

# York Scarborough Bridge Economic Appraisal Update Technical Note

<b>Specification No.</b> 1	<b>Client name</b> West Yorkshire Combined Authority	<b>Client reference</b> M088	<b>Discipline</b> Transportation
<b>Project name</b> CCAG2 Economics	<b>Date</b> 25 July 2017	<b>Project number</b> 60274233/M088	<b>Prepared by</b> Nick Forgham
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## 1. Introduction

Since the submission of the revised economic appraisal for the West Yorkshire Combined Authority's (WYCA) Cycle City Ambition Grant 2 (CCAG2) in May 2017, City of York Council have provided AECOM and WYCA with additional detail on costings and time saving benefits for cyclists as a result of the Scarborough Bridge scheme. This technical note provides an update to the May 2017 appraisal taking into account the revised costs and additional journey time saving benefit for cyclists, as well as taking the opportunity to update the WebTAG assumptions to the July 2017 databook. A breakdown of the Present Value of Costs (PVC) and Present Value of Benefits (PVB) is presented in this technical note with an Economic Efficiency of the Transport System (TEE) and Public Accounts (PA) table, which are then drawn together in the Analysis of Monetised Costs and Benefits (AMCB) table.

## 2. Overall Appraisal Assumptions

In line with WebTAG Guidance and HM Treasury Green Book, the following appraisal parameters have been used for the economic appraisal to develop the Present Value of Benefits (PVB) and Present Value of Costs (PVC).

- Appraisal Period – 30 years
  - The appraisal is based over a period of 30 years, with the schemes opening in 2018.
  - Annual maintenance costs were calculated as 0.5% of Capital Costs
  - 5 Yearly Renewal Costs were calculated at 5% of Capital Costs
  - 15 Year Renewal Costs were calculated at 10% of Capital Costs
  - Operating and Renewal costs were subject to 1.0% real price increases to 2031
- Discounting – all costs and benefits to be discounted to 2010 prices (WebTAG A1.1); and
  - This is in line with WebTAG discount rates (3.5% years 1 to 30, and 3.0% thereafter).
- Optimism Bias
  - The maturity of the scheme and costings place Scarborough Bridge in Stage 2 of a Transport Project (WebTAG A1.2) and so a 15% Optimism Bias has been applied as this is a Bicycle Scheme. A quantified risk value was added to the costs of these schemes in addition to the Optimism Bias
- Scheme opening year of 2018
- Tax Correction factor of 1.19 was applied in line with WebTAG guidance
- Bridge Demand Inputs provided by CityConnect Cycle Survey Counts undertaken in 2016
  - Current demand growth in line with National Trip End Model (NTEM) version 7.2 forecasts from 2017 for 20 years from the year the appraisal has been prepared in line with WebTAG recommendations.
- Future Corridor Demand developed from 2011 Journey to Work Census Data 1km Buffers
  - Estimation of new user demand was derived from a Disaggregate Mode Choice Model calculation following criteria set out in WebTAG A5.1 utilising current levels of demand from 2011 Census Journey to Work Data

- Growth in line with National Trip End Model (NTEM) version 7.2 forecasts from 2011
- To annualise demand data from daily weekday return cycle trips to annual one way cycle trips the following assumptions were used
  - A factor of 2.0 to convert return journeys into one way trips
  - A Saturday, Sunday and Public Holiday generates 50% of weekday daily demand; and
  - 5 weekdays per week, 2 weekends per week, 52 weeks per year minus 8 weekdays and plus 8 weekend days (to account for public holidays)
- The scheme benefits were appraised using the following criteria
  - Journey Ambience (based on WebTAG A4.1.6)
  - Journey Time Savings
  - Physical Fitness: HEAT Analysis
  - Physical Fitness: Absenteeism
  - Decongestion Impacts
  - Environmental Impacts (Noise, Local Air Quality, Greenhouse Gases)
  - Accidents (Reduction due to car km removed from the highway network)
  - Indirect Taxation Impacts

### 3. Appraisal Updates

Since the May 2017 a number of updates have been made to the appraisal:

1. City of York Council has provided AECOM with a revised capital cost for the project as a result of further progression with the scheme. This additional cost information moves the scheme into Stage 2 of a Transport Project (WebTAG A1.2) requiring a 15% Optimism Bias to be applied from the previous 44%.
2. City of York Council has also stated the expected time saving benefits arising from the scheme which will remove the need for cyclists to dismount and carry their bicycle over the bridge to the other side of 200 seconds per cyclist. This time saving per existing cyclist has been applied using the appropriate WebTAG values (A1.3.2) with the Rule of Half being applied to new users.
3. The Physical Fitness benefits have been reviewed to take into account the National Travel Survey average Cycling Trip length of 4.8km for new users. The opportunity has also been taken to update the WebTAG values to the latest databook of July 2017 for the appraisal as well as revise the TEMPRO Growth calculations to the City of York Local Authority Area.

### 4. Proposed Scheme

The Scarborough Bridge scheme consists of building a new wider bridge across the River Ouse near to the centre of York adjacent to the existing York to Scarborough railway line to provide a new step-free connection to the National Cycle Network and to other urban areas of York north of the River as shown in **Figure 1**.

Figure 1: The Scarborough Bridge CityConnect Scheme



## 5. Cycle corridor assumptions

### 5.1 Demand

#### 5.1.1 Existing daily demand

The level of existing Cycle Demand was provided by surveys undertaken in 2016 by CityConnect over the scheme corridors to provide the two-way cycle demand on the corridor. **Error! Not a valid bookmark self-reference.** provides a summary of the existing demand for the Scarborough Bridge scheme. The current modal share was calculated from 2011 Census Journey to Work data utilising a 1km catchment each side of the cycle corridor to identify the total level of demand split by each mode of travel.

Table 1: Existing Daily Demand for Scarborough Bridge

Study Area Total cycling demand (daily)	Study Area Cycling Modal share	Cycle Route Annual Demand
642	2.0%	182,970

#### 5.1.2 New Users

To calculate the new user demand a disaggregate mode choice model as recommended by WebTAG (A5.1) was used which produced the following levels of demand, as shown in **Table 3**.

Table 2: New User Demand for Scarborough Bridge

Study Area New Demand (daily)	Study Area Cycling Modal share	New User Annual Demand
1,060	13.67%	302,172

## 5.2 Journey Ambience

To assess the journey ambience benefits provided by the Scarborough Bridge scheme, the average cycle trip time on the bridge was calculated and applied to the estimated future corridor demand. Since there is already a cycle crossing at Scarborough Bridge with the scheme providing a new wider step-free bridge the WebTAG recommended journey ambience is 1.81p/min for a Wider Lane has been applied. The average cycle trip time in minutes was estimated using the scheme length and the average cycling speed of 20kph from the National Travel Survey. The results showing the average time per cycle trip for the Scarborough Bridge scheme are shown in **Error! Not a valid bookmark self-reference..**

**Table 3: Average Cycle Trip Time – Scarborough Bridge**

Total Route Length (km)	Km cycled on route per cyclist	Average Cycle Trip time (mins)
1.5	1.5	4.5

The journey ambience values were included for each year of the appraisal with an annual increase in the rate per minute increasing with the WebTAG Value of Time Growth for Non-Work Time.

## 5.3 Journey Time Savings

As a result of new step-free access to a wider shared bridge over the River Ouse in York a journey time saving per cyclist can be determined from removing the need to dismount, walk the bicycle up steps, walk the bicycle over the bridge and then carry the bicycle down the steps. Cyclists using Scarborough Bridge at the moment would typically take:

- 10 seconds to dismount from their bike
- 30 seconds to push the bike up the ramp to bridge
- 120 seconds to cross the bridge walking and pushing the bike
- 30 seconds to push their bike down the ramp off the bridge
- 10 seconds to remount their bike

These assumptions provided by City of York Council total 200 seconds per cyclist which has been applied to existing cyclists with the Rule of Half applied to new cyclists. Cycle users were split by the appropriate WebTAG Journey Purpose to provide an appropriate Value of Time saving from WebTAG A1.3.2 as shown in **Table 5.**

**Table 5: Market Prices Value of Time - WebTAG A1.3.2 (2010 Values)**

Cyclist	Commuting	Other
£10.02	£9.95	£4.54

## 5.4 Physical Fitness

To determine the improvements in health due to long term increases in physical activity arising from improved and more accessible cycle infrastructure, analysis was undertaken using the Health Economic Assessment Tool (HEAT) as recommend in WebTAG A5.1. This methodology calculates the prevention of deaths per person due to taking up physical exercise, in this case cycling. For this scheme, the National Travel Survey average Cycling Trip length of 4.8km was applied. Further physical fitness benefits have been derived from the potential for those taking up cycling improving their health outcomes which could result in reductions in short term periods of absence from work.

## 5.5 Environmental and Decongestion Benefits

The new cycle schemes will generate additional demand for cycling from existing car users resulting in an overall reduction in car trips which will reduce congestion, noise, local air quality and greenhouse gases. To estimate these impacts the following assumptions were adopted:

- The proportion of new cycle users transferring from car was 60% in line with previous appraisal with a car km reduction from the road network at 7km
- Unit rates as identified in WebTAG A4.1 Road Decongestion Benefits were used to derive rates per car km (see Table 8)
- These rates were applied to the reduction in car km to generate estimates for each benefit, with a ramp up of benefits assumed over the first 5 years of appraisal

**Table 6: Marginal External Costs – WebTAG A5.4.2 (Pence per car km, 2010 prices)**

Cost Type	2010	2015	2020	2025	2030	2035
Congestion (Average)	29.9	32.9	40.9	50.7	61.6	78.1
Infrastructure	0.1	0.1	0.1	0.1	0.1	0.2
Accident	3.0	3.2	3.5	3.9	4.4	4.9
Local Air Quality	0.1	0.1	0.0	0.0	0.0	0.0
Noise	0.2	0.2	0.2	0.3	0.3	0.3
Greenhouse Gases	0.9	0.8	0.7	0.7	0.7	1.0
Indirect Tax	-4.7	-3.9	-3.6	-3.4	-3.2	-3.2

## 5.6 Cycling Accidents

This scheme is likely to result in a change in the overall number of accidents within the corridor due to the improved cycling infrastructure offered by the scheme resulting in safer journeys for cyclists and a reduction in car travel due to modal shift. As there is already a fixed crossing in place, accident reductions based on the previous 5 years were not deemed to be taken as an appropriate benefit as a result of the new wider Scarborough Bridge, however accident reductions as a result of modal shift have been included and monetised.

## 6. Present Value of Costs

The cost for the Scarborough Bridge scheme has been provided by City of York Council and includes an element of quantified risk. This resulted in a capital cost for the scheme, including risk, of £4,871,430 (2017 Q2 price). **Table 7** highlights how the full cost of the Scarborough Bridge scheme is to be funded by the programme.

**Table 7: Scheme cost breakdown by funding source (2017 Values)**

Total Costs	CCAG2 Contribution	Match Funding
£4,871,430	£1,935,593	£3,437,775

The Scarborough Bridge scheme is based on an appraisal period of 30 years with the scheme assumed to become operational in 2018. A 15% Optimism Bias has been applied in the appraisal as the maturity of the scheme costings place the project in Stage 2 of a Transport Project (WebTAG A1.2). A high level capital spend profile agreed with CityConnect has been applied to represent the proportion of spend with 70% in 2017 and 30% in 2018.

In the absence of detailed ongoing cost information, an assumption has been made regarding operating and renewal costs for appraisal purposes with the costs subject to a 1.0% real price increase to 2031. Operating costs are expected to be 0.05% of Capital Costs at £24,357 per annum with renewal costs assumed at regular intervals between 5-10% of capital costs as shown in **Table 8**.

**Table 8: Renewals Costs (2017 Prices)**

Description	Replacement Cost	Percentage of Scheme Capex
Year 5	£243,572	5%
Year 10	£243,572	5%
Year 15	£487,143	10%
Year 20	£243,572	5%
Year 25	£243,572	5%
Year 30	£487,143	10%
<b>Total</b>	<b>£1,948,572</b>	

## 7. Present Value of Benefits

A benefits summary table providing Analysis of the Monetised Costs and Benefits (AMCB) is displayed below in **Table 9**. The appraisal undertaken presents a BCR of **1.81** which represents medium value for money and further detail is presented in Economic Efficiency of the Transport System (TEE) and Public Accounts (PA) tables.

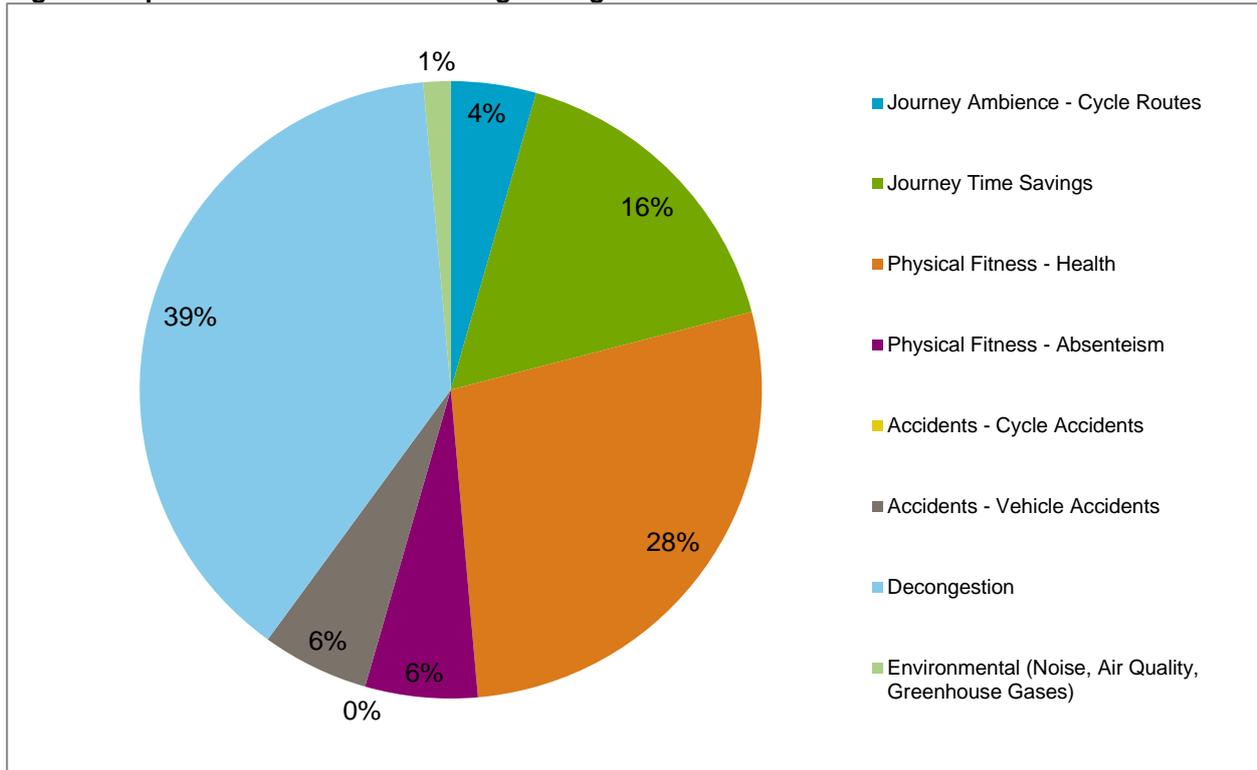
**Table 9: Benefits Summary Table**

Benefit	York Scarborough Bridge
Noise	£41
Local Air Quality	£0
Greenhouse Gases	£120
Journey Ambience	£500
Journey Time Savings	£1,863
Accidents	£628
Physical Fitness (HEAT)	£3,124
Absenteeism	£ 659
Congestion relief	£4,353
Indirect Taxation	-£484
Third party Contributions	£2,850
PVB	£10,804
NPV	£4,834
PVC	£5,970
<b>BCR</b>	<b>1.81</b>

*Values shown in £000s in 2010 discounted prices and values*

A split of the benefits, by proportion, is shown in **Error! Reference source not found.** which demonstrates that the biggest benefit of the scheme will be decongestion, this is followed by improvements to physical fitness with Journey Time Savings making up 16% of the expected benefits for the new wider step-free bridge.

**Figure 2: Split of Benefits – Scarborough Bridge**



## 8. Conclusion

This technical note presents the methodology and assumptions used for the economic assessment of the Scarborough Bridge cycle improvement corridor scheme. The previous appraisal necessitated a Optimism Bias of 44% due to cost uncertainties which significantly affected the value for money of the scheme, with more detailed costings available the Optimism Bias has been revised to 15% consistent with WebTAG A1.2 Stage 2 of a Transport Project. Furthermore, City of York Council have provided information on the likely time savings arising from the new wider step-free bridge which will remove the need to dismount at either end and walk a bicycle across the bridge. It is expected that this will be 200 seconds per cyclist to their typical journey, this time saving has been appraised for existing users with the Rule of Half applied to new users. The time saving arising from the infrastructure changes will increase the attractiveness of Scarborough Bridge for cyclists which may result in reassignment from current crossings further enhancing the viability of the crossing however in light of more detailed information this has not been assessed. Transport Economic Efficiency (TEE) and Public Accounts (PA) tables follow in Figures 3 and 4.

**Figure 3: Transport Economic Efficiency Table**

**Economic Efficiency of the Transport System (TEE)**

<b>Non-business: Commuting</b>	<b>ALL MODES</b>	<b>ROAD</b>	<b>BUS and COACH</b>	<b>RAIL</b>	<b>OTHER</b>		
<i>User benefits</i>	<b>TOTAL</b>	<b>Private Cars and LGVs</b>	<b>Passengers</b>	<b>Passengers</b>	<b>Cyclists and Walking</b>		
Travel time	£1,441	£910			£531		
Vehicle operating costs	£0						
User charges	£0						
During Construction & Maintenance	£0						
<b>NET NON-BUSINESS BENEFITS: COMMUTING</b>	<b>£1,441</b>	<b>£910</b>	<b>£0</b>	<b>£0</b>	<b>£531</b>		
<b>Non-business: Other</b>							
<i>User benefits</i>	<b>TOTAL</b>	<b>Private Cars and LGVs</b>	<b>Passengers</b>	<b>Passengers</b>	<b>Cyclists and Walking</b>		
Travel time	£4,439	£3,233			£1,206		
Vehicle operating costs	£0						
User charges	£0						
During Construction & Maintenance	£0						
<b>NET NON-BUSINESS BENEFITS: OTHER</b>	<b>£4,439</b>	<b>£3,233</b>	<b>£0</b>	<b>£0</b>	<b>£1,206</b>		
<b>Business</b>							
<i>User benefits</i>		<b>Goods Vehicles</b>	<b>Business Cars &amp; LGVs</b>	<b>Passengers</b>	<b>Freight</b>	<b>Passengers</b>	<b>Other</b>
Travel time	£337		£210				£126
Vehicle operating costs	£0						
User charges	£0						
During Construction & Maintenance	£0						
<b>Subtotal</b>	<b>£337</b>	<b>£0</b>	<b>£210</b>	<b>£0</b>	<b>£0</b>	<b>£0</b>	<b>£126</b>
<b>Private sector provider impacts</b>				<b>Freight</b>		<b>Passengers</b>	
Revenue	£0						£0
Operating costs	£0						
Investment costs	£0						
Grant/subsidy	£0						
<b>Subtotal</b>	<b>£0</b>			<b>£0</b>	<b>£0</b>	<b>£0</b>	<b>£0</b>
<b>Other business impacts</b>							
Developer contributions	£0						
<b>NET BUSINESS IMPACT</b>	<b>£337</b>						
<b>TOTAL</b>							
Present Value of Transport Economic Efficiency Benefits (TEE)	<b>£6,216</b>						

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.  
All entries are discounted present values, in 2010 prices and values

**Figure 4: Public Accounts Table**

**Public Accounts**

	ALL MODES TOTAL	ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER Cyclists and Walking
<b>Local Government Funding</b>					
Revenue	£0				
Operating Costs	£376	£376			
Investment Costs	£844	£844			
Developer and Other Contributions	£2,850				£2,850
Grant/Subsidy Payments	£0				
<b>NET IMPACT</b>	<b>£4,070</b>	<b>£1,220</b>	<b>£0</b>	<b>£0</b>	<b>£2,850</b>
<b>Central Government Funding: Transport</b>					
Revenue	£0				
Operating costs	£0				
Investment Costs	£1,900	£1,900			
Developer and Other Contributions	£0				
Grant/Subsidy Payments	£0				
<b>NET IMPACT</b>	<b>£1,900</b>	<b>£1,900</b>	<b>£0</b>	<b>£0</b>	<b>£0</b>
<b>Central Government Funding: Non-Transport</b>					
Indirect Tax Revenues	£484	£484			
<b>TOTALS</b>					
<b>Broad Transport Budget</b>	<b>£5,970</b>				
<b>Wider Public Finances</b>	<b>£484</b>				

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.