



Greater Cambridge Partnership

CAMBOURNE TO CAMBRIDGE BETTER PUBLIC TRANSPORT PROJECT

Appendix B - Economic Case Addendum



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1 INTRODUCTION

1.1 OUTLINE BUSINESS CASE

- 1.1.1. The Cambourne to Cambridge Public Transport Project (CtoC) Outline Business Case (OBC) Economic Case document was prepared in January 2020¹. The OBC was developed in line with HM Treasury and Department for Transport (DfT) guidance on the preparation of a 5-Case business case model.
- 1.1.2. In August 2021, the DfT released an update to the *Transport Business Case* guidance document to reflect the 2020 HM Treasury Green Book review. A further TAG update was produced in November 2023 on the inclusion of Spending Objective Analysis in the business case.

1.2 PURPOSE OF THIS DOCUMENT

- 1.2.1. This Economic Case Addendum provides a companion document to the existing OBC Economic Case.

1.3 STRUCTURE OF THIS DOCUMENT

- 1.3.1. The structure of this document is set out below.
- Chapter 1 sets out the purpose and structure of this document;
 - Chapter 2 provides a summary of the Economic Case developed in January 2020;
 - Chapter 3 sets out the areas of the Economic Case for review and update in this addendum document; and
 - Chapter 4 provides the Economic Case update.

¹ <https://www.greatercambridge.org.uk/asset-library/Sustainable-Transport/Public-Transport/Cambourne-to-Cambridge/C2C-OBC-Jan-2021/C2C-Jan-2020-App-1-Economic-Case.pdf>

2 ECONOMIC CASE

2.1 BACKGROUND

- 2.1.1. The Economic Case for the CtoC scheme, which was published in January 2020, focuses on the monetised impacts of the scheme and included the following:
- Economic, environmental, social and distribution impacts of the scheme;
 - Transport user benefits, safety, air quality, noise, and greenhouse gases captured using the marginal external cost method (TAG Unit A5-4);
 - Active mode impacts assessment using AMAT (TAG Unit A5-1);
 - Value for Money assessment using outputs from the Cambridge Sub-regional Model 2 (CSRM) as well as the monetisation of other scheme benefits proportional to their impact and latest scheme costs.

2.2 SCHEME BENEFITS

- 2.2.1. The Economic Case forecast that the CtoC project will produce the following user benefits (in forecast year 2036):
- The scheme will reduce journey times from Cambourne into Cambridge by 20 minutes in the AM peak hour
 - Bus passenger demand east of Maddingley Mulch is forecast to more than double to over 850 passengers in the AM peak hour
 - An increase in bus travel mode share from 2% to 4%
- 2.2.2. The CtoC scheme was also estimated to produce wider economic benefits (WEIs):
- £636m in increased GVA over 30 years
 - £458m from Land Value Uplift benefits
- 2.2.3. The CtoC scheme will produce environmental benefits as a result of the reduction in the use of private vehicles with a resultant improvement in air quality in the Cambridge City Centre Air Quality Management Area (AQMA).
- 2.2.4. The economic appraisal was carried using the DfT's May 2018 guidance, identifying three levels of economic impact:
- Level 1 impacts – user and non-user benefits, the established monetary economic impacts of a transport investment.
 - Level 2 impacts – productivity benefits, assessed for fixed land use scenarios where changes in economic scale and density produce productivity benefits for companies and workers.
 - Level 3 impacts – investment and employment effects which occur in a dynamic situation where a transport investment can change patterns of private sector investment and employment.
- 2.2.5. These three levels of economic benefits were assessed with reference to the following:
- Level 1 benefits were assessed with reference to the TAG Unit 5-1 and TAG Unit 5-4 guidance focusing on the monetised transport user and non-user benefits.
 - Level 2 benefits were assessed in accordance with TAG Unit A2-1.
 - Level 3 benefits assessment was based on a Land Value Uplift (LVU) approach (TAG Unit A2-1).

- 2.2.6. The Strategic Economic Narrative and Economic Impact Report (2020) provide details on the calculation of the Land Value Uplift (LVU) impacts with the emphasis on the assessment of the LVU of dependent developments.

2.3 FORECAST PLANNING ASSUMPTIONS

- 2.3.1. The CSRM D-Series transport model provided the transport network impacts for the economic appraisal. A standalone public transport model was developed using CUBE. A Foundation Case was developed incorporating local assumptions on housing, employment and other developments and all committed transport schemes. As development schemes dependent on the CtoC scheme, Bourn Airfield and Cambourne West were excluded from the economic appraisal.

2.4 APPRAISAL OUTCOMES

- 2.4.1. The Level 1 benefits of the CtoC scheme were £82m in 2010 prices discounted to 2010 over 60 years. Congestion relief benefits accounted for £63m of the total. Costs were £195.5m PV resulting in an initial BCR of 0.4:1.
- 2.4.2. Level 2 benefits for the 60-year appraisal period were £9.6m PV with agglomeration benefits accounting for £8.8m PV. Combining the Level 1 and Level 2 benefits produced an adjusted BCR of 0.5:1.
- 2.4.3. A switching test was undertaken which showed that the Present Value of Benefits would need to increase by £101.8m to achieve a BCR in the 'Low' VfM category. Level 3 benefits related to LVU amounted to £287.8m PV over 60 years. Applying these Level 3 benefits as a switching value improves the case with the CtoC scheme becoming 'Medium' value for money.
- 2.4.4. Sensitivity tests were carried out for optimism bias, risk, electric vehicle operation and an alternative high growth scenario. The results for these were not materially different from the core scenario.

3 SCOPE OF UPDATE

3.1 INTRODUCTION

3.1.1. The areas of the Economic Case reviewed in this Addendum, are as follows:

- Transport modelling framework
- Economic impacts
- Social impacts
- Environmental impacts (water)
- Social cost-benefit analysis
- Distributional analysis
- Impact on public accounts
- Sensitivity tests
- Value for money

3.2 TRANSPORT MODELLING FRAMEWORK

3.2.1. The OBC Economic Case used the CSRM D-Series model run to produce transport modelling outputs for use in the development of the appraisal. Since the OBC was reported in January 2020, the CSRM transport modelling suite has been updated twice with the development of E- and F-Series model runs. The economic appraisal results reported in this OBC Update Addendum are based on the CSRM F-Series model.

3.2.2. The Do Minimum scenario includes the following transport schemes:

- A14 Cambridge to Huntingdon scheme
- A428 Dualling Black Cat to Caxton Gibbet
- Cambridge South Station
- Waterbeach Station relocation
- GCP Corridor Schemes (CSET, CEA, W2C)
- M11 improvements
- A10 dualling

3.2.3. The Do Something scenario includes the addition of the CtoC scheme.

3.2.4. Given the dependency of the developments at Cambourne West and Bourn Airfield on the CtoC scheme, they are not included in either the Do Minimum or Do Something scenarios.

3.2.5. Forecasts were produced for each of these scenarios for the CSRM forecast year of 2041.

3.3 ECONOMIC IMPACTS

3.3.1. For the economic impacts of the CtoC scheme the values of input assumptions were reviewed and updated as follows:

- Appraisal parameters updated using the values in the November 2023 TAG Databook.
- Use of the latest optimism bias rates and reduced discount rates for health impacts.
- Use of updated cost of carbon values within the Data Book to give more weight to the value of changes in carbon emissions (BEIS carbon values).

SOCIAL IMPACTS

- 3.3.2. The social impacts of the CtoC scheme were updated to take account of the updated transport modelling and demand forecasts, covering impact areas such as accidents, and physical activity, which are valued using the Active Mode Appraisal Toolkit (AMAT). The social impacts assessed qualitatively have been reviewed.

ENVIRONMENTAL IMPACTS

- 3.3.3. The environmental impact inputs to the Economic Case for the OBC update relate to the Water Impact only. The approach for the Water Impact assessment is set out below.
- 3.3.4. The study area encompasses surface water and groundwater features up to 0.5 km from the scheme. The assessment of potential effects to flood risk and the water environment was qualitative covering the following:
- A review of readily available desk-based sources of information and data received from the consultation process.
 - A qualitative assessment of the potential impacts of climate change on mapped flood risk.
 - A qualitative assessment of potential impacts of the scheme on flood risk and water quality.

SOCIAL COST-BENEFIT ANALYSIS

- 3.3.5. The social cost-benefit analysis was updated drawing together updated economic, social and environmental (water) impacts. Assumptions driving the LVU benefits were reviewed and updated to reflect the latest situation for the Cambourne West and Bourn Airfield CtoC dependent development sites.

DISTRIBUTIONAL ANALYSIS

- 3.3.6. The range of impacts are unlikely to change materially with respect to the proportion of the population in age groups and ethnicity groups, proportion of households with disabilities and proportion of households without access to a car ownership. However, a high-level review of the assessment of each of the distributional impacts was undertaken.

IMPACT ON PUBLIC ACCOUNTS

- 3.3.7. The Public Accounts section was updated to reflect the revised capital cost estimates for the preferred route.

SENSITIVITY TESTS

- 3.3.8. A range of sensitivity tests was undertaken to understand the sensitivity of the appraisal to key assumptions.

VALUE FOR MONEY

- 3.3.9. An updated Value for Money Statement was produced based on revisiting the value for money of the scheme based on the changes in benefits and costs. As well as using the latest capital costs, operating and maintenance costs were also reviewed. An updated initial BCR was produced based on Level 1 transport user benefits. The Appraisal Summary Table and DfT Tables were updated. Wider economic impacts were also assessed.

4 ECONOMIC CASE UPDATE

4.1 APPRAISAL METHODOLOGY AND ASSUMPTIONS

- 4.1.1. The Economic Case has been developed following the principles of HM Treasury Green Book and the DfT's Transport Analysis Guidance (TAG). The economic appraisal refers to, and follows the guidance of, the following TAG Units:
- TAG Unit A1-1: Cost-Benefit Analysis (November 2023);
 - TAG Unit A1-2: Scheme Costs (November 2023);
 - TAG Unit A1-3: User and Provider Impacts (May 2022);
 - TAG Unit A4-1: Social Impacts (November 2022);
 - TAG Unit A4-2: Distributional Impacts (May 2023);
 - TAG Unit A5-4: Marginal External Costs (May 2023); and
 - TAG Unit A5-1: Active Mode Appraisal (November 2022).
- 4.1.2. In line with TAG, all costs and benefits in the appraisal have been presented in 2010 present values (market prices). The appraisal period is 60-years reflecting the asset life of the main components of the scheme.

Table 4-1 – Economic Appraisal Assumptions

Criteria	Assumption	Source
Opening year	2028	End of construction period
Appraisal period	60 years	Green Book
Discount rate	<i>Standard discounting:</i> 0 – 30 years: 3.50% 31 – 75 years: 3.00% <i>Health discounting:</i> 0 – 30 years: 1.50% 31 – 75 years: 1.29%	November 2023 TAG Data Book (A1 1.1)
Scheme induced cycle demand	Active Travel Fund uplift tool	Active Travel Fund (ATF) 4 uplifts tool
Journey purpose split – used for change in highway kilometres and MECs calculations	Business: 14.8% Commuting: 31.2% Other: 53.9%	November 2023 TAG Data Book (A1.3.4, percentage of distance travelled by vehicles, average weekday)
Journey purpose split – used for journey time benefits	<i>AM period (07:00 – 10:00)</i> Business: 2.1% Commuting: 25.6% Other: 72.3% <i>IP period (10:00 – 16:00)</i> Business: 1.7% Commuting: 7.2% Other: 91.1% <i>PM period (16:00 – 19:00)</i> Business: 2.6% Commuting: 33.5% Other: 64.0%	November 2023 TAG Data Book (A1.3.4, percentage of person trips, weekday periods)
Values of time per hour	Commuting: £9.95 (2010) Other: £4.54 (2010) Business: mode specific	November 2023 TAG Databook (A1.3.2)
Market price adjustment factor	1.19	November 2023 TAG Databook (A1.3.1)

Methodology for user benefits

- 4.1.3. CSRM F-Series modelling has been used for the inputs for the economic appraisal. Public transport patronage in the Cambourne to Cambridge corridor was provided by Atkins. Highways impacts were extracted from the F-series SATURN model and the impacts were monetised using TUBA.

- 4.1.4. TUBA has been run for a single year 2041, and then to estimate the benefits over the 60-year appraisal period, the following steps have been applied within the appraisal model:
- A demand ramp-up of 25% to 75% in the first three years (2028 to 2030) of scheme opening and 100% afterwards.
 - Background demand growth has been assumed from base to 2041 to calculate the benefit profile from 2028 to 2041, and then population growth has been applied from TAG post-2041 until the horizon year.
 - For time benefits, Value of Time growth has been applied post-2041.

Bus Journey Time Savings

- 4.1.5. The journey times were taken from the SATURN highway assignments for the length of the busway for the Do Something (with the scheme), and the on-road equivalent in the Do Minimum. The busway journey time includes the journey time for accessing the Scotland Farm P&R. A two-minute bus dwell time was assumed at the P&R site.
- 4.1.6. The CSRM model provided forecasts of two-way total passenger numbers by bus service for the Cambourne to Cambridge corridor for each modelled peak period. These bus passenger forecasts were split by direction of travel and by the percentage of bus passengers travelling the whole length of the corridor and part of the corridor only (which was assumed to be to/from the P&R to the city centre). These bus passenger forecasts were from CSRM E-series runs as this was the most recent available information.
- 4.1.7. The bus journey time savings were assumed to apply only to passengers using bus services that use the new busway. Existing passengers transferring from other services, or on services that themselves transfer to the busway were assumed to receive the whole journey time saving. New passengers were assumed to receive 50% of the journey time saving (rule-of-a-half).
- 4.1.8. Bus journey time savings in person seconds per hour were annualised using the TUBA factors and monetised using standard values of time.

Methodology for AMAT

- 4.1.9. Given that the scheme will also provide facilities for cyclists and pedestrians, the DfT's Active Mode Appraisal Toolkit (AMAT) and TAG Unit A5.1 guidance have been used to quantify the impacts of it on walking and cycling demand and benefits. The proposed improved active travel facilities consist of an emergency and maintenance access track adjoining the busway that will also act as a new active travel path for pedestrians and cyclists and, for the majority of the route, for equestrian use and includes the developer designed sections at West Cambridge, Bourn Airfield and Cambourne West.
- 4.1.10. AMAT enables the following benefits to be quantified:
- User benefits - journey ambience;
 - Business benefits - reduction in absenteeism;
 - Health benefits - economic benefits of preventing early mortality through cycle exercise; and,
 - Marginal external cost savings – reduction in highway kilometres driven by cars due to mode switch to cycling.

4.2 SCHEME COSTS

4.2.1. The following cost lines have been considered within the economic appraisal:

- Capital expenditure; and
- Operating, maintenance and renewal costs.

Capital Expenditure

4.2.2. The Financial Case Addendum, Section 3.2, sets out the capital cost estimate of £192.3m (nominal). The base cost for appraisal is £109.06m excluding sunk costs. The breakdown of capital costs is shown in Table 4-2. A Quantified Cost Risk Assessment was carried out in February 2024 which provides a P80 value for risk (31% of base cost). The inflation estimate reflects the impact the Covid-19 pandemic has had on the economy since the original OBC submission with additional inflation contingency of 3% per annum.

4.2.3. It has been assumed that CtoC will be delivered as an optical guidance system.

Table 4-2 – Breakdown of Capital Costs

Cost Line	£m
Base Cost (2023 prices)	109.06
Risk	37.94
Inflation	24.33
Land	7.47
Total	178.80

4.2.4. The cost profile is presented in Table 4-3 and assumes a construction start date in Q1 2026 with scheme construction completed in Q4 2027. Sunk costs totalling £13.48m that have already been incurred in the years 2014 to 2024² and are not included within the appraisal.

Table 4-3 – Cost Profile

Cost Profile	2024	2025	2026	2027
Cost Profile	2%	11%	38%	49%

4.2.5. It should be noted that for the economic appraisal the base cost was deflated and discounted to 2010 prices and values and adjusted to market prices in line with guidance.

² £0.4m assumed as sunk cost in 2024.

- 4.2.6. An update to TAG Unit A1.2 since the original submission advises that estimates for both risk and optimism bias adjusted costs should be calculated to provide insights to the overall picture of scheme costs. In the appraisal, either the risk or optimism bias adjusted costs can be considered.
- 4.2.7. At this stage, the recommended optimism bias levels are 23% for roads and 33% for rail including guided bus. As these percentages are similar or lower than the risk estimate, the risk value of 31% has been applied.

Operating, Maintenance and Renewal Costs

- 4.2.8. Operating costs have been assumed to remain the same as for the OBC submission. Whole life operating costs over a 60-year period were produced which equate to approximately £3.4m (2019 prices) per annum. Consistent with the original 2020 OBC no bus revenue has been considered at this stage.
- 4.2.9. Maintenance and renewals costs have been revisited by WSP and are estimated to be approximately £128,000 per annum (2022 prices). These have been appraised over a 60-year period within the model.
- 4.2.10. Optimism bias has not been applied to operating costs as consistent with the original submission. Within the appraisal model, the operating costs have been deflated and discounted, and adjusted to market prices.

4.3 KEY MODELLING RESULTS

Public Transport Journey Times

- 4.3.1. Modelled public transport journey times for the forecast year of 2041 for the Do Minimum and Preferred Option are shown in Table 4-4.
- 4.3.2. The journey times shown are by time period and represent average journey times by bus from Cambourne to Grange Road (the Cambridge City Centre end of the new busway) and includes the journey time for accessing the Scotland Farm P&R. A two-minute bus dwell time was assumed at the P&R site. In 2041, the CtoC services will offer a step change in travel time in the AM peak hour with the average journey time reducing from around 33 minutes to 17 minutes.

Table 4-4 – Cambourne to Cambridge Inbound Journey Times (Minutes, 2041)

Option	AM Peak Hour	Inter-Peak Hour	PM Peak Hour
Do Minimum	33:11	25:16	26:36
Preferred Option	17:02	16:40	16:50
Change in Journey Time	19:54	5:00	9:26

Source: WSP analysis of the CSRM Core Minus Scenario

Public Transport Demand Forecast

- 4.3.3. The daily forecast passenger demand for bus services using the CtoC busway is 10,300 bus trips over a 12-hour period. Of this total, 8,800 trips are new bus trips.

4.4 ECONOMIC APPRAISAL

Journey Time Benefits

- 4.4.1. The scheme seeks to improve bus connectivity and reduce congestion issues along the A428 and A1303 by providing quicker, more reliable journeys for users travelling via the proposed bus infrastructure improvements. Highway users will also experience journey time benefits due to decongestion as a result of modal shift from private car to public transport. Total journey time benefits as a result of the scheme are presented in Table 4-5. These benefits represent a total of £45.59m PV. It should be noted that the 2020 OBC used the D-Series CSRM which did not produce user (PT) journey time benefits.

Table 4-5 – Journey Time Benefits

Journey Time Benefits (£m, 2010 PV)	
Journey Time Benefits (PT)	29.86
Journey Time Benefits (Highway)	15.73
Total	45.59

Vehicle Operating Costs

- 4.4.2. The scheme results in reduced road traffic and hence produces decongestion benefits. There is a forecast mode shift from private car to public transport along the A428 and A1303 as a result of providing a competitive public transport alternative based on providing quicker, more reliable public transport journeys. Total VOC savings of £2.70m PV as a result of the scheme are presented in Table 4-6.

Table 4-6 – Vehicle Operating Costs Savings

Vehicle Operating Costs Savings (£m, 2010 PV)	
Vehicle Operating Costs (Fuel)	0.81
Vehicle Operating Costs (Non-Fuel)	1.89
Total	2.70

Active Travel

- 4.4.3. Table 4-7 below shows the benefits associated with improving active travel through provision of better-quality bus infrastructure along the CtoC corridor. These impacts have been calculated using the DfT's AMAT. This table shows the active travel benefits associated with improved active travel journeys that are mainly generated through the health benefits of cycling and walking including reduced risk of premature death and reduction in absenteeism from work. The impact on journey ambience is also significant as enhanced provision of cycling infrastructure improves the quality of journey experienced by cyclists.
- 4.4.4. There are decongestion benefits associated with mode shift from private car, improving journey times for other highway users. Associated with this, there is a reduction in

indirect tax revenues where fuel usage reduces, but this is negligible. Mode shift from private car to active travel mode also produces benefits in terms of reduced accidents and greenhouse gas emissions. Total active travel benefits are £21.3m PV.

Table 4-7 – Active Travel Benefits

Active Travel Benefits (£m, 2010 PV)	
Congestion	0.45
Infrastructure	negligible
Accident	0.07
Local Air Quality	negligible
Noise	negligible
Greenhouse Gases	0.03
Reduced risk of premature death	4.88
Absenteeism	0.57
Journey Ambience	15.33
Indirect Taxation	0.01
Total	21.34

Marginal External Costs

- 4.4.5. In line with TAG Unit A5.4, the DfT's Marginal External Costs (MECs) approach has been used for estimating the benefits for trips which continue to use the local highway network in terms of congestion, infrastructure, accidents, local air quality, noise, greenhouse gases, and indirect tax impacts. The MECs approach is based on the change in external costs arising from an additional or removed vehicle (in terms of forecast change in modelled vehicle-kms) on the network.
- 4.4.6. Table 4-8 below shows the scheme benefits due to changes in vehicle kms compared with the Do Minimum. Congestion, greenhouse gases, and indirect tax benefits have been excluded to avoid double counting with TUBA. As the CSRM model forecasts an increase in highway kms in the Inter Peak time period, especially to/from model Park & Ride zones, there is an overall increase in vehicle kms. This results in total MECs benefits of -£2.23m PV.

Table 4-8 – Marginal External Costs Benefits

Marginal External Costs Benefits (£m, 2010 PV)	
Congestion	not assessed
Infrastructure	-0.02
Accident	-2.02

Local Air Quality	-0.06
Noise	-0.13
Greenhouse Gases	not assessed
Indirect Taxation	not assessed
Total	-2.23

Costs

- 4.4.7. The Present Value of costs over the appraisal period is shown in Table 4-9.

Table 4-9 – Costs Over Appraisal Period

Costs (£m, 2010 PV over appraisal period)	
Capital	82.29
Operating, Maintenance and Renewals	55.67
Total	137.96

INITIAL BCR

- 4.4.8. The above costs and benefits have been combined to form the Present Value of Costs (PVC), Present Value of Benefits (PVB), Net Present Value (NPV) and the initial Benefit Cost Ratio (BCR). The results are presented in Table 4-10 indicating an initial BCR of 0.5:1.
- 4.4.9. The DfT tables (TEE, PA and AMCB tables) are included in Appendix A, whilst the Appraisal Summary Table is included in Appendix B.

Table 4-10 – Preferred Option Initial BCR

Analysis of Monetised Costs and Benefits (£m, 2010 PV)	
Noise	-0.13
Local Air Quality	-0.05
Greenhouse Gases	1.22
Journey Quality	15.33
Physical Activity	5.45
Accidents	-1.94
Economic Efficiency: Consumer Users (Commuting)	21.66
Economic Efficiency: Consumer Users (Other)	22.29
Economic Efficiency: Business Users and Providers	4.79
Wider Public Finances (Indirect Taxation Revenues)	-0.93

Present Value of Benefits (PVB)	67.67
Broad Transport Budget	137.96
Present Value of Costs (PVC)	137.96
Net Present Value (NPV)	-70.29
Benefit to Cost Ratio (BCR)	0.5:1

ADJUSTED BCR

Wider Impacts

4.4.10. Transport investments such as the CtoC scheme are likely to affect the wider economy beyond the direct impacts on transport users and individuals living close to it. A scheme such as CtoC could potentially deliver the following wider economic impacts:

- **Agglomeration** - productivity benefits of businesses being clustered together.
- **Labour supply impacts** - those who are economically inactive due to high perceived transport costs or lack of transport links may now have better access to employment opportunities.
- **Output change in imperfectly competitive markets** - reducing businesses travel costs such that they can increase output, reduce prices and increase productivity.

4.4.11. In line with OBC stage, a proportionate approach has been undertaken to quantify and monetise the impacts associated with agglomeration, labour supply and output change. This involved applying a percentage uplift to the transport user benefits delivered by the scheme.

4.4.12. The DfT's Value for Money Framework (2017) identifies agglomeration, labour supply impacts and output change in imperfectly competitive markets as 'evolving monetised impacts', meaning they can be included within an Adjusted BCR and should be considered under a fixed land use assumption. The impacts have been estimated by comparing the transport user benefits of scenarios in Do Minimum (P) and Do Something (S) and in line with the 2020 OBC an uplift was applied to users benefits, as follows:

- 14% of total user benefits to account for agglomeration and labour market impacts.
- 10% of business user benefits for 'Output change in imperfectly competitive markets', as per TAG Unit A2.1.

4.4.13. The wider impacts for the preferred option are set out in Table 4-11.

Table 4-11 – Wider Impacts- Preferred option

Impacts	(£m, 2010 PV)
Agglomeration	2.58
Tax revenues arising from labour market impacts	
Output change in imperfectly competitive market	0.37
Total	2.95

Adjusted BCR

- 4.4.14. The adjusted BCR includes all monetised benefits associated with the initial BCR and the wider impacts. The adjusted BCR is set out in Table 4-12.

Table 4-12 – Adjusted Benefit to Cost Ratio- Preferred option

Analysis of Monetised Costs and Benefits (£m, 2010 PV)	
Initial PVB	67.67
Wider impacts	2.95
Adjusted Present Value of Benefits (PVB)	70.62
Present Value of Costs (PVC)	137.96
Net Present Value (NPV)	-67.34
Adjusted BCR	0.5:1

- 4.4.15. Based on the AMCB results, the total monetised benefits are still less than costs by nearly £67.3m NPV. The adjusted BCR of the scheme remains 0.5:1.

SENSITIVITY ANALYSIS

- 4.4.16. Recognising the uncertainty around the appraisal assumptions and inputs, sensitivity analysis has been undertaken to assess the robustness of the appraisal results.
- 4.4.17. The sensitivity tests are as follows:
- Test 1: Replacement of the 40% optimism bias uplift based on the identified risk allowance with a 28% uplift based on the mid-point for the road and rail levels identified in TAG
 - Test 2: CtoC plus Making Connections (City Access) sensitivity test. Whilst Making Connections is not being taken forward, the scenario provides an assessment of an illustrative package of traffic management and public transport enhancement interventions on the economic performance of the CtoC scheme. It was assumed there would be no change in active mode benefits compared to the core scenario.
 - Test 3: Application of a 20% reduction to the core scenario scheme benefits to calculate a low growth scenario.
 - Test 4: Application of a 20% increase to the core scenario scheme benefits to calculate a high growth scenario.

- 4.4.18. Table 4-13 presents the sensitivity test results.

Table 4-13 – Sensitivity test results

Sensitivity Test	PVB (£m 2010 PV)	PVC (£m 2010 PV)	NPV (£m 2010 PV)	Initial BCR	Adjusted BCR
CtoC Preferred Scheme	67.67	137.96	-70.29	0.5:1	0.5:1

Test 1: Optimism Bias decreased	67.67	138.69	-71.02	0.5:1	0.5:1
Test 2: CtoC and City Access	78.23	137.88	-59.65	0.6:1	0.6:1
Test 3: Low growth	54.14	137.96	-83.82	0.4:1	0.4:1
Test 4: High growth	81.21	137.97	-56.76	0.6:1	0.6:1

LAND VALUE UPLIFT ASSESSMENT

4.4.19. As described in the Strategic Case Addendum, the proposed developments at Cambourne West and Bourn Airfield are dependent on the introduction of the CtoC scheme. TAG Unit A2-2 sets out the approach to valuing the welfare effects associated with the transport scheme and dependent development. Estimating the costs and benefits of the transport scheme under assumptions of land-use change requires the consideration of four elements:

- Land Value Uplift (LVU) – the change in land value as a result of conversion of land to a more productive use. This is a private benefit that accrues to the landowner/developer rather than wider society.
- Transport External Costs (TECs) – the impact of the development on existing transport users.
- Non-Transport Complementary Interventions (NTCI) – costs associated with community or education facilities or any other facility.
- Land Amenity Value (LAV) – The change in amenity value associated with different land-use types e.g., conversion of land from agricultural land to housing, recreational or forested land.
- Other impacts – this usually includes environmental, social and distributional impacts that are termed externalities from the dependent development.

4.4.20. The method used to value the total benefits of dependent development incorporates all private and societal benefits and costs associated with the scheme and the development unlocked or attributable to the transport scheme.

$$Total\ benefits = LVU_D + Other - TEC - LAV - NTCI$$

Where:

LVU_D = Land Value Uplift for that proportion of housing dependent on the transport scheme.

$Other$ = Environmental, social and distributional impacts outlined in TAG Unit A3 and A4.

TEC = Transport External Costs.

LAV = Land Amenity Value, based on changing land-use.

$NTCI$ = Non-Transport Complementary Interventions, with the benefits of these NTCIs.

Land Value Uplift

4.4.21. The LVU has been calculated according to the methodology set out in TAG Unit 2-2 Appendix D and the DLUHC Appraisal Guide (March 2023). New development linked

to the scheme creates economic value which is reflected in the uplift in the value of land. For the economic appraisal, the difference between this new value – once all the costs of changing land use have been factored in – and its previous value is the LUV and represents the net private benefit of the development which accrues to the landowner/developer.

Deadweight and Dependent Development

- 4.4.22. In the CtoC scheme corridor, a total of 2,000 homes (Cambourne West 1,500 and Bourn Airfield 500) can be delivered without the scheme. This is defined as the ‘deadweight’ housing and represents the number of homes that can be delivered, whilst still maintaining a reasonable level of service on the existing transport network. This means that 3,850 (Cambourne West 850 and Bourn Airfield 3,000) homes are dependent on the scheme, so called ‘dependent development’, which represents the full housing quantum (5,850 homes) minus the deadweight housing.

Housing Delivery and Profile

- 4.4.23. The housing delivery profile is based on the housing trajectory for Cambourne West and Bourn Airfield sites. It is assumed that the 2,000-deadweight housing will be delivered first, and then the dependent development would come forward.

Displacement

- 4.4.24. As well as the potential deadweight, the development may result in a decrease in housing demand in adjoining areas or elsewhere in the target area. As such, the appraisal seeks to capture the gross impact of the intervention (measured by land value uplift) and deduct any reduction in the economic activity displaced from elsewhere. As such, the level of displacement is combined with the assessment of deadweight to provide the net change in land value or overall additionality that is attributable to the scheme.
- 4.4.25. The level of displacement has been calculated in line with DLUHC Appraisal Guidance. This guidance sets out the process and recommended thresholds for the calculation of displacement. The level of displacement depends on the proportion of social / affordable rented housing, the level of affordability, the level of development and the number of units built.
- 4.4.26. Combining values with the recommended thresholds contained in the DLUHC guidance document provides a level of displacement for Cambourne West and Bourn Airfield of 23% and 20% respectively.

Additionality

- 4.4.27. To estimate additionality the following formula has been used.

$$\text{Additionality} = (1 - \text{deadweight}) \times (1 - \text{displacement})$$

- 4.4.28. Approximately, 64% (Cambourne West) and 14% (Bourn Airfield) of the total housing quantum is anticipated to be deadweight housing. Using the method and process outlined for the calculation of displacement, approximately 23% of the development at Cambourne West and 20% of the development at Bourn Airfield is expected to be displaced from adjoining areas or elsewhere in the target area.

4.4.29. The total additionality value of the development is calculated at 28% for Cambourne West and 69% for Bourn Airfield, equivalent to 3,850 homes. Table 4-14 shows the calculation of additionality and the component data sources used in the calculation of the deadweight and displacement.

Table 4-14 – Additionality Value of the Development

Ref	Item	Cambourne West	Bourn Airfield	Criteria/Calculation	Source
a	Total no. of units	2,350	3,500	-	Greater Cambridge Council
b	Deadweight no. of units	1,500	500	-	Economic Impact Report
c	Deadweight % of total (b/a)	64%	14%	-	Calculation
d	Proportion of social/affordable rent of total	30%	40%	-	Economic Impact Report
e	Affordability Ratio	10.46	10.46	-	South Cambridgeshire, Local Authority Housing Affordability, 2022
f	Work-place based affordability ratio (Low)	60%	60%	<ul style="list-style-type: none"> 60% if local authority affordability ratio of equal to or over 10 (low), 80% between 7 and 100 (medium) and 100% if equal to or below 7 (high). 	DLUHC Appraisal Guide
g	Net additions to stock over the past 10 years	12.4%	12.4%	Change from 2013 to 2022	South Cambridgeshire, DLUHC housing stock statistics, 2022
h	Development activity (High)	55%	55%	<ul style="list-style-type: none"> 45% if net additions to housing stock over the past 10 years is less than or equal to 5%, (low) 50% if net additions to the housing stock over the past 10 years is between 5% and 7% (medium) and 55% if net additions to the 	DLUHC Appraisal Guide

Ref	Item	Cambourne West	Bourn Airfield	Criteria/Calculation	Source
				housing stock over the past 10 years is greater than 7% of the housing stock (high)	
i	No. of units being delivered	100%	100%	<ul style="list-style-type: none"> 40% if 100 total units or fewer, 60% between 101-250 total units, 70% between 251-500 units; and 100% if over 500 total units 	DLUHC Appraisal Guide
j	Displacement (1-d)*f*h*i	23%	20%	$= (1-0.30) \times 0.60 \times 0.55 \times 1.00$ $= (1-0.40) \times 0.60 \times 0.55 \times 1.00$	Calculation
k	Additionality (1-c)*(1-j)	28%	69%	$= (1-0.64) \times (1-0.23)$ $= (1-0.14) \times (1-0.20)$	Calculation

Gross Development Value

- 4.4.30. The Gross Development Value (GDV) is the estimated total revenue a developer could obtain from the land, in the context of housing this is calculated by multiplying the number of dwellings in the development area by the assumed house price per dwelling.

$$GDV = \text{House prices} \times \text{number of dwellings in the development area}$$

- 4.4.31. The Viability Assessment by Aspinall Verdi³ estimated an average value of residential land of £4,761 per m² (2024 prices)⁴. Based on the mix of housing sizes proposed for the site, the average property size is 106m². This results in an average house price on the development sites of £506,051 (2024 prices)⁵. The Land Registry dataset shows a house price increase in the district, with house prices rising on average by 2.2% in real terms over the last 10 years.
- 4.4.32. Real house price growth at 2.2% has been applied every year from 2024 to 2049 and is combined with the housing delivery profile to provide an estimate of the GDV or total housing value for the development in 2024 prices. Adjusting to 2010 market prices and discounting to 2010 values, for the purposes of economic appraisal, gives a GDV estimate of £672.07m for both the sites.

³ First Proposals Viability Report, Greater Cambridge Local Plan, August 2021

⁴ 2021 prices changed to current year 2024 with GDP deflator.

⁵ 2021 prices changed to current year 2024 with GDP deflator.

Build Costs

- 4.4.33. Table 4-15 shows the values and sources of developer cost components as well as professional fees and developer profits associated with the development for both the sites.

Table 4-15 – Development Cost Components

Parameter	Value	Source
Average house size	106 sqm	Weighted average of build sizes based on mix house sizes in South Cambridgeshire
Build costs	£1,419/sq. mt. (2024 prices) ⁶	Viability Assessment
External cost	15.0% of build costs	Viability Assessment
Professional Fees	10.0% of build costs	Viability Assessment
Developer Profit	20.0% of GDV	Viability Assessment
Sales Agent and Legal Fees	2.0% of GDV	Viability Assessment
Marketing	1.5% of GDV	Viability Assessment
Finance Costs	7.5% of GDV	Viability Assessment
Contingency	5% of build costs	Viability Assessment
Growth in build costs	<ul style="list-style-type: none"> ■ 2024: 2.6% ■ 2025: 2.6% ■ 2026: 4.0% ■ 2027: 3.6% ■ 2028: 4.0% ■ 2028 onwards: average of 2024 to 2028 	BCIS All in Tender Price Index (TPI) forecast at January 2024
Dwellings/acre	16	Economic Impact Report

- 4.4.34. Over the development horizon, the developer costs are estimated to be £369.64m (2010 prices and values), or £439.87m once adjusted to market prices for both the sites.

Current Land Value

- 4.4.35. Currently the sites identified for development are agricultural land (intensive). Based on the Economic Impact Report, it has been assumed that 16 dwellings can be developed in one acre of the site extent. For the 3,850 additional homes at Cambourne West and Bourn Airfield that are dependent on the scheme, the area allocated for development would be approximately 189 acres or 76 hectares. Based on the Viability Assessment, a value for the land in its current agricultural usage at £11,500 per acre (or £28,420 per hectare), in 2024 prices⁷. It has been assumed that this valuation would grow in line with the real house price growth assumption which underpins the GDV calculation.

⁶ 2021 prices changed to current year 2024 with GDP deflator.

⁷ 2021 prices changed to current year 2024 with GDP deflator.

Multiplying this by the number of acres of housing development in each year, converting to 2010 prices and discounting to 2010 gives a current land value of £0.79m, or £0.94m once also adjusted to market prices for both the sites.

Non-Transport Complementary Interventions (NTCI)

- 4.4.36. The developments will also include non-transport complementary interventions such as the provision of schools, green infrastructure, and community facilities. TAG Unit A2-2 requires that the cost of NTCIs should be included in the valuation of dependent development as they are intrinsically linked to the uplift in land values i.e., the benefits are assumed to be captured by the land value uplift.
- 4.4.37. The total cost of NTCIs in 2024 prices⁸ is estimated to be £29.33m for both Cambourne West and Bourn Airfield sites.
- 4.4.38. In the appraisal, these costs have been adjusted for real growth in line with BCIS TPI inflation forecasts, converted to 2010 prices and discounted to 2010. The resultant cost is £7.56m (2010 prices and values), or £8.99m once adjusted to market prices for both the sites.

Transport External Costs

- 4.4.39. Transport External Costs (TECs) capture the effect of additional transport demand imposed by dependent transport users on all other users, such as increased levels of congestion and/or overcrowding. These costs arise as a result of those trips generated by the new development which are dependent on the scheme.
- 4.4.40. The assessment of TECs associated with dependent development has been assessed in line with TAG Unit A2.2 using the scenarios below to capture the additional costs to existing transport users with and without the dependent development:
- Scenario S: without the dependent development but with the transport scheme
 - Scenario R: with the dependent development and with the transport scheme
- 4.4.41. CSRM model outputs for the two scenarios have been extracted and processed in TUBA, using the same assumptions used for the calculation of the transport user benefits. The impact on journey times, vehicle operating costs and indirect tax were calculated using the approach set out in section 4.1.4. In line with guidance in TAG Unit A2-2, the Scenario S demand matrix is used in TUBA for both scenarios (Do Minimum and Do Something) as the TECs represent the impact of development traffic on existing users. Table 4-16 shows the estimate of the TECs over the appraisal period.

Table 4-16 – Transport External Costs

	£m (2010 prices and values)
Journey time impact	-35.99

⁸ 2021 prices changed to current year 2024 with GDP deflator.

VOC (Fuel and Non-Fuel) impact	-2.77
Indirect tax impact	0.74
Overall TECs impact	-38.02

- 4.4.42. The journey time impact of the dependent development is estimated at -£35.99m (2010 prices and values, market prices) over the appraisal period. The VOC fuel and non-fuel impacts of the development are estimated at -£2.77m for all transport users. There is a small indirect tax impact of £0.74m. The total transport external costs imposed by dependent transport users on all other users is estimated at -£38.02m (2010 prices and values, market prices) for Cambourne West and Bourn Airfield developments.

Land Amenity Value

- 4.4.43. Land Amenity Value (LAV) is estimated based on the change in land amenity expected from the new developments. The sites allocated for housing development are currently greenfield land, the majority of which is used for agricultural purposes.
- 4.4.44. The housing scheme, as well as addressing housing needs in the area, delivers a range of other significant amenity benefits such as open space, active transport (cycleways and footpaths) and other recreational use facilities and land-types that will serve and benefit existing residents in the wider area.
- 4.4.45. The change in amenity value has been valued using estimates of external benefits of undeveloped land contained in the TAG Valuing Dependent Development Workbook⁹.
- 4.4.46. Based on planning assumptions of 16 dwellings per acre and the profile of housing completions over the development horizon to 2049, the estimated land take for housing is calculated at approximately 189 acres for both the sites.
- 4.4.47. In line with TAG Unit A2-2, this development area is assumed to have zero amenity value. As such, the loss of amenity value from the change in land use associated with the residential development is estimated at -£0.16m (2010 prices and values) for both Cambourne West and Bourn Airfield sites.

Health Impacts

- 4.4.48. The formula for estimating the external health impacts from additional rented affordable housing is set out in Annex G of the DLUHC Appraisal Guidance. There are both external impacts and private impacts associated with health improvements. The private health benefits from additional rented affordable housing are already accounted for in the land value uplift calculations. The external benefits to society from a reduction in rough sleeping and/or the probability of a new tenant that had been living in a poor

⁹ DfT (2021) TAG: economic impacts worksheets, Valuing Dependent Development Workbook, externality values, <https://www.gov.uk/government/publications/tag-economic-impacts-worksheets>

condition or overcrowded property moving into a new property as part of the development brought about by the scheme has been calculated.

- 4.4.49. The affordable housing component of the new development assumption is 30% for Cambourne West and 40% for Bourn Airfield in line with the Local Plan (as shown in Table 4-14). This amounts to approximately 2,105 affordable homes spread over the development horizon from 2028 to 2049, or 1,158 affordable homes once deadweight and displacement are accounted for.
- 4.4.50. The external health impact of an additional affordable housing unit is £206 per year (2010 prices), or £3,900 in present value terms over 30 years. This is calculated in line with DLUHC Appraisal Guidance and is a function of the annual health care cost (£4,900) multiplied by the probability that someone is a former rough sleeper (1.5%) plus the probability of a new rented affordable housing unit reducing overcrowding (88.5%) multiplied by the annual impact of reduced overcrowding at £149 per unit annual saving.
- 4.4.51. The total health impacts from additional affordable housing delivered by the housing development is £0.09m (2010 prices and values) for both the sites.

Summary

- 4.4.52. The LVU, TECs, NTCIs, LAV and health benefits of affordable housing as set out above provides a total benefit for the dependent development of £184.18m (2010 prices and values, market prices). Table 4-17 shows the estimation of total benefits by element. All benefits are expressed in 2010 prices and values and in the market price unit of account.
- 4.4.53. The economic appraisal shows that over the delivery period to 2049, the dependent developments at Cambourne West and Bourn Airfield generates significant benefits.

Table 4-17 – Valuing the Benefits of the Dependent Development

Element	£m (2010 prices and values)
GDV	672.07
Build costs (excluding NTCI costs)	-439.87
Current land value	-0.94
NTCI costs	-8.99
Land Value Uplift	222.26
TECs	-38.02
LAVs	-0.16
Health impacts of affordable housing units	0.09
Total benefits (2010 prices and values, market prices)	184.18

Sensitivity

- 4.4.54. A sensitivity test has been carried out to assess the effect of an additional 2,000 homes in the Cambourne West area to provide further support of longer-term strategic growth, as identified in the latest Emerging Local Plan (assuming build out from 2031 to 2049, 40 homes/hectare and an annual build out rate as per Bourn Airfield and Cambourne

West). The additional homes add £115.79m (2010 prices and values, market prices) to the total dependent development benefits. The increased total dependent development benefits of £299.97m are presented in Table 4-18.

Table 4-18 – Valuing the Benefits of the Dependent Development with additional 2,000 homes

Element	£m (2010 prices and values)
GDV	1,000.55
Build costs (excluding NTCl costs)	-652.06
Current land value	-1.40
NTCl costs	-8.99
Land Value Uplift	338.10
TECs¹⁰	-38.02
LAVs	-0.23
Health impacts of affordable housing units	0.13
Total benefits (2010 prices and values, market prices)	299.97

No Displacement

- 4.4.55. The dependent development impact assessment described above used a calculation of the displacement effect based on the latest DLUHC Appraisal Guide. An alternative scenario has also been tested assuming no displacement reflecting the broad consensus that 150,000-250,000 new homes are needed in Cambridge and therefore displacement is unlikely to be an issue. To test this scenario, we have assumed that there is no displacement in the core scenario and additional housing assessments. The respective results are £241.59m and £392.16m (2010 prices and values, market prices) for both scenarios, as presented in Table 4-19 and Table 4-20.

Table 4-19 – Valuing the Benefits of the Dependent Development with No displacement

Element	£m (2010 prices and values)
GDV	845.94
Build costs (excluding NTCl costs)	-553.74
Current land value	-1.19
NTCl costs	-11.32
Land Value Uplift	279.69
TECs	-38.02
LAVs	-0.20

¹⁰ The TECs assessment does not take account of the additional traffic from the additional 2,000 dwellings which would require more modelling.

Health impacts of affordable housing units	0.12
Total benefits (2010 prices and values, market prices)	241.59

Table 4-20 – Valuing the Benefits of the Dependent Development with additional 2,000 homes and No Displacement

Element	£m (2010 prices and values)
GDV	1,273.09
Build costs (excluding NTCl costs)	-829.66
Current land value	-1.79
NTCl costs	-11.32
Land Value Uplift	430.32
TECs¹¹	-38.02
LAVs	-0.30
Health impacts of affordable housing units	0.16
Total benefits (2010 prices and values, market prices)	392.16

- 4.4.56. In line with guidance in the Value for Money Framework, induced investment impacts are considered within the *Indicative Monetised Impacts*. Therefore, these Level 3 impacts are not considered within the Initial or Adjusted Benefit Cost Ratio (BCR) for the scheme but are used to determine a 'switching value' of the VfM category.

Switching value analysis

- 4.4.57. The adjusted BCR presented in Table 4-12 implies the scheme delivers Poor value for money. The switching value analysis considers the quantum of benefit and percentage of LVU required to change the value for money category.
- 4.4.58. Table 4-21 sets out the additional PVB and percentage of LVU benefits required to switch the VfM category for the core scenario and the sensitivity tests. If at least 37% of the LVU benefits are realised, the scheme will achieve Low value for money, and with over 74% of LVU benefits, it would be categorised as Medium value for money in the core scenario. In the additional 2,000 homes scenario, the scheme will achieve High VfM category by capturing 68% of LVU benefits. In the no displacement scenario with an additional 2,000 homes, the scheme will achieve Low, Medium and High VfM categories by capturing 17%, 35%, and 52% of LVU benefits respectively.

¹¹ The TECs assessment does not take account of the additional traffic from the additional 2,000 dwellings which would require more modelling.

Table 4-21 – PVB and LVU percentage switching value required to change VfM category

Scenario	Switching value to reach	Low	Medium	High	Very High
Core	PVB (£m 2010 PV)	67.3	136.3	205.3	481.2
	% of LVU	37%	74%	111%	261%
Core with additional 2,000 homes	PVB (£m 2010 PV)	67.3	136.3	205.3	481.2
	% of LVU	22%	45%	68%	160%
Core with no displacement	PVB (£m 2010 PV)	67.3	136.3	205.3	481.2
	% of LVU	28%	56%	85%	199%
Core with additional 2,000 homes and no displacement	PVB (£m 2010 PV)	67.3	136.3	205.3	481.2
	% of LVU	17%	35%	52%	123%

4.4.59. Table 4-22 below shows how the different levels of LVU impacts on the VfM category.

Table 4-22 – Switching value impact on VfM category

Scenario	% of LVU	100%	75%	50%
Core	LVU value (£m 2010 PV and market prices)	184.18	138.13	92.09
	VfM Category	Medium	Medium	Low
Core with additional 2,000 homes	LVU value (£m 2010 PV and market prices)	299.97	224.98	149.98
	VfM Category	High	High	Medium
Core with no displacement	LVU value (£m 2010 PV and market prices)	241.59	181.19	120.79
	VfM Category	High	Medium	Low
Core with additional 2,000 homes and no displacement	LVU value (£m 2010 PV and market prices)	392.16	294.12	196.08
	VfM Category	High	High	Medium

ENVIRONMENTAL IMPACTS

Introduction

4.4.60. The environmental impact inputs to the Economic Case for the OBC update relate to the Water Environment.

Water Environment

- 4.4.61. The Bin Brook is the only river that is classified as a main river by the Environment Agency within 1km of the scheme area. The proposed scheme crosses the Bin Brook towards the eastern end of the scheme, adjacent to Heschel Road. Small areas of the scheme are located within the Flood Zone 3 related to the Bin Brook, land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%). However, the majority of the site is within Flood Zone 1, land assessed as having a 1 in 1,000 or less annual probability of river flooding (<0.1%).
- 4.4.62. The proposed scheme crosses multiple areas which are at high risk to surface water flooding. However, these areas predominantly have modelled depths below 150mm.
- 4.4.63. The risk of flooding will most likely increase over the lifetime of the scheme as a result of climate change. However, the scheme will be designed to ensure that it is not at risk of flooding for its lifetime without adverse impacts elsewhere.
- 4.4.64. A water environment appraisal of the proposed scheme has been carried out following the guidance in TAG Unit A3 section 10.
- 4.4.65. Applying this methodology, the scheme is anticipated to have a **neutral-slight adverse impact** on the water environment.
- 4.4.66. The TAG Worksheet for Water Environment is included in Appendix C.

SOCIAL IMPACTS

Introduction

- 4.4.67. The Social Impact appraisal covers the user and non-user experience of the transport project and its impact on social factors. Guidance is provided in TAG Unit 4.1.

Results

- 4.4.68. A review was undertaken of the 2020 OBC Social Impact assessment which affirmed that the scheme will deliver a broadly positive benefit across impact areas. The assessment scores for the OBC Social Impact assessment are set out in Table 4-23.

Table 4-23 - Social impacts Assessment

Impact Area	Score	Assessment Comments
Accidents	Slight adverse	The scheme will result in some increase in accidents due to the increased travel on the highway network to access the Park and Ride site.
Physical Activity	Moderate beneficial	The AMAT,(TAG Unit A5-1) assessment shows monetised benefits of over £4.88m over 60 years for the reduced risk of premature death and almost £0.6m of benefits from reduction in absenteeism.
Security	Neutral	Negative impacts in terms of encouraging users to leave vehicles are offset by security features provided by the Park and Ride facility. Overlaps with Journey Quality are assessed within Journey Quality section.

Severance	Slight beneficial	The scheme will provide improvements to pedestrian movement through segregated paths alongside the bus route. The proposed route will cut across some footways introducing additional complexity through signals and crossings as a result of the busway, which may result in some minor hindrance to movement, however the benefits to pedestrian flow are on balance likely to be greater.
Journey Quality	Slight beneficial	Traveller care impacts are expected to be beneficial due to the new facilities and services. Frustration due to congestion and parking is likely to be improved with the scheme. A conservative slight beneficial assessment has been made in the absence of demand data.
Option values and non-use values	Large beneficial	The number of households benefitting from the existence of the service is higher than the threshold of 1,000 required for a large beneficial impact assessment.
Accessibility	Slight beneficial	Residents along the route will benefit from wider public transport provision with better private car and public transport access to Cambridge where many services and activities are based. Difficulties would still exist for more remote residents not close to the route who do not have access to a private car. Those from the wider area with access to a private car will be most likely to realise the benefits of the scheme.
Personal Affordability	Neutral	There may be slight beneficial impacts that arise from the free parking compared to costly parking in the city centre, and the reduction of miles travelled therefore a reduction in fuel consumption, though this may be offset by the cost of the bus service however this is expected to be in line with costs across the Cambridge network.

Source: Mott MacDonald (2020) Appendix K – Social Impact and Distributional Impact Appraisal Report

- 4.4.69. The Social Impacts of the CtoC scheme have been updated to take into account the updated transport modelling and demand forecasts, covering impact areas such as accidents and physical activity, which was valued using the AMAT. The other social impacts assessed qualitatively have been reviewed and updated.
- 4.4.70. The scheme design changes since the development of the OBC were also reviewed with respect to the effect on the social impact assessment. These changes are summarised below:
- Change in the alignment to avoid the Waterworks site
 - Change in the alignment through Hardwick to an on-road solution between St Neots Road and the A428

- Diversion of the Bridleway east of the M11, to provide improved connectivity with the Comberton Greenway
- The NMU connection proposed between the Scotland Farm Park and Ride site and Dry Drayton is to be reviewed for inclusion in a future programme.

Accidents

- 4.4.71. The collisions data for the A428/A1303/M11 area shows that there have been multiple accidents of varying severity in the areas surrounding the A11/A1307 junction and the route into Cambridge. Whilst the preferred option will reduce traffic on this route due to mode shift to the busway, there is an overall disbenefit of -£1.94m PV over the appraisal period. This arises due to the impact on MECs accident estimation of an increase in vehicle kilometres associated with access/egress to the Park and Ride site.

Physical Activity

- 4.4.72. The preferred off-road option for the scheme will provide segregated continuous cycling and walking facilities along the route which will make non-motorised travel more attractive and accessible. Also, the scheme includes cycle parking, sheds and shelters at the Park and Ride site and at stops along the route. This is likely to encourage higher levels of physical activity. The AMAT assessment shows monetised benefits of over £4.88m PV over 60 years for the reduced risk of premature death and almost £0.57m PV of benefits from a reduction in absenteeism. Physical activity impacts have been scored as moderate beneficial. The level of monetised benefits is similar to the OBC so there is no change in the scoring of the impact.

Security

- 4.4.73. The scheme aims to encourage mode shift from car to public transport and active modes by means of Park and Ride and a new off-road bus and non-motorised user route. There is a potential negative security impact in encouraging users to leave their vehicles, however using the Park and Ride (which has CCTV and lighting) will help to prevent car users parking in potentially less secure locations closer to the centre. It is not intended to light the bus route, which may create negative impacts for cyclists and pedestrians using the route during off-peak and darker periods. Further there is a potential for overlap with journey quality impacts; to avoid double counting some indicators (which reflect perception of security and journey quality) have only been considered in the journey quality impact assessment. Security impacts have been scored as neutral. The scheme impact is therefore considered unchanged.

Severance

- 4.4.74. It is important that appropriate crossing points are provided to ensure pedestrian and cycle journeys can still be made following the introduction of the scheme. While cycle and pedestrian movements would still take place, with little to no deviation from the desired route, there could be a small amount of hindrance to movement resulting in slightly longer journey times. However, the provision of better connections and footpaths for pedestrians along the route into Cambridge is likely to outweigh any slight journey lengthening due to new crossing points, therefore this impact is judged at slight beneficial. Given the scheme design and crossing points are very similar to that assessed in 2020, the severance impact score of 'slight beneficial' is unchanged.

Journey Quality

- 4.4.75. Traveller journey quality impacts are expected to be beneficial, with travellers benefitting from the clean surroundings, good facilities and information and an improved travelling environment typically provided by modern Park and Ride facilities. Traveller stress would be expected to reduce because of the scheme. The scheme would encourage travellers to leave their vehicles at the Park and Ride, reducing the number of vehicles in Cambridge City Centre and associated congestion and frustration. Wait times for services and stress associated with finding a parking space will be reduced. Traveller views are not expected to be impacted significantly. The OBC assessment of journey quality on the CtoC infrastructure and services resulted in a score of 'slight beneficial'. This score was considered conservative. The scale of impact is considered to be unchanged.
- 4.4.76. With respect to the cycling and walking elements of the scheme, the AMAT assessment shows monetised benefits of over £15.33m PV over 60 years due to improvement in journey ambience. Additionally, a qualitative review of the impacts using TAG 4.1 journey quality impacts worksheet was conducted and determined that there will be a moderate beneficial impact on journey quality following improvements through the scheme. The improvements in cycling infrastructure result in enhanced journey ambience which is scored as moderate beneficial.

Option values and non-use values

- 4.4.77. The estimated number of households in the CtoC corridor that could benefit from the option of using the transport scheme is more than 40,000, past the threshold of 1,000 households that signifies a large impact. Future development sites should also be taken into consideration as there is significant potential development in the area. These include sites at Hardwick, Cambourne and Bourn Airfield totalling more than 6,000 dwellings. The residents at these sites will all benefit from the option of having the scheme's services to access quality public transport services, particularly where a car is not available i.e., the car is being used by another household member or it is off the road for a period. Consequently, the Option Values impact is considered to have a large beneficial impact given the number of households with the option of using CtoC services.

Accessibility

- 4.4.78. The assessment of accessibility impact produces slight beneficial impacts. This is due to the scheme providing better access to public transport and access to services and activities via the new route. Accessibility will be improved particularly for residents in the wider corridor with access to a car who can use the Park and Ride. Accessibility was scored as slight beneficial. This impact is not considered to have changed.

DISTRIBUTIONAL IMPACTS

Introduction

- 4.4.79. The assessment of distributional impacts indicates that the range of impacts are unlikely to change with respect to the proportion of population in age groups and ethnicity groups, proportion of households with disabilities and proportion of households without access to a car. A review of the OBC assessment of each of the distributional impacts has been carried out which has concluded that there is no requirement for an update at this stage of business case development.

4.4.80. The Distributional Impact (DI) appraisal presented in the OBC has been carried out in line with TAG Unit A4.2, proportionate to the size of the scheme and the level of quantitative data available at this stage of the business case development. A DI appraisal considers the variance of transport intervention impacts across different social groups, seeking to identify those social groups that would be adversely or beneficially disproportionately impacted by the intervention(s). A DI appraisal is comprised of three stages: an initial screening stage, assessment of impacts and appraisal of the impacts. The eight distributional impacts assessed for the scheme are, as follows:

- User benefits
- Noise
- Air quality
- Accidents
- Security
- Severance
- Accessibility
- Affordability

User Benefits

4.4.81. The DI analysis of user benefits assesses the impact of the scheme benefits on income groups. A proxy study area of the Cambridge and South Cambridgeshire local authority areas was used for user benefits. The income distribution in Cambridge was produced using the 2015 Index of Multiple Deprivation in Cambridge and South Cambridgeshire. This showed that levels of deprivation were low with 48% within the least deprived quintile of deprivation. User benefits would therefore reflect the income distribution with a significant proportion accruing to the least deprived residents. The user benefit distribution is not considered to have changed materially.

Noise, Air Quality and Security

4.4.82. The OBC assessed the noise, air quality and security impacts as neutral impacts. This assessment is not considered to have changed.

Accidents

4.4.83. The distributional analysis of accidents in the OBC is based on a study area of 1km around the scheme. The OBC noted that if detailed accident modelling data is provided at FBC stage for the preferred option, this approach will be revised to include any links on the network that trigger the appraisal output criteria. As per TAG Unit 4.1 guidance, the OBC assessed the distribution of children (under 16), young people (16-25) and older people, as evidence suggests these groups have a greater risk of being involved in a traffic collision. The population of children locally is close to the national average, whilst the proportion of young people is greater than the national average. The distribution of children and young people with a greater propensity for involvement in accidents is unlikely to have changed and hence there is no update to this assessment.

Severance

4.4.84. The severance impact assessment was carried out with respect to vulnerable social groups (including older residents, residents with disabilities, children, residents without access to a car). The proportion of residents in each group was assessed. The key

outcome of the assessment of severance impacts was a slight beneficial severance for children due to the scheme providing pedestrian infrastructure and pedestrian crossings of roads to reduce severance effects. The scheme would also reduce severance effects in terms of access to amenities which are trip attractors for these vulnerable social groups, increasing mobility and opportunities to access education, sporting facilities and health centres. This resulted in a slight beneficial assessment for older residents and those without a car. The scheme design changes are unlikely to change the outcomes of this assessment.

Accessibility

- 4.4.85. As CtoC provides a new public transport route and service, the OBC appraised the distributional impact of the potential changes to accessibility on different social groups. The scheme was assessed as providing beneficial accessibility impacts due to wider public transport provision to amenities. Some residents will still experience barriers to accessibility living further away from the CtoC corridor and being without access to a car. The distributional analysis showed that income levels are high compared to national levels and the costs of accessing transport services was not a significant barrier. As the proportion of young adults and BAME groups is relatively high these groups will benefit more from the improved accessibility offered by CtoC. These groups were considered to experience a large beneficial impact. The outcomes of this appraisal of the distributional analysis of the scheme impacts on accessibility is unlikely to have changed given that the income distribution and social group composition is unlikely to have changed.

Personal Affordability

- 4.4.86. The distributional analysis of Personal Affordability was assessed as a neutral impact. This was due to reduced parking charges and potential reduced car fuel costs being offset by bus fare charges. This impact was therefore scoped out of the distributional impact appraisal. This outcome is unlikely to have changed.

VALUE FOR MONEY STATEMENT

- 4.4.87. The initial BCR indicates that the preferred option will produce Poor Value for Money with a BCR of 0.5:1. The NPV (2010 prices over 60 years) is -£70.29m. The main source of benefit contributing to the PVB is journey time benefits for existing and new users of public transport and highway users. Additionally, there are benefits related to active travel improvements, particularly improved journey quality for cyclists, and an increase in physical activity, which in turn leads to health benefits including reduced risk of premature death. The preferred option PVB is £67.67m.
- 4.4.88. The construction costs of the scheme include the busway infrastructure and the emergency access track which also provides an active travel facility. Costs also include scheme operating, maintenance and renewal costs. The PVC is £137.96m which includes a risk allowance of approximately 31%.
- 4.4.89. Under a range of sensitivity scenarios the implied case for the scheme remains as Poor Value for Money. However, as stated in the 2020 OBC Value for Money Statement, schemes assessed within the City Deal Assurance Framework with a BCR of less than 2:1 (Medium Value for Money) are still to be considered for funding if a compelling case for investment can be made with respect to delivery of City Deal objectives. The

preferred option for CtoC meets the City Deal objectives for the A428/A303 corridor by improving accessibility to transport, supporting economic growth, providing a sustainable transport network/system, provision of enhanced connectivity between Cambourne and Cambridge, and finally, contributing to enhanced quality of life by reducing highway congestion and improving air quality.

- 4.4.90. Economic growth in Cambridge is supported by the proposed new housing at the sites at Bourn Airfield and Cambourne West. In turn, the construction of these housing developments is dependent on the CtoC scheme being in place for full delivery of the planned housing.
- 4.4.91. The LVU assessment shows that the development of this land for housing produces for the dependent development an increase in land value of £184.18m PV. However, in the economic appraisal this benefit is excluded from the BCR as DfT guidance (TAG Unit A2.1 - Wider Economics Impacts Appraisal) states these benefits are indicative monetised benefits in recognition of the uncertainty around the magnitude of the impacts as they represent feedback effects between land use and the transport market due to the CtoC scheme.
- 4.4.92. The estimated change in land value because of the CtoC scheme provides an indicative monetary valuation of the user benefits which has been considered for a switching value test.
- 4.4.93. The switching value test for the CtoC scheme indicates that if 37% of the LVU benefits are realised the scheme will achieve Low Value for Money (namely, above 1:1), and with 74% of LVU it would be categorised as Medium Value for Money (namely, above 1.5:1). If the additional 2,000 homes in Cambourne West are delivered, High Value for Money would be achieved, with around 68% of the estimated LVU benefits meeting the City Deal Assurance Framework investment threshold. In the no displacement test with an additional 2,000 homes, High Value for Money would be achieved with around 52% of the estimates of LVU.

SPENDING OBJECTIVE ANALYSIS STATEMENT

- 4.4.94. The aim of the spending objective analysis is to ensure the preferred option aligns with the SMART objectives originally set for the scheme. Through comparing relevant appraisal results with the scheme benefit assertions, the spending objective analysis statement (SOAS) connects the Strategic Case Addendum with the Economic Case Addendum.
- 4.4.95. During the optioneering process, as discussed in section 2.3 of the Strategic Case Addendum, a preferred option has been developed. Economic analysis has been undertaken for the preferred option only, therefore, the SOAS analyses the absolute performance of this option. More information about the relative performance of all shortlisted options can be found in the Strategic Case of the 2020 OBC document¹² produced by Mott MacDonald.
- 4.4.96. Section 5 of the Strategic Case Addendum sets out which measurements need to be appraised, and why, to best value the performance of the preferred option against each of the objectives. Several measurements have been chosen, since the objectives cover a number of aims to be achieved.

Performance of the Preferred Option

- 4.4.97. Table 4-24 presents the performance of the preferred option against the three scheme objectives.

Objective 1: Improved accessibility to support economic growth

- 4.4.98. As set out in the Strategic Case Addendum, the three measurements used to assess the performance for this objective are dependent development, business users and transport providers benefit and access to services impacts.
- 4.4.99. Development of the CtoC guided busway and active travel infrastructure will have an impact by unlocking opportunities for dependent developments. A detailed explanation of calculations can be found under the section on Land Value Uplift Assessment above. Furthermore, the developments provide an improvement in productivity through agglomeration benefits and better labour market access. The monetised benefit of the dependent development is approximately £184.18m PV, greatly supporting economic growth.
- 4.4.100. Benefit for business users and transport providers is valued at £4.79m PV. This aligns with the aim of increased accessibility and connectivity for business travel, leading to higher productivity due to more efficient travel and, therefore, economic growth.
- 4.4.101. The access to services impact is assessed to be Slight Beneficial, demonstrating the benefit from wider public transport provision with better public transport access to Cambridge where many services and activities are based.

¹² [2020 OBC Strategic Case | Greater Cambridgeshire Partnership \(greatercambridge.org.uk\)](https://greatercambridge.org.uk/2020-OBC-Strategic-Case)

Objective 2: Sustainable transport network providing connectivity along the corridor

- 4.4.102. The performance against this objective is captured by the impact on total public transport journey times, which is valued at £29.86m PV. Benefits are realised from improved bus connectivity and reduced congestion issues along the A428 and A1303 by providing faster, more reliable journeys for users travelling via the proposed bus infrastructure improvements.

Objective 3: Enhanced quality of life by reducing congestion and improving air quality

- 4.4.103. Reduced congestion can be measured through the experienced journey time benefits, valued at £29.86m. Benefits due to decongestion will be experienced by public transport users as a result of developing the bus-only route.
- 4.4.104. The scheme impact on air quality was valued to be negligible at -£0.05m.
- 4.4.105. Journey quality impact is appraised to be £15.33m showing the value of benefits created by the scheme improvements due to the new facilities and services developed. The physical activity impact is valued at £5.45m due to mode shift to active travel.

Table 4-24 - Spending Objectives, Relating TAG Impacts and Option Performance

Objectives	Objective 1: Improved accessibility to support economic growth			Objective 2: Sustainable transport network providing connectivity along the corridor	Objective 3: Enhanced quality of life by reducing congestion and improving air quality			
Measurement	<ul style="list-style-type: none"> Dependent Development (Land Value Uplift) Business Users & Transport Providers Access to Services 			<ul style="list-style-type: none"> Total Journey Time Benefits 	<ul style="list-style-type: none"> Air Quality Journey Quality Physical Activity Congestion / Journey Time Benefit 			
TAG Impact relating to the measurement	Monetised TAG Dependent Development impact (£m)	Monetised TAG Business Users & Transport Providers impact (£m)	TAG seven-point scale for Access to Services impact	Monetised TAG Journey Time Benefits (£m)	Monetised TAG Air Quality impact (£m)	Monetised TAG Journey Quality impact (£m)	Monetised TAG Physical Activity (£m)	Monetised TAG Journey Time Benefits (£m)
Summary of benefits referenced in the Strategic Case Addendum	Asserts a positive impact on the economy by supporting productivity growth through agglomeration economies and a change of land use, since some development is dependent on the scheme.	Asserts a positive impact for business users & transport providers by reducing journey times and congestion, resulting in more time used for productive activities.	Asserts a positive impact by improving labour market access and mobility.	Asserts a positive impact through a reduction in bus passenger journey times between Cambourne West and Cambridge city centre.	Asserts a positive impact through encouraging mode shift from cars, therefore, reducing traffic levels during peak times in Cambridge city centre.	Asserts improved journey times and reliability through an HQPT system and provides an alternative to car travel.	Asserts a positive impact through encouraging the uptake of active travel.	Asserts positive impact through delivering the segregated busway and the HQPT system.
Preferred Option performance	184.18	4.79	Slight Beneficial	29.86	-0.05	15.33	5.45	29.86

Key Uncertainties

4.4.106. Sensitivity analysis has been undertaken to assess the robustness of the appraisal results, recognising the uncertainties around the appraisal assumptions and inputs. The sensitivity analysis is discussed in more detail under Sensitivity Tests in section 4.4.

4.4.107. The sensitivity tests to assess the key uncertainties are:

- Test 1: Replacement of the 40% optimism bias uplift based on the identified risk allowance with a 28% uplift.
- Test 2: CtoC plus Making Connections (City Access) sensitivity test
- Test 3: Application of a 20% reduction in scheme benefits from core scenario to calculate the low growth scenario.
- Test 4: Application of a 20% increase in scheme benefits from core scenario to calculate the high growth scenario.

4.4.108. The relevant values for the SOAS from the sensitivity tests are shown in Table 4-25. All impacts are similar to the ones in the core scenario, with the exception of the 'Making Connections' sensitivity test. This is due to the type of scheme measures that were planned as part of the 'Making Connections' scheme, e.g. traffic management and public transport enhancements. Since the difference is more beneficial relative to the core scenario in supporting the objectives, it is apparent that in any of the tested scenarios, the overall support of the objectives still holds true.

Spending Objective Impact

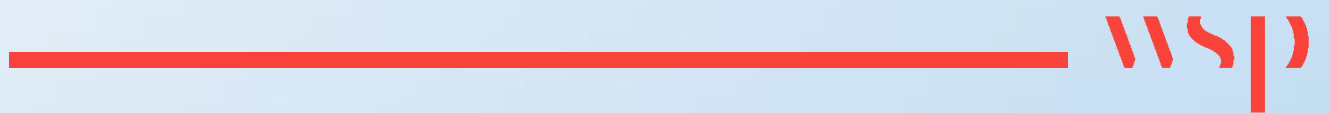
4.4.109. The performance of the preferred option, based on the chosen measures in the Strategic Case Addendum, shows significant support for the objectives with all values other than one contributing a beneficial impact. The uncertainties discovered at this stage of the business case have been assessed as part of the sensitivity tests, which also show that the overall level of support for the objectives is unlikely to change.

Table 4-25 – Preferred option performance under the core and sensitivity scenarios

Objectives	Objective 1: Improved accessibility to support economic growth			Objective 2: Sustainable transport network providing connectivity along the corridor	Objective 3: Enhanced quality of life by reducing congestion and improving air quality			
TAG Impact relating to the measurement	Monetised TAG Dependent Development impact (£m)	Monetised TAG Business Users & Transport Providers impact (£m)	TAG seven-point scale for Access to Services impact	Monetised TAG Journey Time Benefits (£m)	Monetised TAG Air Quality impact (£m)	Monetised TAG Journey Quality impact (£m)	Monetised TAG Physical Activity (£m)	Monetised TAG Journey Time Benefits (£m)
Core Minus	184.18	4.79	Slight Beneficial	29.86	-0.05	15.33	5.45	29.86
Risk/Optimism Bias	184.18	4.79	Slight Beneficial	29.86	-0.05	15.33	5.45	29.86
Making Connections	193.73	4.19	Slight Beneficial	35.84	0.14	15.33	5.45	35.84
Low growth	184.18	3.83	Slight Beneficial	23.89	-0.04	12.26	4.36	23.89
High growth	184.18	5.75	Slight Beneficial	35.83	-0.07	18.39	6.54	35.83

Annex A

DFT TABLES



Selected Scenario Core Minus

Note - the columns within which benefits and costs sit needs to be considered for each project

Note - the columns within which benefits and costs are shown need to be considered for each project

Economic Efficiency of the Transport System (TEE)									
Non-business: Commuting		ALL MODES	ROAD	BUS and COACH		RAIL	OTHER		
User benefits		TOTAL	Private Cars and LGVs	Passengers	Passengers				
Travel time	20,710		8,820		11,890		-	-	-
Vehicle operating costs	948		948						
User charges	-				-		-	-	-
During Construction & Maintenance	-								
NET NON-BUSINESS BENEFITS: COMMUTING		21,659	9,768	-	11,890		-	-	-
OTHER									
Non-business: Other		ALL MODES	ROAD	BUS and COACH		RAIL	OTHER		
User benefits		TOTAL	Private Cars and LGVs	Passengers	Passengers				
Travel time	20,995		4,111		16,885		-	-	-
Vehicle operating costs	1,290		1,290						
User charges	-				-		-	-	-
During Construction & Maintenance	-								
NET NON-BUSINESS BENEFITS: OTHER		22,285	5,401		16,885		-	-	-
Business									
User benefits			Goods Vehicles	Business Cars & LGVs	Passengers	Freight	Passengers		
Travel time	4,325		2,822	616		1,087		-	-
Vehicle operating costs	487		385	82					
User charges	-					-		-	-
During Construction & Maintenance	-								
Subtotal	4,792	(2)	3,007	698		1,087		-	-
Private sector provider impacts					Freight	Passengers			
Revenue	-				-		-		
Operating costs	-				-		-		
Investment costs	-				-		-		
Grants/subsidy	-								
Subtotal	-	(3)			-		-		
Other business impacts									
Developer contributions	-	(4)							
NET BUSINESS IMPACT		4,792	(5) = (2) + (3) + (4)						
TOTAL									
Present Value of Transport Economic Efficiency Benefits (TEE)	48,736	(6) = (1a) + (1b) + (5)							
Notes: Benefits appear as positive numbers, while costs appear as negative numbers.									
All entries are discounted present values, in 2010 prices and values									

Note - costs are currently attributed to the road infra column but this should be considered on a project by project basis. Private sector costs are assumed to be netted against local government funding.

Note: Costs are currently allocated to the road infra column but this should be considered on a project by project basis. Private sector costs are assumed to be netted against local government funding.

Public Accounts (PA) Table									
		ALL MODES	ROAD	BUS and COACH		RAIL	OTHER		
<u>Local Government Funding</u>		TOTAL	INFRASTRUCTURE						
Revenue	-								
Operating Costs	55,669		55,669						
Investment Costs	-		-						
Developer and Other Contributions	-								
Grant/Subsidy Payments	-								
NET IMPACT	55,669	(7)	55,669						
<u>Central Government Funding: Transport</u>									
Revenue	-								
Operating costs	-		-						
Investment Costs	82,293		82,293						
Developer and Other Contributions	-								
Grant/Subsidy Payments	-								
NET IMPACT	82,293	(8)	82,293						
<u>Central Government Funding: Non-Transport</u>									
Indirect Tax Revenues	931	(9)	931		-		-		
<u>TOTALS</u>									
<u>Road Transport Budget</u>		137,962	(10) = (7) + (8)						
<u>Wider Public Finances</u>		931	(11) = (9)						

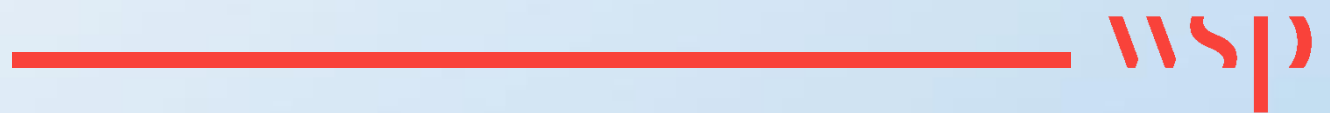
Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.

All entries are discounted present values in 2010 prices and values.

Analysis of Monetised Costs and Benefits (£000s)			
Noise	-	130	(12)
Local Air Quality	-	55	(13)
Greenhouse Gases		1,217	(14)
Journey Quality		15,326	(15)
Physical Activity		5,454	(16)
Accidents	-	1,943	(17)
Economic Efficiency: Consumer Users (Commutoal)		21,659	(1a)
Economic Efficiency: Consumer Users (Other)		22,285	(1a)
Economic Efficiency: Business Users and Providers		4,792	(5)
Wider Public Finances (Indirect Taxation Revenues)	-	931	(11) - sign changed from PA table, as PA table represents costs, not benefits
Present Value of Benefits (see notes) (PVB)		67,674	(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)
Broad Transport Budget		137,962	(10)
Present Value of Costs (see notes) (PVC)		137,962	(PVC) = (10)
OVERALL IMPACTS			
Net Present Value (NPV)	-	70,288	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)		0.49	BCR=PVB/PVC
Note: This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in progress. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.			

Annex B

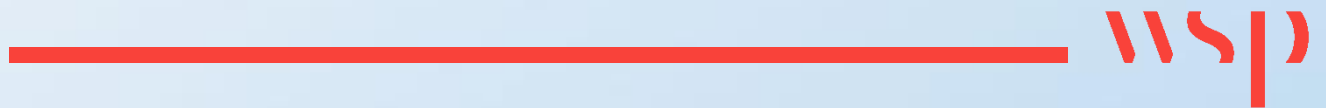
APPRAISAL SUMMARY TABLE



Appraisal Summary Table				Date produced:		1282024		Contact:		
Name of scheme:		Cambourne to Cambridge Better Public Transport Scheme						Name		
Description of scheme:		The Greater Cambridge Partnership (GCP) is promoting a transport scheme to improve connectivity between the town of Cambourne and Cambridge City Centre along the A428/A1303, creating a vital link to ease congestion, offer sustainable travel choices, connect communities and support growth. An OBC was submitted in 2020, and has now been reviewed by WSP. This AST draws on the AST previously submitted, with any differences noted and monetary values updated.						Organisation	WSP	
								Role	Advisor	
Impacts		Summary of key impacts			Assessment					
					Quantitative		Qualitative	Monetary	Distributional	
Economy	Business users & transport providers	Impacts of the scheme on business users and transport providers have been estimated using TUBA. It is expected that the scheme will improve connectivity from Cambourne to the economic centres in Cambridge.			Value of journey time changes(£)			N/A	£(NPV)	7-pt scale/ vulnerable grp
					Net journey time changes (£)					
					0 to 2min	2 to 5min	> 5min			
	Reliability impact on Business users	Not assessed at this stage			N/A			N/A	N/A	
Regeneration	Not assessed at this stage			N/A			N/A	N/A		
Wider Impacts	Proposed developments at Cambourne West and Bourn Airfield will result in land value uplift and other wider economic impacts such as agglomeration.			N/A			N/A	187,121,151		
Environmental	Noise	The scheme is expected to encourage modal shift from private car to public transport or active travel thereby reducing the amount of vehicle movements, and as a result noise, along the A428 and A1303.			N/A			Neutral	-129,515	
	Air Quality	The impact on air quality is expected to be neutral.			N/A			Neutral	-54,909	
	Greenhouse gases	The reduction in highway kilometres as a result of modal shift will lead to a net decrease in user greenhouse gas emissions.			Change in non-traded carbon over 60y (CO2e)			Neutral	1,217,015	
					Change in traded carbon over 60y (CO2e)					
	Landscape	Not assessed at this stage			N/A			N/A	N/A	
	Townscape	Not assessed at this stage			N/A			N/A	N/A	
	Historic Environment	Not assessed at this stage			N/A			N/A	N/A	
	Biodiversity	Not assessed at this stage			N/A			N/A	N/A	
	Water Environment	The Bin Brook is the only river that is classified as a main river by the EA within 1km of the scheme area. The proposed scheme crosses the Bin Brook towards the schemes east, adjacent to Heschel Road. Small areas of the scheme are located within the Flood Zone 3 related to the Bin Brook, land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%). However, the majority of the site is within Flood Zone 1, land assessed as having a 1 in 1000 or less annual probability of river flooding (<0.1%). The proposed scheme crosses multiple areas which are at high risk to surface water flooding. However, these areas predominantly have modelled depths below 150mm. The risk of flooding will most likely increase over the lifetime of the scheme as a result of climate change. However, the scheme will be designed to ensure that it is not at risk of flooding for its lifetime without adverse impacts elsewhere.			N/A			Neutral - Slight Adverse	Not quantified at this stage	
Social	Commuting and Other users	Impacts of the scheme on business users and transport providers have been estimated using TUBA. It is expected that the scheme will improve connectivity from residential areas in Cambourne to employment centres in Cambridge.			Value of journey time changes(£)			-	43,944,064	
					Net journey time changes (£)					
					0 to 2min	2 to 5min	> 5min			
	Reliability impact on Commuting and Other users	Not assessed at this stage			N/A			N/A	N/A	
	Physical activity	The introduction of a new off-road segregated cycle track will result in physical activity benefits. The Active Mode Appraisal Toolkit (AMAT) has been used to assess these benefits and show monetised benefits of £4.88m for the reduced risk of premature death and £0.57m benefits from reduction in absenteeism.			N/A			Moderate Beneficial	5,454,050	
	Journey quality	Users will benefit from an improved travelling environment provided by modern Park and Ride facilities, cleaner surroundings and improved journey information. Wait times are also expected to be reduced and the improvement in journey times will benefit user's journey perception. For car users there may be minor disbenefit from the introduction of the bus gate west of Long Road. Active travel users will benefit from new facilities replacing the previous on-road non-segregated lane.			N/A			Moderate Beneficial	15,325,968	
	Accidents	A reduction in accidents for active travel users is captured within the AMAT. It is expected the reduction in private car traffic will also reduce accidents.			N/A			Slight Beneficial	-1,942,731	
	Security	The new Park and Ride facilities include CCTV and lighting which will help to improve security for users. The scheme is not intended to light the bus route, which may create negative impacts for cyclists and pedestrians using the route during darker periods.			N/A			Neutral	N/A	
	Access to services	The scheme will provide better access to public transport and therefore access to services and activities via the new route.			N/A			Slight Beneficial	N/A	
	Affordability	Not assessed at this stage			N/A			N/A	N/A	
Severance	The provision of improved connections and footpaths for pedestrians along the route into Cambridge are likely to outweigh any slight journey lengthening due to new crossing points.			N/A			Slight Beneficial	N/A		
Option and non-use values	Residents along the route and in the proposed developments will benefit from the option of having the scheme's services to access quality public transport services, particularly where a car is not available.			N/A			Large Beneficial	N/A		
Public Account	Cost to Broad Transport Budget	The Broad Transport Budget which captures the public sector cost of the scheme has been estimated in line with TAG			N/A			N/A	137,962,267	
	Indirect Tax Revenues	The scheme will result in increased direct tax revenues as a result of greater spending on public transport fares and fuel spends.			N/A			N/A	-931,224	

Annex C

TAG WORKSHEET FOR WATER ENVIRONMENT



TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area: Surface water and groundwater features located within c.1km of the Site and/or hydraulically connected to the Site have been considered.	Bin Brook and tributaries	Water supply	Main river. 'Moderate' WFD status. Likely to support local water supplies.	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
Potential Impacts: •Increase to surface water flood risk due to increased impermeable surface area. •Increase to fluvial flood risk due to decrease in flood plain storage from water features such as the installation of culverts and bridges. •Permanent impact that may affect the hydromorphological quality of water features associated with works within or in close proximity to water features such as the installation of culverts and bridges. •Increased pollution risk to surface water features.		Transport and dilution of waste products	Main river. 'Moderate' WFD status.	Local	Low	Cannot be substituted	Medium	Negligible - Increased runoff into watercourse but no significant loss in quality and can be mitigated through the use of SuDS.	Insignificant
		Biodiversity	Moderate' ecological WFD status. No known fish species or designations.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant
		Aesthetics	Low - heavily modified within study area.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant
		Cultural Heritage	No known cultural assets.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant
		Recreation	No known recreation uses.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant
		Value to economy	No known commercial uses.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant
		Conveyance of flow and material	Flows through multiple culverts north of site area.	Local	Low	Limited potential for substitution	Medium	Negligible to slight adverse - Proposed scheme crosses the Bin Brook but on pre-existing crossing, hydraulic modelling shows that the new bridge has potential to have a minor impact conveyance and flow but can be mitigated in design.	Insignificant
Land Drains and Ditches	Water supply	Ordinary watercourses, unlikely to be part of local water supplies.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant	
	Transport and dilution of waste products	Ordinary watercourses.	Local	Low	Limited potential for substitution	Low	Negligible - Increased runoff into watercourse but no significant loss in quality and can be mitigated through the use of SuDS.	Insignificant	
	Biodiversity	Small watercourses, not monitored by WFD. No known fish species or designations.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant	
	Aesthetics	Straightened watercourses.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant	
	Cultural Heritage	No known cultural assets.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant	
	Recreation	No known recreation uses.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant	
	Value to economy	No known commercial uses.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant	
	Conveyance of flow and material	Flows in predominantly rural areas.	Local	Low	Limited potential for substitution	Low	Negligible	Insignificant	
• Potential decrease in flood plain storage	Floodplain	Conveyance of flood flows	Located in Flood Zone 3, flood risk associated with the Bin Brook. Areas at High risk of flooding from surface water sources along the route from overland flow paths. Site specific hydraulic modelling (Bin Brook Model) indicates that there will be no increased fluvial flood risk to any third party land.	Regional	Low	Limited potential for substitution	High	Negligible to Slight Adverse - Proposed scheme crosses the Bin Brook but on pre-existing crossing, hydraulic modelling shows that the new bridge has potential to have a minor impact floodplain but can be mitigated in design.	Insignificant
		Biodiversity	Located within a 'Moderate' ecological WFD status. No known fish species or designations.	Local	Low	Limited potential for substitution	Low	Slight Beneficial - Proposed watercourse crossings have potential to impact feature, but will be mitigated by BNG enhancement.	Insignificant
		Aesthetics	Site is mostly located in a rural area.	Local	Low	Limited potential for substitution	Medium	Negligible	Insignificant
• Increased pollution risk to groundwater.	Groundwater	Water supply	Located approximately 500m away from a source protection zone 3, south of the western most point of the site. Good WFD status. High groundwater vulnerability zones are located in small areas in the east of the site, the majority of the site is low risk, with areas over the principal aquifers of the West Marly Chalk and Woburn Sands Formation being medium risk. The West Marly Chalk aquifer is approximately less than 6.5m in thickness and so unlikely to be significantly utilised for water supply due to its thickness. The Woburn Sands aquifer is identified as being in poor chemical condition and good quantity condition and may possibly used for abstractions.	Local	Low	Limited potential for substitution	Medium	Negligible - Increased runoff from the scheme but no significant loss in quality and can be mitigated through the use of SuDS.	Insignificant
		Transport and dilution of pollutants	No known discharge points.	Local	Low	Cannot be substituted	Low	Negligible	Insignificant
		Groundwater flow	Groundwater flow to rivers.	Local	Low	Cannot be substituted	Medium	Negligible	Insignificant
		Value to economy	No known commercial uses.	Local	Low	Cannot be substituted	Low	Negligible	Insignificant
		Biodiversity	Provides baseflow to rivers.	Local	Medium	Cannot be substituted	High	Negligible	Insignificant

Reference Sources

OS Mapping, MAGIC GIS Portal, British Geological Survey, Environment Agency's online maps for flood risk and Environment Agency's Catchment Data Explorer, site specific hydraulic modelling (Bin Brook Model).

Summary Assessment Score

Neutral - Slight Adverse

Qualitative Comments

Review of the EA's Flood Map for Planning (Rivers and Sea) indicates that sections of the site is located in Flood Zone 3. The fluvial flood risk is associated with the Bourn Brook. Review of the EA's Flood Risk from Surface Water map indicates that areas along the route are at High risk of flooding from surface water sources. The Bin Brook is classified as main rivers.



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