.
- Conclusions.

5.2. Dependencies, interdependencies, and constraints

Dependencies

5.2.1. The successful delivery of this Scheme is not dependent on the prior delivery of any other scheme, nor is any other scheme dependent on it.

Interdependencies and Constraints

- 5.2.2. There are also no interdependencies to the Scheme.
- 5.2.3. There are also no constraints to the Scheme beyond those identified in the strategic dimension which have been mitigated through continued scheme development.

5.3. Organisation and transition between project stages

- 5.3.1. The Scheme forms part of National Highways Complex Infrastructure Programme (CIP). It is being delivered in accordance with National Highways' PCF Major Projects lifecycle, which requires approval of key deliverables at staged gateways.
- 5.3.2. This section outlines the approach to managing the transition from PCF Stage 4/5 Construction Preparation to:
 - PCF Stage 6 Construction, Commissioning and Handover, then
 - PCF Stage 7 Project Closeout
- 5.3.3. The operating models for each of these stages have been developed to provide the capabilities necessary to support them and the transition to the next stage. This section sets out what these capabilities are, how they will be provided and the measures in place to ensure the smooth transition between stages.



PCF Stage 4/5 Operating Model

- 5.3.4. Although the National Highways PCF process only allows a project to be in one stage at a time, a strategy to overlap PCF stages 4 and 5 was agreed and implemented to enable the project to achieve its 2022-23 Delivery Plan commitments. This meant that the PCF Stage 4 (Statutory procedures and powers) was run in parallel with PCF Stage 5 (Construction preparation) and the final Stage Gate Assessment Review (SGAR) for each stage completed in sequence in line with the National Highways PCF process.
- 5.3.5. The key activities and services covered in Stages 4 and 5 were design development and the management of the statutory process to obtain the DCO. Other key activities included all environmental and traffic analysis, land and property negotiation, consultation, and statutory processes necessary to define the preliminary design solution and gain the planning powers to deliver the scheme.
- 5.3.6. By overlapping PCF Stage 5 with Stage 4 this has also allowed the progression of a number of key activities in preparation for the start of PCF Stage 6 including:
 - The Delivery Integration Partner (DIP), Skanska and Mott MacDonald, progressing:
 - i. detailed design based on the DCO submission.
 - ii. early enabling works and preparation for delivery of the main works construction phase, following lessons learnt from the A14 Cambridge to Huntingdon scheme, to mitigate risks to the main works construction programme.
 - Continued stakeholder engagement and communication activities with the local community as well as regional and national Stakeholders
 - Delivery of the FBC to support the investment decision for the scheme.
 - Detailed construction readiness planning, including the mobilisation of staff and resources to deliver the project.
- 5.3.7. The PCF Stage 4/5 operating model consisted of integrated delivery teams from both National Highways and the DIP to manage the following workstreams:
 - Sponsorship (National Highways)
 - Business Case (National Highways)
 - Land and Landowners (National Highways and DIP)
 - Consent and External Organisations (National Highways and DIP)
 - Detailed design and Construction preparation (DIP)
 - Commercial and Procurement (National Highways and DIP)



- Supporting Services (covering PMO services, technical risk and assurance, Customer, Internal and External Communications, Benefits and Legacy (including designated funds), Equality, Diversity and Inclusion (EDI), IT and Digital, Environment, Health, Safety and Wellbeing.
- 5.3.8. These were led by Project Directors from National Highways and DIP, the Project Managers from National Highways and DIP, and workstreamspecific strategic leads within the Strategic Leadership Team (SLT), supported by the operational leads within the Operational Leadership Team (OLT). Each workstream contained resources from both parties but was led and managed by one National Highways SLT owner to ensure continuity and be responsible for meeting the delivery expectations.
- 5.3.9. The scheme was also supported by National Highways CIP Business Partners and Advisors.

PCF Stage 6 Operating Model

- 5.3.10. The key activities and services that will be covered in PCF Stage 6 (Construction, Commissioning and Handover) to complete the construction of the scope approved by the DCO including:
 - Obtaining the necessary land for the construction of the scheme via the General Vesting Declaration (GVD) process
 - Completing all necessary construction activities including mitigation activities
 - Handing over to Operational Maintenance the new elements of the SRN
 - Handing over new assets to Local Authorities
 - Completion of Accommodation works for Landowners
 - Re-instatement of any temporary land take associated with the scheme
 - Discharging of DCO requirements
- 5.3.11. The PCF Stage 6 will consist of integrated delivery teams from both National Highways and the DIP to manage the following workstreams:
 - National Highways Led Functions
 - DIP Led Functions
 - Supporting Services
 - Business Partners and Advisors
- 5.3.12. These will be led by the Project Directors from National Highways and DIP, the Project Managers from National Highways and DIP, and the workstream-specific strategic leads within the SLT, supported by the operational leads within the OLT.



- 5.3.13. In Stage 6, the SLT will continue to define and communicate the strategic vision for the Scheme, motivate the delivery team and ensure the approach to delivery is aligned to the National Highways ambitions, behaviours, and values. The SLT will remain largely the same as in Stage 4/5 to ensure consistency of direction to the project.
- 5.3.14. In Stage 6, the OLT will change to be more focused on the delivery of the construction made up of members of National Highways, the DIP and supporting functions to run the daily operations, and project management of the scheme and to coordinate the transfer of information between workstreams. The OLT will be co-led by the National Highways Project Manager and the DIP's Project Director who will be responsible for management of the construction for the Scheme with representation from both the National Highways and DIP delivery teams to support these activities. The OLT will:
 - Agree key daily operational activities
 - Manage delivery performance against plans and objectives
 - Lead the implementation of SLT strategies and plans, and inform the workstreams of key updates
 - Identify areas needing escalation to the SLT
 - Provide a strong project management community and share key project and workstream updates, good practices, and successes; and
 - Identify key actions, issues, risks, and opportunities from the workstreams and resolve programme issues and blockers.
- 5.3.15. Common to all National Highways projects, the operating model also includes supporting services from a comprehensive network of National Highways Business Partners and Advisors responsible for providing support and advice to the scheme across a range of specialisms such as Finance, Legal, Specialist Engineering Services (SES), Equality, Diversity and Inclusion (EDI) and Operations. They serve to increase the capabilities provided for the scheme and enforce the 'voice' of the businesses to ensure the National Highways' strategic and directorate requirements are met. These support services maintain a pivotal role in advising on decision making and communications.
- 5.3.16. Due to the A428 being a scheme within the Complex Infrastructure Programme (CIP) the delivery model for business partners differs from many RDP schemes and those found in the Regional Investment Programme (RIP). Due to the size and complexity of the Scheme it benefits from having dedicated and imbedded resources from some of the business partner services rather than being shared across many projects. Specifically, these are: Sponsorship, Commercial and Procurement, PMO Communications and Customer.
- 5.3.17. The increased support from using this model ensures the availability and continuity of that expert guidance during the lifecycle of the project.



- 5.3.18. Table 5-1 summarises the key responsibilities and services within the Stage 6 workstreams, the required transition from Stage 4/5 and the change in focus. Each workstream has a National Highways lead from the core project management team, supported by various business partners and the supply chain.
- 5.3.19. Project Management will include additional capabilities in Stage 6 which include:
 - Development of IT and digital technologies to support the design, monitor construction and manage reporting and data transfers between contractors and National Highways.
 - An enhanced and stronger capability in risk, opportunities, efficiencies, and change management to be provided by the DIP.
 - Benefits Management within operations to manage and monitor the delivery of the benefits approved in the FBC, address any changes or risks to planned benefit and impact levels during construction and on completion, and to explore any opportunities to further expand the beneficial legacy of the Scheme.
 - Report on new areas such as progress in delivering the breakdown of key Benefits from the Scheme, Carbon Management and Biodiversity Net Gain (BNG).
 - Within the PMO will sit the coordination function via the PCF process to ensure technical and operational services provided by the National Highways SES and Operations Directorate (OD) support the detailed design and transition documentation to operations and management.



Workstreams	Stage 6 key services/responsibilities	Difference from Stage 5	Transition Action	Transition Action Owner
External Communications	To ensure a high quality of appropriate information is shared with our external stakeholders, including social media, direct media, and targeted correspondence.	Increased engagement and resource levels to manage the frequency needed.	Enhance	Senior Communications and Engagement Manager (Business Partner)
Sponsorship	To support the delivery team in reporting progress and issues to senior bodies/DfT/HMT, and to hold the project to account in delivering the benefit outcomes approved in the FBC.	To support the delivery team in obtaining appropriate approvals from senior bodies/DfT/HMT, and to deliver the FBC.	Streamline/ Reduce (following FBC completion)	Project Sponsor
Property and Compensation	To provide expert advice and guidance on all land matters including GVD and land take – to support the project management team in meeting the needs of our affected landowners.	No Change	Retained from stage 5	Senior Property Advisor (Business Partner)
Benefits and Legacy	To ensure appropriate benefits management tools and processes are in place to monitor during construction. To ensure the Scheme engages and works with our stakeholders to deliver projects for wider benefit outside of the direct scheme remit.	Increased resourcing (DIP) to support effective monitoring of benefits during the construction phase	Retain from Stage 5	Benefits and Legacy Manager
Commercial Assurance	To lead the assurance of the commercial position of the scheme delivery. To ensure accurate financial planning and spend profiles and to	Focus will grow to include the additional construction activities	Retain from Stage 5	Head of Commercial Delivery

Table 5-1 Summary of PCF Stage 6 workstreams



Workstreams	Stage 6 key services/responsibilities	Difference from Stage 5	Transition Action	Transition Action Owner
	review the expenditure and payment requests of the contractors			
Lessons Learnt	To ensure all appropriate lessons learnt on the Scheme are formally captured and suitable for use by other schemes now and in the future. To also ensure useful material is available for the scheme to apply other lessons learnt.	No Change	Retain from Stage 5	Programme Lead
Customer	To represent and be the voice of the customer, to ensure the Scheme is delivered as effectively as possible while at all times considering customer impacts and how to mitigate where possible. To make sure communications shared with the customer are of high quality, and to lead public information events (PIE).	Greater interaction with the construction teams to input into decision making on our works and the impact of customers during construction phase	Retain from Stage 5	Programme Lead / CIP Customer Lead
Local Authority Liaison	To lead the engagement with the various local authorities that are affected by the scheme, to ensure there is a positive working relationship and the technical and legal requirements are being met by all. Ultimately to lead the scheme to an effective handover of new assets to these authorities.	Focus moves from DCO activities to the detailed engagement around design and construction of local roads and other matters	Enhance	Programme Lead
Designated Funds	To support stakeholders with developing opportunities to obtain Designated Funds, to own the formal application and IDC meetings and if approved to	No Change	Retain from stage 5	Benefits and Legacy Manager



Workstreams	Stage 6 key services/responsibilities	Difference from Stage 5	Transition Action	Transition Action Owner
	project manage the delivery of the funded schemes.			
Strategic Stakeholders	To manage the relationship with key strategic stakeholders such as elected members such as County Councillors, MPs, or Parish Councillors. To be a visible presence and to create pro- active engagement with all to ensure mitigation of any escalation that would have a negative impact.	No Change	Retain from stage 5	Programme Lead
3rd Party Infrastructure Projects	To lead the interaction with any other significant infrastructure projects such as East West Rail Company. To ensure there are consistent ways of working and that regular engagement is undertaken as projects mature. To arrange any formal agreements that may be needed.	No Change	Retain from stage 5	Programme Lead
Scheme Handover / National Highways Ops liaison	To manage the relationship with the Operations department to ensure they are consulted at appropriate stages of delivery, to plan and implement a successful handover of the Scheme into operational maintenance by working with the adopting authorities.	Increased engagement in the early planning of the adoption of the constructed assets	Enhanced	Programme Lead
Construction Management and planning	To manage the construction of the Scheme and the associated activities delivered by any subcontract service providers. On cost time and quality.	A significantly increased workstream to match the needs of the scheme in stage 6	Enhanced	Programme Lead



Workstreams	Stage 6 key services/responsibilities	Difference from Stage 5	Transition Action	Transition Action Owner
	Focus shifts from advanced works and enabling works to full construction.			
Landowner and Accommodation works	To manage the relationships with the affected landowners and to ensure that they are satisfied with the appropriate offerings of accommodation works that are delivered on time and to quality. Ensure there is a positive relationship with the District Valuer and land agents.	Increased resourcing to support the agreement and delivery of the accommodation works and the engagement with landowners during the construction phase	Enhanced	Programme Lead
Engineering	To provide appropriate technical input into the Scheme design and construction methodology. To ensure buildability of the design and provide guidance and support where needed.	Increased resourcing to support the additional size and scope of engineering requirements in stage 6 construction stage	Enhanced	Programme Lead
Environment and Ecology	To plan, monitor and manage the Scheme delivery by way of environmental impacts, ensuring the appropriate legislation is adhered to, the appropriate licences have been obtained and the relevant procedures are in place.	Increased resourcing to support the additional size and scope of environmental management in stage 6 construction stage	Enhanced	Programme Lead
Health and Safety	To manage the Health and Safety policy and procedures for the project. To ensure the Scheme is legislatively compliant and offering the safest possible ways of working. To ensure all appropriate training is undertaken and that there is a culture of everyone home safe and well each day.	Increased resourcing to support the additional size and scope of Health and safety management during the stage 6 construction phase	Enhanced	Programme Lead



Workstreams	Stage 6 key services/responsibilities	Difference from Stage 5	Transition Action	Transition Action Owner
Design	To provide on-going support to the detailed design that would have been completed during stage 5. To manage any change needed and provide further detail as needed	At stage 6 the design will be predominantly complete with a greatly reduced resource need to support any change and support as needed	Reduced	Programme Lead
Utilities	To lead on the delivery of any utility company engagement and interaction as part of the Scheme requirements. To ensure cost, quality and planning are in place to de-risk the delivery of the Scheme.	Main shift of focus is from planning to managing the delivery of utility works	Retained	Programme Lead
Consents	To ensure all appropriate consents are granted at a time that allows works to commence in line with plan	Increased resource to support the additional needed for consents during the stage 6 construction phase	Enhanced	Programme Lead
People and training	To maximise the development of the teams working on the scheme, to ensure the right resourcing levels are understood that the right people are available and are retained. To ensure all appropriate training is available.	Increased resourcing to support the significant increase in personnel working on the scheme during the stage 6 construction phase	Enhanced	Programme Lead
Internal Communications	To manage the creation and delivery of high-quality internal communication channels within the scheme. Ensure the appropriate messages are communicated in a timely manner and that the values and behaviours of the scheme are included as part of the messages.	No change	Retained	Programme Lead



Workstreams	Stage 6 key services/responsibilities	Difference from Stage 5	Transition Action	Transition Action Owner
Procurement	To manage the purchasing of all sub- contract suppliers, materials, and services. To ensure appropriate quality, cost, and programme. To manage suitability of suppliers to project behaviours and values.	Increased resourcing to support the additional activities required to deliver stage 6 construction activities	Enhanced	Head of Commercial Delivery
DCO Compliance and discharge	To ensure all DCO conditions are met and discharged in line with expectations and to manage DCO change	Reduced from stage 4/5 as DCO decision delivered	Reduced	Programme Lead
ITS / Digital	To lead the development and implementation of the appropriate digital tools to maximise the capability of the scheme. Ensure tools are value added and align to central development of IT structure such as Major Projects Delivery Transformation (MPDT).	Increased scope to cover the additional requirements of the detailed monitoring of stage 6 construction activities	Enhanced	Programme Lead
РМО	To lead the project reporting into central National Highways (monthly). To manage the PCF and other governance process' To Lead the creation of management packs and other supporting documents that feed into senior meetings. To drive the development of good project controls.	No Change	Retained	Head of PMO
Technical Assurance	Technical Advisor to lead the National Highways review of the design suitability, ensuring it meets governance and DMRB standards. Ensure as built	Increased resourcing to support the additional activities needed to deliver stage 6 including more physical activity on site	Enhanced	Safety, Engineering and Standards



Workstreams	Stage 6 key services/responsibilities	Difference from Stage 5	Transition Action	Transition Action Owner
	quality is suitable, and all appropriate records are appropriate.			
Project Controls	To develop and implement high quality project controls that offer maximum value for the scheme. To ensure that the Scheme is considering the wider drive for productivity monitoring. To ensure the Scheme have strong visual management in delivery.	Increase in the project controls needed to manage the stage 6 activities	Enhanced	Head of PMO



Technical and Commercial Assurance capability

- 5.3.20. Continuing from Stage 5, National Highways will use integrated partners to provide support in the areas of Commercial and Technical Assurance.
- 5.3.21. The required capabilities for managing the main works contractor's construction activities will be achieved through a combination of National Highways delivery team and via the Technical Advisor (TA), provided by Atkins through the RDP framework (which is separate and independent from the DIP). The TA will:
 - ensure the design is appropriately completed and then executed on site, including site supervision of the main works.
 - support with technical discussions with adopting authorities including National Highways Operations.
 - ensure compliance to technical standards across a broad range of procedural requirements.
 - act as a peer reviewer to assure the work that will be undertaken directly by the DIP as part of their own assurance mode is embedded into the scheme delivery; and
 - assures the performance against the RDP High Level requirements which underpins the DIP performance.
- 5.3.22. The required capabilities for managing the commercial aspects of the delivery of the project will be achieved through a combination of the National Highways' Commercial team and via. Mace, the commercial framework partner. The Commercial partner will support with:
 - The commercial management of the main works design and construction.
 - all commercial assurance and contractual requirements.
 - monitor and control contractual changes.
 - manage commercial incentivisation and performance through the RDP mechanisms.
- 5.3.23. The partner supplying these is in place and is active in its role.


Ensuring a smooth Transition between PCF Stage 5 And Stage 6

Continuity of key personnel and the SLT

- 5.3.24. The continuity of key personnel across the scheme will be vital to supporting the smooth transition to construction. The Stage 6 organisation model will retain the CIP Sponsorship Director and the Scheme Project Director and Project Manager from PCF Stage 4/5 to ensure consistency in strategic decision making, as well as a number of core National Highways staff who have been involved throughout PCF Stage 4/5 to ensure retention of their knowledge, skills, and relationships.
- 5.3.25. Given the long duration of the Scheme, succession planning, and management will be crucial to ensuring the Scheme has a continuation of high-quality personnel. Succession Plans will be put in place for key National Highways roles on the Scheme such as the Project Director and Project Manager. In addition, key contracts such as the RDP (and therefore the DIP) include requirements for team development, retention, and succession planning to ensure the high performing team is sustained when staff leave the Scheme.
- 5.3.26. A bespoke Leadership Development Programme has also been produced in collaboration with an external consultant, based on lesson learned from the A14 Cambridge to Huntingdon project. This will be implemented to:
 - Further develop the behavioural and collaborative leadership skills of the SLT and OLT to lead their workstreams and create a collaborative winwin culture together which will increase the confidence in delivering the construction phase to the agreed scope, budget, milestones.
 - Support leaders to build and maintain an ambitious, positive and delivery focused culture, viewed as a great place to work, in order to maximise the retention and performance of the Stage 6 team which will be fully in place from Start of Works (SOW)
- 5.3.27. The project team has engaged with the DIP and the internal National Highways Business Partners to create a collaborative working environment in which dependencies and planning for deadlines are approached as an integrated team. This was evidenced by the results of the Senior Leadership Team Behavioural Management Framework (BMF) survey outputs which showed a strong 78% in leading behaviours, with some behaviours being fully leading or in the green category (by challenging and supporting each other). This collaborative working approach to delivering the Scheme will be built upon further by the DIP which also has a requirement embedded in their contract to undertake similar BMF activities to build an integrated project team.

Increased Capability and Resourcing of the DIP

5.3.28. The National Highways project team and the DIP (Skanska and Mott MacDonald) are currently co-located and work together as a fully integrated team.



- 5.3.29. The DIP Stage 5 team are fully resourced and ready to transition to Stage 6. They have produced a fully detailed staff resourcing schedule for Stage 6 and have been working with the Skanska central reallocation and recruitment team since February 2022 to:
 - Identify individuals who will be internally transferred to the scheme from other projects; and
 - Develop an external recruitment strategy for any positions that cannot be filled at the correct time.
- 5.3.30. Staff numbers in the DIP have increased from September 2022 from the previous c.30 FTE to c.100 at present, heading towards a peak of c.220 FTE by September 2023 as the project prepares for construction.
- 5.3.31. The majority of the key DIP Stage 6 staff will have significant experience from leading the successful delivery of the National Highways Tier 1 A14 Cambridge to Huntingdon project. This includes 7 of the 9 members of the DIP OLT team.

Early Enabling Works

- 5.3.32. The Scheme's procurement strategy incorporated lessons learned from other National Highways and nationally significant infrastructure schemes. This included learning from the A14 Cambridge to Huntingdon project which identified the need to deliver utilities and archaeology mitigation works early in order to de-risk the main works programme and support the smooth transition from the development phase into construction.
- 5.3.33. Prior to the enabling works being delivered, an extensive ground investigation and trial trenching exercise was undertaken. This served two purposes:
 - It supported the DCO examination and, acted on the lessons learned from the A14 project, it focussed the Archaeological Mitigation Strategy on specific areas rather than whole scale mitigation; and
 - It gave confidence on the amount of cost, resource and time required for the archaeology, to improve delivery. It gave confidence in carrying out the early enabling works.
- 5.3.34. Then followed a series of enabling works procured in PCF Stage 4/5 commensurate with the strategy outlined in the OBC. This included:
 - Archaeological Mitigation works was completed in a number of fields to support the gas main diversions described below and/or to de-risk sensitive locations to enable main works to begin promptly following the DCO decision by SoS.



- National Grid Transmission (NGT) High Pressure Gas mains diversion which completed in summer 2021 – serving the nearby Great Barford Power Station, the project (in collaboration with NGT) was delivered during a planned outage at the power station to avoid the cost of paying for an externally required further outage.
- Cadent Gas main diversion scheduled for completion in autumn 2023.
- 5.3.35. In Stage 5, Skanska was contracted to discharge overall Principal Contractor duties under an RDP contract and to lead on the enabling works surveys. They were also responsible for the security of the site and held the Overseeing Organisation Agent (OOA) role to support early engagement with utility companies on what was required in either the upgrading or diversion of water, electrical and oil supplies.
- 5.3.36. Undertaking these long duration activities, and building successful relationships with the utility companies, has enabled the main works construction phase to commence with all the necessary enablers in place and all the risks associated with programme clashes between the main works and enabling works removed.

Commissioning and Handover of Assets in PCF Stage 6

- 5.3.37. Handover of Strategic Road Networks (SRN) will be to the National Highways Operations Division (O/D) who will take responsibility for the operational maintenance of the assets throughout its remaining lifecycle.
- 5.3.38. Engagement commenced from the early part of Stage 4 to build on the learning developed on the A14 project where early planning and engagement with O/D throughout Stages 4-6 evidenced an increased efficiency in the handover, commissioning and effectiveness of the maintenance regime carried out.
- 5.3.39. The Scheme is engaging with the O/D as part of its progressive assurance process to build in clarity and alignment to the end of the construction phase, working closely with the respective asset leads who will approve their readiness for adoption.
- 5.3.40. As part of the wider engagement, the Scheme will be undertaking regular engagement with emergency services and traffic officers to ensure the necessary information, familiarity and understanding of the new assets is established.
- 5.3.41. The Scheme has also ensured involvement and continuity of knowledge from the staff that led the A14 project, in order to adopt the lessons learned about the design and its relation to land take, to ensure surplus land is kept to a minimum when designing road layouts to help expedite the schemes' ability to handover assets and move to Stage 7.



- 5.3.42. Planning for the adoption of the new local highways and junctions as well as walkers, cyclist, and horse-rider (WCH) provisions by local authorities has also been undertaken since Stage 5, building on the model and process used by the A14 project.
- 5.3.43. The Scheme has also fed in lessons learned provided by the Local Authorities with an agreed set of standards that have been shaped as part of a legal agreement between the A428 and the Local Authorities. This will allow a model to be followed that articulates the expectations and standards to be delivered by all stakeholders.

PCF Stage 7 Operational Model

- 5.3.44. Stage 7 represents the closeout of the project and the final elements of the scheme. This stage includes:
 - the final accounts.
 - a review of project effectiveness.
 - any remaining defect rectification; and
 - initiation of the Post Opening Project Evaluation (POPE).
 - closing, decommissioning and re-instatement of site compound(s)
- 5.3.45. Section 5.8 Benefits Management expands on the purpose of the POPE and how National Highways will monitor the realisation of the scheme benefits (as approved in the FBC) once the Scheme is open for traffic. Lessons learned from the A14 project will be used to ensure the effective delivery of Stage 7.

PCF Stage 7 Capability Requirements

5.3.46. The Operating model for this stage will be finalised towards the end of PCF Stage 6. This will include a continuity of personnel to ensure an effective closeout of the scheme by personnel owning the appropriate knowledge and history to support this.



5.4. Governance and assurance

5.4.1. This section details the approach being taken forward to ensure robust application of National Highways' and DfT's Governance and Assurance procedures which the Scheme must adhere to progress between stages.

Background

- 5.4.2. As a Nationally Significant Infrastructure Project (NSIP), due to size and complexity, the scheme is part of the Government's Major Project Portfolio (GMPP). The Infrastructure and Projects Authority (IPA) classifies the project as a Tier 1B scheme. The Scheme has been given this categorisation. Ultimate authority lies with the Secretary of State (SoS) for Transport at the DfT and the Chief Secretary to the Treasury (CST) at HMT.
- 5.4.3. As a Tier 1 project it follows the well-established governance and assurance pathways. This provides a clear distinction between decision making, assurance, co-ordination, and issue resolution.
- 5.4.4. Its assurance reviews since this date have therefore been undertaken by DfT (who have delegated these to National Highways Corporate Assurance), with the Business Case to be reviewed through a Treasury Approval Point (TAP) rather than a full Major Project's Review Group (MPRG).

The organisation of governance and assurance

- 5.4.5. The Scheme's Tier 1B Governance and Assurance regime has clear separation between decision making, assurance, issue resolution and co-ordination activities.
- 5.4.6. This regime was developed by National Highways in conjunction with IPA and DfT and ensures that the requirements for approvals defined by NH's Licence are adhered to in an efficient and effective manner.





Figure 5-1 A428 Project Governance and Assurance model



- 5.4.7. The Tier 1 governance and assurance covers three levels of defence. At project level, the Project Committee, chaired by the Senior Responsible Officer (SRO) is the primary decision-making forum and is responsible for monitoring progress, resources, risks, and project finances.
- 5.4.8. The SRO, National Highways' Director of Complex Infrastructure Programme, has clear delegated authority and is the ultimate decision maker within CIP. The CIP Sponsorship Director and scheme Project Sponsor are accountable to the SRO. The SRO is supported in the decision making by the other committee members and, where appropriate, technical experts. The SRO cannot make or delegate decisions that commit National Highways to:
 - Invest beyond what has been approved for the Scheme.
 - Extend beyond the approved scope for the Scheme.
 - Make decisions that would impact upon the economic dimension.
- 5.4.9. Any project decisions that go beyond set boundaries relating to cost, scope or programme changes are escalated to the relevant National Highways Committee. For example, the Project Committee escalates programme related matters to the CIP Programme Committee.
- 5.4.10. As noted above, as a Tier 1 project, the ultimate authority to invest is granted by the DfT's SoS and the Chief Secretary to the Treasury. Prior to the Ministerial submission, approvals must be given at all levels of defence the approval sequence is set out in Figure 5-1 above.
 - Project Committee level 1.
 - National Highways' Investment Decision Committee (IDC) level 2.
 - National Highway's Investment Committee (IC) (a sub-committee of the National Highways Board) or the National Highways Board.
 - DfT's Investment, Portfolio and Delivery Committee (IPDC) level 3A.
 - DfT and His Majesty's Treasury (HMT) Ministers level 3B.
- 5.4.11. To facilitate the above, DfT is represented at several governance bodies, including the Project Committee. The sponsorship team also meet regularly with HMT (as well as the DfT and IPA) to provide updates on project progress and detail as needed. This ensures transparency and an ongoing shared understanding to support progressive assurance.
- 5.4.12. The multi-organisation membership across decision making, co-ordination, issue resolution and assurance meetings and groups provides for regular project related interaction and collaboration across the National Highways, DfT, HMT and IPA. Other government departments attend as required.



Updated Full Business Case Approval (uFBC) Approval

- 5.4.13. The FBC was approved by NH, DfT and SoS Ministers on the basis that there would be no delays due to the DCO process. Following the granting of DCO, the CST approval was on the basis of no JR.
- 5.4.14. Given the JR claim has been refused permission by the Court twice (in January and March 2023) and to minimise the impact of further delays, the Scheme will commence Tier 1 governance for the updated FBC update in June 2023 with National Highways endorsement to be sought in June 2023 and DfT's IPDC in July 2023. The Scheme will then seek Ministerial approval in August and September 2023.

Project Control Framework (PCF) and project assurance

- 5.4.15. The Scheme follows the Major Projects PCF process which sets out how National Highways, together with DfT, manages and delivers projects of over £10 million capital value. The PCF is designed to ensure that National Highways delivers road schemes which meet its customers' aspirations in a consistent, cost efficient and timely manner. It defines responsibilities and deadlines, setting expectations in respect of outputs. These are assured through a series of gateways, Stage Gate Assessment Reviews (SGARs), across the life of a project.
- 5.4.16. The PCF process sets out a clear structure for the project life cycle which has influenced the operating model defined for each stage. Three phases (options, development, and construction) are broken down into seven key stages as shown in Figure 5-2, which also shows the SGARs and independent assurance reviews.
- 5.4.17. These reviews are recorded in the Integrated Assurance and Approvals Plan (IAAP). This is a quarterly submission which accompanies the Government's Major Projects Reports (GMPP), setting out the planning, coordination and provision of assurance activities and approval points throughout the project lifecycle.



Figure 5-2 PCF Process Overview - SGARs, Independent Assurance Reviews, and Operations Technical Leadership Group



Stage Gate Assessment Review (SGAR)

- 5.4.18. At the end of each stage the SGARs provide assurance that:
 - The stage is complete.
 - The PCF process has been followed.
 - The scheme is ready to proceed to the next stage.
- 5.4.19. SGARs cannot be further apart than 1 year. Therefore, where a project stage is longer than this period, an interim SGAR is held.
- 5.4.20. SGARs are evidence-based reviews that draw on documentation to demonstrate that the scheme is equipped to accomplish its objectives. The completed and planned SGARs for the scheme are as set out in Table 5-2 Planned SGARs for the Scheme.
- 5.4.21. The PCF Stage 4 Interim SGAR rating of Amber in February 2022 reflected the Review Manager and Sponsor's concern that the project had not demonstrated sufficient progress in planning for product completion to achieve a green rating at SGARs 4 and 5. This position was corrected at the second interim SGAR in June 2022 by the project implementing a robust PCF product tracking tool using a PowerBi dashboard. This enabled early identification and resolution of potential delays to the PCF products ensuring the project addressed concerns ahead of the second interim SGAR 4 in June 2022 and subsequently the full SGAR in September 2022.



- 5.4.22. The project completed PCF Stage 5 as planned and a SGAR 5 was held in November 2022 which confirmed all products were in place however due to the outstanding risk of legal challenge and the project could not proceed therefore, the project was awarded a Red outcome. Now that the risk of the DCO being quashed has been extinguished a final SGAR5 will be held in September 2023 looking only at any products which have been updated or become time expired since the interim SGAR5. Prior to the issuing of the Notice to Proceed and the Start of Works.
- 5.4.23. The PCF process requires all schemes to present their operational solution to the Operations Technical Leadership Group (Ops TLG) at PCF stage gates 3, 5 and 7. The review by Ops TLG places focus on operational, safety and maintenance issues, helps the scheme develop consistent approaches and ensures knowledge is shared across project teams. The Scheme was reviewed by Ops TLG in line with the appropriate PCF stages and a certificate of compliance issued, this was February 2021 for Stage 3 and July 2022 for Stage 5, respectively.
- 5.4.24. In order to utilise as much as of the 2023 earthworks season as possible, the Start of Works was scheduled four months after the granting of DCO powers, a much shorter period than normal. Accordingly, Stage Gates 4 and 5 are also relatively close and as a consequence, much of Stage 4 and Stage 5 work has been completed in parallel. Some SGAR products were brought to only one of the SGARs rather than both. This approach was endorsed by the product owners, the Sponsors, and the PCF team.



Assurance Milestone	Phase	Forecast/ Actual Date	Status
SGAR 2 (interim)		July 2017	GREEN
SGAR 2	Ontion Selection	September 2017	RED
SGAR 2 (close out)	Option delection	January 2018	GREEN
SGAR 3 (interim 1)		May 2019	GREEN
SGAR 3 (interim 2)	Preliminary Design	August 2020	GREEN
SGAR 3		February 2021	GREEN
SGAR 4 (interim 1)		February 2022	AMBER
SGAR 4 (interim 2)	procedures	June 2022	GREEN
SGAR 4 (full)		November 2022	GREEN
SGAR 5	Construction Preparation	November 2022	RED
SGAR 5 (interim)	Construction Preparation (de-risk products)	2023	Live
SGAR 5 (full repeat)	Construction Preparation	2023	Live
SGAR 6 (interim 1)		2024	Live
SGAR 6 (interim 2)	Construction Commissioning and Handover	2025	Live
SGAR 6 (interim 3)		2026	Live
SGAR 6 (interim 4)		2027	Live
SGAR 6		2027	Live
SGAR 7	Closeout	2028	Live

Table 5-2 Planned SGARs for the Scheme



Independent Assurance Reviews

- 5.4.25. The Scheme has been subject to a number of independent assurance reviews. Firstly, there have been Gate Reviews, organised by IPA and run by specialist external reviewers at key points in the delivery lifecycle. These reviews are timed to support requests for funding and business case approval and therefore normally occur shortly before an IPDC authority request.
- 5.4.26. Going forward, following the change in IPA assurance practice for Tier 1B projects in late 2021, these reviews will still be run by external experts but will be organised by National Highways Corporate assurance on behalf of the DfT.
- 5.4.27. Secondly, up and to contract award, there have been an independent Commercial Review organised by the CIP Sponsorship and Commercial Directors.
- 5.4.28. Each review results in a series of recommendations. Actions to address recommendations are planned and tracked, aimed at increasing the level of delivery confidence in the scheme. A log of these recommendations and associated actions and responses is included in all authority requests to IPDC. Sets out the independent assurance reviews that have been carried out to date.

Business Case Governance and Assurance

- 5.4.29. In October 2019, IPDC (formerly BICC) approved the A428 Outline Business Case which subsequently received Ministerial approval. Alongside this approval was the setting of 5 "Trigger Points" based on changes in cost, benefit, schedule, scope, or funding.
- 5.4.30. These trigger points provide an early warning of material changes to the project that could undermine its success, to ensure that preventative action and / or timely decisions can be made. If these triggers are reached, the project must present its proposed next steps for approval to IPDC.
- 5.4.31. In May 2021 a below the line paper was submitted to IPDC which advised that as a result of delays in the DCO process, the revised Start of Works milestone of Q2 2022/23 was in breach of the Schedule Trigger point. The revised Start of Works milestone would therefore be Q3 2022/23.
- 5.4.32. In July 2022 IPDC approved a new set of Trigger Points based on the revised cost estimate and schedule. A sixth Trigger Point, a combined cost / benefit measure was also introduced.
- 5.4.33. In March 2023, IPDC noted that due to the delay caused by the legal action, the Benefits Trigger Point has been breached. In parallel to seeking the FBC update approval, the Scheme will also seek to rebaseline and approval of a revised set of Trigger Points as set out in Table 5-3.



Ref	Criteria	Trigger Points	Baseline	Impact
1	Costs	Forecast costs rise by (5%)	Cost	Reduction in BCR
2	Benefits	Benefits fall by (10%)		Reduction in BCR
3	Combined Costs/Benefits	Any combination of costs rising and benefits falling that would result in the BCR dropping to below 1.5	1.63	Project may no longer be classified as Medium VfM
4	Schedule	A delay in project schedule that would result in an increase in costs in excess of 10% or failure to meet the SoW and OfT forecast date	SoW, Q3 2023/24	
5	Scope	A change in the project scope that would result in material change to the scheme as approved at DCO	Scheme as submitted within the DCO application	
6	Funding	If additional funding outside of what has been approved would be required.	As per HMT funding records	including Portfolio Risk

Table 5-3 Proposed Trigger Points as of July 2023.



Governance of Portfolio Risk Draw Down

- 5.4.35. As stated in the Financial Dimension at Section 3 DIP contract budget and strategic assumption risks, Scheme funding is split into two elements.
- 5.4.36. Core funding of **Contract** is delegated to the SRO before Portfolio Risk Provision. This is equivalent to the total of the Contract budget, National Highways' cost (which sit outside the contract budget) and the most likely value outcome of National Highways Scheme strategic risks and uncertainties, called the Central Project Risk Provision. These are specific identified areas of uncertainty where the DIP can seek to increase the Contract budget. This is managed by the Scheme's change control process.
- 5.4.37. In addition to this, the Portfolio Risk Provision of **Contract** is for further extraordinary costs that would be allowable to be reclaimed under the Contract or under the provision of the Central Project Risk Provision if there had been sufficient funds. A transfer from the Portfolio Risk Provision to Core costs requires a release from the Central Risk Reserve and therefore requires IDC approval.
- 5.4.38. Prior to the request being presented to the IDC, a Change Control Form must be submitted and endorsed by the National Highways Change Control Steering Group so that the baseline can be updated accordingly.

Project Reporting

- 5.4.39. Project reporting will be conducted at various levels across the project in accordance with the A428 Operating Model and fed upwards into the CIP Reporting Drumbeat as well as various National Highways and Central Government reporting requirements.
- 5.4.40. As set out above, the scheme is part of the Government's Major Project Portfolio (GMPP) and reports quarterly to the DfT Tier 1 portfolio team.
- 5.4.41. Workstream level reporting is coordinated by Workstream Leads and all project level reporting is coordinated by the Project Management Office (PMO).
- 5.4.42. A business intelligence platform (Chrysalis) has been developed to enable a data driven single source of the truth visualisation which the project team can use to inform discussions and decision making.
- 5.4.43. The PMO delivers a robust monthly project rhythm of the Integrated Project Controls (IPC) items: Scope, Time, Cost and Risk along with Change Management. This delivers tight control, monitoring and analysis of each facet to allow effective decision making and communication of a single source of the truth KPIs / outputs. This governance model enables full collaboration between client, designer, and contractors (Tier 1 / 2) involved on the project. The project drumbeat is fed with data from key standard governance meetings:
 - Change Group (Scope).



- Clause 32 Review Meeting (Time / Schedule).
- Commercial Review Meeting (Cost).
- Risk / Opportunity Review Meeting (Risk).
- Workstream Leads Review Meeting (Time / Schedule / Cost / Risk).
- Project Executive Group (PEG).
- 5.4.43. Each of these meetings are fed with project rich data direct from source systems. This enables real-time analysis to drive a forward look meeting approach to:
 - Celebrate success.
 - Unblock existing issues.
 - Identify and mitigate risks, threats, and opportunities.
 - Identify potential emerging trends.
 - Empower decision makers to make timely decisions or escalate issues that require further support.
- 5.4.44. The data, available for collection, keeps growing and evolving with advancements in technology. Using lessons learnt from the A14 scheme, all data is sourced and processed through a complex data management set-up, with final presentation through Microsoft PowerBi Dashboards (Chrysalis). This ensures that all parties are accessing the exact same data and are able to independently analyse the data. There is no allowance to modify or deviate from the information dates, figures, or financial values, held within the database. The main data sets used for control includes:
 - Health & Safety statistics.
 - Observation inputs.
 - Milestones dates.
 - Schedule dates.
 - Weekly / 3-month lookaheads.
 - Planned Percentage Complete (PPC) scores.
 - Non-Conformance Reporting (NCR) Quality data.
 - Earned Value Management.
 - Design / Request for Information (RFI).
 - Escalate decisions.



5.5. Managing the delivery and implementation of the DCO

5.5.1. There are a number of processes which will be followed now the DCO has been granted and legal claims against it have been extinguished.

Pre-Main Works Activities

Compulsory land acquisition and issue of land notice

- 5.5.2. The DCO authorises National Highways the right over, or the compulsory acquisition powers to acquire land without owner consent and grant powers to use land temporarily. National Highways will acquire the majority of land required for the scheme through Compulsory powers awarded within the DCO. For areas of permanent land take, General Vesting Declaration (GVD) notices and will be served in October 2023 to support the construction programme for the main construction period. Notices for temporary land possessions will be served in accordance with the requirements of the DCO. Draft requirements stipulate 14 days' notice however this may increase to 28 days following submissions made by the NFU and decisions made on other schemes.
- 5.5.3. There are 664 individual plots of land required for delivery of the scheme, possessions will be a mixture of permanent, temporary and the ability to assign rights. Drawing on lessons learnt from the A14 Cambridge to Huntingdon and other schemes GVD notices will be served in batches. This will enable a degree of flexibility and reduce the risk of large-scale delays to the programme.

Discharge of the DCO requirements

- 5.5.4. A structured approach will be undertaken to consultation and approval of documents. This will involvement reaching agreement with stakeholders before submission and review with them on a regular basis. The discharge of requirements will be scheduled to support the enabling works and the main the construction programme. Many of the key activities proceed via the DCO approval, with no need for further approvals provided there is compliance with the pre-commencement plan and biodiversity pre-commencement plan. As the applicant, National Highways will remain responsible for submission of applications to discharge requirements. This will be supported by the DIP to ensure outcomes of technical engagement are captured.
- 5.5.5. The draft requirements as included within the final update to the Draft DCO, are categorised into pre commencement, main works and opening for traffic. These will be finalised when the DCO is made however, at the time of writing it was assumed there would be no material change.
- 5.5.6. Where necessary, critical enabling works will be carried out under local planning consent. These will however accord with Requirement 20, Pre-commencement plan.



- 5.5.7. Due to the powers awarded within the DCO to commence certain works once the DCO is made, there is no anticipated need for the partial discharge of requirements. The DCO once made for the majority of requirements, will require National Highways to formally consult stakeholders on relevant documentation and, where appropriate, amend the documentation in accordance with stakeholder comments prior to submitting a discharge application. Given that several requirements need to be discharged prior to the commencement of the works, any delays to the completion of stakeholder consultation risks causing a delay to the construction programme. Such delays could result if stakeholders are unable to review the consultation material within the agreed timescales.
- 5.5.8. In order to mitigate this risk, National Highways and the DIP will continue to work with the key stakeholders named within the DCO to agree a programme of consultation that is reflective of their available resource, supports the discharge of requirements and meets the needs of the project. In recognition of the fact that such a programme is likely to be subject to regular revision, stakeholders will be informed of changes to the agreed programme monthly.

Consultation Reports and Summary Reports

- 5.5.9. When formally consulted on DCO requirement documentation, stakeholders will receive a large volume of material to review. Should the documentation be amended following consultation and re-issued, the accompanying consultation report will explain how stakeholder comments have been addressed.
- 5.5.10. Summary Reports are submitted alongside the requirement discharge applications. Early consultation, representation of the full narrative of consultation comments and National Highways' responses, and the Summary Reports serve to mitigate the risk of discharge delays by assisting the approving body in reaching an informed decision.
- 5.5.11. To ensure transparency and continued collaboration, promptly after submission of consultation and summary reports to the Secretary of State for approval, National Highways must provide a copy of the summary report to the relevant consultees referred to in the requirement in relation to which approval is being sought from the Secretary of State.



Approval of discharge applications

5.5.12. The process of managing the discharge of DCO requirements is defined within normal National Highways governance PCF stage 5. All discharge applications are to be approved by the SoS, but this is often in consultation with the Local Planning Authority (LPA), Local Highways Authority (LHA) office, or another statutory body, such as the Environment Agency. The process of approving discharge applications can be time-consuming. The SoS may take up to eight weeks to communicate a decision and may augment determination timescales by requesting further information to be provided to assist them in making their decision. However National Highways has sought to further de-risk the discharge process by ensuring appropriate contingency has been built into the Scheme's programme, to reduce the impact of issuing a revised construction commencement date.

Side Agreements

5.5.13. Alongside the DCO, National Highways is also negotiating additional agreements with the Joint Cambridgeshire Authorities, Central Bedfordshire Council and Bedford Borough Council. For example, the approval of detailed design proposals for local roads must be sought prior to the commencement of scheme works. These agreements are well progressed and are expected to be complete prior to the DCO decision.

Permits and licences outside the DCO

- 5.5.14. Although the DCO serves as the principal consent for the scheme, additional consents are required outside of the DCO. Examples include a badger sett closure licence and the Great Crested Newts District Level Licensing Scheme.
- 5.5.15. It will remain the obligation of National Highways to obtain protected species licences. The responsibility for obtaining other consents such as discharge or abstraction permits will lie with the DIP.
- 5.5.16. Since it can take up to four months for the Environment Agency to determine a permit application, with no guarantee of approval, to mitigate this risk, National Highways worked closely with the appointed DIP to apply their technical knowledge, experience, and stakeholder relationships to ensure that proposed designs and associated method statements meet the required standards for approval.

Amendments to the DCO

- 5.5.17. No amendments are currently being considered. If the contractor is unable to comply with DCO requirements, or identifies a change in the design that will be more cost effective, the following DCO applications are considered:
 - Non-Material Change Order (NMCO) allowing minor changes to the DCO to be applied following assessment with regards to necessity, benefit, and impact on delivery.



- Material Amendment Order (MAO) allowing substantial changes including the addition of land, or materially new or different impacts than those assessed in the original Environmental Statement, requiring preapplication consultation and an examination process only slightly shorter than the DCO process.
- A new DCO where the project's scope or objectives have become fundamentally different.
- Town & Country Planning Act (TCPA) application for development on land outside the DCO red line boundary requiring local planning authority planning permission but not needing compulsory acquisition or temporary possession powers.
- 5.5.18. There have been no NMCO, MAO or TCPA applications submitted (save in respect of enabling works) to date.

Post Discharge of DCO Requirements

- 5.5.19. Once the necessary requirements are discharged, consents are acquired, and the works on site are in progress, the DIP are required to submit evidence to National Highways. Their Environmental Specialists will determine compliance against the mitigation measures set out in the documentation such as the Second Iteration EMP as part of Project Governance, defined by PCF.
- 5.5.20. This will be achieved through the actions of the following key individuals named in the FIEMP: the Project Manager, the Environmental Manager, the Environmental Clerk of Works, the Ecological Clerk of Works, the Archaeological Clerk of Works, and the Landscape Specialist.
- 5.5.21. Prior to handover by the main works contractor, for every DCO requirement discharged by the approving body for enabling works and the main works, the contractors must:
 - Provide evidence to National Highways environmental, ecological, and archaeological clerks of works that the DCO agreed plans and procedures are in place and comply with the AMS and FIEMP, for example, they deliver community mitigation and protection such as noise, dust, and traffic monitoring, required by the CEMP during the Works, as per the FIEMP (DCO Requirement 3).
 - Work with National Highways on the other side agreements, for example, on the handover of local roads and the de-trunked A428 to Cambridgeshire County Council, and Bedford Borough Council, and complete the land ownership requirements, liaising with landowners and consultees as required.



5.5.22. The monitoring of ongoing compliance with the Second Iteration EMP during the handover to National Highways is the responsibility of the DIP. A specialist Ecological Clerk of works will be appointed to support and provide suitable evidence that roads are operating within the environmental factors level agreed for noise and air pollution, for example.

5.6. Stakeholder Engagement and Communications

- 5.6.1. This section summarises how the stakeholder engagement and communications activities are being planned for the forthcoming DCO decision and construction thereafter. It sets out the strategic approach to engagement, the structure and the communications planning which will support this.
- 5.6.2. It also outlines how throughout every phase of the project, communication and stakeholder engagement has been designed to capitalise on the existing widespread support for the project and to continue to build advocacy.
- 5.6.3. Our strategy and plans continue to build on this as the Scheme moves towards the construction phase, ensuring it meets not only the requirements of the PCF, but serve our stakeholders, customers and all audiences with the best and most timely engagement and communications possible.

Engagement and Communications moving towards DCO and construction

- 5.6.4. On completion of the Preferred Route Announcement (PRA) the project team created a new Stakeholder Engagement and Communications Strategy (SECS) and a number of supporting plans and documents:
 - Statutory Consultation Strategy;
 - Key Points Brief and Key Messages House.
 - Stakeholder Tracker/Map, complemented now by the use of the Customer Relationship Management (CRM) system.
 - Project Consultation Plan (PCP); and
 - Q&A summary (appended to the SECS).
- 5.6.5. These documents formed the basis of all activity throughout each phase since the PRA and were updated at every milestone including statutory consultation and throughout the Stage 4 DCO period. The current suite of communications and stakeholder engagement products are shown in Figure 5-3.





Figure 5-3 Stakeholder Engagement and Communication

- 5.6.6. Other key upcoming events will be the pre-construction public information events. The plan is to use not only local community venues, such as village halls in key communities along the route, but also to take the Public Engagement Van (the Scheme's mobile visitor centre) on the road to other areas where there is high footfall. These events will ensure the Scheme maximise the opportunities to answer any questions, allay any fears and listen to the publics concerns as it prepares the local communities for the impact of the construction phase.
- 5.6.7. The Communications and Engagement Plan shows how the communications activity will be aligned to the construction milestones and maximises every opportunity to support the National Highways corporate communications strategy, and its two pillars: 'Roads for good' and 'Safer roads.' This will include communications work to explain how the Scheme is supporting the decarbonisation agenda and working to further protect the environment.
- 5.6.8. To improve communications, the Scheme has developed its own:
 - Channels to communicate creating videos, animations, and re-purposing the A14 Cambridge to Huntingdon project's social media channels.
 - Innovative communications activities including a Minecraft version of the Scheme, to share information and inspire pupils in the STEM arena.
 - A series of podcasts and blogs about the early archaeology on the Scheme, working with our archaeological contractors.



Strategy objectives

5.6.9. The objectives of the SECS are to:

- Gain further key stakeholder support and advocacy for the Scheme.
- Gain interest from stakeholders who have not yet engaged on the Scheme and to further establish robust stakeholder relationships with those who have previously participated.
- Ensure public understanding and acceptance of the design and decisionmaking processes, addressing any misinformation around the Scheme proposals.
- Illustrate the benefits of the Scheme in the wider regional context, including its links with all nearby towns and villages and other upcoming schemes e.g., East West Rail; and
- Understand stakeholder and local community views on the potential to deliver a Scheme with legacy benefits that other stakeholders can further develop.
- 5.6.10. To implement this strategy, the Scheme will operate to the following principles:
 - Work with our key stakeholders to help them act as public advocates of the Scheme by providing platforms for them to show their support.
 - Provide information in a variety of formats, evidencing this in the project Equality Impacts Assessment ("EQIA"), to ensure accessibility and financially supported stakeholder engagement for non-statutory input.
 - Fill any potential local information vacuums with ongoing communication with local communities about the project and provide a route for people to ask the project questions and find out more.
 - Maximise opportunities to ensure broad support for the Scheme from all other stakeholders.
 - Proactively engage local communities, the public and road users to increase understanding of and buy into the need for the Scheme and the benefits it can bring; and encourage advocacy of the Scheme.
 - Demonstrate how feedback from all is being taken into consideration and responded to; and
 - Control the media narrative through regular updates to promote Scheme news coverage in the local, regional and trade media (using archaeological surveys, maximising interviews, and thought leadership pieces in the local media and trade media).



Stakeholder mapping and engagement approach

Stakeholders

- 5.6.11. There are a broad range of stakeholders including national and local government, statutory bodies, landowners, and communities as well as internal National Highways stakeholders such as the Operations Directorate.
- 5.6.12. There are more than 130 consultee groups, councils, organisations, and government departments with which the Scheme continues to engage. This includes:
 - Local emergency services
 - Community groups
 - Parish councils
 - Business support groups
 - Walker, Cyclist and Horse Rider ("WCH") groups (including Sustrans and the Disabled Persons Transport Advisory Committee)
 - Environmental groups (such as Rural England, the Forestry Commission, Historic England and the Canal and River Trust)
 - Government bodies (such as the Department for Transport, DVSA, and the Local Government Association).
- 5.6.13. The Scheme will engage with all parties with an interest in the Scheme, such as the National Trust, RSPB, Design Council and CBI East of England.

Engagement Approach

- 5.6.14. As in previous stages of the project, the stakeholders are grouped into four tiers based on their potential influence and impact on the success of the Scheme, as shown in Figure 5-4.
- 5.6.15. Tier 1 stakeholders are deemed critical to the success of the scheme and include the DfT, HMT and the Strategic Stakeholder Board ("SSB") and the host Local Authorities.
- 5.6.16. Tiers 2 and 3 stakeholders are engaged by other means, such as presentations and community forums on specific matters.
- 5.6.17. The project team works closely with local authorities to understand the Hard to reach (Tier 4) groups and the best means of engaging with them to ensure they are kept informed about the Scheme.





Figure 5-4 Categories of Stakeholders

- 5.6.18. The Communications and Engagement Plan identifies all stakeholders and customers within these tiers.
- 5.6.19. The support of key stakeholders is critical to the Scheme and will set the bedrock for successful community relationships during the construction phase. The relationships that have been developed to date will continue to be strengthened throughout the lifetime of the project.
- 5.6.20. Detailed supporting implementation plans setting out the engagement activities to be delivered at key milestone during the construction phase will ensure the Scheme focuses on the customer objectives alongside the Client Scheme Requirements ("CSR"). These include a structured approach to engagement with local authority members, for not only those on the Scheme SSB but also the Ward members who represent communities along the route. The engagement activity will continue to be agreed with the Project Executive Group ("PEG").



Stakeholder Working Groups and Forums

5.6.21. The structure of engagement with Scheme stakeholders is shown in Figure 5-5.



Figure 5-5 Structure of Stakeholder Groups

Strategic Stakeholder Board (SSB)

- 5.6.22. The SSB includes elected and officer representatives of impacted local authorities and DfT Policy Team, the Terms of Reference ("ToR") of which include:
 - collectively provide constructive challenge to the strategic direction of the project to ensure successful delivery of the project and its intended outcomes; and
 - receiving regular updates on the emerging issues.
- 5.6.23. It receives regular updates from the Technical Working Groups who each have their own ToR. Progress from these groups is reported to the PEG where decisions can be made by the Scheme's Project Director or the Senior Responsible Owner ("SRO").
- 5.6.24. The SSB brings together key stakeholders with a shared interest to discuss and find potential solutions to issues arising from the scheme. Membership and TOR of SSB are refreshed at regular intervals throughout the project life cycle to ensure correct representation and engagement.



Community Forums

- 5.6.25. The two Community Forums ('Western' and 'Central and Eastern') are information sharing groups made up of Parish councils and community representatives which meet quarterly. The meetings offer the groups opportunities to hear from specialists about specific areas and expertise as the Scheme moves forwards and into construction.
- 5.6.26. The Scheme has carried out extensive work to develop ideas for legacy and benefits throughout the DCO work. Designated Funds have already been secured for a number of projects including:
 - improvements to St Neots town centre
 - to support asks from the walking, cycling and horse-riding communities; and
 - to support feasibility work on a potential wetlands project for further environmental enhancements.
 - to support archaeological engagement for the enabling works which included interactive video blogs and schools' outreach
- 5.6.27. The forums will continue to work closely with local authorities and community groups to encourage ideas for further legacy project opportunities.

Community Investment, Social Value and Legacy

- 5.6.28. The National Highways Legacy and Benefits Lead for the project has produced a plan of local initiatives and activities which could deliver benefits to the communities. These are being actively discussed and pursued with Parish councils and local groups.
- 5.6.29. The plan will also comply with the Procurement Policy Note (PPN) 06/20 Taking Account of Social Value in the Award of Central Government Contracts. The DIP will contribute to support for Skills, Employment and Education locally, and work with National Highways to realise the existing Legacy Plan.

DfT and HMT

- 5.6.30. The Sponsorship Director leads the engagement with the Client Sponsor team in DfT and HMT. Stakeholder engagement is carried out by a combined team from National Highways, AECOM (to the end of PCF Stage 4), and the DIP (Stages 5 through 7), ensuring the correct level of seniority for each meeting.
- 5.6.31. The Scheme Communications Team works with the central National Highways Communications Team and DfT Communications Team to ensure smooth approvals and information release and to maximise opportunities to build and protect our reputation.



5.6.32. Stakeholder engagement activity and all correspondence is recorded and tracked using the Customer Relationship Management ("CRM") system, MS Dynamics 365, which records and manages all external project correspondence and ensures a detailed record is available.

Equality, Diversity, and Inclusion

5.6.33. To ensure the scheme complies with the requirements of the Equality Act 2010, an Equality Impact Assessment ("EqIA") PCF Product has been produced which is updated and approved at each PCF stage. This also provides evidence of National Highways' compliance with the Public Sector Equality Duty.

5.7. Meeting the needs of the customer

Meeting the needs of the customer

- 5.7.1. National Highways recognises that its customers want to feel safe, in control, stress free, listened to and that they can trust what they are being told. These sentiments underpin the National Highways' Customer Imperatives: to consistently deliver the basics, improve its service and network, and develop its relationship with customers.
- 5.7.2. The A428 Customer Plan defines how the scheme will deliver the Customer Imperatives through its Scheme-specific Customer Principles:
 - keeping traffic moving safely with minimal disruption
 - providing timely and accurate information
 - being a good neighbour
 - Helping walkers, cyclists, horse-riders, and vulnerable network users
 - Delivering better environmental outcomes
- 5.7.3. Figure 5-6 demonstrates how the A428 Customer Plan was developed from a hierarchy of National Highways' strategic and tactical customer commitments, the Scheme-specific requirements identified in the Benefits Realisation Evaluation Plan, and the Stakeholder Engagement and Communication Strategy and Plan (SECS and SECP). The DIP is required to produce and deliver a Customer Delivery Plan aligned to the A428 Customer Plan with the aim of delivering the Scheme-specific customer principles.





Figure 5-6 Process diagram of producing the A428 Customer Plan and Scheme Principles



- 5.7.4. An Activity Matrix supports the A428 Customer Plan. It identifies the desired outcomes under each of the five customer principles and the specific actions required to deliver them. A breakdown of the actions to be managed by the contractor is then provided in the DIP's Customer Delivery Plan. Outcome success is measured by the:
 - Scheme-Specific Performance Measures (SSPM) within the contract
 - Customer metrics relating to the National Highways KPIs, which are monitored by the Office of Rail and Road (ORR)
 - Internal Customer Performance Assurance Assessment (CPAA) where the scheme is scored against seven categories covering the principles outlined in National Highways Roadworks: A Customer View (RACV) toolkit and Dynamic Roadworks Vision Statement
- 5.7.5. The DIP's Customer Delivery Plan will be used by National Highways to manage contractor performance and assess against the National Highways Key Performance Indicators (KPI).
- 5.7.6. Table 5-4 lists the purpose and ownership of the key documents that will be developed and managed by the Scheme to successfully deliver National Highways' Customer Imperatives through its Scheme-specific Customer Principles.



Deliverable	Owner	Delivery	Purpose
A428 Customer Plan	National Highways	Customer Lead and project team	Outlines Scheme principles and how it will seek to achieve outcomes through the life of the scheme.
Customer Activity Matrix	National Highways	Customer lead, project team and contractor	Identify all actions required to deliver the Scheme customer outcomes and track progress in each phase.
Customer Delivery Plan	DIP	DIP	Details how DIP will deliver the Scheme's Customer outcomes during construction as per the A428 Customer Plan and Activity Matrix.
Stakeholder Engagement & Communications Strategy (SECS)	National Highways	Stakeholder Engagement and Communications team	Sets the overarching structure and strategic direction for Scheme stakeholder engagement and communications activity.
Stakeholder Engagement & Communication Plan (SECP)	Senior Communications lead	Stakeholder Engagement and Communications team	Sets out the stakeholder engagement and communications activities to implement during PCF Stages 5 & 6. This document will also detail how the project will keep the community informed on the progress of work, highlight potential areas of disruption, and provide a means for raising concerns.
Traffic Management Plan (TMP)	DIP	Traffic Safety and Control Officer	Outlines the Traffic Management strategies for the construction phase.

Table 5-4 Key customer documents



The customer

- 5.7.7. National Highways' customer is not solely those driving on the SRN, but anyone receiving a product or service from the Scheme and are therefore affected by National Highways services. The Scheme will be an integral part of customers' lives.
- 5.7.8. During the construction phase the customer is defined as the road user, including both motorised and non-motorised users.

Scheme Specific Customer Principles

- 5.7.9. Five customer principles are shown in Table 5-5; full details on the desired outcomes within each, and the Scheme specific actions to deliver the desired outcomes can be found in The A428 Customer Plan Full details of these actions are set out and monitored by the Customer Lead via the Activity Matrix.
- 5.7.10. The National Highways Customer Lead is responsible for regularly reviewing the documentation above to ensure alignment with National Highways' Customer Service Strategy, providing updates where necessary, and holding the contractor to account for the delivery of the customer requirements.

No.	Principle	Aim
1	Keep traffic moving safely, with minimal disruption	To reduce the number of people killed or seriously injured on the National Highways network and enabling individuals and families, from road users to the workforce, make it home safely.
2	Provide timely, reliable, and accurate information to National Highways' customers	To provide travel information in a multitude of channels to reach as many customers as possible, ensuring plenty of time is given (at least 7 days in advance) so journeys can be planned accordingly and working closely with project team to ensure information is always accurate.
3	Be a good neighbour to communities	To keep local people informed and respond to their concerns during and post construction.
4	Help walkers, cyclists, horse-riders, and vulnerable network users	To ensure the non-motorised user customer group is considered during design, construction, and operation of the scheme.
5	Deliver better environmental outcomes	To reduce the Scheme's environmental impact during construction and operation.

Table 5-5 Summary of Customer Principles



Monitoring Delivery

- 5.7.11. The DIP will prepare a Customer Delivery Plan in PCF Stage 5 that sets out how it will meet the objectives of the A428 Customer Plan throughout construction. The Customer Delivery Plan will ensure all staff:
 - with a customer-facing role received customer service training
 - are aware of the DIP's process for dealing with customers
- 5.7.12. In addition, the DIP's TMP considers potential impacts to journeys for all customer types. The effectiveness of the TMP will be assessed by the Traffic Management Forum.
- 5.7.13. The Traffic Management Forum will be attended by the project delivery team, members of the Stakeholder, Communications & Customer Team, representatives from the Local Highway Authorities (Bedford Borough, Central Bedfordshire, and Cambridgeshire County), National Highways Operations team and the Emergency Services.
- 5.7.14. The Traffic Management Forum will discuss works on the highway network relating to the Scheme, identify works taking place on the local highway network in the scheme vicinity, discuss any mitigations required for locally held events (for example Bedford River Festival) and to provide feedback from stakeholders, customers, and communities. The group will meet on a regular basis throughout construction to maintain communication with key stakeholders on traffic related matters, in line with the requirements of the OEMP, to:
 - Understand how the Scheme may impact on the customers and their travel needs in its vicinity, and the impacts of likely traffic changes on local communities during construction and in operation
 - Provide advice to help refine the management of the construction to best serve those needs, especially through the construction period

Measuring Success

- 5.7.15. National Highways' 5-year Delivery Plan (2020/25) outlines how the company's performance will be measured during RIS2. Three of the six performance measures include customer focused targets, these are: improving safety for all; providing fast and reliable journeys; and meeting the needs of all users.
- 5.7.16. The Scheme will manage the DIP's performance. The DIP will be incentivised in accordance with how well they score against the Scheme Specific Performance Measures (SSPM). The DIP will use evidence from the SSPM to complete the Collaborative Performance Framework documents (CPF). The CPF is a National Highways document with measures against each imperative: Safety, Customer and Delivery.



- 5.7.17. Within the Customer measure for the CPF, the DIP is required to complete the Customer Performance Assurance Assessment (CPAA) where the scheme is scored against seven categories covering the principles outlined in the RACV and Dynamic Roadworks Vision Statement.
- 5.7.18. The A428 Customer Plan provides the list of outcomes to be evaluated via the POPE in PCF Stage 7 in order show the final constructed asset has met the requirements of the Scheme's 5 customer principles.
- 5.7.19. Figure 5-7 explains how the scheme has set out to meet each of National Highways' customer focused performance measures and targets. Beyond the contractual performance measures above, the scheme will also use CRM data to gather customer insight and the Network Occupancy team will track performance against accuracy of roadworks information via their Network Occupancy Management System (NOMS) reports, which is issued to the project team on a monthly basis.

Figure 5-7 How the scheme will meet National Highways' customer focused performance measures and targets.





Handover during Operations & Maintenance

- 5.7.20. During construction, the DIP will take responsibility for the operational and maintenance requirements for the newly constructed sections of the A428, A421 and A1. To correctly operate and maintain this piece of the SRN, the DIP will need to develop a Detailed Local Operating Agreement (DLOA).
- 5.7.21. A DLOA will be produced by National Highways and the DIP and will record the agreement on the operational requirements of the road between the DIP, National Highways OD, Maintenance Service Provider, Lead Operations Manager and Senior Responsible Owner. The DLOA will consider which assets will be taken out of maintenance, and arrangements that will be put in place to maintain/operate them during the construction works.
- 5.7.22. The DLOA is critical in ensuring key stakeholders involved in the delivery and handover of the scheme have a common, and agreed, understanding of all parties' responsibilities. The agreement will include protocols and working arrangements which will be adopted and implemented throughout the delivery. The working arrangements are essential in ensuring that:
 - Effective operation of the network is maintained to a high standard
 - Minimal disruption is caused to the road user
 - National Highways has confidence that their obligations as operator of the SRN will always be maintained

5.8. Benefits Realisation Management

- 5.8.1. Benefits realisation management (BRM) is an important discipline in both justifying the reason the project should be delivered (i.e., the case for the scheme) and ensuring the full suite of benefits from the project are delivered.
- 5.8.2. The Scheme's approach to BRM is fully aligned to the principles and expectations of the Infrastructure and Projects Authority (IPA) guidance and National Highways Benefits Management Manual and takes lessons learned from the A303 Stonehenge project in the development of a non-hierarchical benefits map, a Critical Deliverables Matrix, and the Benefits Impacts Analysis.
- 5.8.3. This section of the Management Dimension outlines how BRM has been implemented on the Scheme, and how the Scheme is planning for benefits realisation.

Benefits Management Cycle

5.8.4. Figure 5-8 shows the 5-stage approach taken for BRM for all National Highways' projects. Each stage is briefly explained before it is applied to the Scheme.





Figure 5-8 Benefits Management Cycle

- Identify and quantify identify an exhaustive list of benefits and disbenefits against each of the strategic objectives of the Scheme, which are then refined, filtered, and prioritised to identify the most significant benefits.
- Value and appraise physically measure and evidence the most important benefits (Evaluation) and monetise the benefits that can be appraised in accordance with the Green Book 2020 guidance.
- Plan to realise develop and implement robust plans for the measuring and monitoring the realisation of each selected benefit.
- Work to realise develop and implement robust plans to ensure each of the scheme benefits are delivered.
- Review performance review how the project has performed in achieving its planned objectives, delivering the benefits claimed in the business case.



BRM within the Regional Delivery Partnership (RDP) Framework

- 5.8.5. Within the RDP framework, Benefits Management is a central delivery requirement for all DIPs. During the mobilisation stage, the DIP produced an execution plan for framework Benefits Realisation which sets out:
 - The strategy for delivering benefits management over the life of the RDP Framework contract period.
 - The processes to be used by our DIP to capture, appraise, plan, and deliver benefits, which is in line with National Highways Benefits Management Manual.
 - A suggested RACI (responsible, accountable, consulted, informed) approach for delivering the identified processes.
 - How benefits that contribute to National Highways' Key Performance Indicators will be managed.
 - How the DIP will co-ordinate and share knowledge effectively with other DIPs across the East region and more widely.
- 5.8.6. More specifically, the Scheme's DIP has made 93 commitments as part of their tender submission which are included within the RDP contract. The execution plan identifies commitments relating to BRM and describes the commitments relationship to BRM.
- 5.8.7. The aim is to work collaboratively and effectively, using the tools and processes set out by National Highways' Benefits Management Manual (BMM) and the RDP framework. This will enable the delivery of benefits that are both advantageous to stakeholders and that contribute to delivering National Highways strategic objectives and efficiency targets. This will be delivered within in the following ways:
 - Realising key benefits: combined with the drive to efficiency savings throughout design and construction, the DIP will seek to maximise scheme-level BCRs. RDP has an incentivisation process (Section 4.5, Commercial Case) that is in part driven by the delivery or exceedance of forecast scheme benefits and overall value for money.
 - Maximising contribution to customer benefits: implementation of actions set out in Section 4 of the Customer Benefits Realisation Plan to contribute to National Highways overarching KPIs.

Scope

5.8.8. To address some of the unique benefits of the Scheme, the scope of benefits management needed to expand beyond National Highways' standard approach, which is primarily focused on traffic-related economic benefits. New approaches were needed to identify, quantify, and monitor a wider range of benefits to include the contribution the scheme will make locally to the environment, communities, and economy following the lesson learned from the A303 Stonehenge project.


- 5.8.9. The approach to expanding the scope of benefits for the scheme is proportional to the scale of the total investment and the need to fully justify the Scheme's Value for Money (VfM).
- 5.8.10. To fully realise some of the non-traffic related benefits, such as for active travel, and to further enhance some of the scheme benefits through funding partnerships and the pursuit of longer-term legacy opportunities, strong external partnerships also needed to be established beyond the current road users.

Proportionality

- 5.8.11. A proportional approach has been taken to benefits management to ensure BRM does not create detail and complexity for its own sake, but only adds additional effort where it would add value. All benefits will be managed to a degree, but some more intensively than others.
- 5.8.12. Managing benefits requires the physical quantification, measurement, and monitoring of an individual benefit and is achieved by developing a suitable metric.
- 5.8.13. Some benefits already have well-used and robust methodologies for their quantification and analysis. Most of these benefits and methodologies are described in the DfT Transport Appraisal Guidance (TAG), and will mainly focus on environment, traffic, and safety. Other less conventional scheme benefits are not covered by TAG, and due to the size of the expected benefits these benefits have been identified for enhanced analysis and evaluation. The selection of the benefits chosen for enhanced work was based on a scoping exercise that reviewed:
 - The importance of the non-conventional benefit to the strategic dimension, and therefore the internal and external stakeholders of the scheme.
 - The government's priorities as highlighted in the 2020 Green Book review and DfT's strategic objectives (both referred to in the strategic dimension).
 - The likely scale of the non-conventional benefit, previously unquantified in the economic dimension for OBC, to improve the robustness of the appraisal, and strengthen the BCR and VfM for the scheme.
 - The need to address any misalignment between the scale of benefits described in the strategic dimension and those included in the economic dimension.
 - The robustness of methodologies being used in other sectors, being developed by other government departments.
 - The areas of greatest potential benefit to future National Highways projects.



- 5.8.14. The most significant non-traffic related benefits selected by the scheme for additional evaluation work were:
 - Wider Economic Benefits evaluating the impact of wider economics expected to deliver.
 - Customer Experience assessing how scheme impact the customer experience.
 - Community and Social Impacts evaluating the way the Scheme is delivered in 3 areas: Inspiring future careers, increasing local skills and employment and Increasing community investment.

Stage 1: Identifying and quantifying the individual scheme benefits

- 5.8.15. The individual benefits required from the Scheme were identified by first establishing the strategic objectives. This was achieved by compiling a list of the strategic objectives and priorities at each governance level from HMT, DfT, Client Scheme Requirements, National Highways' license and corporate strategies, the Scheme's specific performance and activity requirements, and stakeholder priorities.
- 5.8.16. This was then used to provide structure to the identification of an exhaustive list of potential benefits and dis-benefits from the Scheme, which was grouped, refined, and ranked to identify the most important benefits to the Scheme's stakeholders that could be directly attributable to the Scheme, and sufficiently quantified, measured and monitored.
- 5.8.17. Since BRM was first implemented in PCF Stage 3 of the project, the list of benefits built on the benefits identified in the OBC, and all the elements of the scheme that were committed in the PRA.
- 5.8.18. Logic mapping was used to interrogate the benefits to find common groupings, and to highlight where different analysis methods would be needed, or ownership split, between different contractors, project workstreams and National Highways departments. All benefits were classified into the National Highways benefit categories:
 - Improving safety for all.
 - Providing fast and reliable journeys.
 - A well maintained and resilient network.
 - Meeting the needs of all users.
 - Being environmentally responsible.
 - Achieving efficient delivery.



- 5.8.19. A list of 50 individual project benefits were developed and then rationalised into 20 benefit management groups which shared common interrelated themes, these are known as main benefits, 6 of which were "conventional" traffic-based benefit groups, and 13 which represented an expansion to the normal scope of benefits for a road improvement project.
- 5.8.20. A Benefits Map (Figure 5-9) was developed to provide an easily understandable visual representation of the link between the physical outputs of the scheme and the 20 main benefits that meet the scheme goals.



Figure 5-9 A428 High Level Benefits Map



Stage 2: Value and appraise the most important benefits

- 5.8.21. Having identified the 20 benefits and 50 sub-benefits a proportional approach was taken to the benefits which would be valued, appraised, and monetised.
- 5.8.22. Benefits appraisal requires the forecast quantity of an individual benefit to be calculated in accordance with the HMT Green Book 2020 guidance, and any new methodologies to be approved by DfT. For some benefits it is important to predict the scale of benefit realised from an investment to decide whether the investment is worthwhile and will sufficiently deliver on its objectives.
- 5.8.23. For most traffic-based benefits, this is calculated using TAG, based on traffic models and forecasts of future traffic flows and patterns.
- 5.8.24. For other benefits, the prediction of the scale of the benefit is calculated in other ways. For example, biodiversity benefits are predicted using Natural England's Biodiversity Metric and carbon quantities for construction are estimated using the National Highways Carbon Tool.
- 5.8.25. In order to justify the scheme economically in terms of the BCR, some benefits must be monetised. Within TAG there is a methodology for valuing the improved journey time for road users, but for new areas of benefit, the Scheme also considered if it would be proportionate to develop new monetisation methods. In the case for the Scheme, no additional appraisal work was deemed necessary over and above the conventional traffic model-based requirements.
- 5.8.26. However additional post-realisation Evaluation was planned to be necessary for the Scheme, over and above the conventional traffic requirements of the standard National Highways Post Opening Project Evaluation (POPE). This was required to strengthen the ability of the Scheme to measure, manage and evidence the scope of the benefits and to communicate them to the Scheme's stakeholders.
- 5.8.27. The additional Evaluation work will also be used to contribute toward the continuous improvement of Benefits Management within National Highways and across other government projects.

Stage 3: Plan to ensure activities to realise the benefits are in place

- 5.8.28. The Scheme is developing a robust plan to measure, monitor, and realise the benefits, using the following steps:
 - Connecting the benefits: identify the connection between the outputs of the scheme and the benefits.
 - Delivering the benefits: ensure the project deliverables will deliver the scheme benefits and are built into the delivery plans and contracts.
 - Protecting the benefits: protect the benefits from project change requests and unplanned risk events.



- Monitoring the benefits: measure real-time performance and to address any shortfalls against targets prior to project completion.
- 5.8.29. Benefit Profiles have been created for all of the most important benefits in terms of the metrics, monitoring approach, stakeholders, risks, and outputs.

Connecting the benefits

- 5.8.30. The relationships between the individual benefits of the Scheme and the scope of critical deliverables required during construction will be established using a Critical Deliverables (CD) matrix. The CD matrix will define the critical deliverables of the scheme as:
 - Activities delivered on the ground (such as a cycle way).
 - Facets of physical assets (such as the width of the cycleway being sufficient for both walkers and cyclists).
 - Ways of working (such as working hours limits to avoid noise at night).
 - Commitments (such as the number of apprenticeships created).
- 5.8.31. The principle of a CD matrix is to manage the complexity of the Scheme due to the large number of activities, owners and reporting lines required to deliver each benefit, which made the standard 'Benefits Register' approach unwieldy. This approach also makes it easier to digitise the information to support the Scheme's use of more advanced data management techniques.
- 5.8.32. The CD matrix will translate the strategic objectives of the Scheme, which informed the business case investment decision, with the project deliverables, time, cost, and quality measures, identifying positive, negative, and null relationships between them, and any relationships that may need further clarification over time.
- 5.8.33. The CD matrix will be structured around the logic maps which were originally developed to define each step in the logic chain from the project deliverables to the final benefits provided by the scheme, highlighting what each of the Critical Deliverable inputs and outputs are likely to be, and ensuring a comprehensive and systematic review of each of these inputs and outputs can be undertaken when signing off the scheme design and progress made and controlling the approval of any change requests.

Delivering the benefits

5.8.34. A key part of realising the benefits defined by the Scheme is to implement a plan and set out clear lines of responsibility for delivering the CD and provides detail of the required profiled benefit outcomes.



- 5.8.35. This will be managed by the Benefits Lead and National Highways Project Sponsor, working alongside the project team to reinforce the requirements of each benefit of the Scheme, ensure it is mapped to the project schedule of deliverables for the DCO design, and to the delivery contracts, and to support the audit and sign-off of deliverables and their associated benefits at each project milestone.
- 5.8.36. The CDM will be used at major project milestones to facilitate benefits-led decision making at a project level and to validate:
 - The detailed design validate the benefits are fully planned to be realised.
 - The delivered outcomes validate the benefits have been delivered in full and to the correct quality.
- 5.8.37. The delivery of benefits realisation is embedded into the project team alongside the time, cost, and quality requirement, and will work closely with the National Highways Sponsorship team to maximise further outcome opportunities.

Protecting the benefits (from risk and change)

- 5.8.38. A risk to the realisation of the planned benefits is a change to project scope during either the design and / or delivery of the construction phase.
- 5.8.39. The CD matrix will be integrated into the Change Control process, which is managed by the Project Management Office, to ensure it is reviewed before any changes are approved.
- 5.8.40. If elements of the Scheme impacted by the change request are identified in the CD matrix, a Benefits Impact Analysis will be completed by the Benefits Lead for the change request, to inform decision making at the Change Group (Section 5.14).
- 5.8.41. Based on the need for the change and the impact on the benefits of the Scheme, the Change Group will decide on the most appropriate action to:
 - Tolerate the change to 'accept the change' and the impact to the benefit.
 - Treat the change to 'accept the change' but the scheme is required to mitigate the impact to the benefit to an acceptable level.
 - Transfer the change to transfer the change to a body outside of the project which has control over or can absorb, the impact to the benefit, or to escalate the change decision to a higher level of delegated authority.
 - Terminate the change to 'reject the change,' and request that alternative options are considered.



- 5.8.42. If a change to the Scheme deliverables is agreed at the Change Group by the Project Director (or the delegated representative), then the CD matrix will be updated by the Benefits Lead and Change Request will be incorporated into the delivery plan for the scheme by the Project Manager. This is further explained in Section 5.14, specifically in Figure 5-14. The Benefits Lead will meet with the project teams and PMO Risk Management monthly to identify all the risks that may prevent realisation of the full benefits of the Scheme, as required by the business case and DCO design.
- 5.8.43. The Benefits Lead will also encourage the project team to identify opportunities to enhance the current benefits of the scheme in order to leave a more lasting longer-term legacy that can continue to grow after Scheme has been completed.

Monitoring the benefits

- 5.8.44. All benefits will be monitored to track progress against the baselines and targets. The intensity of the monitoring will vary between benefits, depending on its significance, ease of monitoring, and degree of influence the scheme has over it.
- 5.8.45. Proportionality is an important consideration in specifying the level of monitoring required (the metrics, frequency, different locations etc), with the level of effort needed aligned, to reflect the scale and importance of the benefits to the Scheme and its stakeholders. Where possible, the monitoring requirements will include the comparison of scheme real-time information with targets based on national benchmarks and trends (such as for cycling, local unemployment, and economic performance), internal benchmarks used in National Highways CIP projects, and industry standards identified from other projects and sectors.
- 5.8.46. The monitoring requirements have been prioritised based on an assessment of the:
 - Availability of existing data.
 - Degree of delivery team influence.
 - Level of strategic priority.
- 5.8.47. A reporting dashboard will be developed to monitor benefits during the construction phase, the dashboard will focus on benefits requiring the most intensive management.

Stages 4 and 5: Realise and Review to validate benefits delivery

5.8.48. The Realise and Review steps will occur during and after completion of the construction phase of the scheme. Implementation of the plans will be developed and carried out by the Benefits Lead, on behalf of the Scheme's Project Sponsor.



- 5.8.49. National Highways recognises that the 'standard' POPE brief, designed for evaluating road schemes, needed to be enhanced for the Scheme, to reflect the addition of non-traffic related evaluation works, and to capture the additional data and lessons learned from the design and delivery of the scheme. The standard POPE brief is to:
 - Validate the traffic model and the calculation of journey time savings, economic benefits, dis-benefits etc.
 - Compare predicted accident benefits with the STATS19 road safety reports.
 - Validate the approved design has been delivered by, for example, evidencing the physical existence of crossing points or areas of habitat.
 - An evaluation scoping study was undertaken at the beginning of PCF Stage 4 to identify the scheme benefits that should warrant more intensive evaluation development to ensure the level of evaluation is proportionate. Therefore, in addition to the 'standard' POPE brief, the project will also evaluate the 3 additional key areas; customer, social value and wider benefits.

<u>Handover</u>

- 5.8.50. Finally, to ensure a smooth handover to the National Highways Operations team and the Evaluation team, post-opening of the Scheme, all monitoring tools and relevant information will be summarised, linked, and clearly signposted in the BREP to enable everything to be clearly and concisely recorded and accessible in one central report. Our approach is to work collaboratively and engage early in the project life cycle to ensure best practice is applied at an early stage.
- 5.8.51. Monitoring and evaluation work during the project through to OfT is funded by the Scheme, which then passes to National Highways CIP Sponsorship Director for post-opening years 1 and 5, and then to National Highways Evaluation Team from year 6 onwards.
- 5.8.52. The CIP Sponsorship Director is responsible for ensuring that benefits realisation and evaluation is properly handed over once the major project has completed.
- 5.8.53. The BREP will include information about the Evaluation of the scheme, which includes a commitment from the Project to carry out the 1yr and 5yr post-Open for Traffic data collection.
- 5.8.54. After 5 years Post Open for Traffic, the CIP Sponsorship Director is responsible for ensuring the Benefits information for the project is handed over to the Chief Analysts Division within Strategy and Planning, and that any remaining realisation activities (e.g., habitat establishment) is properly handed over to the East of England Operations region.



5.8.55. Once the benefits have been handed over to Strategy and Planning, the Chief Analysts Division can then use analysis from the Scheme to improve the delivery and business cases for future schemes.

Benefits Management roles and responsibilities

5.8.56. The roles and responsibilities of the National Highways scheme Project Sponsor, Project Director, Benefits Lead and the PMO in delivering the benefits management of the scheme are summarised in the BRP.

Enhancing the scheme benefits and leaving a positive legacy

- 5.8.57. In addition to the benefits of the scheme design in the DCO submission, an additional programme of activities is being implemented to enhance the benefits of the scheme and deliver additional and wider benefits for its key stakeholders.
- 5.8.58. This is led by the Strategic Stakeholder Board (SSB), formed to provide guidance on the strategic direction of the scheme and focus on the required outcomes. In relation to BRM and legacy benefits, it will focus on:
 - Monitoring and evaluating the project's progress towards the achievement of its objectives, including long term legacy ambitions for the local communities.
 - Challenging the Scheme on its management of risks, opportunities, and options, and provide a critique on its legacy proposals.
 - Monitoring the activity and outputs of working groups to ensure they are properly resourced, working efficiently and effectively, including managing shared ownership, and SSB members take responsibility to address any actions required of their organisation.
 - Maintaining oversight and ratifying any benefit suggestions/actions/plans which come out of the working group proposals.
- 5.8.59. Membership of the SSB consists of the key stakeholders of the scheme, which include National Highways, DfT, local authorities, England's Economic Heartland, Cambridgeshire Chambers of Commerce, Mayor of Bedford Borough and Mayor of Cambridgeshire and Peterborough combined Authority.
- 5.8.60. The SSB oversees several technical working groups to enable regular engagement and input, informed discussions, and advice to be shared between key stakeholders and National Highways for scheme development. It also oversees the A428 Legacy working group, to create additional sustainable outcomes aligned to local priorities and needs which are primarily funded by National Highways Designated Funds. The main purpose of this group is to work collaboratively and in partnership focussed on three themes to:



- Local Economy, Skills & Employment maximise Local Economy, Skills & Employment outcomes for local communities and collectively plan for regional economic grow
- Connected Communities develop and deliver a programme of activity to improve connectivity in Bedfordshire and Cambridgeshire, providing sustainable transport options as well as improving digital connectivity for communities
- Enhancing the Environment increase biodiversity and habitat connectivity, enhance the landscape and improve public access to green space as well as look at innovative solutions to work towards achieving carbon zero
- 5.8.61. Designated Funds are separate to National Highways' core work of operating, maintaining, and improving England's SRN and provide ring-fenced central funds to invest in and support initiatives that deliver lasting benefits for road users, the environment, and communities.

Scheme Social Value and Community Funds

- 5.8.62. A £2.0m commitment has also been made by the Project to support further social value opportunities and enhanced benefits during the delivery of the Scheme. This follows on from the lesson learned during the successful implementation of the Community and Legacy Fund on the A14 Cambridge to Huntingdon scheme.
- 5.8.63. To support additional social value opportunities and enhanced benefits, the scheme has ringfenced funding in the Stage 6 and 7 budgets:
 - £0.25m Community Grants Fund (plus £25k administration fee for Cambridgeshire Community Foundation)
 - £1.725m Project Social Value Fund

5.9. Carbon Management

Introduction

- 5.9.1. The development and implementation of a carbon management process is required to support low carbon infrastructure planning and delivery, to meet the stated aim of net zero by 2050, aligned with the Sixth Carbon Budget's Balanced Pathway to Net Zero.
- 5.9.2. The Government's 'National Infrastructure Strategy' (2020) (NIS) outlined its plans to transform the UK's infrastructure networks, including Carbon Net Zero Emissions by 2050 to put the UK on the path to meeting its net zero emissions target, by transforming infrastructure to decarbonise the UK's power, heat, and transport networks.
- 5.9.3. National Highways published the Net Zero Carbon Plan in July 2021, and the Scheme will implement a Carbon Management Plan (CMP) to support the commitments made in this plan.



- 5.9.4. The CMP will align to latest HMT and DfT guidance and IOS 44001: Collaborative business relationship management systems (formerly BS 11001).
- 5.9.5. In addition to the CMP the Scheme also has a Sustainability Strategy which sets out the principles the Scheme will apply to achieve our strategic objective to 'build a sustainable, responsible team that protects and enhances the environment, considering social and economic considerations'. The strategic objectives are aligned to National Highways' five capitals of sustainability and also work to support the National Highways net zero carbon plan 'Net zero highways: our 2030 / 2040 / 2050 plan'. The three core aims of Protect, Enhance and Legacy will help achieve our strategic objective.
- 5.9.6. The A428 scheme will be using the Stage 3 Environmental Statement baseline figure to measure the construction carbon against, and then will plan and implement best practice carbon reduction measures. These measures have been developed in conjunction with the main works Contractor, Skanska to deliver through the main works construction.
- 5.9.7. There is recognition that post Stage 3 there is limited ability to significantly influence carbon through initiatives that would result in material changes to the DCO. Our approach will be to capture better data during the A428 scheme to help deliver the carbon reductions for future projects and share lessons learnt.
- 5.9.8. The Scheme will use this improved data collection approach to drive design decisions that can help achieve carbon efficiencies in line with the Scheme carbon ambition and the constraints of detailed design and DCO.
- 5.9.9. The Scheme is engaging with a variety of suppliers and the National Highways Innovation teams to support the value engineering and design through procurement and trials of innovative materials and construction methodologies.
- 5.9.10. The CMP will link to the Scheme BREP which identifies all the benefits to be evaluated, appraised, and monitored by the Scheme.
- 5.9.11. Carbon management has been identified to be applicable to several of the Scheme benefits:
 - Benefit 6 (minimising scheme disbenefits) captures the disbenefits from the scheme including the tail pipe emissions.
 - Benefit 14 (improving the delivery of infrastructure projects) captures transforming the delivery of infrastructure projects, including sustainability, circular economy, and low carbon delivery.
- 5.9.12. Table 5-6 highlights the estimated carbon emissions for the baseline design within the Environmental Statement completed at PCF Stage 3.



Reporting Category	Emissions (tCO2e) (approximate)	% Construction emissions
Land Clearance (loss of carbon sink)	-5,850	-3%
Embodied carbon in raw material and transportation of materials to site	163,230	78%
Fuel used on Site	45,210	22%
Worker Travel	4,430	2%
Transport of construction Waste	1,180	1%
Disposal of construction waster	1980	0%
Total	210,180	100.00%

Table 5-6 A428 estimated carbon emissions

Carbon Management Plan

- 5.9.13. The Carbon Management Plan (CMP) for PCF Stages 5 and 6 sets out the framework for managing and reducing project-related greenhouse gas (GHG) emissions on the Scheme in the Regional Delivery Partnership (RDP) framework. The CMP at a project level supports the delivery of the carbon management strategy at a National Highways level.
- 5.9.14. The CMP defines the Scheme's:
 - Leadership, context, and capability
 - Collaboration and communication
 - Governance
 - Quantification, target, and baseline setting
 - Procurement
 - Opportunities, risk, change and assurance
 - Monitoring and reporting
 - Operations and handover



5.9.15. The CMP will be updated as the scheme progresses by the carbon management team within Mott MacDonald for the design and Skanska for the construction development and more detail is obtained for the later activities such as procurement (looking at low carbon materials and reducing material transport) and construction (looking at efficient on-site processes).

Leadership, context, and capability

- 5.9.16. The Scheme has committed to promoting a culture of carbon reduction and continual improvement through the implementation of specific tools, such as the D4RE workshop. It will commit to working collaboratively to deliver performance against the target and define a policy for collaborative working.
- 5.9.17. The CMP links with the need to follow the Infrastructure Project Authority (IPA) and National Highways requirements to identify benefits and look at a strategic alignment and objectives. The Scheme proposes a hierarchy of outcomes and objectives developed in accordance with the Client Scheme Requirements which are aligned to the governance and DfT's strategic priorities.
- 5.9.18. The SLT will ensure a review of CMP is undertaken, which will be reviewed at least annually, and cover the client team, the Delivery Assurance Partner, Commercial Partner, Preliminary Works, and main works Contractors.

Client Scheme Requirements	How it aligns with National Highways Strategic Business Plan (2020-2025) outcomes	Measures for success of objective
To protect the built and natural environment by mitigating the potentially adverse impact of adding additional capacity where technically feasible and economic to do so.	Delivering better environmental outcomes	Air quality, noise and visual pollution, biodiversity, carbon emissions
To enhance accessibility and reduce severance for non-motorised road users where technically feasible and economic to do so.	Meeting the needs of all users	Local community user feedback at community forums and consultations and technical working groups to assess demand for improved facility.

Table 5-7 Client Scheme Requirements – Environment and Community



Collaboration and communication

- 5.9.19. The CMP includes a clear communication and training requirements within section 4 which details out how the team will share the requirements internally with project teams via briefings, toolbox talks, and noticeboards and email bulletins as deemed appropriate.
- 5.9.20. Suppliers will be kept informed and be encouraged to share low-carbon solutions via Invitation to Tender documents and Tender Clinics initially.

Governance

- 5.9.21. The governance arrangements for carbon management will reflect the four roles outlined in PAS 2080. Within section 4 of the CMP the key roles and responsibilities are detailed and the importance they play in delivering a low carbon design throughout PCF Stages 5 and 6.
- 5.9.22. The Project Sponsor is responsible for working with the Project Team and internal and external stakeholders (such as DfT and the central National Highways carbon team) to agree the reduction target at a National Highways level and ensure a CMP is in place to support achievement of the target. The Project Director is responsible for achieving the target through construction.

Quantification, target, and baseline setting

- 5.9.23. There is no contractual target or commitments for carbon reduction as part of the Scheme, however the Scheme expects a target for reduction will be set with reference to strategic commitments asset out in the National Highways Net Zero Carbon Plan. The process for setting the target will be informed by recommendations provided by the DIP and in collaboration with National Highways Carbon Team on what opportunities for carbon reduction will be feasible without impacting the viability of the scheme. To support this, the project will use calculation based, bottom-up assessment of materials and energy estimates, including transport estimates, using the National Highways Carbon Tool.
- 5.9.24. The carbon baseline year will be Stage 3 Environmental Statement using the:
 - Bath Inventory of Carbon & Energy (ICE) version 3 (published 2019).
 - BEIS/Defra GHG gas reporting: conversion factors 2021.
 - construction carbon target for the scheme at PCF Stage 3 in 2021 is 208,380 tonnes CO2e; and
 - scheme reduction will be assessed against the Stage 3 Environmental Statement baseline.



Procurement

- 5.9.25. The RDP is required to use a renewable electricity tariff supply. They must also support the National Highways Sustainable Development Strategy, and meet requirements around energy efficiency, recycling, and waste management.
- 5.9.26. The Sustainability Strategy details the training that will be offered to staff and supply chain in relation to environment and sustainability topics. This will include carbon awareness training to help upskill all operatives with the goal of reducing carbon emissions.
- 5.9.27. Supply Chain forums will be held regularly to provide an environment whereby supply chain can share best practices and develop collaborative relationships with the goal of reducing carbon emissions.

Opportunities, risk, and change

- 5.9.28. The Risk Manager will work with the Project Manager with suitable technical support, to identify and assess risks to achieving the carbon target and identify suitable mitigations or contingencies.
- 5.9.29. Opportunities to reduce carbon below the baseline will be considered through the scheme's Change Group, and the assessment will include the 5 Capitals and Benefits Impact Analysis, along with time, cost, and quality.

Monitoring and Reporting

- 5.9.30. Construction carbon will be monitored throughout the construction period using the National Highways Carbon Tool. The DIP will make quarterly returns of how much materials and energy they are using, including transportation of materials.
- 5.9.31. Analytical techniques will be used on the carbon reporting to identify opportunities for reductions or risks to achieving the carbon target.
- 5.9.32. A Carbon Dashboard has been developed, containing information about the carbon returns, will be reviewed quarterly by the Project Executive Group. The dashboard covers the updated carbon impact of the design and is linked with cost of the design. It is broken down by the key assets across the project as well as by components within the assets. Information is available on the materials, construction plant and transport. The dashboard is available to all staff working on the project to enable the impact of the design changes on carbon to be better understood and support therefore integrate carbon within the change process.



Operations and Handover

- 5.9.33. Handover documents will include a carbon assessment of materials, especially for those pertaining to the majority of the footprint in order to allow for learning in early design and feasibility. New and low-carbon material specifications will be included within the handover to allow for operational requirements to be undertaken for longevity of the asset.
- 5.9.34. A comparison of initial design carbon footprint and as-built carbon footprint will be handed over and learning points will be reviewed for future projects with National Highways. The information will also be shared with the DIP to ensure that all parties are working towards the common goal of carbon neutrality.

Carbon Communication Plan

- 5.9.35. The project team will develop a Carbon Communication Plan led by the Communication Team and will publicise strategic messages from the scheme with regards to its plans to protect the environment and against climate change, supported by expert advisors, positioning how the scheme is focusing on Responsible Project Management and making positive, pragmatic decisions.
- 5.9.36. There will also be an internal communication strategy, including a carbon literacy programme to upskill the project team.

Reduce Road User Carbon

- 5.9.37. The largest component of the scheme carbon emissions (approximately 99%) is road user carbon. There is a clear government mandate to tackle user emissions. In conjunction with the CMP, the project team will work with its legacy working groups to propose solutions to support this in partnership with its stakeholders.
- 5.9.38. This will include promoting a change in driver behaviours such as increasing the use of electric cars by providing charging stations, supporting active travel ambitions to develop improved public transport, cycle and walk-ways.
- 5.9.39. A detailed road user assessment was undertaken at PCF Stage 3 Environmental Statement. The GHG emissions operational assessment adopts a scenario-based assessment, with the quantification of different scenarios to provide a range for the potential additional GHG emissions associated with Scheme operation.
- 5.9.40. These scenarios include:
 - a. A 'do-minimum' (DM) scenario whereby the Scheme is not implemented.
 - b. A 'do-something' (DS) scenario whereby the Scheme goes ahead and the GHG emissions reductions from embedded mitigation measures are taken into account.



- 5.9.41. A comparison of the GHG emissions for the DM and DS scenarios have been undertaken between the year of Scheme opening (2027) and for the lifetime year (2087), 60 years on from the opening year.
- 5.9.42. Further details and the results can be found in the Environmental Statement Chapter 14 Climate.

Further Innovations to reduce Carbon Costs

- 5.9.43. Effective carbon management relies on access to and management of accurate and consolidated data on carbon usage across the asset lifecycle. The scheme's digital requirements will ensure the Contractor uses a digital design approach, using tools such as the digital Project Information Model which is central to the capture of material and asset attributes, to help drive sustainable design and carbon reduction.
- 5.9.44. Carbon values data will be fed into the Data Hub/Lake) as shown where advanced data analytics is undertaken to allow the accurate quantification of carbon usage and trends. This will allow accurate and automated reporting of the Scheme's carbon return and enable the identification of opportunities to improve performance and reduce the scheme's carbon footprint across the scheme and full life of the asset. Optimised whole life asset management using BIM will also help to get the most from the existing asset, reducing renewal requirements by extending periods between major constructions activities.
- 5.9.45. Advanced data analytics will also provide opportunities for the rapid identification of carbon hotspots in different design and material options.
- 5.9.46. The capture of construction plant and vehicle telemetry including GPS equipment will provide opportunities to interrogate logistics plans, plant utilisation and idling and many other areas of construction activity to reduce scheme emissions.
- 5.9.47. A series of measures are being investigated to enable the reduction of the scheme's carbon footprint during the construction phase. These may include:
 - The use REGO certified renewable electricity.
 - Energy efficiency measures on plant and vehicles e.g., reduced idling, using driverless vehicles, portable and micro renewables e.g., reusable cabins incorporating solar panels and water hearing units, and switching from diesel to electricity.
 - Resources efficiency measures in the design and use of materials (avoiding the over-specification of material volumes and plant and reducing material waste (estimated 5-10% of carbon footprint).
 - Opportunities to reduce the usage of concrete, cement, steel, and asphalt on the roads e.g., decarbonisation of steel via material substitution or resource efficiency.



- The low-carbon fuels; and
- Hybrid and energy recovery technologies.
- 5.9.48. In the longer-term, post construction of the scheme, opportunities for further carbon reduction are being driven by the use and availability of electricity ports for customer vehicles, low carbon predictive maintenance and replacement plans and the use of alternate energy fuels such as hydrogen power.



Figure 5-10 Minimum cost route to Net Zero Carbon



5.10. Digital IT and Innovation Management

Introduction

- 5.10.1. Digital IT has been embedded into the scheme following lessons learned taken from the A14 project. This has been achieved by incorporating the requirements into the scheme contract documents to ensure it is integral to the delivery approach and the scope of works.
- 5.10.2. This section describes how Digital IT and Building Information Modelling (BIM) will support the delivery of National Highways three imperatives (Safety, Customer Service and Delivery) using a collaborative way of working, underpinned by digital technology to unlock more efficient methods of designing, building, and maintaining the scheme.

Driving a whole life asset management approach

Optimising asset performance

- 5.10.3. BIM provides a digital framework and processes to enable the capture and management of asset information (design, build, health and safety, materials, costs, risks etc) throughout the project's lifecycle, and the performance and maintenance of the asset during its operational lifecycle. The BIM execution plan (BEP) sets out the details for the project
- 5.10.4. The Scheme is implementing BIM in line with the National Highways Major Projects Employers Information Requirements (EIR) and ISO19650 international standards. The standard aims to optimise the time, cost and management of the design and development of the Scheme, develop a single set of asset data (specifications, performance, progress) to inform National Highways design and construction decisions, and provide an ongoing accurate reflection of the asset to help optimise future maintenance planning, renewals, health and safety, performance, and decommissioning
- 5.10.5. The DIP will be responsible for providing information modelling of the Scheme construction and supporting information flows as described in the BEP. At the end of the project, it will support the handover to operations by supporting staff training, providing greater visibility in controlling performance and safety, and enabling predictive maintenance and renewal interventions to be developed.
- 5.10.6. The asset performance and maintenance data, and the design and operating specification, will be transferred in a format consistent with National Highways Operational Management requirements.

Integration of asset data between contracts and project phases

5.10.7. The digital information created for the scheme will be designed to be transferrable in a way that eliminates re-interpretation and re-formatting of the data. The correct reuse and configuration of data will reduce the introduction of errors, misinterpretation and loss of data which can lead to programme delays, additional costs and the wrong decisions being made.



5.10.8. A consistent specification of digital data and information management requirements have been built into all enabling works and main works contracts to ensure a seamless transfer of information between contract parties during the design, construction, and handover, eliminating the waste, inefficiency and potential loss of information caused by managing paper-based records.

Managing scheme delivery

Design development and monitoring

- 5.10.9. The scheme will implement the digital design processes specified by the ISO19650 standard to optimise design and construction development. Access and exchange of information will use a Common Data Environment (CDE) to ensure only a single source of information is used to support design decisions.
- 5.10.10. This will result in time and cost saving opportunities by reducing the risk of errors caused by using inconsistent, out-of-date, or non-comprehensive data during the design phase with the potential to make even greater efficiencies during the construction phase by the avoidance rework and programme clashes between different works and contract parties.
- 5.10.11. The use of 3D and 4D model visualisations, and construction simulations, will help to reduce design time and support quicker and more effective real time multi-disciplinary design reviews between National Highways, its contractors, and its stakeholders. It will enable reviews to be conducted remotely and for designers from different disciplines to work together in a more integrated way to identify any potential coordination clashes early that could lead to construction rework, safety issues or compromise future operations as described in the BEP.
- 5.10.12. To provide confidence to the scheme that the main works contractor has the required capability in BIM, the BIM Execution Plan and the delivery of multidisciplinary design reviews were evaluated as part of the tender evaluation.
- 5.10.13. BIM will track and manage the evolution of the design and record all design changes. The greater capability to conduct multi-disciplinary design reviews will help to reduce the volume of changes required during construction and provide opportunities to identify and build in programme efficiencies. The visualisations tools will help the designers and construction teams coordinate their work and interactions, and regularly identify risks and issues as the design progresses.



5.10.14. A key lesson learned in BIM from the A14 Cambridge to Huntingdon project was the need to maintain the integrity of the project information and by better managing design changes during construction. BIM is a set of processes supported by technology. In recognition of this, the Scheme has established a Digital Lead role within the main works contract, responsible for implementing the processes and standards needed to realise the benefits from BIM and to drive the behavioural and cultural change needed to embed digital design throughout the supply chain in accordance with the contract.

Optimising construction sequencing

- 5.10.15. BIM will be used to test and validate construction sequencing in a virtual environment during the design and pre-construction phase.
- 5.10.16. This capability will help to determine the most efficient construction sequences to minimise the impact on the customers, and the likelihood of safety, financial and programme delays.
- 5.10.17. It will also create the opportunity to optimise resources such as services and equipment hire that could lead to further cost savings.
- 5.10.18. Reducing health and safety risk
- 5.10.19. Simulation of the construction sequences will enable safety hazards and risks to be more robustly identified and mitigated as part of the planning process.
- 5.10.20. Visualisation tools (as outlined in the BEP) will be adopted to support the development and approval of robust safe working method statements, to provide better understand of the hazards and risks, helping to support the project's ambition of a zero Accident Frequency Rate (AFR) target during construction.

Monitoring construction progress

5.10.21. Digital surveys in the form of drones taking video and still imagery will be used to provide a visual comparison between current physical progress on site compared to planned requirements. This technology will be used to support decision making, validate progress against the original design and identify any anomalies. It will also enhance the opportunity to understand physical conditions without the need to visit site as appropriate.

Bringing the scheme to life

5.10.22. The digital data will also provide an opportunity to share a visualisation of the construction progress with stakeholders in order to help bring them along the journey, particularly in elements of the scheme where progress is not easily visible such as the laying of utilities and communication lines.



- 5.10.23. Given the significance and high-profile nature of the Scheme, it is critical that all stakeholders are brought along on the journey. This will be achieved by using data captured digitally in areas such as archaeology, survey imagery, and visuals of construction works underground. The aim will also be to inspire future generations through STEM activities created from the Scheme's digital data capture.
- 5.10.24. To date, the Scheme's digital design information has been successfully applied in Minecraft educational games for key stage 1 and 2 primary school students. This has been used to spark interest in STEM and deliver interactive educational tools focussed on improving biodiversity and understanding the scheme. The use of digital information will be pivotal to leaving a valuable legacy for future generations.
- 5.10.25. As construction progresses, digital tools will also be used to record all the archaeological information and findings from drawings, photos, geospatial information, and 3D digital scanning. Under the Main Contract, digital hardware and connectivity on site will be provided by the contractor to record, share, and upload valuable information. This will create the ability to rapidly apply a single source of information from the Scheme's design through to the as built and certification process. The Scheme is also utilising Designated Funds to support the delivery of engaging materials for the A428 online heritage platform, virtual and physical exhibitions, and e-learning modules.

Data analytics and periodic reporting

- 5.10.26. The National Highways data reporting, analytics platform, and data hub Chrysalis will be used to deliver intelligence, consistency and efficiency in analysis and reporting for the Scheme. The tool will provide the capability to connect and communicate with a wide range of data sources to undertake semi-automated analysis of data and performance reporting. This will provide enhanced efficiencies in delivering monthly reporting.
- 5.10.27. It will also support decision making by creating audience-specific dashboards fed by a single source of the truth to ensure consistency of understanding across the scheme and drive reporting of performance against the Scheme Specific Performance Measurements, as defined in the Performance Manual. It will deliver real time reporting on key metrics, closely monitor contractor performance, and identify changes or early proactive interventions needed, based on automatically generated trends, to either limit the consequences of declining performances, or grasp opportunities to replicate periods of improved performances.



- 5.10.28. Lesson learned from the A14 project also includes use of the National Highways Major Projects Common Data Environment to identify and assess risks captured from the data analytics. Requirements have been set for the capture of all data which may have impact on risk such as monitoring, worker, plant and vehicle location, and observations relating to health and safety hazards. Data analytics will then be used to recognise patterns leading to potential risks on site, contribute to improving site safety and delivery efficiency.
- 5.10.29. The approach taken to capture and store data in the National Highways Major Projects Common Data Environment aims to enable future projects and users of the scheme to utilise the data sets to undertake further areas of analysis for future innovations.

Cyber Security

- 5.10.30. Information security is being managed in line with the standards, codes of practice and the latest best practices. The scheme's information communication and technology systems are protected against cyber-attack in accordance with the requirements, guidance and recommendations produced by the UK government National Cyber Security Centre, the UK government Cyber Essentials Scheme, the Cabinet Office Minimum Cyber Security Standard and National Highways Cyber and Data Security Policies
- 5.10.31. During the design and construction phase, a project Security Lead will be accountable for the implementation and compliance with these standards and best practices.
- 5.10.32. All IT systems will be vendor supported and provided with automatic deployment of security updates. All systems will be tested for security weaknesses prior to activation and annually, and not use legacy or insecure protocols.

Delivery Assurance

- 5.10.33. Digital requirements have been embedded into the Scheme's contracts to ensure it is fundamental to the design and construction of the scheme. The contractor's adherence to these requirements will be managed via the arrangements set out in the project EIR and BEP.
- 5.10.34. Following lessons learned from other major schemes, digital requirements have been specified from both main works contractor and sub-contractor levels to ensure the control on information transfer permeates throughout the supply chain where a lot of the asset information is first created. The contractors will be held accountable to the contract, while the Digital Lead is held responsible for implementing a consistent set of processes and standards across all the subcontractor levels.



- 5.10.35. Staffing skills, training and cultural change will be critical in embedding the technological innovation to be deployed. To achieve this, the contractor is required not only to provide the Scheme with all the equipment, hardware and software needed, but also the training necessary to implement the processes and technologies specified in the contract. In this way they are contractually committed to embedding the tools and processes rather than just the technology.
- 5.10.36. Digital technology the DIP will be responsible for providing could include the following:
 - Tablets or similar technologies to support on site access to live design information and asset information.
 - Immersive virtual technologies e.g., augmented reality headsets, to support on site visualisation of design model information and utility information.
 - Asset Management software and systems that enable the proactive management of asset performance and safe operations as agreed by National Highways.
 - A federated BIM model to manage a detailed project information model as agreed in the BEP
 - The DIP's chosen project P-CDE and delivering assured information to the National Highways E-CDE to enable the structured management of project data.
 - Tools to automate key project reporting outputs and the identification of key risks (health and safety, design, and programme) using automated data exchange and data analytics within Microsoft's Azure platform; and
 - Digital access control technologies throughout the site which includes biometric identification.
- 5.10.37. The tender process has been used to evaluate the contractor's competency in the use of BIM. Previous experience has not simply been relied on, instead requiring the bidders to apply BIM processes, tools, and technologies within their tender proposals. In this way, it has ensured that the chosen contractor is competent in delivering BIM to National Highways standards and meeting the specific needs of the scheme. The processes and plans developed in their BIM execution plan, which details how they would implement the BIM requirements during construction and into operations, will also enable the contractor to start the detailed design more quickly, based on the accepted framework developed during the tender process.



5.10.38. In addition to the full automation and digitisation of data entry on-site and the use of BIM to reduce errors from poor design and construction visualisation / coordination and the wrong use, location or wastage of materials, the scheme will also focus on minimising the carbon footprint across the following four resource areas during the construction phase: Electricity, Concrete, Diesel, and Steel.

Digital Roads

- 5.10.39. Digital Roads is the part of National Highways transformation journey that sets out how the organisation will harness data, technology, and connectivity to improve the way the Strategic Road Network (SRN) is designed, built, operated, and used. It will allow National Highways to become more efficient, strategic, and sustainable.
- 5.10.40. Ultimately, it means keeping colleagues and customers safer on our roads, improve customer experience and help drive carbon down to the Government's target of net zero. This strategy will deliver greener construction, maintenance and zero emission vehicles.
- 5.10.41. National Highways intend for the SRN to be built, managed, and maintained by utilising digital, data and technology. The Scheme will have three areas of focus:
 - Digital Design and Construction activities will be increasingly automated, modular, and conducted off-site. This will result in safer production, reduced network disruption, increased productivity, and smoother journeys for our customers.
 - Digital Operations operations will use data to drive increasingly preemptive interventions, resulting increased asset life and improved resilience a safer, smoother running network.
 - Digital for Customers customers will be better informed and have trust in the journey information they access, ensuring that they feel safe and in control of their journeys.

5.11. Project Plan

Scheme programme

- 5.11.1. Following the ending of the legal challenge, a revised schedule for delivering the Scheme has been developed, setting out the activities required to achieve National Highways' commitment to commence construction of the Scheme in Q3 FY 2023/24, the use of the Technical Assurance partner in addition to SES, specific activities such as Statutory Undertaking diversions, buildability and Early Enabling Works.
- 5.11.2. This sets out the key milestones, decisions, and approval points for the scheme, comprising of a number of key phases:



- Governance steps leading to the approval of the revised FBC and release of full funding.
- Development and approval of the detailed design in preparation for construction of the Scheme.
- Proposed advanced works including archaeology and Statutory Undertaking diversions, to further de-risk the programme.
- Delivery and putting into service which includes all construction and construction management, commissioning of all elements of the Scheme into service and subsequent Handover.

Scheme planning

- 5.11.3. The approach taken to planning is included in the Major Projects Directorate Planning and Scheduling Manual, the Project Management Plan (PMP), and the Stage Management Plan.
- 5.11.4. The objective is to provide transparency and consistency at all levels of the Scheme. It allows traceability of activities from the detailed to the summary levels and describes the mechanisms for agreeing and changing the baseline that progress is monitored and reported against.
- 5.11.5. The PMP is reviewed quarterly by the project team throughout the Scheme life cycle to ensure alignment with the Major Projects Directorate Planning and Scheduling Manual. It also ensures that each workstream has the required level of detail in the plan to monitor progress and review the need for corrective actions. This is a continual cycle where detail may be added or amended at the working level without any impact on the strategic milestones.
- 5.11.6. The project team has engaged with both the DIP and the internal National Highways Business Partners to create a collaborative working environment in which dependencies and planning for deadlines are approached as an integrated team.
- 5.11.7. Major milestones defining the Scheme through to completion are set out in the baseline schedule for the Scheme, as shown in the table below.



Table 5-8 Project Milestones

Key Milestone	Date
IDC Approval of FBC update and Full Release of Funding	Jun 2023
SoS Approval of FBC update and Full Release of Funding	Aug 2023
CST Approval of FBC update and Full Release of Funding	Sep 2023
SGAR 5	Sept 2023
Notice to Proceed	Oct 2023
Start of Works Stretch Forecast	Oct 2023
Start of Works proposed RIS Milestone	Dec 2023
Open for Traffic proposed RIS Milestone *A date of 2027 has been publicly announced	2027*

Progress to the baseline schedule since FBC in July 2022

5.11.8. The Judicial Review claim which was launched after the FBC submission in 2022 has resulted in date changes for key project milestones. The revised milestone dates are underpinned by a detailed programme providing increased confidence in the project schedule.

Schedule contingency

5.11.9. The schedule is based on the estimates of time required to undertake each planned activity. Contingency allowances are then applied to reflect the potential risks that could impact the planned activities which may result in activities taking longer to complete. Planning contingency (Time Risk Allowance) within the project schedule has been applied against activities deemed to carry minor risk based on historic data and experience. This allows for risks such as poor weather and inefficiencies on site that have a reasonable probability of occurring but are not significant enough to merit inclusion in the risk register.

Management and Reporting of the Schedule

- 5.11.10. Management of the schedule will be executed in accordance with the Major Projects Directorate Planning and Scheduling Manual that feed into the Scheme's PMP. This approach provides transparency and consistency to the schedule at all levels of the project allowing traceability between:
 - Detailed and summary programme levels.
 - National Highways' and the appointed contractor's programme.



- 5.11.11. Schedule actual progress against planned will inform the following key reporting requirements:
 - Project Executive Group (PEG) and CIP Performance review monthly reports.
 - Government's Major Projects Reports (GMPP) quarterly submissions, to assist government in monitoring the delivery of UK's largest projects.
 - Major Projects Delivery Services (MPDS) Data Hub.

5.12. Integrated Project Management Organisation

Integrated PMO

- 5.12.1. The long duration and complexity of delivering an infrastructure project requires a strategy to appropriately identify and manage the uncertainty, risks, and opportunities over its life cycles. To achieve this, National Highways has developed robust and integrated set of processes for risk, change, opportunity management and contract management.
- 5.12.2. National Highways organisational manuals and project specific plans for risk, change and opportunity management are summarised in plans Figure 5-11. The scheme specific deliverables are treated as live documents and updated during each PCF stage.

Figure 5-11 Risk, Change and Opportunity Management – National Highways and Scheme specific plans

	Risk Management	Opportunities Management	Change Management
National Highways Manual	National Highways Risk and Issues Management Manual	National Highways Value Management Manual	Major Projects Baseline and Change Manual
		National Highways Efficiency and inflation Monitoring Manual	
A428 Deliverables	Risk Management Plan	Value Management Delivery Plan	Stage 4 Baseline Management Plan
A428 Deliverables	Risk Management Plan Live Risk Register	Value Management Delivery Plan Value Management Workshop Report	Stage 4 Baseline Management Plan Preliminary Works Change Management Plan



5.13. Risk Management

Overview

- 5.13.1. Over the course of a project lifecycle, many challenges will arise that may affect the ability to deliver a scheme's scope on time, to cost, and quality. The Scheme therefore has a Risk Management Plan (RMP) which sets out an overall structure for the management of risk.
- 5.13.2. The primary objectives of the RMP are to:
 - Ensure that the Scheme has sufficient capability and capacity to identify and manage risk (both threats and opportunities) through the development and delivery cycles.
 - Ensure lessons learnt and best practice are shared from the A14 Cambridge to Huntingdon and other schemes.
 - Establish ownership and accountability across workstreams, detailing specific roles, responsibilities, and reporting requirements.
 - Ensure that workstreams apply a consistent methodology for the dentification, assessment, and management of risk (threats and opportunities) in a timely manner.
 - Provide timely information to support risk-based decision making.
 - Create an open, transparent, and communicative culture for the proactive management of risk.
 - Develop Quantitative Risk Analysis (QRA) for time and cost risk.
 - Have discussions regarding risk and risk transference in subsequent construction financing arrangements.
- 5.13.3. A 'live' risk register is maintained for the Scheme to ensure that risk management is an ongoing activity that is embedded within daily business processes. Risk management has been enhanced through engagement with key staff from the A14 Cambridge to Huntingdon scheme. The A14 scheme is located in the same geographic region, has many similar design features, and requires engagement with the same stakeholders. Sharing of knowledge and lessons learned has supported more comprehensive risk identification, well informed mitigation strategies and improved assessment of cost, time, and quality impacts.



5.13.4. To ensure this framework is embedded within the Scheme, workstream leads have been assigned as the risk owner for all risks within their area of accountability. Specific actions required to manage those risks are then assigned to the individuals that are the most appropriately placed to deliver them. This can be from any workstream, or supplier associated with the scheme, including the Technical Advisor.



Figure 5-12 Summary of Risk Management Process

5.13.5. The workstream leads are accountable for compliance with the core processes contained within the RMP, i.e., identification, assessment, treatment, and review within their area of accountability. Workstream leads are supported and guided by a designated specialist risk management function that forms part of the PMO.

Risk management reviews

- 5.13.6. It is of fundamental importance to have regular risk management reviews taking place on the scheme. Risk management reviews ensure risks are being managed in line with the RMP and that there is an appropriate risk escalation process. Risk review meetings are held at Scheme level as shown in Table 5-9.
- 5.13.7. This collaborative approach to risk management has National Highways retaining overall accountability for risk and the risk management processes whilst assuring that the DIP can articulate and demonstrate that they are aware of significant risks and have plans in place to mitigate threats and exploit opportunities.



Risk management meetings	Attendees	Frequency	Objectives	Outputs
Workstream Risk Review	Chair: Operational Workstream Lead. Facilitator: Risk Lead / Manager. Attendees: Commercial Lead Workstream project manager.	One meeting a month for each workstream on a continuous cycle through the month.	Review of any new risks or opportunities. Consideration of new risk mitigations. Review of the workstream's risks ensuring the register is up to date.	Items for escalation Risk register updates Action and decisions log.
Project Risk Review	Chair: TP Project Manager. Facilitator: Risk Manager. Attendees: Commercial Lead National Highways PM, Operational workstream leads.	Monthly.	Review key project risk(s) from a project wide perspective to reach agreement on: Risk descriptions, impacts, mitigations, Consideration of knock- on risks. Agree risk mitigation plans.	Items for escalation Action and decisions log.

Table 5-9 Risk management meetings

Risk assurance

- 5.13.8. In addition to these reviews, risks can be escalated upwards to the Project Committee and further upwards as follows:
 - The Project Risk Review meeting considers the key scheme risks and acts as a forum for escalation from the workstream reviews to the Project Committee.
 - The Project Committee provides a forum for the escalation of the key scheme risks from the Project Risk Review and oversight that those risks are being managed in line with agreed plans. It also acts as the mechanism for escalation of risks within established National Highways frameworks (via CIP and Major Projects), if necessary; and
 - The Finance, Risk and Assurance Group (FRAG) will provide additional assurance to the Scheme's SRO about the overall risk profile of the scheme and that the key scheme risks are being managed in line with agreed plans.



- 5.13.9. Figure 5-13 shows how the risk framework, review and assurance fit together and sets out the order of risk escalation, as necessary.
- 5.13.10. Beyond Project Committee, risks will be escalated as per the Governance and Assurance model.

Figure 5-13 Risk Assurance and Escalation



Risk management tools

- 5.13.11. Once Scheme risks are identified, they are captured on National Highways' risk management information system, Xactium, where they are organised by workstream, in line with the National Highways standard risk breakdown structure, and subject to a project-specific scoring scheme.
- 5.13.12. Quantitative Risk Analysis (QRA) of the project's risk position is performed on a regular and established basis. This includes both Quantitative Cost Risk Analysis (QCRA) and Quantitative Schedule Risk Analysis (QSRA).
- 5.13.13. The QRA looks at the probability of a range of risks occurring together and produces a quantified assessment of risk across a probability of exceedance bell curve. The QCRA output has been used in the Economic Dimension as part of the VfM appraisal of Scheme costs and benefits, and also in the Financial Dimension in order to calculate the Project Risk contingency allowance.
- 5.13.14. The project regularly reports on the top 5 risks (threats and opportunities) and against each risk the table shows the Likelihood of the threat or opportunity occurring on the Scheme, and the Expected Impact if it occurs. The risks are then ranked by their Severity, equal to their Likelihood multiplied by the Expected Impact. The Expected Mean Value (EMV) of the Severity of the Cost Risk is shown pounds sterling (£).



Risk management capability and capacity

- 5.13.15. The SRO requires that the PMO allocates sufficient resources to the risk management activities to ensure that the scheme can draw upon sufficient skills, knowledge, and experience together with the appropriate tools and techniques to ensure that the risk management processes operate as designed.
- 5.13.16. Risk managers are embedded in the scheme's PMO both within National Highways and within the DIP. These professionals are tasked with mentoring the workstreams by sharing their skills, knowledge, and experience to develop a strong risk and value management culture. Every individual with an assigned risk role receives training to discharge their responsibilities efficiently and effectively.
- 5.13.17. To ensure that the project is adequately prepared for the change in risk exposure and activity presented by construction, a series of proactive measures will be instigated. Ahead of construction there will be a series of Lean and Opportunity "workshops" with the DIP. In addition to team building activities, training, knowledge sharing and understanding how the scheme will operate, these workshops will include the early engagement, trialling and development of the processes required during the monthly drumbeat. This includes identifying risks and mitigations to design, construction, coordination, and communications early and scheduling the delivery of these mitigations into the programme.
- 5.13.18. By taking this approach, the Scheme will increase the maturity of collaborative processes and ensure the upscaling of the risk and opportunities management functions is construction ready.

5.14. Change Management

Baseline change management overview

- 5.14.1. Baseline change management is the way in which any changes to scope, schedule, cost, or risk that affect delivery of the project are introduced in a controlled manner, so that progress and performance measurement against the baseline continues to be robust and reliable.
- 5.14.2. There are three change control processes that operate to control the project, and these processes managed within the organisational levels of Delegation of Authority (DoA):
 - DfT level change and any change requiring approval by National Highways IDC follows the Capital Portfolio Management (CPM) change control process.
 - The Major Projects (MP) level change control, primarily for the drawdown of project and programme risk allowance, follows the processes defined in the National Highways MP.



• Project level change control for approval of changes of a certain impact level based on the DoA of the Project Director who is the chair of the Project Change Group

Figure 5-14 Project Level Change Control Process



Baseline change management principles (Project level)

- 5.14.3. The key principles for change control are:
 - The Project team, with the support of consultees will review all changes before their approval and implementation.
 - The impact of changes on all aspects of the project in terms of scope, budget, time, benefits, quality, safety, environment, risk, and opportunities will be fully assessed.
 - The key point of reference for a change is the agreed baseline, known as the Performance Measurement Baseline (PMB).
 - All changes are fully documented and communicated to all relevant parties.

Change management process (Project level)

- 5.14.4. The project level change control complies with the change processes defined in the MP Baseline Management Manual and Contract Management Manual.
- 5.14.5. The Project Manager is responsible for ensuring the change control process is implemented correctly and for monitoring the lifecycle of the change. An Early Warning Notification (EWN) will be raised as soon as any party is aware of an issue that could impact the objectives and targets of the project.
- 5.14.6. Once a potential change has been identified, a change proforma is completed. This refers to the PMB as a point of reference when outlining the request for change and includes an impact assessment for time, scope, benefits, cost, risk, and opportunities, referencing back to any previously raised EWN or risk.



- 5.14.7. A Project Change Group convenes weekly to consider all proposed changes.
- 5.14.8. The Project Change Group is made up of the leadership of the Integrated project team as well as other Consultees.
- 5.14.9. The Project Change Group approves changes of a certain impact level based on the DoA of the Project Director who is the chair of the Group.
- 5.14.10. In order to make the change control process proportionate to the degree of change, and to enable a more responsive project delivery, this process is tailored to allow the Project Director to authorise others to make decisions within a maximum cost limit.
- 5.14.11. The Change Group allows for input and challenge from the leadership of the Integrated Team to ensure the change required supports the successful delivery of the project.
- 5.14.12. Each change proposal is presented with the Change Proforma which details a full impact assessment and feedback from relevant subject matter experts.
- 5.14.13. During the Change Group meetings, the Project Sponsor and the Benefits Lead will play an important advisory role in the decision to approve or reject a change based on the balance between any negative impacts or risks to the benefits claimed in the business case for the scheme, and any saving to scope, cost or schedule, or improvements to quality and performance.
- 5.14.14. Once the chair approves the change request, all relevant stakeholders are notified, and the change is implemented through the agreement of a compensation event, into the PMB. All decisions and actions are recorded in the project change log.
- 5.14.15. When the change is approved, the change log is updated, and the scope book is also updated to capture the approved scope changes. The project manager will ensure that scope changes have been made correctly and approve the revised scope book. The schedule, cost and risk baselines are also updated in line with the approved change and reviewed with the project manager to ensure full integration.

During the construction phase

- 5.14.16. During the construction phase the impact assessment for a proposed change will be expanded to assess the impacts more explicitly to the benefits claimed in the business case for the project, including the impact to the project's carbon reduction targets.
- 5.14.17. The Critical Deliverables Matrix will be established (refer to Section 5.8) and this tool will form a key part of the change impact assessment process.



- 5.14.18. For each change request, the project team will consult the CD matrix to access if the proposed change will negatively impact the planned benefits of the project, in addition to the current impact measures.
- 5.14.19. Below is the proposed integration of the CDM into the existing project change control process.

Change Management Systems

5.14.20. Change control is instructed via the Contract Event Management and Reporting (CEMAR) system, which has controlled interfaces setup with all other project management tools used on the scheme such as Primavera P6 (scheduling management), PRISM (cost management), Xactium (risk management), Oracle Fusion (budgetary management) and Power BI (reporting).

Delegation of Authority (DoA) Levels

- 5.14.21. DoA have been setup for defining the authority level for decision making within the project or National Highways before escalation to a higher governance body is required.
- 5.14.22. DoA levels have been setup to allow the Project Director to authorise others to make decisions within a maximum cost limit. This is to ensure change is managed and approved at the appropriate levels, avoiding unnecessary delays or levels of governance These levels are explained in the Project Management Plan (PMP) which is alive document controlled by the Project Manager
- 5.14.23. DOA levels have been defined to help facilitate change control in a timely manner and can be found in the Contract Management plan.

5.15. Contract Management

Contractual Management Arrangements

- 5.15.1. There are two main contract management arrangements through the lifecycle of the Scheme:
 - the Collaborative Delivery Framework (CDF); and
 - the Regional Delivery Partner (RDP) framework contract, delivered via the Delivery Integration Partner (DIP).

<u>The Contract for completion of the Development Phase and Construction Phase</u> (PCF Stages 5 to 7):

- 5.15.2. This has been implemented via the DIP through the RDP framework, with IPDC and Ministerial approval, in February 2020.
- 5.15.3. A period of mobilisation and due diligence followed which resulted in an agreed Scheme budget. The Contract Management Plan details how this process operates.


- 5.15.3. A period of mobilisation and due diligence followed which resulted in an agreed Scheme budget. The Contract Management Plan details how this process operates.
- 5.15.4. The agreed Scheme budget will be managed in line with RDP commercial strategy and contract guidelines. There will be particular focus on the DIPs tender obligations and the management of the contract in line with regionally driven change, in particular:
 - When the Scheme transitions from the development phase (end of PCF Stage 5) to the construction phase (PCF Stage 6) in undertaking the assurance and seeking the approvals.
 - In limiting change and focusing the DIP on completing the Scheme within the agreed Scheme budget.
- 5.15.5. National Highways' Contract Management Plan details all the obligations on both National Highways and the DIP supplier. This draws on the Operational Guidance Note (OGN) prepared to assist National Highways and DIPs in managing the contract.
- 5.15.6. Regular monthly DIP performance reviews are in place as well as threat and opportunity management meetings, to manage risks effectively as a joint team and to ensure opportunities are delivered.
- 5.15.7. National Highways will use best practice from the A14 Cambridge to Huntingdon scheme and other Schemes for sub-contract procurement, and this will ensure that the Scheme drives increased performance by using behavioural based procurement.
- 5.15.8. Performance management of the DIP is through the standard National Highways NEC4 contract mechanisms, further enhanced by:
 - Incentivisation arrangements for improving the value of the scheme budget underspend share; key dates; minimisation of adverse impact on road users during construction; and increase in value for money.
 - The Balanced scorecard 12 performance indicators are used to provide the basis for National Highways to allocate further work under the RDP once 18 months of data is available.
- 5.15.9. Throughout the development phase, existing contracts have been used to ensure the Design Supplier, the DIP, the Technical Advisor, and other special advisers deliver against Task Orders, and that design evolution is effectively controlled through use of effective change management processes.

Quality Management

- 5.15.10. The integrated team will work in line with the following standards:
 - OHSAS 18001.



- ISO 9001 and CEN/TS 16880; and
- ISO 14001.
- 5.15.11. The project team will implement a system that follows ISO 44001, which includes a collaboration framework that encompasses the behaviours, organisational culture and management processes that provide a common platform to support effective collaborative business relationships. In addition to this risk management will be deployed in line with ISO 31000.
- 5.15.12. Continual improvement / lean procedures will be embedded in the Scheme using National Highways Lean Maturity Assessment (HELMA) at framework and scheme level.
- 5.15.13. The quality plan details how the teams deliver the requirements set out in the contract to meet National Highways vision, key objectives, and ambition for the framework contract.

Management of contracts

- 5.15.14. National Highways has contracts in place with the Design Supplier (DS):
 - AECOM for PCF Stages 3 and 4; and
 - Skanska for PCF Stages 5 to 7 (as part of the DIP). The DS is Mott Macdonald included as part of the DIP arrangements.

Management of the Design Supplier (DS) contract

- 5.15.15. Skanska and their design partner, Mott MacDonald, are responsible for production of detailed design through the RDP framework. They have worked closely with National Highways and AECOM to take on the detailed design (PCF Stage 5) building on the buildability work and handover undertaken. This is the planned natural evolution of the design process whilst the project has transitioned between PCF stage 3 to parallel running of PCF stage 4 and 5.
- 5.15.16. The detailed design phase will be substantially complete before start of works but is expected to continue into the first 6 months of construction, to allow for completion of Information for Construction, which is part of this phase work required for the subsequent phases of the main construction.
- 5.15.17. The quality of the DS is managed through a staged assurance process. Documents require review, approval, and a signature from the relevant workstream lead and DS Project Manager before issue to National Highways.
- 5.15.18. The management of performance against cost and schedule is undertaken using Earned Value Management against an agreed baseline for each individual Task Order. Earned value statistics are reported monthly and reviewed at the Project Committee. Earned value actual work done is assured and validated by the commercial and project teams.



- 5.15.19. The Collaborative Performance Framework (CPF) is used to measure the performance of the Task Orders against key performance indicators. A toolkit, with appropriate supporting documentation, is completed and submitted to the supplier performance team for review on a quarterly basis. The average CPF score is linked to future work opportunities, financial incentivisation and penalty calculations within the design partner's contract.
- 5.15.20. CPF and Earned Value Management equally applies to the DS as described above.

Management of Regional Delivery Partnership (RDP) contract

5.15.21. The successful implementation of the RDP contract for the Scheme involves the combination of management at a framework and at a Scheme (package) level. This section articulates how this will be achieved within CIP. The following section highlights in broad terms the RDP framework requirements that will consistently be delivered through the overall delivery of the Scheme, and the Contract Management Plan which highlights specifically how the Scheme will manage the delivery of this contract through the CIP operating framework.

Framework Operation

5.15.22. Through the RDP framework, the Scheme will engage with the following national and regional forums (Figure 5-15), set up to assist the delivery of the objectives of the framework that are enacted through each project's selected supplier.

Managing Continuous Improvement and Innovation

- 5.15.23. National Centre of Excellence a strategic body that considers sector wide capability to deliver value and drive innovation to grow capability and capacity across the whole community.
- 5.15.24. The National Centre of Excellence set and manage improvement targets. Initiatives will be generated by the community of client, suppliers and supply chain engaged and contracted to the framework.
- 5.15.25. Regional Centres of Excellence a regional body dealing with regional cohesion, including consistency of technical issues across the region. The main purpose of this forum is to support the client in the efficient and effective delivery of the programme.
- 5.15.26. Sustainable Improvement Hub at forum for the client, suppliers and other key stakeholders work together to sustainably optimise the supply chain and construction logistics for the benefit of the programme. The main purpose of this forum is to increase productivity and optimise productivity.



Figure 5-15 Centre for Excellence Context





- 5.15.27. The operating principles that the Scheme will operate under to support the overall framework governance identified above are:
 - There is a formal agreement at the start of the delivery between the SRO for the Regional Investment Programme (RIP), responsible for delivering the benefits of the overall RDP framework and the Complex Infrastructure Programme (CIP) SRO. This is a key milestone that represents the agreement on the final allocated budget for the scheme, the overall efficiency target, spend profiles, the benefits baseline and overall resourcing for the project.
 - The CIP SRO is responsible for all investment decisions and will ensure full buy in from the RIP SRO when a decision could impact programme delivery regionally.
 - Any changes driven from RDP (for example from the National Centre of Excellence) to the Scheme will require the change management process to be followed and therefore have Project Director sign off and any changes driven by the Scheme needs the concurrence of the RDP programme. Issues between the project and the programme will be resolved, in the first instance, at the RDP programme committee. Escalation beyond this will go the Executive Director Major Projects.
 - The Project Manager attends the East Regional Centre of Excellence and Sustainability Hub.
 - There is a single source of the truth for all reporting and all performance reports will be issued to both the CIP and RDP performance committees.
 - CIP own and manage the overall assurance and approvals provided it stays within the agree budget and programme. Any deviation from the agreed baseline budget and accepted programme will ultimately be reported to and agreed by the SRO.
 - Visibility of the regional threats / opportunities to the scheme define how to manage threat / opportunity at regional and project level collectively and get this agreed at the RDP programme committee within 3 months of the formal agreement milestone.

Mobilisation of the DIP and delivery of Due Diligence Early Works

- 5.15.28. The RDP framework allocated a specific DIP to the A428 package. As the DIP had already undertaken work to mobilise in the Midlands region, they used the lessons learnt from this process to enable a more efficient mobilisation for the Scheme.
- 5.15.29. The mobilisation phase was completed, with all plans written / amended by the DIP, reviewed by National Highways, and collaboratively signed as completed. This allowed the Early Works Order, to commence due diligence, to be issued with no overlap of mobilisation activities.



- 5.15.30. National Highways had the opportunity on the Scheme to implement an efficient and effective due diligence process by taking advantage of the opportunity to integrate it into the PCF Stage 3 process via an Early Works Order to complete a Peer Review. This approach promoted and facilitated a higher degree of interaction, coordination and collaboration between National Highways, AECOM, and the DIP, resulting in maximising the value early in the scheme.
- 5.15.31. Using the buildability support contract with the incumbent designer, the DIP assembled a team of experienced professionals from Skanska, Mott MacDonald, and various other specialist support organisations to provide a more holistic / multidisciplinary input; thereby achieving a greater level of assurance and confidence of the scheme budget by the end of the due diligence period.
- 5.15.32. Targeting development areas enabled the DIP to address the issues raised, which allowed a more refined cost estimate to be produced and hence a higher level of assurance of the overall budget.
- 5.15.33. The due diligence process concluded with a list of items raised during the design review with an accompanying budget which included allowance for these items and the associated risk of design gaps and / or unknowns. This was followed by a period to agree which issues were high risks and required development as well as a period of negotiation to agree the overall scheme budget. The advanced engagement process provided a more refined review with greater confidence in the associated budget. This led to a contractual due diligence phase which was a formality to conclude, as all issues had been identified, agreed, and dealt with leading up to that period.
- 5.15.34. Throughout the above two work-streams, the DIP simultaneously produced their overall scheme budget estimate as their knowledge and understanding of the scheme developed. This design review process ensured there was not a significant difference between the available budget and the DIP's estimate. Coupled with a more collaborative approach whereby the DIP estimators and National Highways cost engineers worked alongside each other throughout the build-up of the DIP's estimate as the outputs of the targeted development works were released. The outcome of this approach was an estimate at the end of the due diligence period, which was understood and agreed by both parties, removing the need for timely negotiation following due diligence and potential further delay.

Delivery of Early Enabling Works

5.15.35. Early enabling works were carried out to inform the detailed design and DCO submission, to de-risk the project timeline and to maintain the anticipated construction phase duration. The three phases of enabling works planned in advance of Start of Works were:



- Phase 1: Surveys and early materials procurement (2020-2021) including geophysical surveys, archaeological trial trenching, geotechnical investigation, ecology surveys and the early procurement of long lead-in material and plant items.
- Phase 2: Utilities (2021-2022) diversion of key utilities that would most likely impact the construction phase critical path activities. It was not possible to carry out all utility diversions as early enabling works. Those which need to be carried out within the construction phase will be prepared so that they can commence on or very soon after start of works.
- Phase 3: Other enabling works (2022-2023) including advance environmental and ecological mitigation activities. It is also necessary to establish a fully functioning main site compound to achieve the construction phase programme.

Delivery of works required for DCO

- 5.15.36. Works carried out in advance of DCO consent were subject to local planning consent via the Town and Country Planning Act. This included carrying out of archaeological mitigation works and provision of temporary welfare compounds. The utilities diversions were carried out utilising the Permitted Development rights of the utility provider.
- 5.15.37. Where appropriate, land required for works will be acquired in advance to enable consent and rights to be attached to the title.
- 5.15.38. Access to land for surveys and investigation by consent is being managed by the DIP. Access is achieved by agreement letter or licence, depending on the wishes of the landowner. Statutory powers can be used if necessary. Landowners are compensated for damage to crops etc. in accordance with National Highways defined compensation rates. Early acquisition will be sought to ensure permissions for the most critical sites.
- 5.15.39. Land acquisition is prioritised to provide sites for the utility works and site compound set up. The appointed District Valuer is carrying out all negotiations on behalf of National Highways. These began once the extent of archaeological trial trenching was completed and the impact on each site established.
- 5.15.40. Compulsory purchase rights will be sought with the DCO application for all land required to ensure acquisition as a fall-back option.

Site compounds

5.15.41. Three site compounds are required, 1 main and 2 satellites. These will be located centrally and at either end of the scheme. To be maximise operations from day 1 start of works the main offices are constructed and occupied and are going through final commissioning including supplementary functionality such as stores and logistics yards. The 2 satellite compounds will be constructed later in 2023.



5.16. Evidence of Similar Projects and Lessons Learnt

Evidence of similar projects

5.16.1. National Highways has experience of successfully delivering major road infrastructure schemes of similar scale, scope, and complexity to the A428 Black Cat to Caxton Gibbet scheme. Current and recent examples include the other Tier 1 schemes in the Complex Infrastructure Programme (CIP), namely A14 Cambridge to Huntingdon, A303 Amesbury to Berwick Down (Stonehenge) and Lower Thames Crossing (Table 5-10)

Project Name	Description	Works Date	Approximate Value	Comments
A14 Cambridge to Huntingdon	21 miles new build dual carriageway construction, A1 improvement, on- line widening and junction upgrades.	Open 2020	£1.5bn	Tier 1 Project sits within the Complex Infrastructure Programme (CIP) allowing continual learning
Lower Thames Crossing	A new crossing of the River Thames between Kent and Essex, together with supporting roads linking to the M25, A13 and M2	2022/2023- RP3		Tier 1 Project allowing continual learning
A303 Amesbury to Berwick Down - Stonehenge	Construction of a twin-bored tunnel as the road passes Stonehenge, coupled with a dual carriageway bypass for Winterborne Stoke to link the existing dual carriageway at Berwick Down.	2023/2024- RP3		Tier 1 Project sits within the Complex Infrastructure Programme (CIP) allowing continual learning. DCO examination ongoing

Table 5-10 Evidence of Similar Projects



Lessons Learnt

- 5.16.2. Throughout the project lifecycle lessons learnt are identified, reviewed, and appropriately recorded. These lessons are recorded using the National Highways PCF manual for the Major Projects Lessons Learned template. The log is used to enable effective knowledge sharing and analysis that can be applied to benefit other projects and programmes and inform future improvements to standards and processes.
- 5.16.3. The Project Manager is responsible for ensuring that a Lessons Learnt Log is maintained for the Scheme. This was produced during PCF Stage 1 and then updated for every subsequent stage. Two other relevant PCF Products are the Lessons Learnt Report, produced during Stage 7, with key lessons captured at the end of each PCF stage in the End of Stage Report. The log is signed off by the SRO and the Project Sponsor and shared with the Integrated Project Team and National Highways Digital Services (which includes the National Highways Major Projects Knowledge Management Team).
- 5.16.4. The evidence generated from lessons learnt activities (such as knowledge transfer meetings, A428 Collaboration Workshops, and site visits) supports effective governance, improved decision making, greater transparency, generates efficiencies, reduces risk to delivery and promotes demonstrable alignment between objectives and outcomes. As well as accumulating internal lessons learnt, the project team has drawn upon reports, data, knowledge, and best practice from current and previous schemes completed by National Highways from our design partners, from stakeholders and from regional forums incorporating other National Highways directorates e.g., Regional Investment Programme (RIP) and the Smart Motorways Programme (SMP). This process is also be supplemented by scheme-specific local knowledge and understanding from Operations Directorate (OD) e.g., existing rat-running and traffic management issues, asset condition, customer issues, etc.
- 5.16.5. The Scheme sits within the Complex Infrastructure Programme (CIP) and is overseen by the same SRO and Sponsorship Director as other CIP schemes, including the A14 Cambridge to Huntingdon and A303 Amesbury to Berwick Down (Stonehenge), ensuring the sharing of good practice and experience as a regular and ongoing activity. Some of the project delivery team has transferred from the delivery team of the A14 Cambridge to Huntingdon scheme, supported by the CIP PMO, facilitating the retention of transferable knowledge and skills. Key roles being transferred from the A14 scheme include:



- CIP PMO Director.
- Head of Risk.
- PMO Manager
- Programme Manager
- Senior Project Manager
- Customer Lead / Assistant Project Manager.
- 5.16.6. Additionally, some key supply chain resources from the contractor (Skanska), who also delivered the A14, are also planned to transfer over to the Scheme for the construction phase providing further retention of knowledge and experience to aid delivery of the Scheme. These roles include:
 - Construction Director
 - Utilities Project Manager
 - Construction Manager
 - Environmental Manager
 - Works Manager

Approach to Lessons Learnt

- 5.16.7. The approach to implementing the lessons learnt starts with the need to mitigate risks and avoid significant past failures as well as identifying opportunities to deliver best practice and improvements to gain further efficiencies or are new innovations expected to create further cost and benefit opportunities for the scheme and future projects.
- 5.16.8. Table 5-11 shows which projects were considered due to their size, scale, and complexity. These schemes were A14 Cambridge to Huntingdon, A303 Amesbury to Berwick Down and the Lower Thames Crossing. These schemes are significant in scale, are managed through Tier 1 governance, have offline sections of carriageway and grade separated junctions – all features of the A428 scheme. The A14 scheme in particular has similar project features such as a bridge crossing of the same river (River Great Ouse) and same railway line (East Coast Mainline). Other National Highways schemes are regularly assessed to ensure knowledge and experience is successfully transferred to the Scheme.



Lessons learned from similar projects

Enabling works

5.16.9. Based on lessons learnt by the A14, it was identified that undertaking enabling works to de-risk the programme would be advantageous. Completion of early archaeological mitigation enabled gas main diversion work to be undertaken prior to main construction. The diversion was on a high-pressure gas main that fed the nearby Great Barford Power Station. The project team successfully tied in the archaeological mitigation with a planned outage at the station, to minimise disruption to customers. Similar approaches have been applied with other utility providers to make use of diversions ahead of main construction.

Archaeology

5.16.10. Lessons have been learnt from the approach taken to archaeological mitigation on the A14. The A428 Archaeological mitigation strategy was designed to challenge the way that archaeological migration was undertaken, and ensure focus was given to new areas of discovery i.e., focused research questions. Traditional wholescale strip, map and search methods have been replaced with targeted investigations, which will not only lead to improved understanding but reduce archaeological costs across the scheme.



Table 5-11 Key projects assessed for sharing of knowledge and experience

Project name	Tier 1 scheme	DCO	Grade Separated junctions	Offline sections	Lesson learnt
A14 Cambridge to Huntingdon	✓	~	~	~	Several knowledge transfer meetings and site visits held covering effective engagement with landowners and tenants about land and compensation, managing engagement of utility companies about the diversion of their plant (and benefits of starting early), managing the DCO process to allow value engineering and to stakeholder engagement in detailed design and consideration of wellbeing, earthworks strategy, structures design and construction methodology. Approach to flexibility in DCO. Regarding archaeology, the need to invest sufficient time in engagement with the local authority archaeologists and agree a cost effective enabling evaluation to de-risk the construction works.
Lower Thames Crossing	V	~	~	~	Greater understanding of Tier 1 governance. A428 team members attended the public statutory consultation events and learnt lessons about event logistics and consultation materials. The CRM system from LTC has been adopted on the A428.
A303 Amesbury to Berwick Down (Stonehenge)	~	~	~	~	Adopted a similar team operating model to provide a governance structure for effective project management, decision making and reporting. Lesson Learnt meeting held in advance of statutory consultation, and knowledge shared about integrated team working, managing expectations, communications and effective stakeholder management, adoption of a robust DCO process.
M42 Junction 6		~	~	~	Lessons from the DCO process, including delivering a compliant process, avoiding changes to the red line boundary and management of sensitive environmental issues. Approach for preparation of the Preliminary Environment information Report (PEIR) shared.



<u>DCO</u>

- 5.16.11. Lessons learnt from the A303 scheme DCO Examination led to the development of a bespoke online tool to support the process for questions, managing volumes, enabling cross discipline collaboration, and maintaining governance. This ensured all the DCO deadlines were met with high quality responses to the Inspectorate.
- 5.16.12. Lessons from the M42 Junction 6 DCO process were also shared, including delivering a compliant process, avoiding changes to the red line boundary and management of sensitive environmental issues.

Land ownership / Acquisition

- 5.16.13. Using lessons learnt from the A14, buildability reviews were undertaken to ensure that all the land required to deliver the scheme was included in the DCO application. Position statements, like Statements of Common Ground were made with landowners, including accommodation works, constraints and considerations, and were submitted to the Inspectorate during the DCO examination process.
- 5.16.14. Further engagement will continue with the remaining landholders to ensure they receive written confirmation of accommodation works. This will reduce the risk of new requirements from landholders emerging during construction and limit grounds for additional compensation claims.
- 5.16.15. The design of highways boundaries was another lesson learnt from the A14 which will ensure that National Highways will not retain maintenance responsibility for isolated parcels of land away from the main carriageway, and that local authorities accept all verges in the de-trunking process.
- 5.16.16. In respect of the handing back of land on A14 after scheme completion, another lessons learnt being adopted by the Scheme is to take condition survey photographs prior to work being undertaken, particularly with respect to existing access tracks. This reduces the risk of dispute with landowners when handing back the land.

Traffic Management

- 5.16.17. Using the experience of the A14 Traffic Management (TM) team early consideration for events that are key traffic generators and/or of local significance was a lessons learnt from the A14 scheme e.g. no major road closures or traffic management switches will occur on the weekend of the 2024 Bedford River Festival.
 - Where possible, major traffic management closures or switches will not take place on key weekends, but where unavoidable, the project team will work with business owners to provide the necessary advanced information and access arrangements.



- Variable messaging signs (VMS) will be used on the approach to the temporary traffic management to provide roadside information on journey time and distance.
- The A14 project has shown the use of social media to share road closure information elicits positive feedback from both local communities and drivers passing through the area.
- Erecting signs on local routes that have been identified as not suitable for construction traffic is another key lesson from the A14, one that will be implemented prior to construction works commencing.
- National Highways Customer Audits will be used to identify best practice from other schemes that performed consistently well throughout their construction.

<u>Utilities</u>

5.16.18. On the A14, some statutory undertakers did not recognise the newly introduced GVD (General Vesting Declaration) powers used to grant access to land for diversions. This could have led to cost and time overruns. Regular meetings have been held with statutory undertakers following the approval of funds at OBC stage. This has enabled the agreement of some early utility diversion works as previously described. Early engagement with National Highways Procurement was undertaken to enable approval for early procurement of materials and design for these works. This close working relationship with the project team and National Highways procurement will continue as the scheme progresses to main construction, to ensure that materials are ordered in advance of when required and design feasibility studies are produced in a timely manner.

Stakeholder Management

5.16.19. From discussions with the A14, the value of continued engagement with stakeholders throughout DCO examination has been shown, which the Scheme has included in its own engagement plans. For example, this has included technical discussions to resolve issues raised during examination and routine governance meetings, which remain ongoing. The CRM system, used by the Lower Thames Crossing scheme, has been adopted by the Scheme to record engagement activity.

Statutory Consultation

5.16.20. From the A47 Wansford scheme, lessons learnt included room layouts and staff well-being. Standard room layouts of the material were used for all statutory consultation events to ensure that the team knew where to direct the public for information. The well-being of staff attending the events were also reviewed with training undertaken on conflict resolution. Very positive feedback was received by members of the public and project staff alike as a result of implementing this lesson.



5.16.21. A lesson learnt meeting was held with A303 in advance of statutory consultation, and knowledge shared about integrated team working, managing expectations, communications and effective stakeholder management, adoption of a robust DCO process.

<u>Design</u>

- 5.16.22. Lessons learnt from drive-throughs of the A5/M1 and A421 schemes enabled the design to be considered in relation to specific areas of maintenance and repair.
- 5.16.23. The design team worked closely with the A14 team to apply lessons learnt to the consideration of the location of the borrow pits to ensure that they were located adjacent to where the material was required, and that all haulage routes are included in the red line boundary reducing the movement of construction vehicles from the local road network. In addition, consideration was given to how the borrow pits will be managed post project completion, with the decision taken to return them to agricultural land once used, as opposed to remaining as amenity areas which require on-going maintenance by the local authorities.

Governance

5.16.24. A similar team operating model to the A303 was adopted, to provide a governance structure for effective project management, decision making and reporting. This ensured that a robust and efficient structure was put in place on the Scheme.

Lessons shared from the Scheme that have been shared with other projects

- 5.16.25. The Scheme delivery team recognises the importance of passing on further learning to other projects so that others may benefit. On 7 December 2021, the scheme held an effective session with National Highways colleagues from the A66 Northern Trans-Pennine project to share lessons on carrying out enabling works in parallel to a DCO supporting the theme of mitigating risk to the construction programme.
- 5.16.26. The A428 team also shared details on DCO and consenting strategy, governance and assurance, archaeology, Statutory Undertakers and utilities, land access requirements, and stakeholder engagement and communications. The session identified critical lessons, risks, and opportunities to better inform the A66 enabling works strategy
- 5.16.27. Lessons learned sessions have also been held with A12 Chelmsford to A120 project earlier in the development phase on the theme of Business Case production and Tier 1 governance to aid the project as it progresses through its required governance and assurance.



5.17. Management Dimension Conclusion

- 5.17.1. The management dimension has demonstrated that there are robust arrangements in place for the delivery and governance of the scheme. It shows that the required processes and resources have been quantified to ensure the scheme is able to manage and deliver the construction to the agreed scope, cost, and milestones and to deliver the objectives and benefits set out in the business case.
- 5.17.2. To achieve this, the necessary organisational change and transitions required to mobilise and deliver the construction phase based on lessons learned from similar size and complexity projects. In addition to:
 - monitor and manage the successful delivery of the benefits and KPIs, including carbon management.
 - manage key stakeholders and maintain advocacy
 - identify and mitigate the potential risks to delivery of the scheme leading to cost increases and the erosion of scheme benefits and to identify opportunities and efficiencies to enhance the planned benefits and reduce cost and risk.
 - manage the approval and discharge of the DCO manage the performance of the main works and enabling works contractors during mobilisation, embedment and throughout construction using the contract and commercial mechanisms in place to incentivise innovations and cost savings and to penalise poor performance
 - manage the requirement to build innovations and efficiencies using digital IT and technology to minimise waste, and improve the transmission of construction information, discoveries and learning between project members and stakeholders
 - manage the development and implementation of carbon management processes to achieve carbon reduction targets set by National Highways and the scheme once fully defined.
 - manage the Tier 1 governance and assurance requirements for the scheme, confirming the arrangements for the assurance and approval of the main works contract procurement, FBC and the ongoing monitoring of the construction.
- 5.17.3. The revised operating model for PCF Stage 6 has been developed using lessons learned from the A14 Cambridge to Huntingdon scheme. This model is expected to provide the most efficient working arrangement during the construction that will ensure alignment of reporting and goals through a single set of collaborative systems, and transparency of working.



- 5.17.4. While retaining the knowledge and a consistency in decision making at the SLT, OLT and workstream levels, the new operating model also reflects the demand for new and enhanced project capabilities including the need for increased technical and commercial assurance to validate the main works design, quality, and progress in delivering the construction works. The Management dimension also demonstrates how resources both in the NH team and DIP that delivered the A14 scheme will transfer to the Scheme further knowledge transfer and embed lessons learned.
- 5.17.5. The stakeholder relationships that have been built to date will be retained throughout the lifetime of the project. The governance that supports these relationships will continue to be reviewed regularly.
- 5.17.6. Lessons learned from a range of other similar infrastructure projects have been built into the design and delivery of the scheme as well as through the employment of staff and specialist advisors from those projects to optimise the costs, benefits, contract measures, design, and timing of the works.
- 5.17.7. The scheme is confident it has secured the skills, capability, resources, and know-how to deliver the final design and construction of the scheme as efficiently and effectively as possible to deliver all the benefits within the specified budget and schedule.



Glossary

BCR	Benefits to Cost ratio			
CSR	Client Scheme Requirements			
CST	Chief Secretary to the Treasury			
DCO	Development Consent Order			
DfT	Department for Transport			
DIP	Delivery Integration Partner			
FBC	Full Business Case			
НМТ	His Majesty's Treasury			
IC	Investment Committee			
IDC	Investment Decision Committee			
IPDC	Investment, Portfolio, Delivery Committee			
NH	National Highways			
NR VAT	Non-recoverable value added tax			
OBC	Outline Business Case			
OJEU	Official Journal of the European Union			
OLT	Operational Leadership Team			
SLT	Strategic Leadership Team			
SoS	Secretary of State			
PCF	Project Control Framework			
PMO	Project Management Office			
RDP	Regional Delivery Partnership			
SRO	Senior Responsible Owner			
TAN	Transport Action Network			
VfM	Value for Money			