



# NDR Final Submission

Economic Appraisal

May 2015

Norfolk County Council



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# Executive Summary

This report contains an economic appraisal of the Norwich Northern Distributor Road (NDR) for the final submission to the Department for Transport (DfT). Results are presented for the DCO scheme with an amendment agreed during the Examination to Drayton Lane, with the Postwick Hub improvement included in the without scheme scenario (Do Minimum) and using November 2014 WebTAG parameters and accident rates. This supplements the results and sensitivity testing that was carried out for the Examination and which has already been provided to the DfT.

In addition results are presented for a part NDR terminating at the A140 and for sensitivity testing of low and high growth for this option. This allows direct comparison with the results produced for the Best and Final Bid submission, but it should be noted that a decision on scheme approval could only be made at this stage on the basis of the DCO submission.

The final target costs for the scheme are currently awaited. This first issue of the report provides the economic appraisal results based on scheme costs used at the Examination and provides an early assessment. When the target costs are received the report will be updated but it should be noted that the benefits will remain unchanged.

The results below show that the full DCO scheme BCR is higher than for the part NDR. The BCR for these tests ranges from 4.80 – 5.47 (inclusive of accident benefits) and 5.77 – 6.95 when wider economic impacts and journey time reliability are included as can be seen from summary table below. Both of these ranges represent very high value for money for all tests (BCR above 4) according to the DfT's Value for Money criteria.

Scenario	Growth	BCR (including accidents)	BCR (also including WEBs and JTR)
DCO scheme – NDR terminating at A1067	Central	5.47	6.95
Part NDR – terminating at A140	Central	5.49	6.43
	Low	4.80	5.77
	High	5.47	6.67

Note: It should be noted that these BCRs are not based on final target costs. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in these BCR calculations but with a 3% optimism bias applied. Therefore the above BCRs will change when the final target costs are included.

The BCR (including accident benefits) for the core scheme at Best and Final Bid (BAFB) Stage in 2011 was 5.97. That scheme was one that terminated at the A140 and included the Postwick Hub improvement as part of the scheme. There are many other differences between the 2011 appraisal base and the current appraisal including a new updated transport model, a different price base, revised growth forecasts and revised economic parameters. However there is a consistency in that all the results represent very high value for money.

# 1 Introduction

## 1.1 Background

Mott MacDonald (MM) has been appointed by Norfolk County Council (NCC) to assist with the development and appraisal of the Norwich Northern Distributor Road, known as the NDR or referred to as the Scheme. The Scheme would be a dual carriageway all-purpose strategic distributor road, to be classified as the A1270 Principal Road, which would link the A1067 Fakenham Road near Attlebridge, to the A47(T) Trunk Road at Postwick. This will be over a length of approximately 20.4km.

The NDR is a project of national significance which requires a Development Consent Order (DCO) under the Planning Act 2008 and this formal planning process began in early 2013. The NDR DCO submission was submitted on 8<sup>th</sup> January 2014 and has been through the examination which ended on 2<sup>nd</sup> December 2014. The Planning Inspectorate issued a report of recommendation to the Secretary of State on 2 March 2015. The Secretary of State's decision letter and report of recommendations are to be published in due course.

It should be noted that original funding approval given in December 2011 as part of Department for Transport's (DfT) Development Pool process was for a part NDR between A47(T) and the A140.

## 1.2 Purpose and layout of report

Since 2011 funding approval was granted for NDR, DfT requested further information as part of the final submission. This comprises economic appraisal of:

- Updated DCO scheme, full NDR from A47(T) to A1067 – This includes a modification at Drayton Lane agreed at the Examination, Postwick Hub improvement represented in the Do Minimum (DM) network (it was approved by Government and is currently being constructed) and using November 2014 WebTAG parameters and accident rates
- Part NDR from A47(T) to A140 with central/ low/ high growth - Postwick in DM and using November 2014 WebTAG parameters and accidents rates

The analysis of the part NDR means that a comparison of the results can be made with those produced for the BAFB, except that the results allow for Postwick in the Do Minimum.

This report presents the results of the above testing. The methodology used to produce the safety and economic appraisal is described in detail in DCO submission document ref. 5.7.

This report contains the following sections after the current introductory section:

- Section 2 – describes details of the appraisals
- Section 3 – contains NDR scheme costs excluding Postwick Hub improvement costs
- Sections 4 to 7 – present the results for appraisals for each case
- Section 8 – presents conclusions from the work

## 2 Description of appraisal tests

### 2.1 Overview

The economic appraisal complies with the latest November 2014 guidance in WebTAG. It has been assumed in the appraisal that the benefits of the scheme do not change for each year beyond 2032 although traffic will continue to grow which suggests that the PVB and the NPV presented for each sensitivity test will be conservative.

For each sensitivity test economic and safety appraisals have been carried out. As with the DCO submission, the economic appraisal calculates TUBA benefits, wider economic benefits (using WITA), journey time reliability benefits and safety benefits based on COBA. It is important to note that TUBA, COBA, WITA and reliability calculations correspond to November 2014 WebTAG. In addition the WITA version (1.2.1.2Be) used has bug fixes to prevent potential incorrect matching of zones in the correspondence files.

The costs of the scheme are shared between local authority and central government.

### 2.2 Details of test cases

Table 2.1 below summarises details of the tests.

Table 2.1: Details of test cases

Test case	Growth scenario	Additional details
DCO scheme – full NDR terminating at A1067	Central	Also includes modifications at Drayton Lane which was agreed during the DCO examination.
Part NDR terminating at A140	Central	A shorter scheme compared to the DCO scheme but is consistent with the scheme that received funding approval from DfT in 2011.
	Low	
	High	

### 3 Revised scheme costs

<To be updated once final target costs are received. Costs used in this version of the report are those presented during the DCO Examination>

Revised scheme costs for NDR with Postwick Hub improvement costs excluded were provided by NCC {expand on the exact source – this will be a contractor’s target cost and agreed with the contractor} and summary costs are given in Table 3.1 below.

Table 3.1: Summary costs excluding Postwick

Cost type	Costs (£m) in 2015Q?? prices	
	DCO scheme	NDR terminating at A140
<i>Investment costs</i>		
Construction		
Land		
Preparation		
Supervision		
Total investment Cost		
<i>Other costs</i>		
Maintenance		
Operation		

Notes: These are initial costs before adjusting for construction price inflation and optimism bias

Costs were adjusted as per Document Reference 5.7. The adjusted costs were used in the sensitivity test scenarios. Construction inflation has been assessed at aa% per annum for the years xx to yy. The use of aa% has been agreed with the County Council’s appointed contractor Birse Civils and is considered appropriate for the following reasons:

<Reasons>

For the DCO examination an Optimism Bias of 15% was employed. For the final submission a lower Optimism Bias of 3% has been adopted <the lower optimism bias value will be applied to the final target costs – in Rev B of the report DCO Examination-derived costs have 15% optimism bias applied> to reflect the further development that has been completed since the DCO examination. This is considered to be justified as the level of uncertainty has reduced as a result of the following:

<Reasons>

In addition the scheme is at full approval stage hence an optimism bias of 3% is recommended by Table 8 of WebTAG A1.2.

## 4 DCO scheme results

### 4.1 Safety analysis results

Accident benefits were calculated using the same approach reported in Document Reference 5.7. Table 4.1 below reports summary accident benefits using local accident rates for this appraisal of the DCO Scheme.

Table 4.1: Accident benefits – DCO Scheme

			Values (£000)
			Do Minimum
Number of PIAs			71,003
Casualties	Fatal		1,896
	Serious		12,623
	Slight		91,510
Accident costs			4,763,961
			Do Something
Number of PIAs			69,851
Casualties	Fatal		1,895
	Serious		12,470
	Slight		90,098
Accident costs			4,722,477
			Accident benefits
Number of PIAs			1,152
Casualties	Fatal		1
	Serious		153
	Slight		1,412
Accident costs			41,484

Source: All monetary values are expressed in £000's in 2010 prices discounted to 2010

The results show that full NDR DCO scheme reduces both numbers of accidents in the Norwich area and the severity of those accidents. The reduction in accidents represents £41m of monetary benefits in 2010 prices and discounted to 2010.

### 4.2 Economic analysis results

Table 4.2 below contains monetised costs and benefits including accident benefits for the DCO scheme.

Table 4.2: Analysis of monetised costs and benefits – DCO scheme

Item	Accidents included (£000)
Accidents (not assessed by TUBA)*	41,484
Greenhouse Gases	-24,081
Economic Efficiency: Consumer Users (Commuting)	67,265
Economic Efficiency: Consumer Users (Other)	501,326
Economic Efficiency: Business Users and Providers	262,530
Wider Public Finances (Indirect Taxation Revenues)	64,884
Present Value of Benefits (PVB)	913,408
Broad Transport Budget Present Value of Costs (PVC)	166,971
OVERALL IMPACTS	
Net Present Value (NPV)	746,437
Benefit to Cost Ratio (BCR)	5.470

Notes: All monetary values are expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

\*The lower conservative accident benefit is included based upon the use of local accident data, as explained in section 7 of Reference Document 5.7

The results show that the Present Value of Benefits (PVB) for this sensitivity test is estimated to be £913m (inclusive of accident benefits), outweighing the £167m Present Value of Costs (PVC) (*PVC is subject to change once the final target costs are included in the appraisal*).

The Benefit Cost Ratio (BCR) of the scheme for this sensitivity test is 5.47 including accidents (*BCR is subject to change once the final target costs are included in the appraisal*). Under the DfT's value for money criteria, this represents a Very High value for money category.

Table 4.3 below contains summary economic appraisal results including wider impacts and journey time reliability for DCO scheme.

Table 4.3: Summary of Economic Appraisal including wider benefits – DCO scheme

Item	Benefits including WEBs and JTR
Present Value of Benefits (PVB)	1,160,859
Present Value of Costs (PVC)	166,971
Net Present Value (NPV)	993,888
Benefit to Cost Ratio (BCR)	6.952

Notes: All monetary values are in £000's and expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in

these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

The BCR for this sensitivity test is improved further to 6.95 (*subject to updating with final target costs*) once journey time reliability benefits (£31m) and wider economic benefits (£217m) are included in the appraisal. These additional benefits amount to £248m (2010 prices discounted to 2010). The inclusion of these benefits increases the BCR to a higher level within the Very High value for money category.

## 5 NDR to A140 results

### 5.1 Safety analysis results

Accident benefits were calculated using the same approach reported in Document Reference 5.7. Table 5.1 below reports summary accident benefits using local accident rates for this appraisal.

Table 5.1: Accident benefits – NDR to A140

		Values (£000)
		Do Minimum
Number of PIAs		71,003
Casualties	Fatal	1,896
	Serious	12,623
	Slight	91,510
Accident costs		4,763,961
		Do Something
Number of PIAs		70,311
Casualties	Fatal	1,885
	Serious	12,487
	Slight	90,633
Accident costs		4,727,914
		Accident benefits
Number of PIAs		692
Casualties	Fatal	12
	Serious	136
	Slight	877
Accident costs		36,047

Source: All monetary values are expressed in £000's in 2010 prices discounted to 2010

The results show that the part NDR scheme under central growth reduces both numbers of accidents in the Norwich area and the severity of those accidents. The reduction in accidents represents £36m of monetary benefits in 2010 prices and discounted to 2010.

### 5.2 Economic analysis results

Table 5.2 below contains monetised costs and benefits including accident benefits for NDR terminating at A140.

Table 5.2: Analysis of monetised costs and benefits – NDR to A140

Item	Accidents included (£000)
Accidents (not assessed by TUBA)*	36,047
Greenhouse Gases	-17,956
Economic Efficiency: Consumer Users (Commuting)	35,514
Economic Efficiency: Consumer Users (Other)	421,831
Economic Efficiency: Business Users and Providers	192,309
Wider Public Finances (Indirect Taxation Revenues)	48,919
Present Value of Benefits (PVB)	716,664
Broad Transport Budget Present Value of Costs (PVC)	130,452
OVERALL IMPACTS	
Net Present Value (NPV)	586,212
Benefit to Cost Ratio (BCR)	5.494

Notes: All monetary values are in £000's and expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

\*The lower conservative accident benefit is included based upon the use of local accident data, as explained in section 7 of Reference Document 5.7

The results show that the Present Value of Benefits (PVB) for this sensitivity test is estimated to be £717m (inclusive of accident benefits), outweighing the £130m Present Value of Costs (PVC) (*PVC is subject to change once the final target costs are included in the appraisal*).

The Benefit Cost Ratio (BCR) of the scheme for this sensitivity test is 5.49 including accidents (*BCR is subject to change once the final target costs are included in the appraisal*). Under the DfT's value for money criteria, this represents a Very High value for money category.

Table 5.3 below contains summary economic appraisal results including wider impacts and journey time reliability for NDR terminating at A140.

Table 5.3: Summary of Economic Appraisal including wider benefits – NDR to A140

Item	Benefits including WEBs and JTR
Present Value of Benefits (PVB)	838,275
Present Value of Costs (PVC)	130,452
Net Present Value (NPV)	707,823
Benefit to Cost Ratio (BCR)	6.426

Notes: All monetary values are in £000's and expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in

these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

The BCR for this sensitivity test is improved further to 6.43 (*subject to updating with final target costs*) once journey time reliability benefits (£18m) and wider economic benefits (£104m) are included in the appraisal. These additional benefits amount to £122m (2010 prices discounted to 2010). The inclusion of these benefits increases the BCR to a higher level within the Very High value for money category.

## 6 NDR to A140 – Low growth results

### 6.1 Safety analysis results

Accident benefits were calculated using the same approach reported in Document Reference 5.7. Table 6.1 below reports summary accident benefits using local accident rates for this sensitivity test.

Table 6.1: Accident benefits – NDR to A140 low growth

		Values (£000)
		Do Minimum
Number of PIAs		65,540
Casualties	Fatal	1,747
	Serious	11,631
	Slight	84,506
Accident costs		4,402,900
		Do Something
Number of PIAs		64,317
Casualties	Fatal	1,730
	Serious	11,435
	Slight	82,950
Accident costs		4,338,708
		Accident benefits
Number of PIAs		1,223
Casualties	Fatal	17
	Serious	196
	Slight	1,556
Accident costs		64,192

Source: All monetary values are expressed in £000's in 2010 prices discounted to 2010

The results show that the part NDR scheme under low growth reduces both numbers of accidents in the Norwich area and the severity of those accidents. The reduction in accidents represents £64m of monetary benefits in 2010 prices and discounted to 2010. The benefits are higher than the central growth scenario mainly due to taking difference between two large numbers. However when casualty numbers and accident costs for corresponding DM and DS scenarios are compared, they are consistent across two growth scenarios.

### 6.2 Economic analysis results

Table 6.2 below contains monetised costs and benefits including accident benefits for NDR terminating at A140 for low growth.

Table 6.2: Analysis of monetised costs and benefits – NDR to A140 low growth

Item	Accidents included (£000)
Accidents (not assessed by TUBA)*	64,192
Greenhouse Gases	-16,291
Economic Efficiency: Consumer Users (Commuting)	47,438
Economic Efficiency: Consumer Users (Other)	376,659
Economic Efficiency: Business Users and Providers	142,174
Wider Public Finances (Indirect Taxation Revenues)	44,800
Present Value of Benefits (PVB)	658,972
Broad Transport Budget Present Value of Costs (PVC)	137,244
<b>OVERALL IMPACTS</b>	
Net Present Value (NPV)	521,728
Benefit to Cost Ratio (BCR)	4.801

Notes: All monetary values are in £000's and expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

\*The lower conservative accident benefit is included based upon the use of local accident data, as explained in section 7 of Reference Document 5.7

The results show that the Present Value of Benefits (PVB) for this sensitivity test is estimated to be £659m (inclusive of accident benefits), outweighing the £137m Present Value of Costs (PVC) (PVC is subject to change once final costs are included in the appraisal).

The Benefit Cost Ratio (BCR) of the scheme for this sensitivity test is 4.80 including accidents (BCR is subject to change once final costs are included in the appraisal). Under the DfT's value for money criteria, this represents a Very High value for money category.

Table 6.3 below contains summary economic appraisal results including wider impacts and journey time reliability for NDR terminating at A140 low growth.

Table 6.3: Summary of Economic Appraisal including wider benefits – NDR to A140 low growth

Item	Benefits including WEBs and JTR
Present Value of Benefits (PVB)	792,419
Present Value of Costs (PVC)	137,244
Net Present Value (NPV)	655,175
Benefit to Cost Ratio (BCR)	5.774

Notes: All monetary values are in £000's and expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in

these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

The BCR for this sensitivity test is improved further to 5.77 once journey time reliability benefits (£18m) and wider economic benefits (£116m) are included in the appraisal. These additional benefits amount to £134m (2010 prices discounted to 2010). The inclusion of these benefits increases the BCR to a higher level within the Very High value for money category.

## 7 NDR to A140 – High growth results

### 7.1 Safety analysis results

Accident benefits were calculated using the same approach reported in Document Reference 5.7. Table 7.1 below reports summary accident benefits using local accident rates for this sensitivity test.

Table 7.1: Accident benefits – NDR to A140 high growth

		Values (£000)
		Do Minimum
Number of PIAs		76,498
Casualties	Fatal	2,051
	Serious	13,638
	Slight	98,561
Accident costs		5,132,053
		Do Something
Number of PIAs		75,433
Casualties	Fatal	2,030
	Serious	13,439
	Slight	97,212
Accident costs		5,065,332
		Accident benefits
Number of PIAs		1,064
Casualties	Fatal	21
	Serious	200
	Slight	1,349
Accident costs		66,721

Source: All monetary values are expressed in £000's in 2010 prices discounted to 2010

The results show that the part NDR scheme under high growth reduces both numbers of accidents in the Norwich area and the severity of those accidents. The reduction in accidents represents £67m of monetary benefits in 2010 prices and discounted to 2010.

### 7.2 Economic analysis results

Table 7.2 below contains monetised costs and benefits including accident benefits for NDR terminating at A140 for high growth.

Table 7.2: Analysis of monetised costs and benefits – NDR to A140 high growth

Item	Accidents included (£000)
Accidents (not assessed by TUBA)*	66,721
Greenhouse Gases	-18,777
Economic Efficiency: Consumer Users (Commuting)	67,067
Economic Efficiency: Consumer Users (Other)	437,946
Economic Efficiency: Business Users and Providers	171,220
Wider Public Finances (Indirect Taxation Revenues)	51,068
Present Value of Benefits (PVB)	775,245
Broad Transport Budget Present Value of Costs (PVC)	141,845
OVERALL IMPACTS	
Net Present Value (NPV)	633,400
Benefit to Cost Ratio (BCR)	5.465

Notes: All monetary values are in £000's and expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

\*The lower conservative accident benefit is included based upon the use of local accident data, as explained in section 7 of Reference Document 5.7

The results show that the Present Value of Benefits (PVB) for this sensitivity test is estimated to be £775m (inclusive of accident benefits), outweighing the £142m Present Value of Costs (PVC) (*PVC is subject to change once final target costs are included in the appraisal*).

The Benefit Cost Ratio (BCR) of the scheme for this sensitivity test is 5.47 including accidents (*BCR is subject to change once final target costs are included in the appraisal*). Under the DfT's value for money criteria, this represents a Very High value for money category.

Table 7.3 below contains summary economic appraisal results including wider impacts and journey time reliability for NDR terminating at A140 for high growth.

Table 7.3: Summary of Economic Appraisal including wider benefits – NDR to A140 high growth

Item	Benefits including WEBs and JTR
Present Value of Benefits (PVB)	946,367
Present Value of Costs (PVC)	141,845
Net Present Value (NPV)	804,522
Benefit to Cost Ratio (BCR)	6.672

Notes: All monetary values are in £000's and expressed in 2010 prices discounted to 2010. Costs used in this appraisal are derived from the DCO Examination stage and include a 15% optimism bias. Final costs will be different to costs used in

these calculations but with a 3% optimism bias applied. Therefore the above PVC and BCRs will change when the final target costs are included.

The BCR for this sensitivity test is improved further to 6.67 (*BCR is subject to change once final target costs are included in the appraisal*) once journey time reliability benefits (£24m) and wider economic benefits (£147m) are included in the appraisal. These additional benefits amount to £171m (2010 prices discounted to 2010). The inclusion of these benefits increases the BCR to a higher level within the Very High value for money category.

## 8 Conclusion

The series of sensitivity tests were undertaken as part of the final submission to DfT. These tests will provide DfT updated appraisal results for DCO scheme (full NDR from A47(T) to A1067) and also central/ low/ high growth for part NDR (from A47(T) to A140).

The sensitivity test results indicate that BCRs for these sensitivity tests vary from 4.80 – 5.47 (inclusive of accident benefits) and 5.77 – 6.95 when WEBs and JTR are included. Both of these represent very high value for money for all sensitivity tests (BCR above 4) according to DfT's VfM criteria. It should be noted that these BCRs are not based on final target costs and the calculations will be revised when the final costs are available.