The Lake Lothing (Lowestoft) Third Crossing Order 201[*]

Document 7.3: Economics Report

Planning Act 2008

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Foreword

This Economics Report relates to an application ('the Application') submitted by Suffolk County Council ('the Council' / 'the Applicant') to the Secretary of State (through the Planning Inspectorate) for a Development Consent Order ('DCO') under the Planning Act 2008.

If made by the Secretary of State, the DCO would grant development consent for the Applicant to construct, operate and maintain a new bascule bridge highway crossing, which would link the areas north and south of Lake Lothing in Lowestoft, and which is referred to in the Application as the Lake Lothing Third Crossing (or 'the Scheme').

This Economics Report has been prepared in accordance with the requirements of section 37(3)(d) of the Planning Act 2008 and regulation 5(2)(h) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 ('the APFP Regulations'), and in compliance with relevant guidance.

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Acronyms

ABP	Associated British Ports
APFP	Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
BCIS	Building Cost Information Services
BCR	Benefit Cost Ratio (*i* and *a* denote *initial* and *adjusted*)
COBALT	Cost and Benefit in Accidents Light Touch (software)
DCO	Development Consent Order
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridge
EIA	Environmental Impact Assessment
GDP	Gross Domestic Product
LSOA	Lower layer Super Output Area
NMU	Non-Motorised User
NPV	Net Present Value (*i* and *a* denote *initial* and *adjusted*)
NTM	National Transport Model
OB	Optimism Bias
OBC	Outline Business Case
PVB	Present Value of Benefits (*i* and *a* denote *initial* and *adjusted*)
PVC	Present Value of Costs (*i* and *a* denote *initial* and *adjusted*)
QRA	Quantified Risk Assessment
SATURN	Traffic Modelling Software
SDI	Social and Distributional Impacts
SCC	Suffolk County Council
SoS	Secretary of State
SRN	Strategic Road Network
TAG	Transport Appraisal Guidance
TEE	Transport Economic Efficiency
TUBA	Transport User Benefit Analysis (software)
UC	User Class
VOC	Vehicle Operating Costs

Tables

Figures

1 Introduction

1.1.1 This document is the Economics Report for the Lake Lothing Third Crossing. It has been prepared on behalf of Suffolk County Council (SCC) as a supporting document to the Development Consent Order application.

1.1.2 The economics report details the analyses undertaken to establish the scheme's value for money using the Department for Transport's (DfT) Transport Appraisal Guidance (TAG).

1.1.3 This report:

- summarises the transport modelling process used;
- details the data and assumptions used; and
- reports the monetised costs and benefits in both geographical and temporal terms.

1.2 Description of the Scheme

1.2.1 The scheme involves the construction, operation and maintenance of a new bascule bridge highway crossing linking the areas north and south of Lake Lothing in Lowestoft, hereafter referred to as the Lake Lothing Third Crossing ("the Scheme").

1.2.2 The Scheme would provide a new single-carriageway road crossing of Lake Lothing, consisting of a multi-span bridge with associated approach roads, and would comprise:

- an opening bascule bridge over the Port of Lowestoft, in Lake Lothing;
- on the north side of Lake Lothing, a bridge over Network Rail's East Suffolk Line, and a reinforced earth embankment joining that bridge, via a new roundabout junction, to the C970 Peto Way, between Rotterdam Road and Barnards Way; and
- on the south side of Lake Lothing, a bridge over the northern end of Riverside Road including the existing access to commercial property (Nexen Lift Trucks) and a reinforced earth embankment (following the alignment of Riverside Road) joining this bridge to a new roundabout junction with the B1531 Waveney Drive.

1.2.3 The Scheme would be approximately 1 kilometre long and would be able to accommodate all types of vehicular traffic as well as non-motorised users ("NMUs"), such as cyclists and pedestrians.

1.2.4 The opening bascule bridge design would allow large vessels to continue to use the Port of Lowestoft. When closed, the new bridge will have a clearance of at least 12m, which is much higher than the existing bascule bridge, which has a clearance of 2.16m. This will enable smaller boats to pass without the requirement of opening the new bridge. This, and its location west of the lake turning circle and a large proportion of the active quayside, means that it will have to open less frequently than the existing A47 bascule bridge at the harbour entrance.

1.2.5 A new control tower building would be located immediately to the south of Lake Lothing, on the west side of the new highway crossing, to facilitate the operation of the opening section of the new bascule bridge.

1.2.6 The Scheme would also entail the following changes to the existing highway network:

- the closure of Durban Road to vehicular traffic at its junction with Waveney Drive;
- the closure of Canning Road at its junction with Riverside Road, and the construction of a replacement road between Riverside Road and Canning Road to the west of the Registry Office;
- a new access road from Waveney Drive west of Riverside Road, to provide access to property at Riverside Business Park;
- improvements to Kimberley Road at its junction with Kirkley Run;
- part-signalisation of the junction of the B1531 Victoria Road / B1531 Waveney Drive with Kirkley Run;
- the provision of a pontoon for use by recreational vessels, located to the east of the new highway crossing, within the Inner Harbour of Lake Lothing; and
- works to facilitate the construction, operation and maintenance of the Scheme, including the installation of road drainage systems; landscaping and lighting; accommodation works for accesses to premises; the diversion and installation of utility services; and temporary construction sites and access routes.

1.2.7 The works required for the delivery of the Scheme are set out in Schedule 1 to the draft DCO (application document reference 3.1), where they are referred to as "the authorised development", with their key component parts being allocated reference numbers, which correspond to the layout of the authorised development as shown on the Works Plans

(application document reference 2.4). The General Arrangement Plans (application document reference 2.2) illustrate the key features of the Scheme.

1.2.8 Figure 1-1 below provides a diagrammatic representation of the Scheme:

Figure 1-1: Location of the Scheme in Lowestoft

1.2.9 The scheme is a new road crossing over Lake Lothing, a large saltwater lake which flows into the North Sea. The lake is approximately 180m across at its widest point, and forms the inner harbour of the Port of Lowestoft. This area has suffered greatly from the decline of shipbuilding and traditional industries, and is a key area for regeneration. The scheme will support regeneration by improving access to the lake area and by relieving congestion in, and around, the town centre. This congestion relief will also help businesses within the town and port increase the efficiency in the movements of goods, improving the connections between suppliers and markets, and thus increasing productivity.

1.2.10 The choice of a “central” corridor (approximately midway between the A47 bascule bridge and Mutford Bridge) for the third crossing means that traffic can travel easily between the Northern Spine Road (Peto Way) and the Southern Link Road (Tom Crisp Way) without using either of the existing bridges, helping to reduce congestion and reduce community severance. Tom Crisp Way was opened in 2010 to ease congestion along the A12 and divert traffic away from residential areas. In 2015 the Lowestoft Northern Spine Road was opened to provide through traffic a quicker route to the northern part of the A12 via Denmark Road, Peto Way and Millennium Way, without having to go through the town centre.

1.3 Objectives

1.3.1 The overall aim of the scheme is:

To stimulate regeneration, sustain economic growth, and enhance Lowestoft as a place to live and work in, and to visit.

1.3.2 The specific objectives of the scheme are:

- To open up opportunities for regeneration and development in Lowestoft.
- To provide the capacity needed to accommodate planned growth.
- To reduce community severance between north and south Lowestoft.
- To reduce congestion and delay on the existing bridges over Lake Lothing.
- To reduce congestion in the town centre and improve accessibility.
- To encourage more people to walk and cycle, and reduce conflict between cycles, pedestrians and other traffic.
- To improve bus journey times and reliability.
- To reduce accidents

1.4 Structure of this report

1.4.1 The remainder of the report is structured as follows:

- Chapter 2 – describes the economic appraisal approach;
- Chapter 3 – provides information on the estimation of costs;
- Chapter 4 – outlines the economic appraisal method and describes the user benefit results;
- Chapter 5 – describes the safety benefits results;
- Chapter 6 - describes the active mode benefits;
- Chapter 7 – outlines the journey reliability results;
- Chapter 8 – outlines the wider benefit results;
- Chapter 9 – describes the social, distributional and severance impacts;
- Chapter 10 – summarises the scheme value for money statement;
- Chapter 11 – presents the results of the low and high growth sensitivity tests; and
- Chapter 12 – summarises the report and its conclusions.

2 Economic Appraisal Approach

2.1 Introduction

2.1.1 The economic appraisal is based on the outputs of a SATURN highway assignment model which predicts the movement of people and vehicles in the Do Minimum and Do Something modelled scenarios based on a range of standard parameters.

2.2 Methodology

2.2.1 The economic appraisal of the scheme has been undertaken in accordance with current WebTAG guidance, including:

- TAG Unit A1 cost-benefit analysis;
- TAG Unit A2 economic impacts; and
- TAG Unit A5-1 Active Mode Appraisal.

2.2.2 The methodology is based on the DfT Value for Money Framework (July, 2017). An overview of the appraisal process is presented in Figure 2-1.

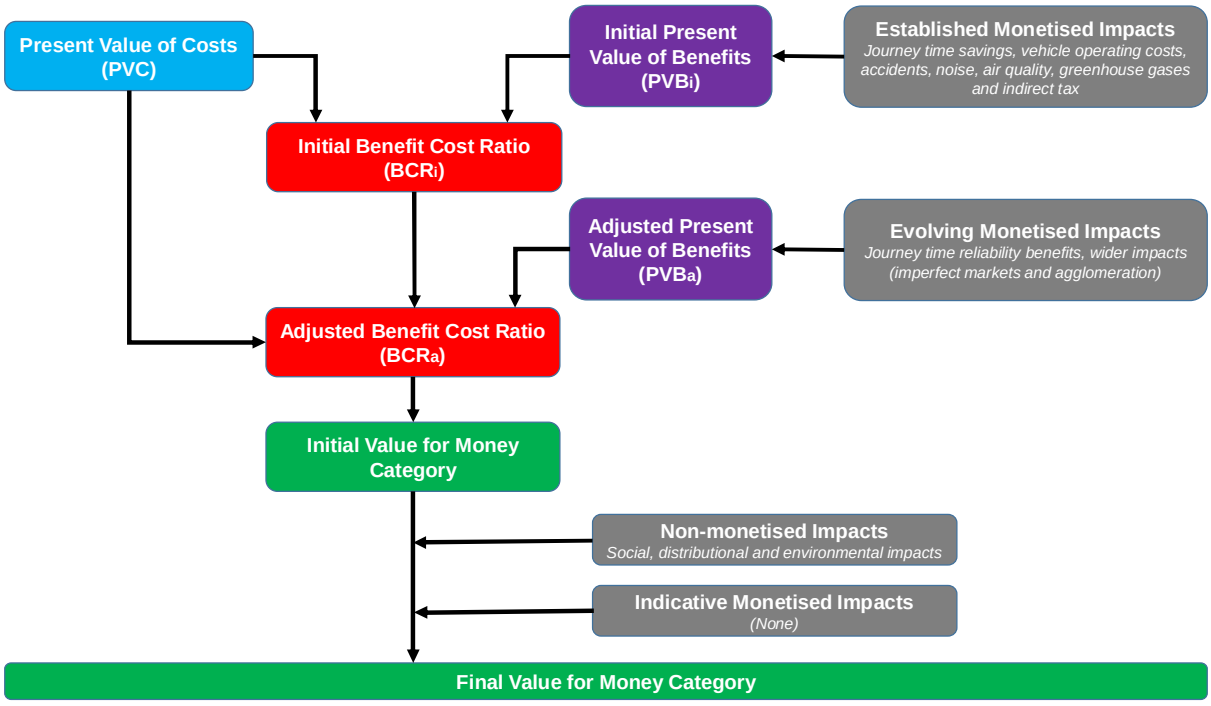

Figure 2-1: Process to derive BCR

2.2.3 The Present Value of Cost (PVC) is calculated using the discounted whole life costs of the scheme.

2.2.4 TUBA (Transport User Benefit Analysis) is used to calculate the user benefits due to time and vehicle operating cost savings resulting from the scheme, and the business user impacts from

TUBA are used to estimate 'wider benefits': specifically the increased output of the business user market as a result of changes to the efficiency of the transport system. COBALT (Cost and Benefit to Accidents – Light Touch) is used to assess benefits arising from changes in accidents as a result of the scheme. An active mode appraisal is undertaken to determine the economic benefits of increases in active travel resulting from the scheme. A reliability assessment was used to estimate the value of benefits arising from journey time reliability. Each of the benefits are described in chapters 4, 5, 6, 7 and respectively.

2.2.5 The DfT Value for Money Framework identifies three categories of monetised impacts:

- Established: where the method for estimating the impact and the monetary value is tried-and-tested;
- Evolving: where some evidence exists to support the estimation of a monetary value but is less widely accepted and researched; and
- Indicative: where monetary valuation methods are not considered widely accepted or researched to be definitive, with a high degree of uncertainty in terms of the magnitude of the impact.

2.2.6 In line with the DfT Value for Money Framework, both established and evolving benefits were combined to derive the monetised impacts (no indicative benefits have included within this assessment). These benefits were compared with costs to produce an initial Benefit Cost Ratio (BCR - including user, safety and active mode benefits), then subsequently an adjusted BCR (which additionally includes reliability benefits and a subset of 'wider benefits' associated with 'output change in imperfectly competitive markets' – see TAG A2.1). The BCR value determines the value for money category, the ranges of which are described in paragraph 10.1.5. The value for money category can itself be adjusted if any indicative monetised or non-monetised impacts (such as the consideration of social and distributional impacts) are considered to materially alter the overall value for money category.

2.2.7 Many of the impacts assessed are based on outputs from the Lowestoft Highway Assignment Model. The development of the model is described in the Data Collection Report, Local Model Validation Report and the Forecasting Report (Appendix C, F and E respectively within the Transport Assessment (application document reference 7.2).

2.3 Assumptions

2.3.1 The full list of assumptions related to model development and forecasting are set out in the LMVR and Forecasting Report. Key assumptions are summarised below:

2.3.2 The modelled assessment years are:

- Base year (2016); and
- Opening year (2022).
- Future Year (2037)

2.3.3 The modelled time periods are:

- AM peak (08:00 – 09:00);
- Average interpeak (10:00 – 16:00); and

- PM peak (17:00 – 18:00).

2.3.4 This is consistent with advice presented in Section 2.5 of TAG Unit M3.1 (Jan 2014).

2.3.5 The following user classes are modelled:

- UC1: Car – Home Based Work Inbound (Work to Home);
- UC2: Car – Home Based Work Outbound (Home to Work);
- UC3: Car – Home Based Employers Business Inbound;
- UC4: Car – Home Based Employers Business Outbound;
- UC5: Car – Non Home Based Employers Business;
- UC6: Car – Home Based Other Inbound;
- UC7: Car – Home Based Other Outbound;
- UC8: Car – Non Home Based Other;
- UC9: LGV; and
- UC10: HGV.

2.3.6 The following assumptions were made in relation to the modelling of the bridges within the SATURN highway assignment model.

2.3.7 The bridge opening durations, where they are closed to traffic, were modelled as follows:

- The A47 bascule bridge and the Mutford Bridge – both 5 minutes; and
- The proposed bridge – 6 minutes.

2.3.8 The bridges are each assumed to lift once every hour during each time period, AM, interpeak and PM, even though in reality this does not always occur in the case of the existing bridge. (This is described more fully within the 'Vessel Survey Report', 62240712-MAR-LL-RP-MA-0007, Appendix B to the Preliminary Navigation Risk Assessment (Application Document Reference 6.7).

3 Costs

3.1 Scheme preparation and construction

3.1.1 The cost of the scheme has been estimated at 2017:Q4 prices. It includes all costs associated with scheme preparation and construction, including land costs.

Scheme element	Costs (£) in 2017:Q4 prices					
	17/18	18/19	19/20	20/21	21/22	Total
Scheme preparation	7,344,000	2,700,000	4,100,000	1,800,000	1,100,000	17,044,000
Cost of construction	0	0	7,800,000	33,500,000	10,400,000	51,700,000
TOTAL (excluding QRA)	**7,344,000**	**2,700,000**	**11,900,000**	**35,300,000**	**11,500,000**	**68,744,000**
Quantified risk (QRA)	**600,000**	**4,000,000**	**3,000,000**	**3,000,000**	**2,300,000**	**12,900,000**
Risk adjusted TOTAL	**7,944,000**	**6,700,000**	**14,900,000**	**38,300,000**	**13,800,000**	**81,644,000**

Table 3-1: Scheme preparation and construction costs (2017:Q4 prices)

3.1.2 The above costs include an allowance for risk, in the form of a quantified risk assessment (QRA). The process of capturing and quantifying risk adheres to the guidance set out in TAG Unit A1-2: Scheme Costs.

3.2 Maintenance and renewal

3.2.1 The whole life costs of the scheme have also been estimated. A breakdown of the estimated capital renewal, annual maintenance and bridge operation costs is presented in Table 3-2.

	Costs (£) in 2017:Q4 prices
Annual cost	147,054
15th year after opening	368,670
30th year after opening	368,670
45th year after opening	2,042,184
60th year after opening	368,670
Total (60 years)	11,383,206

Table 3-2: Breakdown of capital maintenance, renewal and operating costs for the scheme

3.3 Optimism bias

3.3.1 In line with the guidance in TAG Unit A1.2, an optimism bias (OB) uplift to scheme costs, which is necessary to counter the systematic tendency of appraisers to be overly optimistic (and underestimate scheme costs), of 23% has been applied to all scheme costs to ensure that the cost-benefit analysis is robust. This is the recommended uplift for a fixed link (bridge) scheme at Stage 2 - Outline Business Case stage. The purpose of OB is to ensure that the cost-benefit analysis is robust. Optimism bias is only applied to costs in the economic appraisal and is not included in the forecast out-turn costs.

3.4 Present Value of Costs (PVC)

3.4.1 For the purposes of the Economic Appraisal, all the above costs have been adjusted to 2010 prices using WebTAG data book (July 2017) values as set out in Table 3-3:

	2010	2011	2012	2013	2014	2015	2016	2017
Increase on 2010	100.00	102.01	103.58	105.55	107.29	107.88	109.75	111.72

Table 3-3: Adjustment to 2010 prices

3.4.2 Finally, a discount factor based on the HM Treasury "Green Book" is applied, to adjust costs occurring in different periods to a standard base year of 2010. An annual discount rate of 3.5% was applied for the first 30 years after opening and 3% for years 31 to 60. This reflects the lower weighting placed on costs (and benefits) incurred at a future date compared to those incurred in the present.

3.4.3 As shown in Table 3-4, the present value of costs (PVC) is £80.470 million.

Risk adjusted costs in £			
	Scheme preparation and construction	Maintenance, renewal and operational	Total
2017:Q4 price base	81,644,000	11,383,206	93,027,206
2010 prices	73,078,056	10,188,901	83,266,957
2010 prices including optimism bias (23%)	89,886,009	12,532,348	102,418,357
Discounted Present Value of Costs (PVC)	**77,125,330**	**3,344,893**	**80,470,223**

Table 3-4: Present Value of Costs

3.4.4 In line with TAG Unit A1.2 (Scheme Costs), sunk costs have not been included in Table 3-4 as these are costs which represent expenditure prior to the economic appraisal and which cannot be retrieved.

3.4.5 It should also be noted that the £81.644M total cost of the scheme (in 2017:Q4 prices), presented in Table 3-4, differs from the £89.544M total cost that is presented in Appendix A.

This difference is due to the latter figure including an adjustment for expected inflation between the date of the cost estimate and when the expenditure is expected to occur.

3.4.6 Appendix A provides context for the current cost estimate in 2017:Q4 prices and allows for comparison against the cost estimate presented in the Financial Case of the Outline Business Case in December 2015.

4 Transport Economic Efficiency

4.1 Transport Economic Efficiency benefits

4.1.1 The Transport Economic Efficiency (TEE) benefits consist of:

- Travel time[1] and Vehicle Operating Costs (VOC) benefits as a result of the scheme;
- Travel time and Vehicle Operating Costs (VOC) benefits as a result of maintenance activities; and
- Travel time and Vehicle Operating Costs (VOC) disbenefits as a result of construction activities.

4.2 Method

4.2.1 User benefits have been assessed using the DfT's Transport Users Benefit Appraisal (TUBA) software, an industry-standard method of assessing economic benefits from transport schemes, in accordance with guidelines set out in WebTAG Unit A1. TUBA calculates the benefits related to journey time savings, vehicle operating cost savings, carbon emissions and fuel tax revenue. The current version of TUBA is 1.9.7, which includes the parameter values as published in the WebTAG data book (July, 2017).

4.2.2 Annualisation factors for the three modelled time periods were based on values obtained from local traffic survey data. Scheme appraisal was undertaken for a 60-year period from opening, in accordance with HM Treasury's Green Book.

4.3 Results

The results of the TUBA assessment, used to create the Transport Economic Efficiency Table (TEE) are presented in Table 4-1.

Benefits (£000's in 2010 prices and values)		
Consumer – commuting user benefits	Travel time	£32,423
	Vehicle operating costs	£-539
	Subtotal	**£31,884**
Consumer – other user benefits	Travel time	£138,961
	Vehicle operating costs	£2,978
	Subtotal	**£141,939**
Business benefits	Travel time	£88,642
	Vehicle operating costs	£7,957
	Subtotal	**£96,599**

1 Travel time or journey time savings are monetised by using DfT values of time – shorter journey times therefore generate cost savings and economic benefits. These journey time savings are also discussed within the Transport Assessment (application document reference 7.2).

Total TEE benefit	**£270,422**

Table 4-1: Transport user benefits

4.3.1 The total transport economic efficiency benefit is **£270.422 million**.

5 Safety Benefits

5.1 Method

5.1.1 The assessment of scheme safety benefits was undertaken using COBALT (Cost and Benefit to Accidents – Light Touch), the DfT's cost-benefit analysis software for accident savings. The appraisal used the latest COBALT parameter file 2017.1 (released 10th October 2017).

5.1.2 COBALT assesses the safety aspects of road schemes using detailed inputs of either (a) separate road links and road junctions that would be impacted by the scheme; or (b) combined links and junctions. For the Lake Lothing Third Crossing scheme combined links and junctions were assessed. As COBALT does not accept links with a 20mph speed limit, a speed of 30mph was assigned to links in both the Do Minimum and Do Something networks which were below this threshold.[2]

5.1.3 Five year accident data was obtained for Lowestoft between July 2012 and August 2017. COBALT default accident rates were used across the COBALT network except for links within Lowestoft for which the actual observed accidents were applied.

5.1.4 The assessment was based on a comparison of accidents by severity using Without-Scheme' and 'With-Scheme' forecasts from the SATURN model using details of link characteristics, relevant accident rates and costs and forecast traffic volumes by link. The COBALT assessment was undertaken to assess the scheme over a 60 year period (2022 to 2081) with an opening year of 2022 and design year of 2037.

5.2 Results

5.2.1 The COBALT analysis estimates that 169 accidents will be saved over the 60 year appraisal period as a result of the scheme, as shown in the following table:

	'Without' scheme accidents	'With' scheme accidents	Reduction in accidents
Accidents in 60 years	96,059	95,890	169

Table 5-1: Accident savings over 60 years

5.2.2 COBALT also provides a summary of the number of casualties saved as a result of the scheme, as shown in the following table.

[22] Note only two 20mph zones are present within Lowestoft, with a further 20mph stretch around Olton Street between Somerleyton Road and Union Lane. The 30mph adaption within the COBALT analysis is not considered to generate any material impact on accidents or accident rates.

Casualty summary over 60 years			
Type	**Total 'without' scheme casualties**	**Total 'with' scheme casualties**	**Total casualties saved by scheme**
Fatal	1,578	1,570	8
Serious	14,835	14,794	41
Slight	116,986	116,741	245
TOTAL	**133,399**	**133,105**	**294**

Table 5-2: Casualty savings over 60 years

5.2.3 The economic benefits of the accident savings are calculated by comparing the cost of accidents over the 60 year appraisal period, with and without the scheme, at 2010 prices, discounted to 2010, as detailed in Table 5-3.

Economic summary over 60 years		
'Without' scheme accident costs (£000's)	**'With' scheme accident costs (£000's)**	**Total accident benefits saved by scheme (£000's)**
4,958,863	4,936,934	21,930

Table 5-3: Present value of accident savings over 60 years (2010 prices, discounted to 2010)

5.2.4 The total accident benefits using this assessment method are **£21.930 million**.

6 Active Mode Benefits

6.1 Method

6.1.1 An active mode appraisal seeks to capture scheme benefits associated with active modes (cycling and walking), and uses the methodology outlined within the DfT's TAG unit A5.1. Within this appraisal physical activity, absenteeism, journey quality and journeys time benefits have been considered.

6.1.2 The active mode appraisal has been conducted over a 30 year appraisal period, in line with TAG Unit A5-1. The benefits have been discounted and reported in present values using the schedule of discount rates provided in the TAG data book (July 2017). As the appraisal has taken place in 2017, a discount rate of 3.50% per year has been applied until 2046, with a rate of 3.00% thereafter. Again, in line with TAG, the values have included real growth in line with forecast GDP/capita.

6.2 Results

6.2.1 The opening year benefits for each active mode impact are summarised for the Core Scenario in Table 6-1 and the 30 year appraisal results in Table 6-2.

Impact	Pedestrian	Cycle user	Total
Physical activity (Health)	£119,370	£44,085	£163,455
Absenteeism	£13,184	£5,559	£18,742
Journey quality / Ambience	£55,226	£86,422	£141,648
Journey time	£15,110	£1,551	£16,661
Total	**£202,889**	**£137,617**	**£340,506**

Table 6-1: Summary of opening year active mode impacts Core Scenario (2010 prices)

6.2.2 Table 6-2 summarises the PVB for each active mode impact for the Core Scenario over the 30 year appraisal period.

Impact	Pedestrian	Cycle user	Total
Physical activity (Health)	£2,376,335	£877,621	£3,253,956
Absenteeism	£262,454	£110,657	£373,111
Journey quality / Ambience	£1,099,396	£1,720,439	£2,819,835
Journey time	£300,800	£30,868	£331,668
Total	**£4,038,985**	**£2,739,584**	**£6,778,569**

Table 6-2: Summary of active mode impacts over 30 year appraisal period (2010 prices and values)

6.2.3 The total discounted active mode benefit is **£6.779 million**.

7 Reliability Benefits

7.1 Method

7.1.1 Reliability has been assessed in line with WebTAG Unit A1.3, Section 6.3 (Reliability – urban roads) using the following relationships, based on calculation of the standard deviation of journey times from journey time and distance for each O-D (origin-destination) pair:

$$\textit{Reliability benefit}^{3} = -\sum \Delta\sigma_{ij} \left(\frac{T_{ij}^{2}+T_{ij}^{1}}{2}\right) \times 0.4 \times VOT$$

Where: $\Delta\sigma_{ij} = 0.0018\left(\left(t_{ij2}\right)^{2.02} - \left(t_{ij1}\right)^{2.02}\right) d_{ij}^{-1.41}$

VOT = value of time (£/sec)

T = number of trips (1 = before improvement, 2 = after improvement)

t = journey time (s) (1 = before improvement, 2 = after improvement)

d = distance (km)

i,j = subscript denoting quantity from zone i to zone j

7.1.2 For the calculation of benefits, a linear trend was assumed between the two modelled years of 2022 and 2037, with the trend assumed to be flat thereafter.

7.2 Results

7.2.1 The results from the reliability assessment are summarised below:

- The discounted reliability benefit calculated for the year 2022 is equal to £0.488 million (in 2010 prices and values);
- The discounted reliability benefit calculated for the year 2037 is equal £0.593 million (in 2010 prices and values); and
- The total discounted reliability benefit over the 60 year assessment period between 2022 and 2081 is equal to **£23.068 million** (in 2010 prices and values).

[3] It should be noted that the DfT recommended value for the reliability ratio (0.4) in the equation above has halved since the reliability assessments in the 2015 business case, which reduces reliability benefits.

8 Wider Benefits

8.1 Method

8.1.1 The methodology used to calculate 'wider benefits' is set out with WebTAG A2.1 and includes the following components:

- Agglomeration – the concentration of economic activity in an area can be improved by transport schemes as accessibility between businesses and workers is improved by reduced journey times, thus generating productivity benefits from the 'closer' proximity;
- Output change in imperfectly competitive markets – a reduction in transport costs (for business and freight) allows businesses to profitably increase their output (goods and services) that require the use of transport in their production; and
- Changes to tax revenues arising from labour market impacts (such as labour supply moving to more productive jobs) – the quality and efficiency of the transport network and infrastructure can affect the decisions of business about where to locate and work (as a result of travel costs impacting labour market decisions). Changes in transport cost can incentive individuals to work, the number choosing to work and thus the amount of labour supplied in the economy. The changes in tax revenues associated with these impacts are not captured within commuter user benefits.

8.1.2 Whilst all three types of benefits are likely to arise as a result of the scheme in Lowestoft, (because the lack of lake crossing points and bridge openings constrain the free and efficient movement of people and transport of goods), only output change in imperfectly competitive markets is captured and included within this appraisal.

8.1.3 WebTAG A2.2 recommends these impacts are estimated using a simple 10% uplift applied to total user benefits for business. Paragraph 4.3.1, provides further explanation and guidance on this calculation:

8.1.4 *"The welfare effects which arise due to the presence of imperfect competition (the market structure distorts the efficient operation of the market), is estimated by applying a 10% uplift factor to the business and freight user benefits".*

8.1.5 Table 4 of WebTAG A2.2 also confirms the 10% uplift of business user benefits.

8.2 Results

8.2.1 The results of the wider impacts assessment, which estimate the value of output change in imperfectly competitive markets is **£9.659 million**.

9 Social and Distributional Impacts

9.1 Introduction

9.1.1 Three forms of Social and Distributional Impact (SDI) analysis have been undertaken to support the economic analysis of the scheme using methods set out within the DfT's Transport Appraisal Guidance (TAG) Unit A4-1 and A4-2. These focus on user benefits, accidents and severance impacts, which are considered to be of most importance and relevance to the scheme. SDI benefits are often referred to as welfare benefits and they are considered to be important in economic appraisal by the Government because they don't just look at purely economic indicators. The scheme benefits are considered in the context of specific social groups (with differences in age, gender, economic position, etc.) and over differential spatial areas, hence the name social and distributional analysis.

9.2 Distributional analysis of user benefits

9.2.1 The TUBA benefits (time and vehicle operating costs), calculated over a 60-year period after scheme opening, were identified for each model zone and allocated to Lower Layer Super Output Areas (LSOAs). In order to assign benefits calculated by TUBA to appropriate residential areas, the predominant home trip-end was assumed, which for AM peak benefits were trips from the zone (row total), and for the PM peak benefits were trips to the zone (column total). For the inter peak, benefits were trips from the average of the two.

9.2.2 Following the guidelines set out in TAG Unit A4.2, Chapter 2 and the defined scoring system presented in Table 8 of the TAG unit (reproduced as Table 9-1 below), benefits are totalled for each income quintile and the percentage share of benefit or disbenefit is compared with the population distribution by income.

Beneficial and 5% or more greater than the proportion of the group in the total population	✓✓✓
Beneficial and in line (+/-5%) with the proportion of the group in the total population	✓✓
Beneficial and 5% or more smaller than the proportion of the group in the total population	✓
There are no transport user benefits or disbenefits experienced	
A disbenefit which is 5% or more smaller than the proportion of the group in the total population	x
A disbenefit which is in line (+/- 5%) with the proportion of the group in the total population	xx
A disbenefit which is 5% or more greater than the proportion of the group in the total population	xxx

Table 9-1 System of grading of transport user benefits DI's for each of the social groups

9.2.3 The distribution of income between the modelled zones is analysed using data from the Index of Multiple Deprivation[4] is illustrated in Figure 9-1:

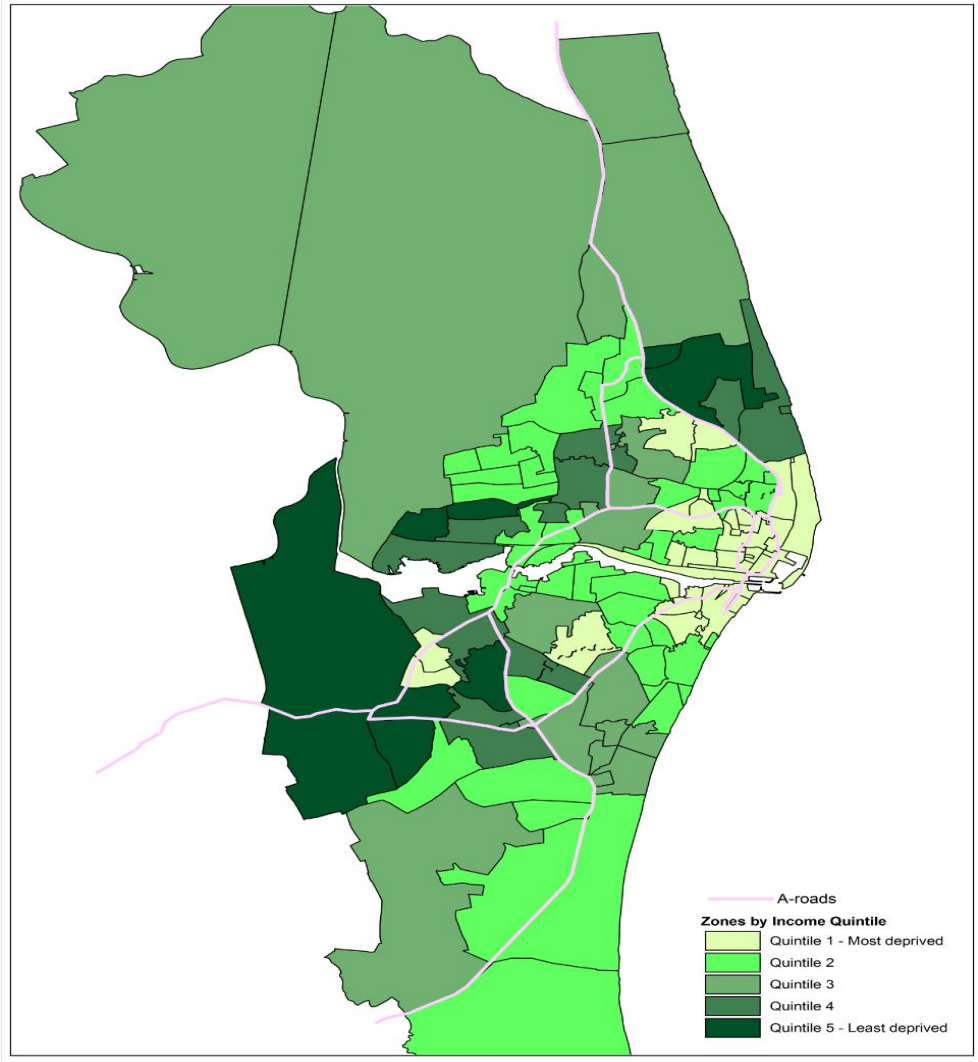

Figure 9-1 Model zones categorised by income quintiles

9.2.4 This indicates that income is unevenly distributed in Lowestoft, with the most deprived areas being in the east of the town and around Lake Lothing and the outer harbour, and with higher incomes towards the west and north of the town. This means that different income groups may experience the benefits of the scheme differently. The scheme is closest in proximity to areas in the lowest income quintile. As sustainable travel modes (walking and cycling) are most attractive for short journeys, it is likely that the lowest income quintiles will benefit most from the scheme for these short distance sustainable journeys.

[4] https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

9.2.5 The distribution of user benefits between different income groups was analysed for the AM, interpeak and PM peak periods in Table 9-2, Table 9-3 and Table 9-4 respectively.

Benefit / disbenefit	IMD Income domains - quintiles (£M)					Total
	Q1 (0% < 20%)	Q2 (20% < 40%)	Q3 (40% < 60%)	Q4 (60% < 80%)	Q5 (80% < 100%)	
Total user benefit	19.9	19.4	21.1	0.4	5.1	65.8
Total user disbenefit	0.0	0.0	0.0	0.0	0.0	0.0
Net user benefit	19.9	19.4	21.1	0.4	5.1	65.8
Net user disbenefit	0.0	0.0	0.0	0.0	0.0	0.0
Net user benefit / disbenefit	19.9	19.4	21.1	0.4	5.1	65.8
Share of net user benefit	30%	29%	32%	1%	8%	100%
Share of net user disbenefit	0%	0%	0%	0%	0%	0%
Share of population	26%	30%	20%	16%	9%	100%
Assessment	ü ü	ü	ü ü ü	ü	ü ü	

Table 9-2 Distributional analysis for user benefits - AM peak period

Benefit / disbenefit	IMD Income domains - quintiles (£M)					Total
	Q1 (0% < 20%)	Q2 (20% < 40%)	Q3 (40% < 60%)	Q4 (60% < 80%)	Q5 (80% < 100%)	
Total user benefit	25.4	10.7	14.8	0.9	2.7	54.6
Total user disbenefit	0.0	0.0	0.0	0.0	0.0	0.0
Net user benefit	25.4	10.7	14.8	0.9	2.7	54.6
Net user disbenefit	0.0	0.0	0.0	0.0	0.0	0.0
Net user benefit / disbenefit	25.4	10.7	14.8	0.9	2.7	54.6
Share of net user benefit	47%	20%	27%	2%	5%	100%
Share of net user disbenefit	0%	0%	0%	0%	0%	0%
Share of population	26%	30%	20%	16%	9%	100%
Assessment	ü ü ü	ü	ü ü ü	ü	ü	

Table 9-3 Distributional analysis for user benefits - Interpeak period

Benefit/ disbenefit	IMD Income domains - quintiles					Total
	Q1 (0% < 20%)	Q2 (20% < 40%)	Q3 (40% < 60%)	Q4 (60% < 80%)	Q5 (80% < 100%)	
Total user benefit	50.0	16.5	18.4	0.6	4.8	90.2
Total user disbenefit	0.0	0.0	0.0	0.0	0.0	0.0
Net user benefit	50.0	16.5	18.4	0.6	4.8	90.2
Net user disbenefit	0.0	0.0	0.0	0.0	0.0	0.0
Net user benefit / disbenefit	50.0	16.5	18.4	0.6	4.8	90.2
Share of net user benefit	55%	18%	20%	1%	5%	100%
Share of net user disbenefit	0%	0%	0%	0%	0%	0%
Share of population	26%	30%	20%	16%	9%	100%
Assessment	ü ü ü	ü	ü ü	ü	ü	

Table 9-4 Distributional analysis for user benefits - PM peak period

9.2.6 The user benefits are mainly distributed among quintiles 1, 2 and 3 (Q1 being the most deprived) which represent circa 75% of the population in the area of analysis. This pattern is consistent across the AM, interpeak and PM peak periods of travel demand. Therefore, the distributional impact shows that the scheme mainly benefits the less well-off sectors of the local population.

9.3 Distributional analysis of accident benefits

9.3.1 The distribution of accident benefits was also investigated using the guidance set out within TAG Unit 4-2.

9.3.2 As shown below in Table 9-5, none of the links identified in the analysis area have more than 50 casualties in the 5 year period from July 2012 to August 2017, the TAG threshold for further consideration. Therefore, in line with WebTAG guidance, a detailed analysis is not required. It is however noted that 48 casualties on the A12 is close to the 50 casualty threshold.

Description	Number of casualties
A1117	30
A1144	19
A1145	3
A12	48
A146	26
B roads	27
C roads	9
Total	**162**

Table 9-5 Description of screened Lowestoft links and number of casualties

9.3.3 The distribution of road accident casualties by age group and mode of transport is shown in Table 9-6 and Table 9-7.

Group	Total	% in Lowestoft analysis area (2012-2017)	% in accidents (national average)
Children (under 16 years old)	18	11%	9%
Young People (16-24)	52	32%	25%
Older People (65+)	11	7%	9%
Other ages	81	50%	58%
Total	162	100%	100%

Table 9-6 Casualties by age group

Group	Total	% in Lowestoft analysis area (2012-2017)	% in accidents (national average)
Pedestrian	18	11%	13%
Cyclist	32	20%	11%
Motorcycle	18	11%	10%
Other (Incl. car drivers, passengers)	94	58%	66%
Total	162	100%	100%

Table 9-7 Casualties by mode

9.3.4 These values are based on existing road data, and show that the proportion of the vulnerable group casualties on the affected links is higher in comparison with the national average for children and young people, cyclists and motorcyclists.

9.3.5 The scheme considered cycle safety as part of the design and will provide additional cycle infrastructure, such as dedicated cycle routes resulting in increased accessibility for journeys in Lowestoft. Therefore, the higher cycling accident rate in Lowestoft compared to the national average may fall back into line as a result of the scheme.

9.4 Severance

9.4.1 Community severance is defined as the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows. Severance will only be an issue where either vehicle flows are significant enough to significantly impede pedestrian movement or where infrastructure presents a physical barrier to movement.

9.4.2 Within Lowestoft, Lake Lothing and the railway line that runs alongside it are two physical constraints that present very significant barriers to north-south movement, resulting in significant existing severance issues.

9.4.3 Whilst it is noted that community severance primarily concerns those using non-motorised modes and, for the purposes of impact classification, should only be based on pedestrian impacts, the existing severance issues due to these physical features affect all modes and users and overcoming these constraints and the negative impact of these are one of the key

drivers of the scheme.

9.4.4 The scheme undoubtedly and significantly reduces the existing community severance by providing an additional third crossing point in the 2.65km distance between the town's existing bridges. This additional piece of highway infrastructure will reduce congestion, inefficiency of the highway network, journey time and journey distance. It also provides additional route choice and an additional link between the more centrally located communities on both sides of the river, eliminating the need to have to travel to either the east or west of Lowestoft to use one of the existing bridges.

9.4.5 The scheme will provide increased and improved footway and cycle provision which will make journeys by sustainable modes both easier and faster, enhancing access to local facilities and thereby reducing severance for pedestrians, cyclists and non-car households.

9.4.6 Figure 9-2 shows the spatial distribution of households with no access to a car.

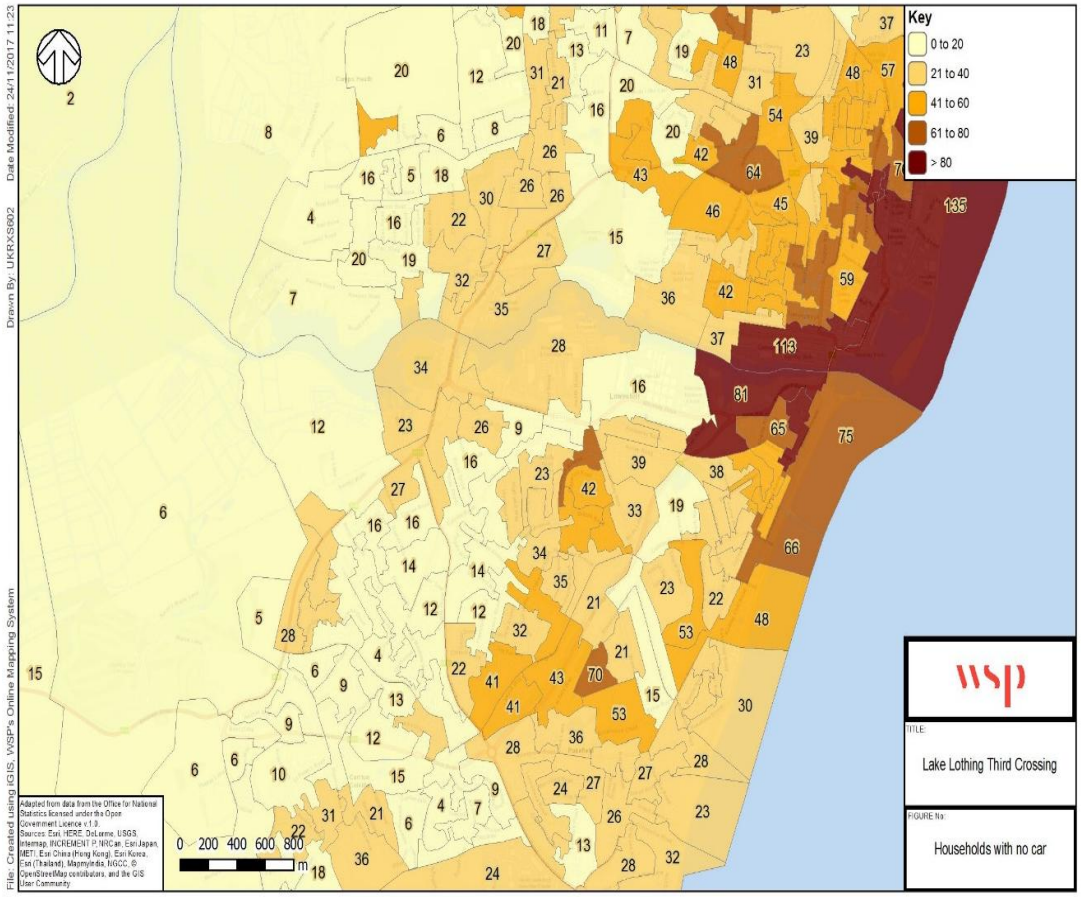

Figure 9-2 Households with no car

9.4.7 It can be seen there is a high concentration of households without cars in close vicinity and to the east of the proposed new bridge. In addition, as highlighted previously in Figure 9-1, many of the most deprived areas in Lowestoft are located around Lake Lothing. Therefore, it is reasonable to assume that there will be an above average number of pedestrian trips in the area in close vicinity to the proposed new bridge and all these pedestrian trips will experience a significant reduction in severance.

9.4.8 The impact of the scheme on pedestrians is therefore considered to be **Large Positive**.

9.4.9 Moving on to the distributional impacts of severance it is important to note the limitations of this analysis as this section of the guidance is based upon traffic-induced severance specifically (a narrow definition of severance), not the severance caused by the Lake and railway line which, as highlighted above, sever the town for north-south movements and arguably has a substantially more important impact on accessibility and travel movement in Lowestoft.

9.4.10 TAG notes that certain groups in society are more vulnerable to the effects of severance than others. Such groups include people without access to a car, older people, and people with disabilities and parents with pushchairs. Children are considered to be potentially vulnerable to severance as they are more likely to cross the road at dangerous crossing points, and find it difficult to judge the speed of traffic, hence putting themselves at risk of road accidents.

9.4.11 These groups often experience longer journey times, or are often required to use pedestrian routes that are inappropriate and difficult to use.

9.4.12 The severance assessment has examined key links within the study area that will have a 10% increase or decrease in traffic flow (as outlined within the guidance), using the percentage difference between the Do Minimum and Do Something SATURN model scenario in 2037 to take into account the ‘worst case’ scenario.

9.4.13 Figure 9-3 illustrates these flow changes on the highway network (links).

Figure 9-3 Links with more than +/- 10% difference in flows

9.4.14 Increased traffic flow on local roads where there are concentrations of vulnerable groups (older people, under 16s and no car households) has the potential to impact these groups' ability to access attractors such as primary schools and the town centre.

9.4.15 As shown earlier in Figure 9-2, there are several areas with concentrations of households without access to a car in close proximity to the links likely to be affected by an increase of traffic flows, therefore some of these groups are likely to experience increased severance.

9.4.16 The spatial distribution of older people and children aged under 16 are presented in figures Figure 9-4 and Figure 9-5.

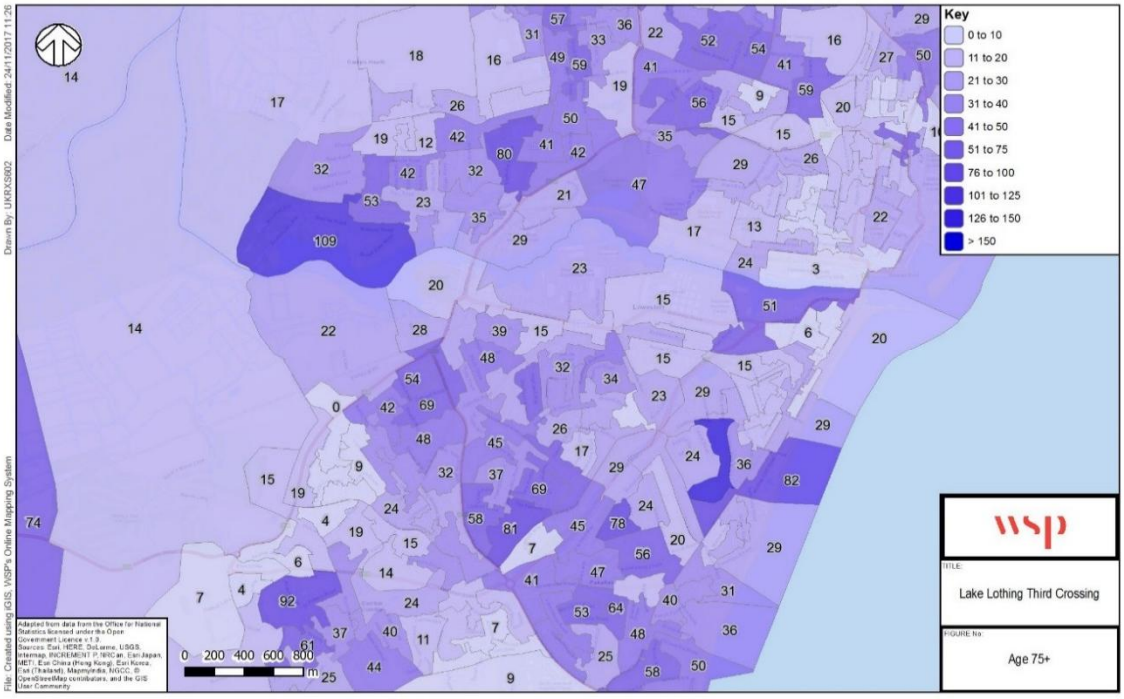

Figure 9-4 Population over 75's

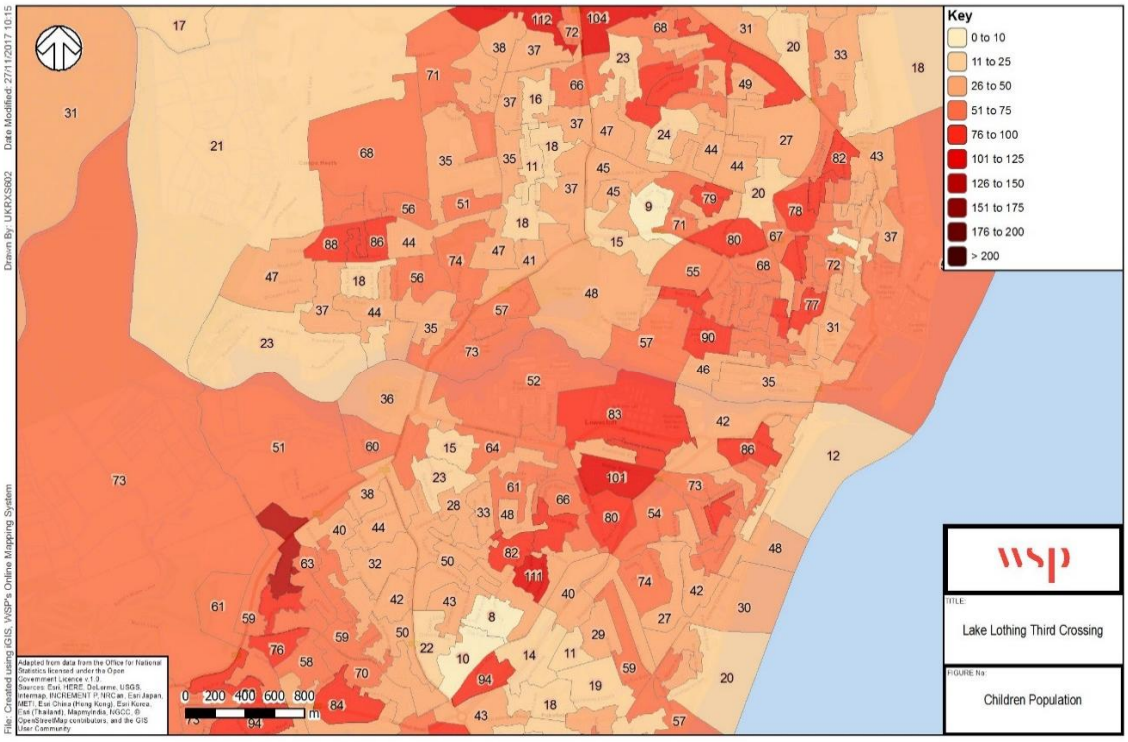

Figure 9-5 Population of children under 16

9.4.17 Increased concentrations of children under 16 are higher in areas where there are schools in the nearby vicinity. There are eleven schools on the northern side of the lake, out of which 6 experience an increase in traffic above the 10% threshold on the links which serve them. On the southern side of the lake there are seven schools, out of which only 2 experience an increase in traffic above the 10% threshold on links directly serving them. However, at each of the affected school locations there are ample pedestrian crossing facilities and so any additional impacts at these locations are expected to be negligible / neutral.

9.4.18 The impact of the scheme on children under 16 is therefore considered to be **Neutral**.

9.4.19 As identified earlier, the majority of households with no cars lie on the eastern side of the town. Looking at the change in traffic flow, there is a reduction in traffic on that side of town, due to traffic rerouting from the existing A47 bascule bridge to take the new bridge using roads through the centre of the town. Therefore the impact of traffic on households with no cars can be considered to be **Slight Positive**.

9.4.20 Looking at the areas where there is a large concentration of retail activity (London Road North, London Road South and North Quay Retail Park), links serving these areas experience a reduction in traffic, apart from North Quay Retail Park where there is an increase. However, considering that North Quay Retail Park isn't very accessible by foot, the majority of users will travel there by car and so it is not deemed to have a negative impact on pedestrians (The scheme will also add pedestrian crossing points near to the retail park, therefore improving accessibility for pedestrians in this location). The A47 to the east of London Road North does not have many controlled crossing points, therefore the reduction of traffic on the A47 will make it easier and safer for pedestrians to access shops. The same can be said for London Road South although there are several crossing locations there already. Overall, the impact on shopping through severance changes can be considered to be **Large Positive**.

9.4.21 The overall SDI assessment on severance is therefore considered to be **Large Positive.**

9.4.22 The DfT value for money framework does permit the value for money category to be altered if indicative impacts or non-monetised impacts (such as social and distributional impacts) are considered to be material. This is discussed more in the value for money statement below.

10 Value for Money Statement

10.1 The Benefit Cost Ratio

10.1.1 As described in chapter 2 the initial and adjusted BCRs are used to determine the value for money category.

10.1.2 The value for money assessment of the scheme has been undertaken in line with WebTAG and is based on assessment of the economic impacts as described above.

10.1.3 The initial Benefit-Cost Ratio (BCR) is calculated by dividing the Present Value of Benefits (PVB) by the Present Value of Costs (PVC).

10.1.4 The Adjusted BCR includes all monetised benefits associated with accident savings, greenhouse gas reductions and indirect taxation impacts including benefits accruing from reliability and wider impacts. The Initial BCR does not include the reliability and wider impact benefits. The calculations of the initial and Adjusted BCR are set out in Table 10-1.

Analysis of Monetised Costs and Benefits	(£000's in 2010 prices, discounted to 2010)
Greenhouse gases (figures obtained from TUBA analysis)	-246
Physical activity (active mode appraisal)	6,779
Accidents (safety benefits)	21,930
Economic efficiency: Consumer users (Commuting)	31,884
Economic efficiency: Consumer users (Other)	141,939
Economic efficiency: Business users and providers	96,599
Wider public finances (Indirect taxation revenues)	-620
Present Value of Benefits (PVB)	**298,264**
Cost to broad transport budget	
Investment costs	77,125
Operating costs	3,345
Present Value of Costs (PVC)	**80,470**
Net Present Value (NPV)	**217,794**
Initial BCR	**3.707**
Reliability	23,068
Wider benefits – output change in imperfectly competitive markets	9,659
Adjusted Net Present Value (NPV)	**331,020**
Adjusted BCR	**4.11**

Table 10-1 Analysis of monetised costs and benefits

10.1.5 According to the DfT Value for Money Framework (July 2017), Value for Money (VfM) categories are defines as follows:

- Poor VfM if BCR is below 1.0;
- Low VfM if the BCR is between 1.0 and 1.5;
- Medium VfM if the BCR is between 1.5 and 2;
- High VfM if the BCR is between 2.0 and 4.0; and
- Very High VfM if the BCR is greater than 4.0.

10.1.6 Based on the Analysis of Monetised Costs and Benefits (AMCB), the total monetised benefits exceed the costs by more than £217 million and the total adjusted monetised benefits exceed the costs by more than £240 million. The initial BCR of the scheme is **3.707** and the adjusted BCR of the scheme is **4.11**. This means that the value for money category is **Very High**.

10.1.7 The DfT value for money framework does permit the value for money category to be altered if indicative impacts or non-monetised impacts (such as social and distributional impacts) are considered to be material. Given that the scheme BCR is already categorised in the highest value for money category, there is in effect no adjustment that is required as a result of the Large Positive outcome in the SDI analysis.

11 Low and High Growth Tests

11.1 Methodology

11.1.1 WebTAG A1.1 stipulates that sensitivity tests should be employed when undertaking economic appraisal to account for uncertainty associated with any assumptions used within the analysis that can affect the BCR and subsequent value for money category. One such set of recommended tests are the high and low growth tests which are applied to the travel demand contained within the model forecasting process.

11.1.2 Low and high growth matrices were produced in accordance with WebTAG Unit M4 'Forecasting and Uncertainty' (May 2017), which applies a proportional increase or decrease to the base year demand to produce the high and low growth matrices respectively. TAG stipulates the proportional should be the square root of the number of years between base year and forecast year, multiplied by 2.5%. This percentage figure represents the degree of *"uncertainty around annual forecasts from the National Transport Model (NTM), based on the macro-economic variables that influence the main drivers of travel demand*."

11.1.3 Applying this adjustment from a base year of 2016, and forecast years of 2022 and 2037 results in the following proportions which need to be added or subtracted from the core scenario to produce high and low growth matrices:

- 2022: 6.1%
- 2037: 11.5%

11.2 Transport Economic Efficiency benefits

11.2.1 The Transport user benefits for the low and high growth tests are presented in Table 11-1 and Table 11-2.

Benefits (£000's in 2010 prices and values)		
Consumer – commuting user benefits	Travel time	£29,245
	Vehicle operating costs	£2,392
	Subtotal	**£31,637**
Consumer – other user benefits	Travel time	£107,449
	Vehicle operating costs	£8,471
	Subtotal	**£115,920**
Business benefits	Travel time	£74,083
	Vehicle operating costs	£5,423
	Subtotal	**£79,506**
Total TEE benefit		**£227,063**

Table 11-1 Transport user benefits - low growth

Benefits (£000's in 2010 prices and values)		
Consumer – commuting user benefits	Travel time	£55,836
	Vehicle operating costs	£2,833
	Subtotal	**£58,669**
Consumer – other user benefits	Travel time	£188,745
	Vehicle operating costs	£4,724
	Subtotal	**£193,469**
Business benefits	Travel time	£127,574
	Vehicle operating costs	£11,762
	Subtotal	**£139,336**
Total TEE benefit		**£391,474**

Table 11-2 Transport user benefits - high growth

11.3 Benefit Cost Ratios

11.3.1 The Benefit Cost Ratio for the low growth test is shown in Table 11-3.

Analysis of Monetised Costs and Benefits	(£000's in 2010 prices, discounted to 2010)
Greenhouse gases (figures obtained from TUBA analysis)	2,507
Physical activity (active mode appraisal)	6,779
Accidents (safety benefits)	21,930
Economic efficiency: Consumer users (Commuting)	31,637
Economic efficiency: Consumer users (Other)	115,920
Economic efficiency: Business users and providers	79,506
Wider public finances (Indirect taxation revenues)	4,969
Present Value of Benefits (PVB)	**263,247**
Cost to broad transport budget	
Investment costs	77,125
Operating costs	3,345
Present Value of Costs (PVC)	**80,470**
Net Present Value (NPV)	**187,777**
Initial BCR	**3.271**
Reliability	23,068
Wider impacts – Output change in imperfectly competitive markets	9,659
Adjusted Net Present Value (NPV)	**215,510**
Adjusted BCR	**3.68**

Table 11-3 Analysis of monetised costs and benefits - low growth

11.3.2 Using the low growth scenario, the initial BCR of the scheme is **3.271** and the adjusted BCR of the scheme is **3.68**. In a low growth scenario therefore, the value for money category would drop from **Very High** to **High** compared to the core scenario.

11.3.3 The Benefit Cost Ratio for the high growth test is shown in Table 11-4.

Analysis of Monetised Costs and Benefits	(£000's in 2010 prices, discounted to 2010)
Greenhouse gases (figures obtained from TUBA analysis)	1,857
Physical activity (active mode appraisal)	6,779
Accidents (safety benefits)	21,930
Economic efficiency: Consumer users (Commuting)	58,669
Economic efficiency: Consumer users (Other)	193,469
Economic efficiency: Business users and providers	139,336
Wider public finances (Indirect taxation revenues)	2,780
Present Value of Benefits (PVB)	**424,819**
Cost to broad transport budget	
Investment costs	77,125
Operating costs	3,345
Present Value of Costs (PVC)	**80,470**
Net Present Value (NPV)	**344,349**
Initial BCR	**5.279**
Reliability	23,068
Wider impacts – Output change in imperfectly competitive markets	9,659
Adjusted Net Present Value (NPV)	**377,080**
Adjusted BCR	**5.69**

Table 11-4 Analysis of monetised costs and benefits - high growth

Using the high growth scenario, the initial BCR of the scheme is **5.279** and the adjusted BCR of the scheme is **5.69**. This means that the value for money category would remain in the **Very High** when compared to the core scenario.

12 Summary and Conclusion

12.1 Conclusions

12.1.1 The cost benefit analysis for the scheme shows that the initial monetised benefits of the scheme (PVBi) of £298.26 million are greater than the monetised costs of the scheme (PVCi) of £80.47 million. The initial benefit-cost ratio (BCRi) is **3.707** which demonstrates that the scheme offers **High** value for money.

12.1.2 The adjusted monetised benefits of the scheme (PVBa), including the £23.07 million reliability benefits and the £9.659m of wider benefits, total £331.02 million. Therefore, the adjusted benefit-cost ratio (BCRa) is **4.11** which demonstrates that the scheme offers **Very High** value for money.

12.1.3 All three categories of road user experience forecast time and vehicle operating cost savings as a result of this scheme with Other users experiencing the largest time savings and Business users experiencing the largest vehicle operating cost savings. Business will benefit from reduced congestion, faster journeys, improved journey time reliability and increased accessibility (they will see a reduction in their transport costs (for business and freight) and will therefore be able to profitably increase their output (goods and services) that require the use of transport in their production). Commuters will similarly benefit from shorter, more reliable and cheaper, journeys to work. These benefits, which are included in the BCR calculations will support local development and the regeneration of Lowestoft's economy.

12.1.4 Within Lowestoft, Lake Lothing and the railway line that runs alongside it are two physical features that present very significant barriers to north-south movement, resulting in significant existing severance issues affecting all modes and users. The scheme will undoubtedly and significantly reduce the existing community severance by providing an additional third crossing point between the town's existing bridges. This additional piece of highway infrastructure will reduce congestion, inefficiency of the highway network, journey time and journey distance. It also provides additional route choice and an additional link between the more centrally located communities on both sides of the river, eliminating the need to have to travel to either the east or west of Lowestoft to use one of the existing bridges.

12.1.5 The provision of increased and improved footway and cycle provision making journeys by sustainable modes both easier and faster, enhancing access to local facilities and thereby reducing severance for pedestrians, cyclists and non-car households. The impact of the scheme on pedestrians is therefore considered to be **Large Positive**.

12.1.6 Eight out of the eighteen schools in the vicinity of scheme experience an increase in traffic above the 10% threshold on the links which serve them. However, at each of the affected school locations there are ample pedestrian crossing facilities and so any additional impacts at these locations are expected to be negligible and the impact of the scheme on children under 16 is therefore considered to be **Neutral**.

12.1.7 The majority of households with no cars lie on the eastern side of the town which experiences a reduction in traffic due to traffic rerouting from the existing A47 bascule bridge to take the

new bridge using roads through the centre of the town. Therefore the impact of traffic on households with no cars can be considered to be **Slight Positive**

12.1.8 There is a large concentration of retail activity at London Road North, London Road South and North Quay Retail Park. The first two locations experience a reduction in traffic will make it easier and safer for pedestrians to cross the busy A47 to access shops. North Quay Retail Park experiences an increase in traffic but the majority of users travel there by car and so it is not deemed to have a negative impact on pedestrians and the overall impact on shopping can be considered to be **Large Positive**.

12.1.9 The overall SDI assessment on severance is therefore considered to be **Large Positive.**

13 Appendix A

13.1 Introduction

13.1.1 This Appendix sets out a light-touch Financial Case for the Lake Lothing Third Crossing in order to provide a basis for comparing the current scheme cost estimate with the cost estimate presented in the Financial Case of the Outline Business Case in 2015. This Appendix describes:

- How much the scheme is expected to cost and how this has been calculated; and
- The anticipated profile of expenditure over time (whole life costs).

13.2 Costs

13.2.1 The estimated capital cost of the scheme, at 2017:Q4 prices (excluding sunk costs, future inflation and non-recoverable VAT) is shown in Table 13-1.

Scheme	Cost in £
Lake Lothing Third Crossing	81,644,000

Table 13-1 Estimated capital cost of Lake Lothing Third Crossing

13.2.2 The build-up of the cost estimate and spend profile over time is demonstrated in Table 13-2.

Scheme element	Costs (£) in 2017:Q4 prices					
	17/18	18/19	19/20	20/21	21/22	Total
Scheme preparation	7,344,000	2,700,000	4,100,000	1,800,000	1,100,000	17,044,000
Cost of construction	0	0	7,800,000	33,500,000	10,400,000	51,700,000
TOTAL (excluding QRA)	**7,344,000**	**2,700,000**	**11,900,000**	**35,300,000**	**11,500,000**	**68,744,000**
Quantified risk (QRA)	**600,000**	**4,000,000**	**3,000,000**	**3,000,000**	**2,300,000**	**12,900,000**
Risk adjusted TOTAL	**7,944,000**	**6,700,000**	**14,900,000**	**38,300,000**	**13,800,000**	**81,644,000**
Adjustment to out-turn (Inflation)	0	0	1,200,000	5,100,000	1,600,000	7,900,000
Scheme Cost (out-turn prices)	**7,944,000**	**6,700,000**	**16,100,000**	**43,400,000**	**15,400,000**	**89,544,000**

Table 13-2 Breakdown of scheme costs for the Lake Lothing Third Crossing

13.3 Out-turn price adjustment

13.3.1 The cost estimates assume a price base of 2017:Q4. An allowance is therefore made for expected inflation between the date of the estimate and the date when the expenditure is expected to occur.

13.3.2 The uplift factors to reflect price inflation have been estimated based on the Building Cost Information Services (BCIS) five-year forecast for increases in tender prices and construction costs associated with construction inflation.

13.3.3 The inflation allowance for construction of the Lake Lothing Third Crossing is £7.90 million.

13.4 Sunk costs

13.4.1 'Sunk' costs are those costs which represent expenditure incurred prior to the scheme appraisal and which cannot be retrieved. In line with TAG Unit A1.2 (Scheme Costs), these 'sunk' costs were not included in the economic appraisal and are not presented as part of the overall scheme cost. The costs incurred prior to the scheme appraisal, at 2017:Q4 prices, total £2.24 million and are presented in Table 13-3.

Scheme element	Costs (£) in 2017:Q4 prices		
	2015 / 2016	2016 / 2017	Total
Construction contracts	0	0	0
Design investigations, surveys, procurement and supervision	1,186,000	967,000	2,153,000
Statutory undertakers works	0	0	0
Land and compensation	0	87,000	87,000
Total cost	**1,186,000**	**1,054,000**	**2,240,000**

Table 13-3 Lake Lothing Third Crossing spend to date ('sunk costs')

13.5 Whole life costs

13.5.1 The Lake Lothing Third Crossing scheme will give rise to additional revenue liabilities for capital renewals and maintenance and for the cost of day to day operation of the bridge, when compared to a future scenario in which the Lake Lothing Third Crossing does not exist. All maintenance obligations will be met as part of the maintenance regime operated by Suffolk County Council.

13.6 Capital renewal costs

13.6.1 Approximately £1.60 million (at current 2017 price base) will be required for the purposes of resurfacing / renewing the new highway infrastructure (including the bridge approaches and bridge surface) over a 60 year period. It is anticipated that the surface and binder courses would need to be replaced every 15 years after scheme opening, with a full depth reconstruction after 45 years.

13.6.2 Approximately £1.55 million (at current 2017 price base) will be required for the purposes of bridge repair and rehabilitation costs over a 60 year period. This includes the costs incurred to avoid structural corrosion, painting the structure and make structural repairs with an allowance for the bridge parapets to be replaced after 45 years.

13.7 Annual maintenance and operating costs

13.7.1 Approximately £10,000 (at current 2017 price base) will be required to meet annual highways maintenance liabilities including communications equipment, drainage clearance, road and street lighting operation, winter maintenance (i.e. application of salt and snow clearance) and infrastructural and safety inspections.

13.7.2 Approximately £137,000 (at current 2017 price base) will be required to meet annual bridge maintenance liabilities. These costs are mainly comprised of operation and maintenance of the bascule bridge.

13.7.3 The whole life costs identified above have been factored into the economic appraisal, contained within the Economic Case and have therefore had an impact on the estimated BCR and NPV.

13.7.4 A breakdown of annual maintenance and capital renewal costs is presented in Table 13-4.

	Highway costs (£ in 2017 prices)	Bridge costs (£ in 2017 prices)	Total costs (£ in 2017 prices)
Annual maintenance	10,356	136,698	147,054
15 Years	303,428	65,242	368,670
30 Years	303,428	65,242	368,670
45 Years	687,632	1,354,552	2,042,184
60 Years	303,428	65,242	368,670

Table 13-4 Breakdown of annual maintenance and capital renewal costs, by highways and bridge costs