The Norfolk County Council (Norwich Northern Distributor Road (A1067 to A47(T))) Order

Proposed Minor Change to the Application for Development Consent: Drayton Lane (south)

Planning Act 2008

Infrastructure Planning

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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1 THE APPLICATION

1.1. This document is submitted in relation to the application for a Development Consent Order by Norfolk County Council to the Secretary of State, under the Planning Act 2008.

1.2. The application is for the Norfolk County Council (Norwich Northern Distributor Road (A1067 to A47(T))) Order, to grant development consent for the construction of a new highway running west to east, to south, between the A1067 Fakenham Road and the A47 Trunk Road at Postwick, including improvements to the existing highway network to the north and north east of Norwich.

1.3. This document comprises part of Norfolk County Council's proposals to make minor amendments to the form of the Norwich Northern Distributor Road which it has applied for.

2 INTRODUCTION

2.1. On 7 of January 2014, Norfolk County Council (NCC) submitted an application for development consent (the 'application') to the Planning Inspectorate for the Norwich Northern Distributor Road (NDR). The application was accepted for examination on 4 February 2014.

2.2. As a result of on-going discussion and engagement with local residents, the Police and Drayton Parish Council, NCC would like to make a minor change to the application in relation to the proposed closure of Drayton Lane (south) at its junction with Reepham Road.

2.3. The proposed change would remove the proposed closure of Drayton Lane (south) at its junction with Reepham Road so as to keep Drayton Lane (south) open, and therefore retaining the existing road layout west of Reepham Road.

2.4. The Department for Communities and Local Government document *Planning Act 2008: Guidance for the examination of applications for development consent* (paras. 105 to 107, p. 21) recognises that applicants may need to change a proposal after an application has been accepted for examination. The proposed change is not considered to result in a materially different project and this point is considered further in relevant sections of this report.

2.5. This proposed change would address local residents', Drayton Parish Council and Police concerns raised in connection with highway safety on Reepham Road, Hall Lane and their junctions. It is considered that the change will provide a more acceptable solution for the local community and road users in general.

2.6. This document demonstrates that the proposed change to the application is minor and does not materially affect the scheme which is the subject of the DCO application. NCC has undertaken engagement with the principal parties potentially affected by the proposed change, and has taken their representations into account.

2.7. This document is structured as follows:

a) Section 3 introduces the proposed modification to the original application Scheme
b) Section 4 summarises the need for the changes

c) Section 5 explains the process of stakeholder engagement undertaken.
d) Section 6 assesses the engineering and buildability effects of the proposed changes.
e) Section 7 assesses the environmental effects of the proposed changes.
f) Section 8 assesses the traffic, safety and economics effects of the proposed changes.
g) Section 9 concludes the document, summarising the need and the impacts of the proposed change

3 THE PROPOSED MODIFICATION TO THE SCHEME

3.1. Description of proposed changes

3.1.1. As proposed in the application, the C282 Reepham Road would be realigned to form a T-junction with the new Link Road from the Drayton Lane Roundabout (on the NDR). As part of the proposed junction arrangement, the application proposed to stop up the C261 Drayton Lane (south) with the construction of a cul-de-sac turning head at its south westerly point of stopping up.

3.1.2. The proposed change would remove the stopping up and the construction of the cul-de-sac on Drayton Lane (south), keeping Drayton Lane (south) open with the construction of a T-junction with the improved/realigned C261 Reepham Road.

3.1.3. The proposed change is shown in drawings R1C150-MP-5157 and R1C150-MP-5158 included in Appendix A.

3.2. Proposed changes to the application documents

3.2.1. The proposed changes to the Scheme would require the following amendments to application documents. Following acceptance of the change by the Planning Inspectorate, NCC proposes to submit revised versions of any application documents which the Planning Inspectorate considers necessary, and in accordance with a timetable to be agreed. It may be, for instance, that other changes are required to the draft DCO early in the examination period, and it would be sensible for the below changes to be made at the same time as those, rather than submitting two versions of the draft DCO in relatively quick succession.

3.3. Works descriptions

3.3.1. The proposed change would involve minor amendments to the Draft DCO (Application Document 3.1) as indicated in the tables below.

Table 3.1 Schedule 1 Authorised Development - Work No. 7(vii) (page 44 of application draft DCO):

Application text	Proposed change
"(vii) the improvement of the C282 Drayton Lane (south), on its west side, by the construction of a cul-de-sac turning head at its south westerly point of stopping up, to the south of the C261 Reepham Road"	Text deleted entirely – subsequent numbering and cross reference in Work No. 7 to be updated accordingly.

Table 3.2 Schedule 1 Authorised Development - Work No. 7(x) (page 45 of application draft DCO):

Application text	Proposed change
the construction of a cycle track (with a right of way on foot), over a length of stopped up C282 Drayton Lane (South), between the C282 Drayton Lane (South) and the C261 Reepham Road;	Text deleted entirely – subsequent numbering and cross reference in Work No. 7 to be updated accordingly.

Table 3.3 Schedule 2 Requirements – List of Works Plans within Table in Requirement no. 4 (page 58 of application draft DCO):

Application text	Proposed change
R1C093-R1-5002, R1C093-R1-5003, R1C093-R1-5004, R1C093-R1-5005, R1C093-R1-5006, R1C093-R1-5007, R1C093-R1-5008, R1C093-R1-5009, R1C093-R1-50010, R1C093-R1-50011, R1C093-R1-50012, R1C093-R1-50013	R1C093-R1-5002, R1C093-R1-5003, R1C093-R1-5004, R1C093-R1-5005A, R1C093-R1-5006, R1C093-R1-5007, R1C093-R1-5008, R1C093-R1-5009, R1C093-R1-5010, R1C093-R1-5011, R1C093-R1-5012, R1C093-R1-5013

Table 3.4 Schedule 2 Requirements – List of General Arrangement Plans within Table in Requirement no. 4 (page 58 of application draft DCO):

Application text	Proposed change
R1C093-R1-5015, R1C093-R1-5016, R1C093-R1-5017, R1C093-R1-5018, R1C093-R1-5019, R1C093-R1-5020,	R1C093-R1-5015, R1C093-R1-5016, R1C093-R1-5017, R1C093-R1-5018A, R1C093-R1-5019, R1C093-R1-5020,

R1C093-R1-5021, R1C093-R1-5022, R1C093-R1-5023, R1C093-R1-5024, R1C093-R1-5025, R1C093-R1-5026	R1C093-R1-5021, R1C093-R1-5022, R1C093-R1-5023, R1C093-R1-5024, R1C093-R1-5025, R1C093-R1-5026

Table 3.5 Preamble Schedule 2 Requirements – List of General Arrangement Plans within Table in Requirement no. 4 (page 58 of application draft DCO):

Application text	Proposed change
R1C093-R1-5015, R1C093-R1-5016, R1C093-R1-5017, R1C093-R1-5018, R1C093-R1-5019, R1C093-R1-5020, R1C093-R1-5021, R1C093-R1-5022, R1C093-R1-5023, R1C093-R1-5024, R1C093-R1-5025, R1C093-R1-5026	R1C093-R1-5015, R1C093-R1-5016, R1C093-R1-5017, R1C093-R1-5018A, R1C093-R1-5019, R1C093-R1-5020, R1C093-R1-5021, R1C093-R1-5022, R1C093-R1-5023, R1C093-R1-5024, R1C093-R1-5025, R1C093-R1-5026

Table 3.6 Schedule 3 Streets Subject to Permanent Alternation of Layout (page 69 of application draft DCO):

Application text		Proposed change
C282 Drayton Lane (South)	*(i) An increase in width, together with associated carriageway tie-in works, on its west side, from a point 2 metres south of its junction with the C261 Reepham Road, southwards for 26 metres, so as to provide a turning head at the southerly point of the stopped up C282 Drayton Lane (South), to the south of the C261 Reepham Road.*	Text deleted entirely.

Table 3.7 Schedule 6 Streets to be Stopped Up: Part 1 Streets for which a substitute is to be provided, and other new streets to be provided (page 88 of application draft DCO):

Application text				
Street Plans (Sheet 4 of 12)/ East of Bell Farm Track to Drayton Lane (Cont'd)	In the Parishes of Horsford, and Drayton In the District of Broadland In the County of Norfolk	C282 Drayton Lane (South)	A length: From its junction with the C261 Reepham Road, generally southwards for a distance of 2 metres.	S* (Cycle Track with a right of way on foot) * Substitute Street for non-motorised vehicular traffic

Proposed change				
Street Plans (Sheet 4 of 12)/ East of Bell Farm Track to Drayton Lane (Cont'd)	In the Parishes of Horsford, and Drayton In the District of Broadland In the County of Norfolk	-	-	S – Not Used

Table 3.8 Schedule 6 Streets to be Stopped Up: Part 2 Private access for which a substitute is to be provided and other new means of access to be provided (page 101 of application draft DCO):

Application text			Proposed change		
PMA 24	Field access to farmland of Manor Farm, from	X20	PMA 24 – Not Used	-	X20 – Not Used

	the C282 Drayton Lane (South), at a point 14 metres generally south of its junction with the C621 Reepham Road, westwards for a distance of 2 metres.				

3.4. **Plans/drawings/sections**

3.4.1. The proposed change would involve minor amendments to the plans/drawings/sections submitted as part of the DCO application as indicated in Table 3.9 below.

Table 3.9 Plans/drawing/sections

Title	Sheet	Drawing number	Status
Reference: 2.1 Location Plan			
'Plan number R1C093-R1-5000' replaced with 'Plan number R1C093-R1-5000A' and which removes the closure of Drayton Lane (south) identification.			
Reference: 2.2 Land Plans			
'Plan Number DCO-LP-04 Plan Revision: 0' replaced with 'Plan Number DCO-LP-04A Plan Revision: A' and which has an area of land from Plot 4/30 deleted, and former Plot 4/31 deleted, from the plan.			
Reference: 2.3 Work Plans			
'Plan number R1C093-R1-5005' replaced with 'Plan number R1C093-R1-5005A' to reflect the amended DCO boundary.			
Reference: 2.4 Street Plans			

'Plan Number DCO-SP-04 Plan Revision: 0' replaced with 'Plan Number DCO-SP-04A Plan Revision: A' and which shows the amended Street and Access provisions identified in the above amendments.
Reference: 2.6 General Arrangement Plans
'Plan number R1C093-R1-5018' replaced with 'Plan number R1C093-R1-5018A' which shows the amended Street and Access provisions identified in the above amendments.

3.5. **Book of Reference**

3.5.1. The proposed change would involve the minor amendments to the Book of Reference (Application Document 4.3) as indicated in Table 3.10 below:

Table 3.10 Book of Reference

	Proposed change
Part 1 *Plot 4/30* *Page XX*	The area measurement included in the description included in the 'Extent, description and situation of the land or right' column, in Part 1, is reduced from '3,999 square metres' to '3669 square metres'
Part 1 *Plot 4/31* *Page XX*	All details included in the 'Owners or reputed owners'; 'Lessees or reputed lessees'; 'Tenants or reputed tenants (other than lessees)'; and 'Occupiers', columns are deleted; The details included in the 'Extent, description and situation of the land or right' column are substituted with the words 'Not used'

3.6. **Statement of Reasons**

3.6.1. The proposed change would involve minor amendments to the Statement of Reasons (Application Document 4.1), as shown in the table below.

Table 3.11 Statement of reasons

	Proposed change
Appendix 1: Table 1 *Page 60*	Delete plot 4/31 from Work No.7
Appendix 1: Table 1A	Delete plot 4/31 from "Required for new highway (Non-NDR)

Page 64	
Appendix 2: Paragraph 37 *Page 83*	Delete "4/31" from paragraph heading

3.7. **Reports/statements**

3.7.1. The proposed change would involve minor amendments to the NDR Traffic Forecasting report (Application Document 5.6) and Economic Appraisal Report (Application Document 5.7) as shown in the tables below.

Table 3.12 NDR Traffic Forecasting Report: Application Document ref. 5.6 Volume 3 Appendix I

Application	Proposed change
Traffic flow plot Figure I.1	Replace with revised Figure 6.4 in the technical report in Appendix E
Data in Tables I.3 and I.5	Replace with new data contained in Table 6.1 and Table 6.2 in the technical report in Appendix E

Table 3.13 Economic Appraisal Report Application Document ref. 5.7

Application	Proposed change / New Text
(page 7) para 1.1.4 "The economic appraisal results show that the NDR is likely to deliver present value of benefits (including TUBA transport user benefits and COBA accident benefits) of £773m over a 60 year appraisal period in 2010 prices discounted to 2010. This compares with present value costs of £186m."	The economic appraisal results show that the NDR is likely to deliver present value of benefits (including TUBA transport user benefits and COBA accident benefits) of £783m over a 60 year appraisal period in 2010 prices discounted to 2010. This compares with present value costs of £186m.
(page 7) para 1.1.5 "Additional benefits in relation to wider economic impacts (WEBs) and journey time reliability (JTR) amount to a further £216m in 2010 prices discounted to 2010 which	Additional benefits in relation to wider economic impacts (WEBs) and journey time reliability (JTR) amount to a further £221m in 2010 prices discounted to 2010 which improve the value for

improve the value for money assessment of the Scheme. The table below shows a summary of the economic appraisal results for the NDR." ***Scenario including Accidents*** / ***Scenario also including WEBS and JTR*** *Present Value of Benefits (PVB)* — *773,317* / *989,063* *Present Value of Costs (PVC)* — *185,542* / *185,542* *Net Present Value (NPV)* — *587,775* / *803,521* *Benefit to Cost Ratio (BCR)* — *4.168* / *5.331*	money assessment of the Scheme. The table below shows a summary of the economic appraisal results for the NDR. **Scenario including Accidents** / **Scenario also including WEBS and JTR** Present Value of Benefits (PVB) — 783,315 / 1,003,786 Present Value of Costs (PVC) — 185,508 / 185,508 Net Present Value (NPV) — 597,807 / 818,278 Benefit to Cost Ratio (BCR) — 4.223 / 5.411
(page 7) para 1.1.6 "The scheme delivers a benefit-to-cost ratio (BCR) of 4.17 (inclusive of accident benefits) and a BCR of 5.33 when WEBs and JTR are included. Both of these represent very high value for money (BCR above 4) according to DfT's VfM criteria."	The scheme delivers a benefit-to-cost ratio (BCR) of 4.22 (inclusive of accident benefits) and a BCR of 5.41 when WEBs and JTR are included. Both of these represent very high value for money (BCR above 4) according to DfT's VfM criteria.
(page 27) para 5.2.1 "The results of the assessment of user benefits and user charges are shown in the TEE table of TUBA output file which is presented in Table 5.1. All values quoted are in 2010 prices, discounted to 2010. The TEE	The results of the assessment of user benefits and user charges are shown in the TEE table of TUBA output file which is presented in Table 5.1. All values quoted are in 2010 prices, discounted to 2010. The TEE table shows that the

table shows that the NDR scheme achieves total transport economic efficiency benefits of about £700m in the 60 year assessment period."	NDR scheme achieves total transport economic efficiency benefits of about £708m in the 60 year assessment period.
(page 28) Table 5.1 Transport Economic Efficiency (TEE)	Replace with Table 6.9 of technical report in Appendix E
(page 30) Table 5.3 Analysis of Monetised Costs and Benefits	Replace with revised numbers from Table 4.5 of technical report in Appendix E
(page 30) para 5.4.2 "The results show that the Present Value of Benefits (PVB) is estimated to be £773m (inclusive of accident benefits), outweighing the £186m Present Value of Costs (PVC)."	The results show that the Present Value of Benefits (PVB) is estimated to be £783m (inclusive of accident benefits), outweighing the £186m Present Value of Costs (PVC).
(page 30) para 5.4.3 "The Benefit Cost Ratio (BCR) of the scheme is 4.17 including accidents. Under the DfT's value for money criteria, this represents a Very High value for money category."	The Benefit Cost Ratio (BCR) of the Scheme with is 4.22 including accidents. Under the DfT's value for money criteria, this represents a Very High value for money category.
(page 30) para 5.5.1 "The BCR is improved further to 5.33 once journey time reliability benefits (£28m) and wider economic benefits (£187m) are included in the appraisal as can be seen from Table 5.4 below. More details on wider economic impacts and journey time reliability can be found in Sections 8 and 9 respectively. These additional benefits amount to £216m (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."	The BCR is improved further to 5.41 once journey time reliability benefits (£29m) and wider economic benefits (£192m) are included in the appraisal as can be seen from Table 5.4 below. More details on wider economic impacts and journey time reliability can be found in Sections 8 and 9 respectively. These additional benefits amount to £221m (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.
(page 31) Table 5.4: Summary of Economic Appraisal including Wider Benefits	Replace with revised numbers in Table 4.6 of technical report in Appendix E
(page 32) Table 6.1: Total User Benefit by Time Period	Replace with revised numbers in Table 6.10 of technical report in Appendix E

(page 36) Table 6.3: Net User Benefits by Time Saving Bands (£000)	No change compared to DCO
(page 36) Table 6.4: Net User Benefits by Distance Bands (£000)	No change compared to DCO
(page 32) para 6.3.2 "73% of benefits are due to time savings of more than 2 minutes, and approximately 44% are longer than 5 minutes. The allocation of user benefits to distance bands, shows that longer trips into or around the city account for the majority of the scheme's generated benefits, reflecting its function of providing ease of access to the A47(T) trunk road, providing alternative route for cross city trips and providing benefit to other longer journeys into the city."	No change compared to DCO
(page 37) Table 6.5: Total User Benefits as a Proportion of Total User Costs	No change compared to DCO
(page 41) para 7.6.2 "The reduction in accidents represents £41.2m of monetary benefits in 2010 prices and discounted to 2010."	The reduction in accidents represents £43.4m of monetary benefits in 2010 prices and discounted to 2010.
(page 42) Table 7.1: Accident Assessment with Local Accident Rates	Replace with revised numbers in Table 4.4 of technical report in Appendix E
(page 42) para 7.6.4 "The reduction in accidents represents £205.7m of monetary benefits in 2010 prices and discounted to 2010."	The analysis using default COBA rates has not been repeated for the Drayton lane modification as the method using the local rates has been taken as a more conservative estimate of benefits in the main appraisal
(page 43) para 7.6.5 "The different assessments yield quite different results in terms of: *• The level of benefit reported. When COBA default rates are used, the overall benefits are £205.7m and significantly greater than local rates*	7.6.5 The different assessments yield quite different results in terms of: • The level of benefit reported. When COBA default rates are used, the overall benefits are £205.7m and significantly greater than local rates

case, which reports benefits of £41.2m. *• The impact on casualties. Whilst both assessments lead to an overall reduction in casualties, it can be seen that the application of local rates in the assessment leads to an increase of seven fatalities, whilst using default rates leads to a decrease of 21."*	case, which reports benefits of £43.4m. • The impact on casualties. Whilst both assessments lead to an overall reduction in casualties, it can be seen that the application of local rates in the assessment leads to an increase of seven fatalities, whilst using default rates leads to a decrease of 21.
(page 47) para 8.3.1 "Summarised below are wider economic benefits calculated using the DfT's WITA software (version 1.1). Table 8.1 shows that agglomeration benefits make up the bulk of the £187m total wider benefit impacts."	8.3.1 Summarised below are wider economic benefits calculated using the DfT's WITA software (version 1.1). Table 8.1 shows that agglomeration benefits make up the bulk of the £192m total wider benefit impacts.
(page 48) Table 8.1: Summary Wider Economic Benefits of NDR	Replace with revised numbers in Table 6.12 of technical report in Appendix E
(page 48) para 8.3.3 "The estimated benefits of £187m for wider economic impacts feed into the overall VfM consideration."	8.3.3 The estimated benefits of £192m for wider economic impacts feed into the overall VfM consideration.
(page 51) para 9.4.2 "Table 9.1 below shows reliability benefits of around £28m (in 2010 prices discounted to 2010) for the 60 year appraisal period. This is equivalent to around 4% of the time benefits generated by the scheme."	9.4.2 Table 9.1 below shows reliability benefits of around £29m (in 2010 prices discounted to 2010) for the 60 year appraisal period. This is equivalent to around 4% of the time benefits generated by the scheme.
(page 51) Table 9.1: NDR Reliability Benefits	Replace with revised numbers in Table 6.13 of technical report in Appendix E
(*page 53) Table 10.1: Summary of Economic Appraisal (£000's)*	Replace with revised numbers in Table 4.6 of technical report in Appendix E
(page 53) para 10.1.4 "The BCR of 4.17 represents Very High value for money under the DfT's VfM criteria. The PVB includes accident benefits but does not include wider economic benefits or	10.1.4 The BCR of 4.22 represents Very High value for money under the DfT's VfM criteria. The PVB includes accident benefits but does not include wider economic benefits or journey time

journey time reliability benefits. When these are included the BCR increases to 5.33."	reliability benefits. When these are included the BCR increases to 5.41.

3.8. Environmental statement

3.8.1. The proposed change would involve minor amendments to the Environmental Statement (Application Document 6.1) as shown in the table below.

Table 3.14 Environmental Statement Volume 1 Table 2.9 Road Closures (page 30)

Application text	Proposed change
C282 Drayton Lane – a 892 metres length from its junction with the C261 Reepham Road: Chainage 5350	Text deleted

4 NEED FOR PROPOSED CHANGES

4.1. Early iterations of the scheme design prior to 2013 had both Hall Lane (North) and Drayton Lane (South) junctions with Reepham Road open. However, following discussions with Drayton Parish Council it was agreed that design would be changed to close Drayton Lane (south) in order to reduce traffic through the centre of Drayton. Written representations have been made by local residents voicing objections to this closure were received before and through the formal statutory pre-application consultation. NCC considered the different views and at the time of making the application, decided to close Drayton Lane (south) as part of the NDR scheme.

4.2. A number of meetings have been held between NCC, Drayton Parish Council, members of the local community representing the views of Hall Lane and Reepham Road, and the local County Councillor. At these meetings local residents raised, in their opinion, fundamental concerns regarding the current NDR proposals for Drayton. These concerns relate mainly to the proposed main route between the NDR and Drayton being via the Reepham Road, Hall Lane (North) and their junction, and in particular the closure of Drayton Lane (south) at its junction with Reepham Road.

4.3. The 54 households (87 residents) of Drayton Hall Park, Hall Lane (represented by the chairman of the residents association) have also expressed strong objections to the closure of Drayton Lane (south) and have expressed concerns about safety issues with Reepham Road, Hall Lane and their junction being used as the main route between Drayton and the NDR.

4.4. The issues raised by local residents and the community are summarised in Appendix B.

4.5. In response to the concerns raised by the local community, Parish Council and the Police, NCC tested a number of alternatives to keep Drayton Lane (south) open using the NDR's strategic transport model and also carried out a Stage 1 Road Safety Audit on the options.

4.6. The Road Safety Audit submission, Report and Designers Response is included as Appendix C.

4.7. The Road Safety Audit concluded that a roundabout at either the junction of Drayton Lane or Hall Lane (north) with Reepham Road would be a safer option for these junctions if either of the roads were to be closed. However the installation of a roundabout is likely to generate more traffic through the

centre of Drayton. This increase is considered by NCC to conflict with the concept of the NDR, which is to reduce traffic within communities where possible.

4.8. The results of this work were discussed with the local residents and Drayton Parish Council. The outcome from the discussions was that the local community's preference was a roundabout at the Reepham Road/Drayton Lane (south) junction and Hall Lane (North) being closed. There was an agreement to seek a modification to the scheme that would keep the junctions of Reepham Road with both Drayton Lane (south) and Hall Lane (north) open, which would retain the current road layout. The proposed modification provides a safer and more acceptable solution for the local community and road users with only a slight increase in forecast traffic on School Road south of Hall Lane compared to the current scheme.

4.9. The local community has made it clear to NCC that they would strongly object to the NDR scheme as applied for.

4.10. In consultation with representatives from the local community, the Parish Council and the Police, NCC is proposing to implement traffic calming measures on Hall Lane and to introduce a speed limit on Drayton Lane (south). These measures are not part of the NDR scheme and are proposed to be implemented irrespective of whether the NDR goes ahead. They are currently planned to address existing local concerns about traffic flows, HGV use, speed, safety and accidents in this location. Whilst these measures do not form part of the NDR scheme for which an application has been made, they have been taken into account in arriving at the forecast traffic flows discussed in Section 8 of this report.

5 STAKEHOLDER ENGAGEMENT

5.1. NCC has undertaken a targeted consultation on the potential scheme change to ensure that relevant stakeholders and the local community were given an opportunity to consider it and comment.

5.2. A letter, dated 27 March 2014, setting out NCC proposals was sent to a consultation area that was agreed with the relevant Parishes and District Council and included those considered to be most likely to be impacted by the proposed change. Consultees included Parish and District councils, 63 stakeholders and land owners as well as 4312 residential and business addresses. A copy of the letter and the drawing showing the area of consultation ***(R1C093-R1-4801)*** is included in Appendix D.

5.3. 45 responses were received by the end of the consultation on the Friday 25 April 2014 and can be summarised as follows;

- 5 Councils in favour of keeping the junction open (including Broadland District Council, Hellesdon, Drayton, Horsford & Felthorpe Parish Councils)
- 1 response from the Norfolk Constabulary in favour of keeping the junction open
- 27 Individual responses in favour of keeping the junction open
- 1 response representing 54 households in favour of keeping the junction open
- 6 Contained no comment relating to closure
- 3 Against keeping the junction open
- 2 For keeping open if a roundabout provided instead of the proposed junction.

5.4. A number of responses also raised concerns about the impact of the proposals (both with or without the closure) on Hall Lane, in particular the safety at the junctions with Reepham Road or Drayton Lane (south).

5.5. NCC has considered the responses, alongside its continued discussions with the local community, and given the support as mentioned above considers that it should seek to make the change to the NDR scheme proposed in this report.

6 ENGINEERING AND BUILDABILITY EFFECTS

6.1. Design and Geometry

6.1.1. The proposed change would remove the closure of the existing section of Drayton Lane (South) at its junction with Reepham Road. The layout of the bellmouth of Drayton Lane (south) would remain as the current existing layout. Drayton Lane (north) would remain closed therefore the existing junction arrangement would change from a crossroads to a simple T-junction.

6.2. Structures

6.2.1. The proposed change would have no impact on existing or proposed structures.

6.3. Non Motorised Users

6.3.1. The NMU provision would remain unchanged on the north side of Reepham Road, however the removal of the stopping up of Drayton Lane (south) would result in the loss of a suitable route for the use by pedestrians/cyclists and horse riders along the potential minor road.

6.4. Drainage

6.4.1. The proposed change would have no impact on the drainage design.

6.5. Public Utilities

6.5.1. There is no impact on the existing public utilities as a result of the proposed change.

6.6. Private Means of Access

6.6.1. The proposed change would remove the closure of Drayton Lane (south) at Reepham Road, therefore the need for a combined turning head and field access would be removed. The existing field access from Drayton Lane (south) will be retained.

6.7. Construction

6.7.1. The proposed change would have a minimal impact on the Scheme construction works - the existing Drayton Lane (south) junction with Reepham Road would remain as per the existing layout, and therefore works to stop up the existing junction mouth would not be required.

7 ENVIRONMENTAL EFFECTS

7.1. This section describes the potential environmental effects of the proposed minor changes to the scheme to keep Drayton Lane (south) open compared to the scheme which is the subject of the DCO application.

7.2. The environmental impacts associated with the proposed change to keep Drayton Lane (south) open during construction and the operational environment associated with the removal of the Drayton Lane Closure are listed in the tables below:

7.3. **Table 7.1**: Construction Environmental Impacts Associated with the Removal of Drayton Lane Closure

Closure of Drayton Lane as Proposed within the ES	Removal of Drayton Lane Closure compared with ES
Groundwater	No significant change
Surface Water	No significant change
Flora and Fauna	No significant change
Geology	No significant change
Soils	No significant change
Motorised Users	Large adverse temporary impact reduced
Landscape	No significant change
Non-Motorised users	Slight adverse due to loss of potential segregated cycle route
Air Quality	No significant change
Noise	No significant change

7.4. **Table 7.2**: Operational Environmental Associated with the Removal of Drayton Lane Closure

Closure of Drayton Lane as Proposed within the ES	Removal of Drayton Lane Closure compared with ES
Groundwater	No significant change
Surface Water	No significant change
Flora and Fauna	No significant change
Geology	No significant change
Soils	No significant change
Motorised Users	The removal of the closure will result in slight increases in forecast traffic on the NDR (east), School Road (south of Hall Lane), Drayton Lane

	and Costessey Lane and reductions of traffic on NDR (west) Reepham Road and Hall Lane. Traffic calming on Hall Lane, between School Road and Reepham Road may impact on traffic speeds, however, the changes will not have significant impacts on road users overall.
Landscape	No significant change
Non-Motorised users	Slight adverse due to loss of potential segregated cycle route.
Air Quality	The overall numbers of vehicles in the area will not change and threshold limits for Air Quality will not be approached. The impacts are not significant.
Noise	There will be noise associated with changes to traffic movements, however there are no sensitive receptors along Drayton Lane where the most significant changes occur (0 to 5700 vehicles per day) in addition the road is in use at the present time. Therefore it is anticipated there will be no significant impacts.

8 TRAFFIC, SAFETY AND ECONOMNIC EFFECTS

8.1. A traffic, safety and economic appraisal was undertaken in April 2014 to assess the impacts of the Drayton Lane (south) modification.

8.2. The variable demand model (VDM) forecasts, which make allowance for traffic generation, redistribution and mode choice effects arising from the introduction of the Scheme, have been prepared for the NDR proposed opening year of 2017 and the design year of 2032. These were used in the assessment of the possible modification to Drayton Lane (south).

8.3. The modelling shows that the main traffic impact of keeping Drayton Lane (south) open at its junction with Reepham Road, compared with the currently submitted Scheme, is a change in traffic movements from Hall Lane (north) to Drayton Lane (south). The model suggests that there is also a reduction through Drayton on School Road, but that there is not quite the same reduction with Drayton Lane (south) kept open.

8.4. The key changes in Annual Average Daily Traffic (AADT) flows with the Drayton Lane (south) modification compared to the submitted Scheme are set out in section 4.2 of the full report by Mott MacDonald contained in Appendix E. This report also contains full details of the operational assessment of junctions, safety appraisal and economic appraisal.

8.5. Operational analysis results show that the junctions on Reepham Road with Drayton Lane (south), Hall Lane (north) and the link to the NDR will operate within desirable capacity in forecast years even with all traffic movements uplifted by an additional 10-20% in sensitivity tests. It is therefore concluded that the modification would be acceptable in operational terms.

8.6. A cost benefit accident analysis has been undertaken for the modified network. This shows that there would be fewer serious and slight casualties as a result of the shorter journey distance for traffic travelling between Drayton and Horsford and the NDR, including taking account of the effect of the traffic management measures noted above.

8.7. The economic analysis shows that with the modification the Benefit Cost Ratio (BCR) will increase slightly to 4.22 (inclusive of accident benefits) and 5.41 when wider economic benefits and journey time reliability are included. Both of these represent very high value for money (BCR above 4) according to the Department for Transport's Value for Money criteria. It is not expected

that the modification would have any impact on the economic development analysis.

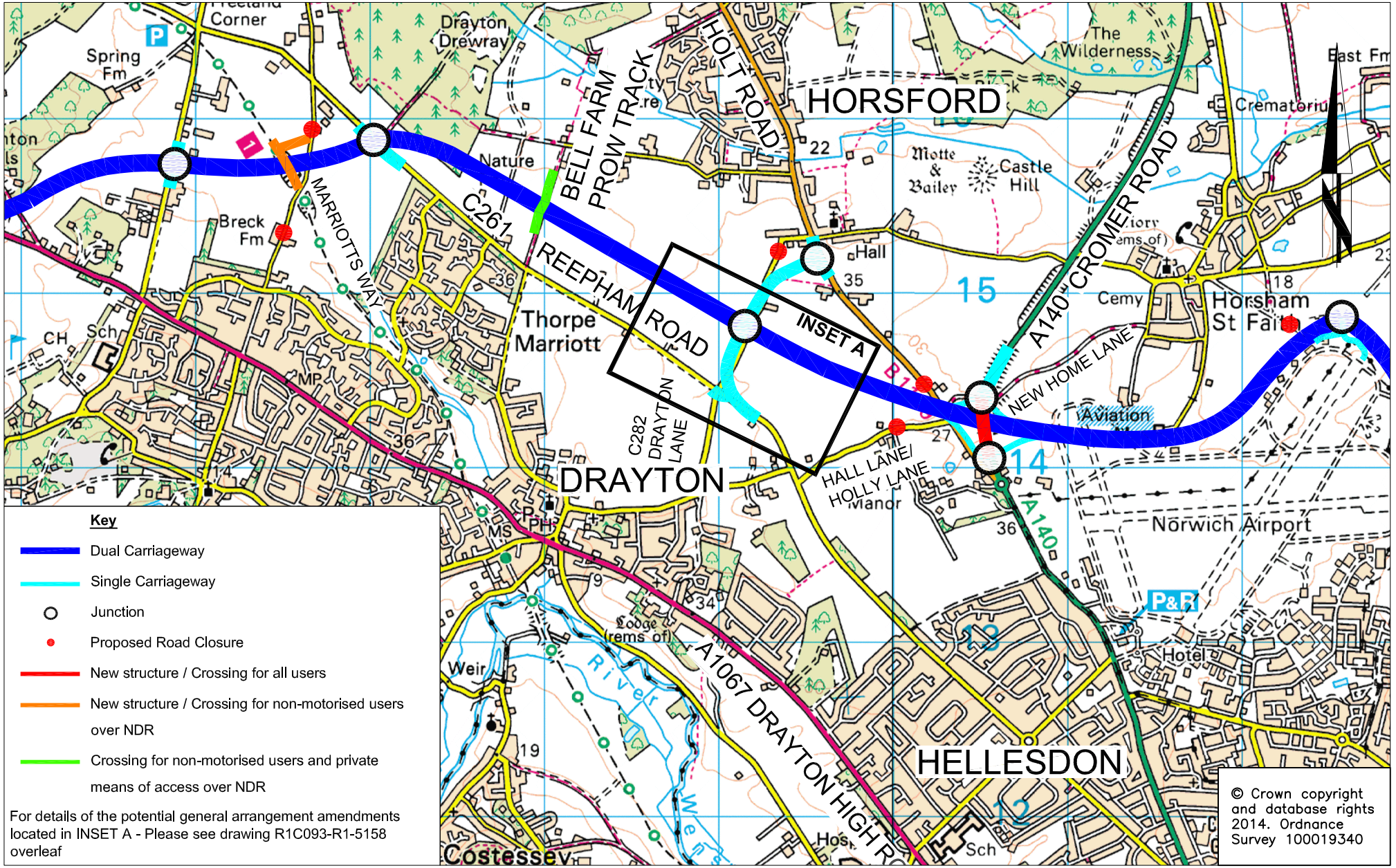
9 CONCLUSION

9.1. The proposed change is minor, does not materially affect the Scheme and does not result in any materially worse or different environmental effects.

9.2. The responses received from the targeted consultation for the proposed change indicates a majority of responses including Broadland District Council, Horsford Parish Council, Drayton Parish Council, Hellesdon Parish Council and Felthorpe Parish Council support the proposed change.

9.3. The proposed change would address a number of local residents, Drayton Parish Council and Police concerns raised in connection with highway safety on both Reepham Road, Hall Road and their junction and it is considered that the change will provide a safer and more acceptable solution for the local community and road users in general.

APPENDIX A: The proposed change



Norfolk County Council working with Birse Civils, Mott MacDonald

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall
Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

Norwich Northern Distributor Road
Potential minor modifications - Removal of Drayton Lane (South) closure, Location plan

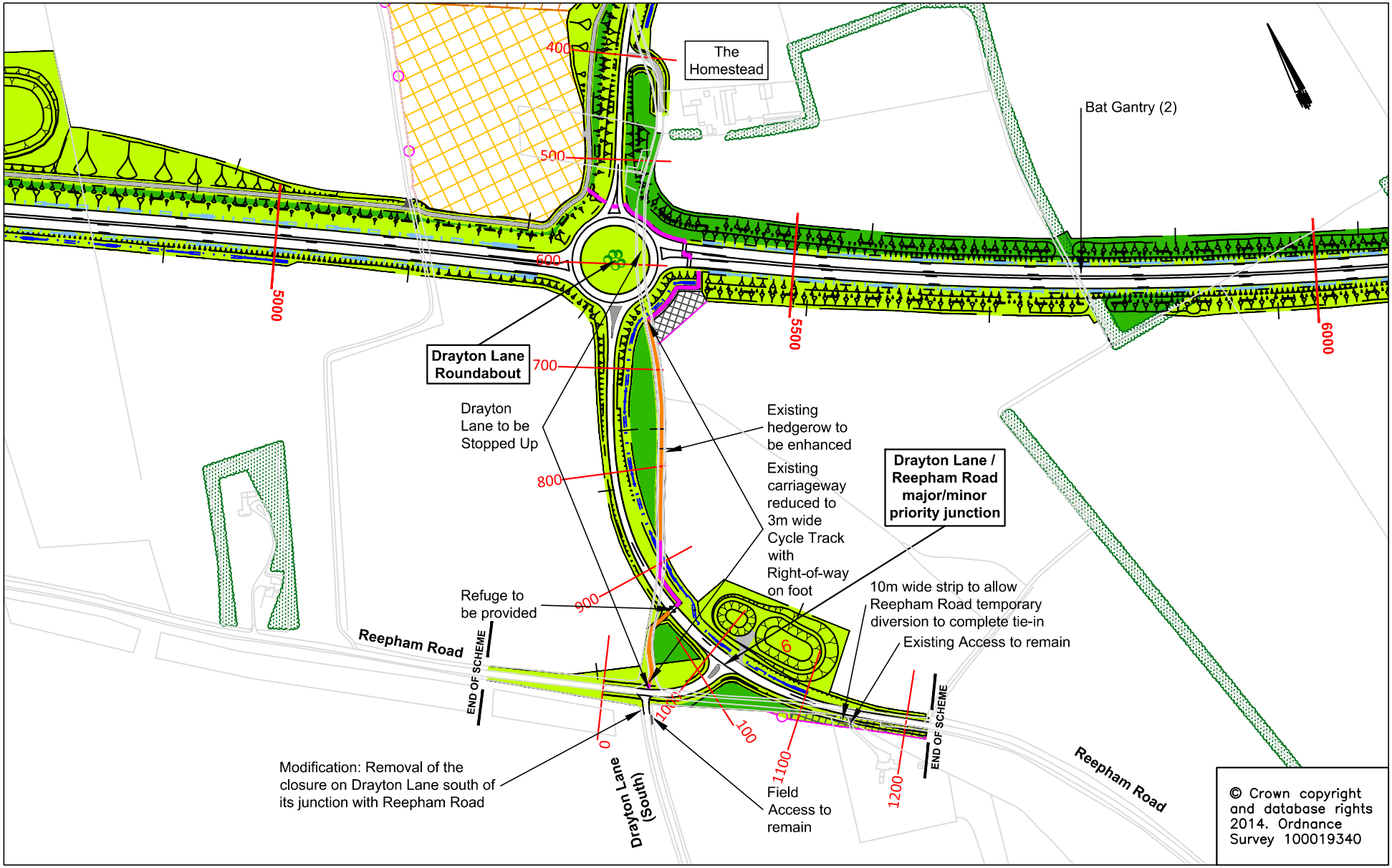
REV.	DESCRIPTION	CHECKED	DATE

	INIT.	DATE
SURVEYED BY	OS	2014
DESIGNED BY	RH	03/14
DRAWN BY	RH	03/14
CHECKED BY	MH	13/14

DRAWING No. R1C093-R1-5157
PROJECT TITLE Norwich Northern Distributor Road
SCALE 1:30000
FILE No. R1C093

ORIGINAL SIZE: A4

BIL 28/10/13



Norfolk County Council working with Mott MacDonald Birse Civils

To: McCabe
Interim Director of Environment
Transport and Development
Norfolk County Council
County Hall
Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

Norwich Northern Distributor Road
Potential minor modification
INSET A - Removal of Drayton Lane South Closure

REV.	DESCRIPTION	CHECKED	DATE

	INIT.	DATE	DRAWING No. R1C093-R1-5158
SURVEYED BY	OS	2014	
DESIGNED BY	RH	03/14	PROJECT TITLE Norwich Northern Distributor Road
DRAWN BY	RH	03/14	
CHECKED BY	MH	03/14	SCALE 1:5000 / FILE No. R1C093

ORIGINAL SIZE A4

BIL 8/10/13

APPENDIX B: Concerns raised by local residents

The concerns raised by the local residents and community relating to the closure of Drayton Lane (South) are summarised below:

- The relevant sections of Reepham Road and Hall Lane, together with their junction, is considered to be a more dangerous and less safe route when compared to Drayton Lane (south);

- Hall Lane (north) is not sufficiently wide enough (in a number of places) to allow large vehicles to pass each other. Current weight restrictions are being ignored and a recent traffic survey confirmed that 755 HGV's (class 5-12) on average within a week used this road. Even some of the lighter HGV's / buses are large vehicles and cannot pass each other. Weight restrictions will not prevent the problem;

- The raised verges on both sides of Hall Lane (north) are constantly hit by vehicles, to the extent they are seriously eroding and are dangerous hazards. This is not the case in Drayton Lane (south);

- There are a considerable number of electric and telegraph poles very close to the edge of the road (even more so with the verges eroding) on both sides along Hall Lane (north) whereby, in particular, wing mirrors of lorries and vans etc. can collide with them. This is not the case in Drayton Lane (south);

- There are bends on both stretches of Reepham Road and Hall Lane (north) forming part of the current proposed route and there has been recorded and unrecorded accidents on this route. Drayton Lane (south) is a straight road and has no accidents; In 2010 NCC agreed to reduce the speed limit to 40 mph and install "Bend" and "Slow" signage on Hall Lane (north) due to the hazards along the road.

- Due to the local community's major concerns for road user safety, Norfolk Constabulary was requested to become involved over the safety issues. Their Traffic Liaison Officer visited the site on 27/12/13 and sent a T40 Road Defect / Improvement Notification to NCC agreeing with the majority of the points raised by the community and also suggesting a right turn lane on Reepham Road into Hall Lane;

- The current NDR scheme with Drayton Lane (south) closed would result in a significant increase in the number of vehicles turning right off Reepham Road into Hall Lane with resultant safety concerns, as recognised by the Police and NCC Safety Audit Team;

- Hall Lane (north) is an unclassified road ("intended for local traffic only") in NCC's route hierarchy and it's very poor construction results in considerable repairs being needed to the road surface on a continual

basis at a major cost to tax payers. This is not the case with Drayton Lane (south) which is classified as a "C" road;

- A recent traffic survey (carried out by NCC in Nov / Dec 2013) confirmed there is a staggering 10,327 vehicles on an average week breaking the speed limit along Hall Lane (north) by travelling between 40-100 mph in a 40 mph speed limit, close to the bend and past the entrances to residential properties (including the entrance to Drayton Hall Park). Thus highlighting the need for a footpath and traffic calming on this road. Speed is not as crucial on Drayton Lane (south) as there are no bends or residential properties / pedestrians; If the proposal modification does not proceed it was agreed by NCC that a trod (unbound footpath) would be provided on the northern verge of Hall Lane (North);

- Hall Lane (north) currently has no footway. This together with the current level of traffic makes it difficult for pedestrians from the 5 residential properties at the northern end of Hall Lane to safely walk into the village. Police records show a recorded accident where a pedestrian was hit by a vehicle on the bend on Hall Lane (north). There are no residential properties on Drayton Lane (south) and therefore no problems with pedestrians;

- Less traffic along Hall Lane (north) would make it more suitable for cycling and cycle connection with Holly Lane. A priority of Drayton Parish Council is to have a safe cycle route in and out of Drayton;

- As set out in Volume 6 Section 2 Part 6 (TD42/95) of the Design Manual for Roads and Bridges and NCC's Audit Team Safety Audit Report dated 27th January 2014, a roundabout at the junction of either Drayton Lane or Hall Lane (north) with Reepham Road is a safer option for these junctions if either of the roads were to be closed;

- There are a considerable amount of vehicles coming in and out of the entrance to Drayton Hall Park and the residents find it extremely unsafe, especially turning right and with traffic speeding on Hall Lane;

- The residents of Drayton Hall Park (especially with many of them being elderly) use Drayton Lane all the time to visit St. Faiths Doctors surgery and specifically do not want that road closed

The local residents have provided NCC with considerable documentation including photographs and videos to demonstrate some of the above points in support of their concerns.

APPENDIX C: Road Safety Audit and Designers Response

Norfolk County Council

Norwich Northern Distributor Road
Drayton Lane / Hall Lane

Stage 1 Safety Audit

2014

Prepared by Norfolk County Council

January 2014

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Norwich Northern Distributor Road
Drayton Lane / Hall Lane

Stage 1 Safety Audit

2014

January 2014

Prepared by:-

Environment Transport and Development
Highway Projects
Norfolk County Council
County Hall
Martineau Lane
NORWICH
Norfolk
NR1 2SG

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communication for all

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Norwich Northern Distributor Road
Drayton Lane / Hall Lane

Stage 1 Safety Audit

2014

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(Name) Mark Kemp

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File Reference: R1C093/Drayton/SA1/2014/DN

Issue Status: Final

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Contents - Stage 1 Safety Audit Report 2014

Appendices - Stage 1 Safety Audit Report 2014

1. BACKGROUND

1.1. A Stage 1 Road Safety Audit on the Norwich Northern Distributor Road (NDR) was carried out in November 2013 prior to submitting an application for development consent under the Planning Act 2008. This application was submitted in January 2014.

As part of the NDR proposals a new priority junction is proposed at the existing C282 Drayton Lane / C261 Reepham Road crossroads and introduces a closure of Drayton Lane to the south of Reepham Road. (See Site Location and Engineering Layout Sheet 4) in Appendix A.

Following a number of comments from residents of Hall Lane, Norfolk County Council has considered a number of possible alternative options which keep Drayton Lane (south) open. Traffic modelling and PICADY assessments have been carried out to assess the impacts of these options. The aim of this Safety Audit is to assess the safety implications of the current proposal and the possible alternative options. The alternative options are summarised in the table below:

Test ref	Reepham Rd junction type	C282 Drayton Lane	U57141 Hall Lane	C282 Hall Lane calming
NDR	Priority	Closed	Open	No
Test C	Roundabout	Open	Open	No
Test D	Roundabout	Open	Closed	No
Test E	Roundabout	Open	Closed	Yes
Test F	Priority	Open	Open	Yes
Test G	Priority	Open	Closed	Yes

Also see option layouts in Appendix B.

2. SCHEME DESCRIPTION

2.1. The NDR will connect with Drayton Lane via a new at-grade roundabout junction. Sections of Drayton Lane to the north and south of its junction with the NDR will be re-aligned. The realigned Drayton Lane between the NDR and Reepham Road will connect with Reepham Road by means of a new

priority junction and Drayton Lane (south) will be stopped up at its junction with Reepham Road.

3. TRAFFIC MODELLING

3.1. A summary of the traffic modeling of the various tests is included in Appendix C. The impacts of Tests C and D were not considered acceptable by the design team due to the additional traffic they would encourage on School Road through the centre of Drayton. Therefore Tests E, F and G were carried out including traffic calming measures on the southern end of C282 Hall Lane.

3.2. The current NDR proposal introduces a closure of Drayton Lane (south) at its junction with Reepham Road. Residents of Hall Lane have expressed concerns that this will increase the number of vehicles using Hall Lane to access or travel through Drayton. Norfolk Police have expressed concerns that more vehicles will be turning right onto Hall Lane from Reepham Road if Drayton Lane (south) is closed, as very little traffic makes this maneuver at present. It has been suggested by Norfolk Police that a Right Hand Turn Lane should be considered for this junction to facilitate right turning traffic and reduce queuing. See Norfolk Police T40 Road Improvement Notification in Appendix D.

3.3. The current strategic transport model used to assess the impact of the NDR for the development consent application is based largely on new origin destination surveys and extensive traffic counts carried out in autumn 2012. Additional traffic surveys on Hall Lane and Drayton Lane were carried out in November/December 2013. A PICADY Assessment for this junction has been completed using modeled flows and is contained in Appendix E. A sensitivity test has also been carried out where the modeled flows were increased by 10% to reflect the latest traffic surveys.

3.4 The PICADY Assessment shows that the junction is operating within desirable capacity with Ratio of Flow to Compacity (RFC) values of less than 0.85 with maximum predicted delays of 22 seconds and maximum predicted queues of 3 Passenger Car Units (PCU's) for right turning traffic in 2032.

3.5 In view of the results of the traffic modeling exercise as explained in Appendix C and the operational assessment using PICADY included in Appendix E, the preference would be to continue with the current scheme as the operational assessment suggests that Reepham Road would operate satisfactorily without a dedicated right turn lane and the traffic modeling showed that the current scheme was the most effective at reducing traffic flows into Drayton when compared to a non-NDR scenario.

4. NON MOTORISED USERS (NMU)

4.1. As Drayton Lane will be realigned between the NDR and Reepham Road, the old carriageway of Drayton Lane will be converted to a cycle track (with right of way on foot). A refuge for NMU's to cross the realigned Drayton Lane will be provided. Access to Drayton Lane (south) will be maintained for use by NMU's.

5. SIGNAGE

5.1. The junction will be signed in accordance with The Traffic Signs Regulations and General Directions 2002 including the Traffic Signs Manual, and other relevant standards. This will include all relevant warning and regulatory signs, direction signs to provide route information and other information signs that are considered necessary. This will include other signs on the existing road network which may need to be modified to take account of the introduction of the NDR, to be compatible with the County Councils routing strategies. Signs will be unlit where Regulations permit; those that will require illumination will be within 50 yards of a street lighting system.

6. LIGHTING

6.1. No lighting is proposed at this location.

7. DRAWINGS

7.1. Relevant drawings are provided in the Appendices as follows:

- Site Location
- NDR Engineering Layout Sheet 4, drawing number R1C093-R1-4006F
- Option Layouts

8. OTHER INFORMATION

9.1 Other relevant information is provided in the Appendices as follows:

- .PICADY Assessments
- Traffic Modelling Information
- Norfolk Constabulary T40 Road Improvement Notification

APPENDIX A

Norfolk County Council

Mott MacDonald

Birse Civils

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE / HALL LANE
SITE LOCATION

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	DN	01/14
DRAWN BY	DN	01/14
CHECKED BY	MAK	01/14

DRAWING No. R1C093-R1-4376

PROJECT TITLE: Norwich Northern Distributor Road

SCALE 1:50000

FILE No. R1C093

ORIGINAL SIZE: A3

Key

- Northern Distributor Road
- Indicative Woodland creation
- Indicative Grassland creation
- Indicative Scrubland creation
- Existing Woodland
- Existing pond, lake or river
- Proposed Site Compound
- Proposed Temporary Topsoil Storage area
- Proposed Temporary Traffic Diversion (to complete tie-in)
- Proposed Culverts
- Proposed Drainage Lagoons
- Proposed Bat Gantry
- Existing Footpaths
- Existing Restricted Byways (RB) and Bridleways (BR)
- Proposed Cycle Tracks (with right of way on foot)
- Proposed Footways/Cycleways
- Proposed Bridleways
- Proposed Private Means of Access (PMA)
- Proposed Turning Heads (some with combined Field Access)
- Proposed Swales
- Proposed Ditches
- Chainage

Metres 25 0 25 50 75 100 125 150 175 200 Metres

CUT LINE TO SHEET 4

New Field Access

New Field Access

5

4500

5000

Existing access to Pad to remain

Temporary Topsoil Storage

New Field Access

Site Compound with temporary mitigation measures

PMA combined with Cycle Track with Right-of-way on foot

New Field Access

New Field Access

Drayton Lane

100

200

300

400

500

600

700

800

900

1000

1100

1200

Holt Road / Drayton Lane Roundabout

END OF SCHEME

Horsford RB7

Home Farm

B1149 Holt Road

Glebe Farm

Section of Horsford RB7 to be Stopped Up

The Homestead

Drayton Lane to be Stopped Up

Bat Gantry (2)

CUT LINE TO SHEET 5

5500

6000

Drayton Lane Roundabout

Temporary Traffic Management

Drayton Lane to be Stopped Up

Existing hedgerow to be enhanced

Existing carriageway reduced to 3m wide Cycle Track with Right-of-way on foot

Drayton Lane / Reepham Road major/minor priority junction

Refuge to be provided

Reepham Road

10m wide strip to allow Reepham Road temporary diversion to complete tie-in

Existing Access to remain

Combined Turning Head and Field Access

Field Access to remain

Existing Field Accesses to remain

Holly Lane

The Lindens

Church Street

Existing Field Access to remain

Existing Field Access to remain

Holt Road / Drayton Lane Roundabout

Home Farm

B1149 Holt

Ch. 5330
Drayton Lane Roundabout

DATUM=26.000

CHAINAGE	EXISTING LEVELS	PROPOSED LEVELS
4400.000	32.363	30.371
4450.000	31.908	30.121
4500.000	30.920	29.871
4550.000	29.884	29.621
4600.000	29.065	29.374
4650.000	29.339	29.428
4700.000	29.581	29.728
4750.000	30.121	30.029
4800.000	30.631	30.329
4850.000	31.396	30.630
4900.000	32.130	30.931
4950.000	32.735	31.231
5000.000	33.219	31.532
5050.000	33.868	31.833
5100.000	33.637	32.133
5150.000	35.452	32.434
5200.000	35.431	32.734
5250.000	35.950	33.035
5300.000	36.467	33.336
5350.000	37.502	33.637
5400.000	37.388	33.938
5450.000	37.309	34.239
5500.000	37.169	34.541
5550.000	36.997	34.842
5600.000	36.730	35.091
5650.000	36.977	35.232
5700.000	36.975	35.265
5750.000	36.890	35.188
5800.000	36.383	35.003
5850.000	35.976	34.709
5900.000	35.635	34.315
5950.000	35.411	33.901
6000.000	34.823	33.487
6050.000	33.880	33.073
6100.000	32.812	32.658
6150.000	32.553	32.244
6200.000	32.185	31.830

Norfolk County Council

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Norwich NR1 2SG

DRAWING TITLE

NORWICH NORTHERN DISTRIBUTOR ROAD
ENGINEERING LAYOUT AND PROFILE - MAINLINE
SHEET 4 OF 12

REV.	DESCRIPTION	CHECKED	DATE
A	See Revision Sheet for details	MKu	01/13
B	See Revision Sheet for details	MKu	04/13
C	See Revision Sheet for details	MKu	07/13
D	See Revision Sheet for details	MKu	08/13
E	See Revision Sheet for details	JB	09/13
F	See Revision Sheet for details	MKu	11/13

	INITIALS	DATE
SURVEYED BY	OS	2008
DESIGNED BY	JT	05/12
DRAWN BY	JT	05/12
CHECKED BY	MKu	06/12

DRAWING No. R1C093-R1-4006F

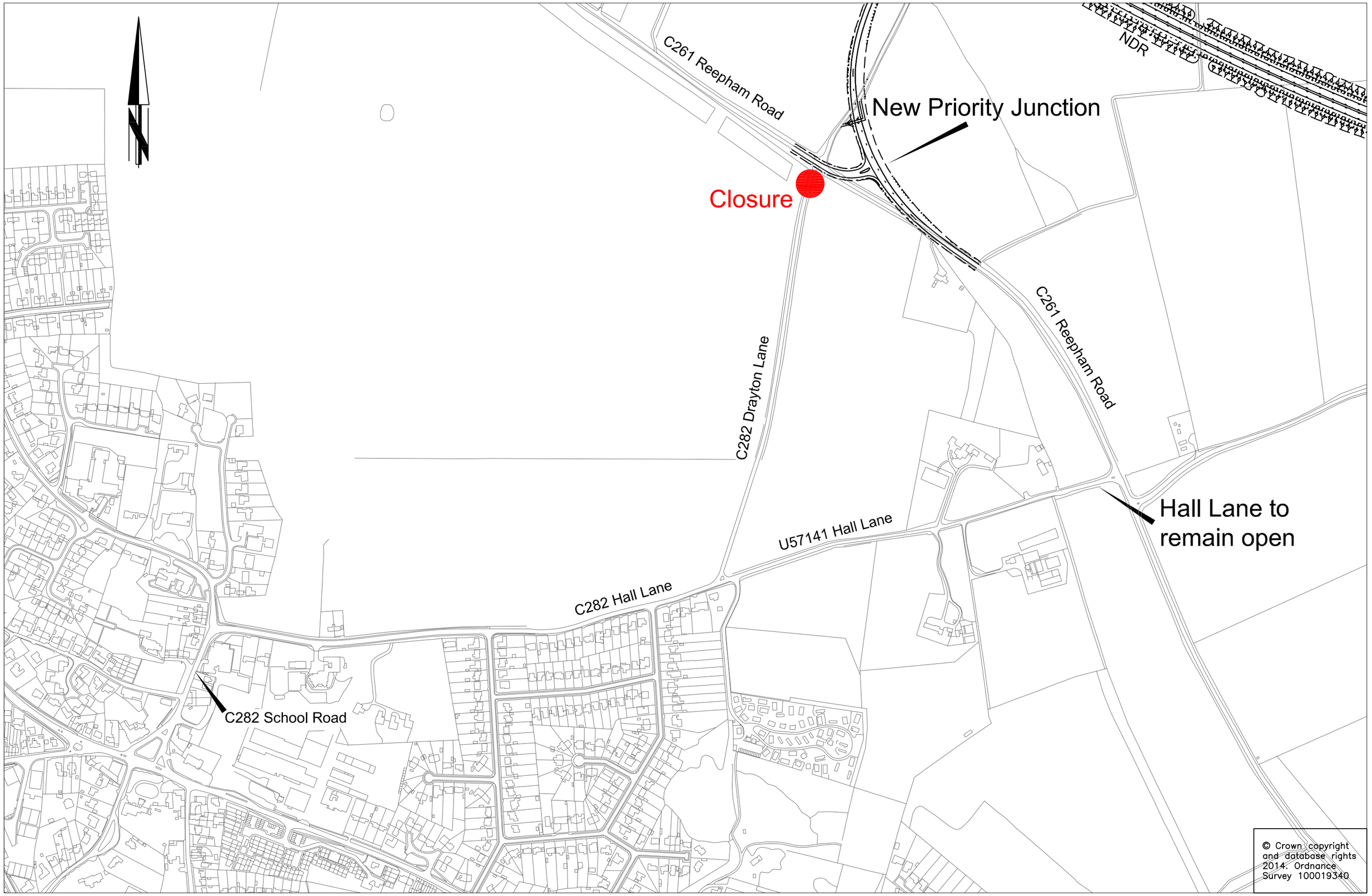
PROJECT TITLE: Norwich Northern Distributor Road

SCALE 1:2500/1:250

FILE No. R1C093

ORIGINAL SIZE: A1

APPENDIX B



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DRAWING TITLE

NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE / HALL LANE
NDR PROPOSALS

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	DN	01/14
DRAWN BY	DN	01/14
CHECKED BY	MAK	01/14

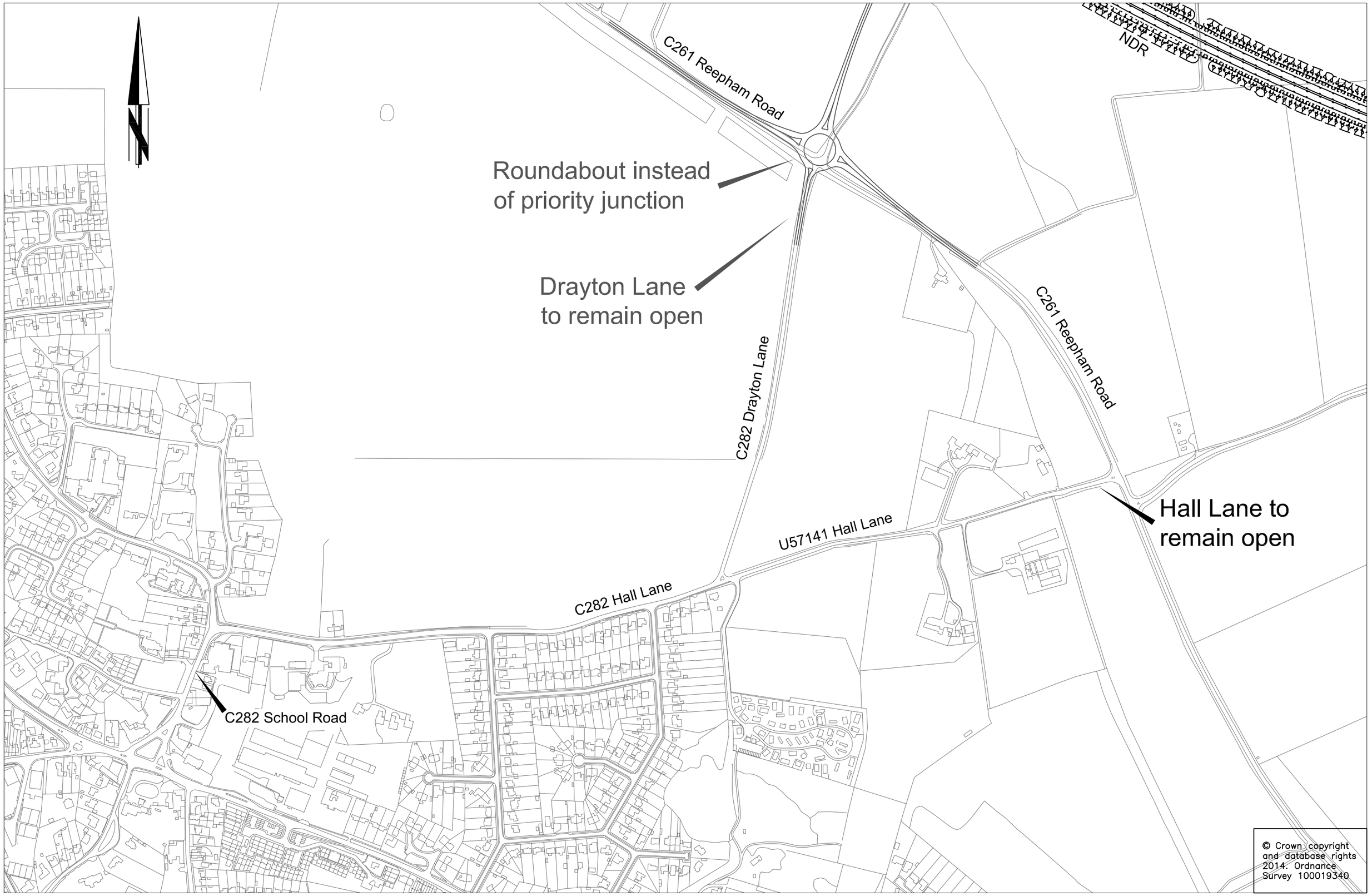
DRAWING No. R1C093-R1-4377

PROJECT TITLE
Norwich Northern Distributor Road

SCALE 1:5000

FILE No. R1C093

ORIGINAL SIZE: A3



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DRAWING TITLE

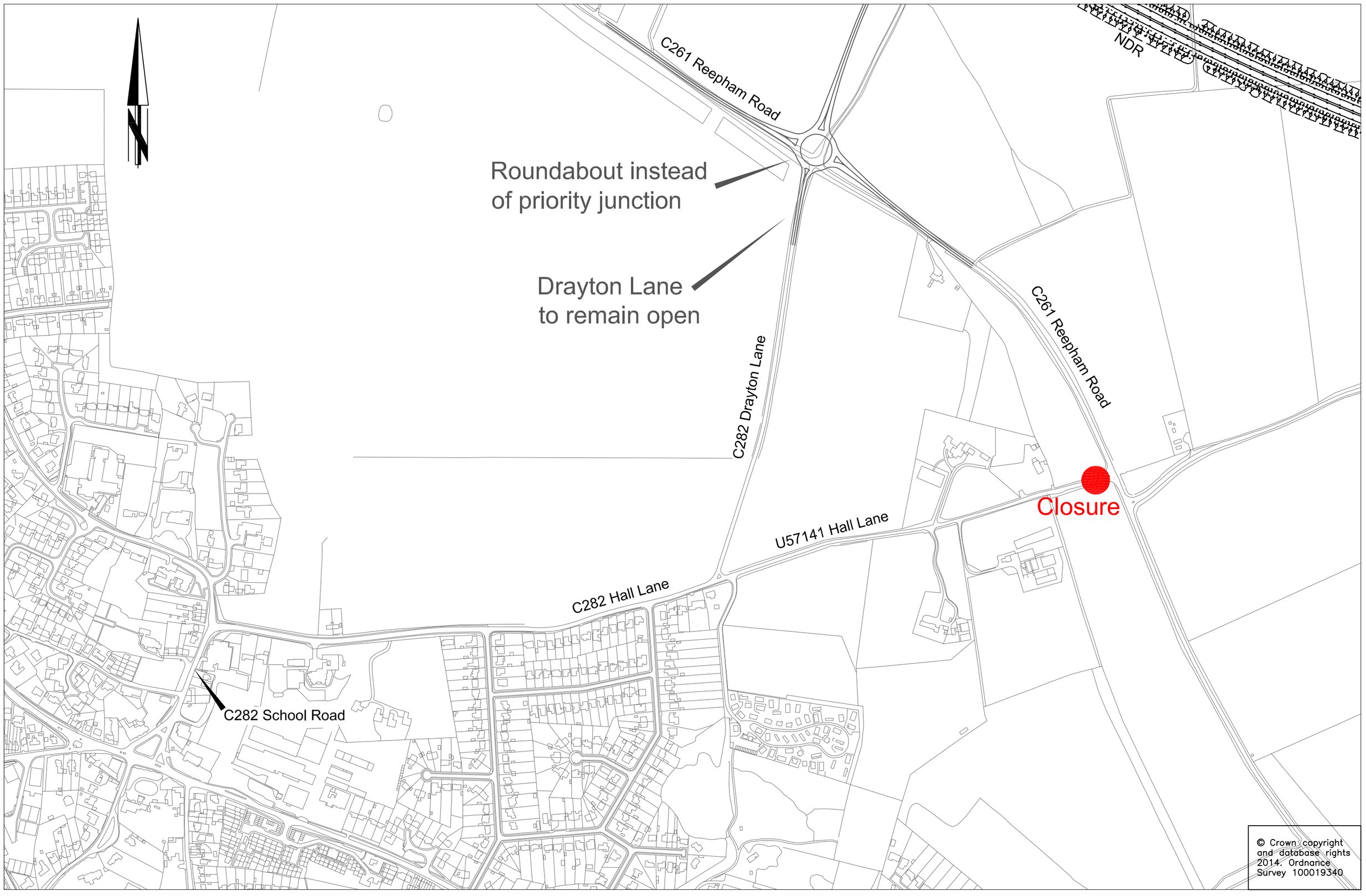
NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE / HALL LANE
TEST C PROPOSALS

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	DN	01/14
DRAWN BY	DN	01/14
CHECKED BY	MAK	01/14

DRAWING No. R1C093-R1-4378
PROJECT TITLE: Norwich Northern Distributor Road
SCALE 1:5000
FILE No. R1C093

ORIGINAL SIZE: A3



Norfolk County Council
Mott MacDonald
Birse Civils

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Norwich NR1 2SG

DRAWING TITLE

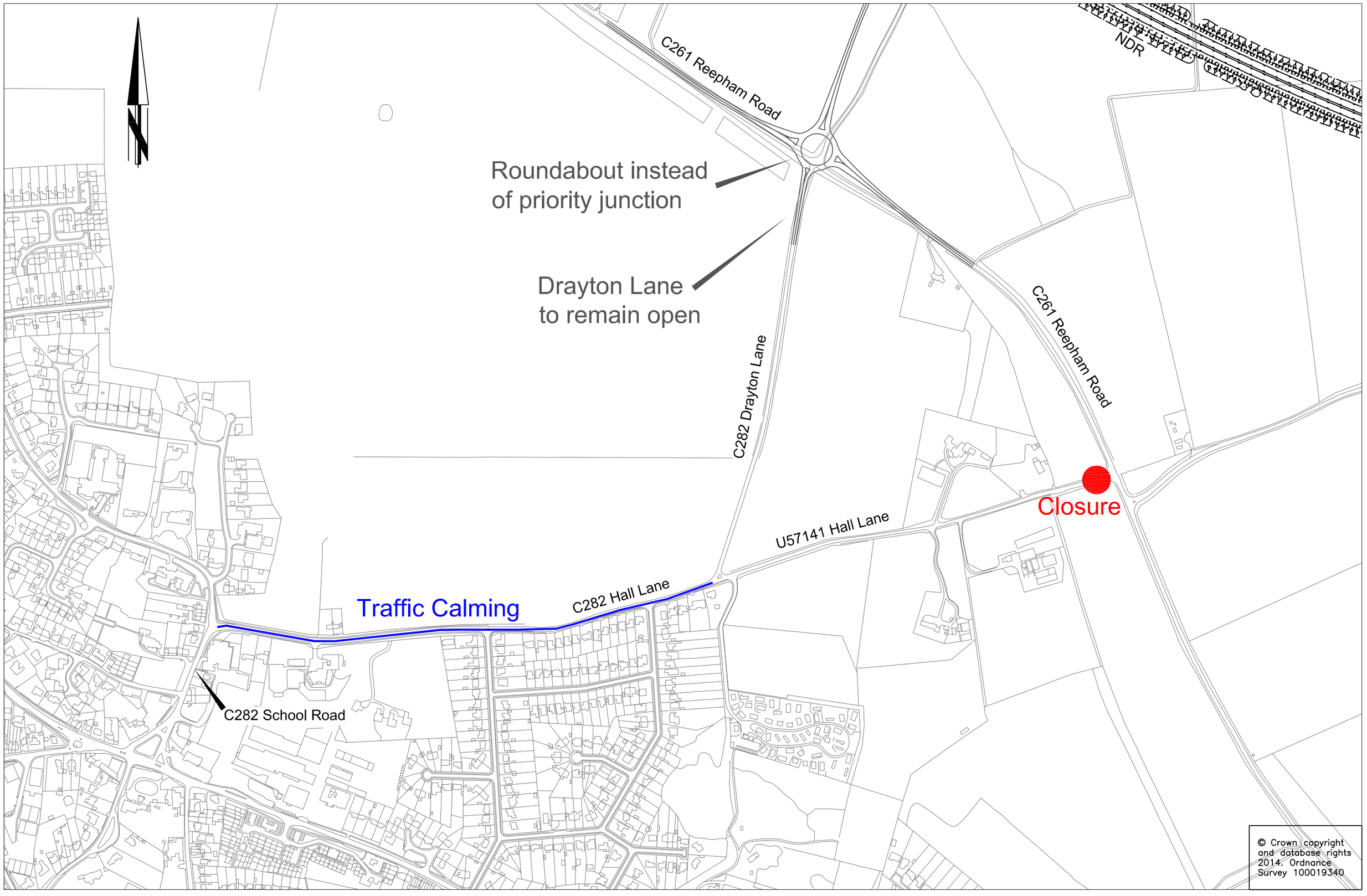
NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE / HALL LANE
TEST D PROPOSALS

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	DN	01/14
DRAWN BY	DN	01/14
CHECKED BY	MAK	01/14

DRAWING No. R1C093-R1-4379
PROJECT TITLE Norwich Northern Distributor Road
SCALE 1:5000
FILE No. R1C093

ORIGINAL SIZE: A3



Norfolk County Council
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Birse Civils

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DRAWING TITLE

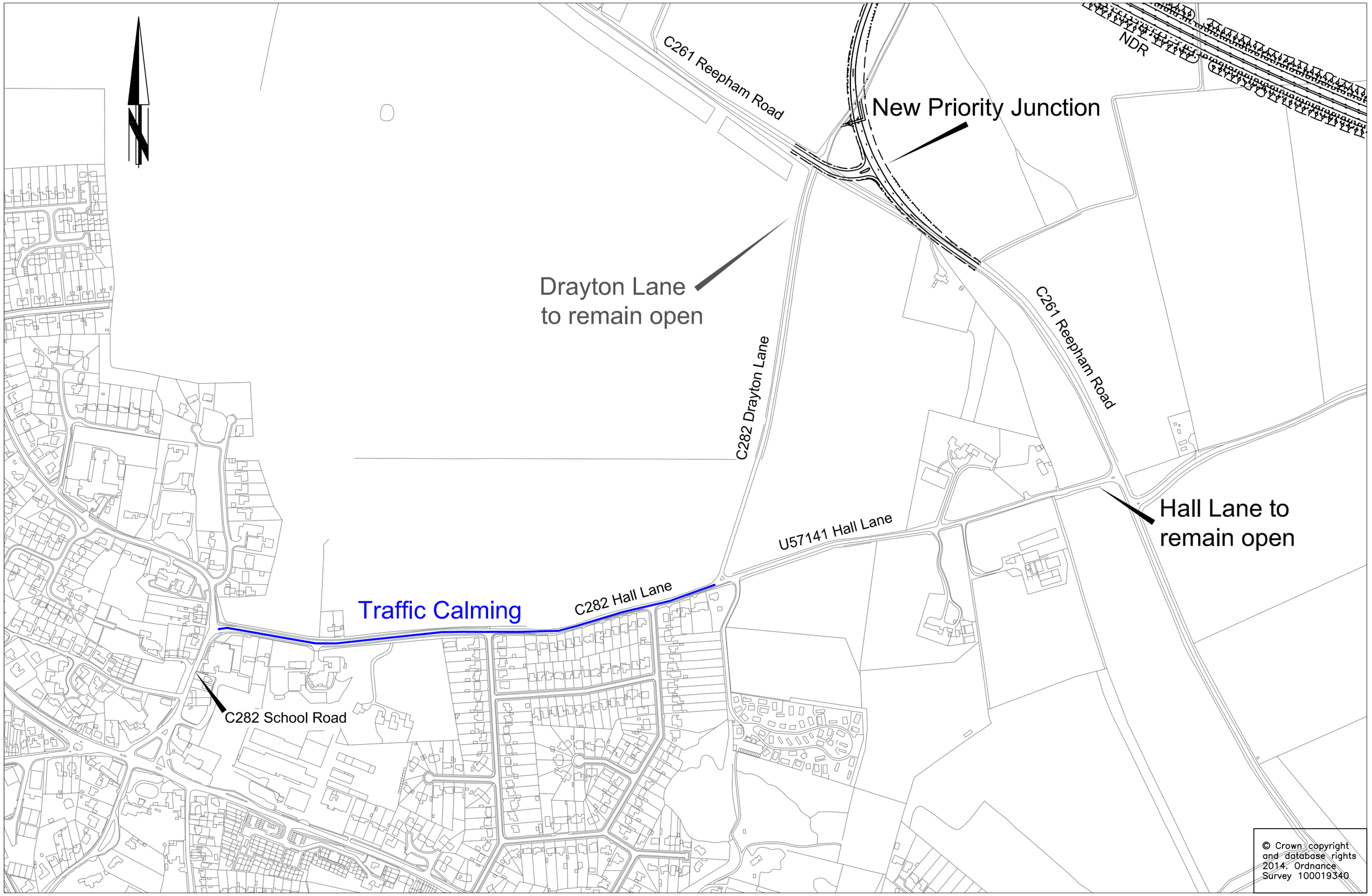
NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE / HALL LANE
TEST E PROPOSALS

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	DN	01/14
DRAWN BY	DN	01/14
CHECKED BY	MAK	01/14

DRAWING No. R1C093-R1-4380
PROJECT TITLE Norwich Northern Distributor Road
SCALE 1:5000
FILE No. R1C093

ORIGINAL SIZE: A3



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Birse Civils

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Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

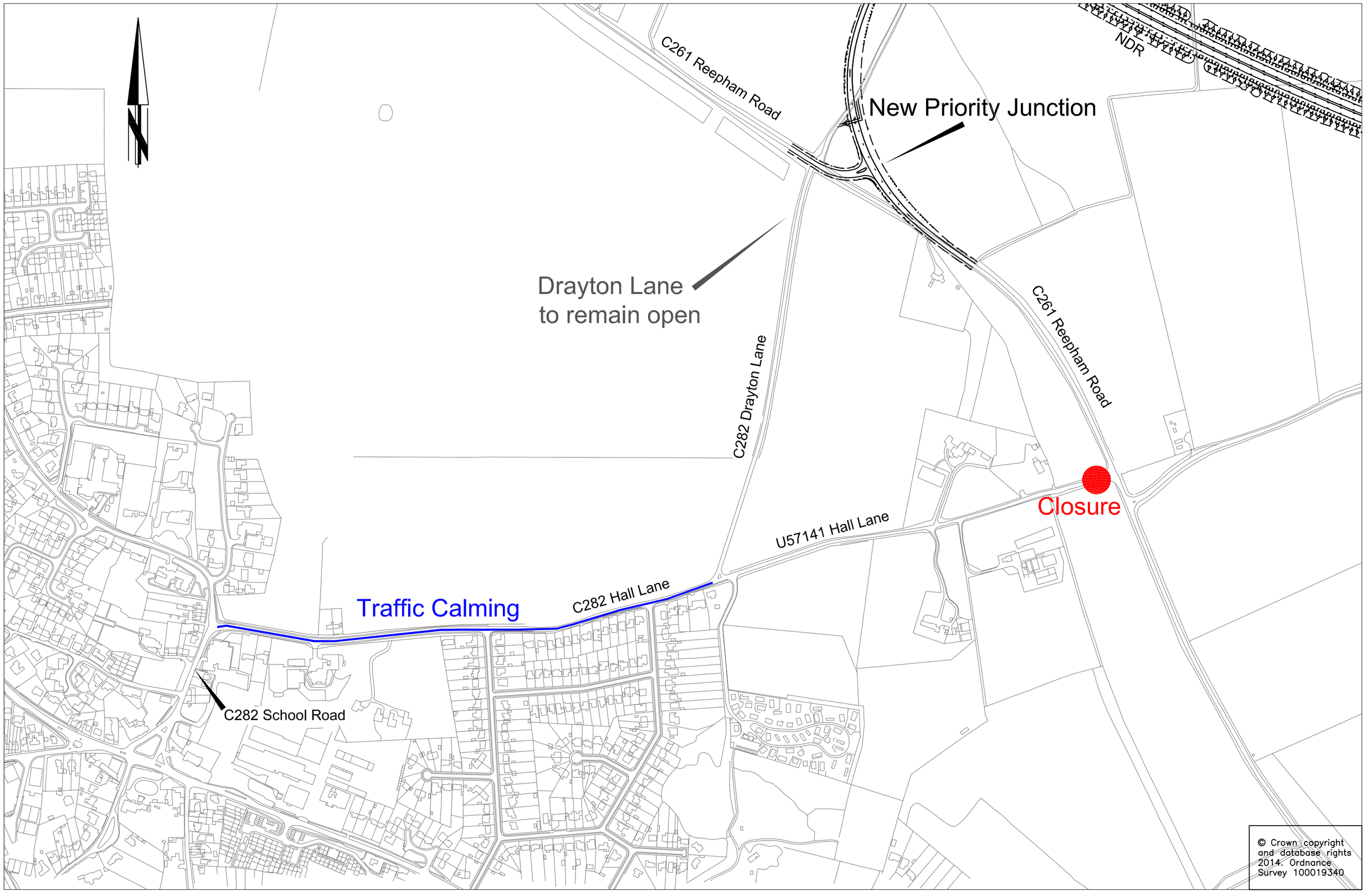
NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE / HALL LANE
TEST F PROPOSALS

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	DN	01/14
DRAWN BY	DN	01/14
CHECKED BY	MAK	01/14

DRAWING No. R1C093-R1-4381
PROJECT TITLE: Norwich Northern Distributor Road
SCALE 1:5000
FILE No. R1C093

ORIGINAL SIZE: A3



Norfolk County Council

Mott MacDonald

Birse Civils

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE / HALL LANE
TEST G PROPOSALS

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	DN	01/14
DRAWN BY	DN	01/14
CHECKED BY	MAK	01/14

DRAWING No. R1C093-R1-4382

PROJECT TITLE Norwich Northern Distributor Road

SCALE 1:5000

FILE No. R1C093

ORIGINAL SIZE: A3

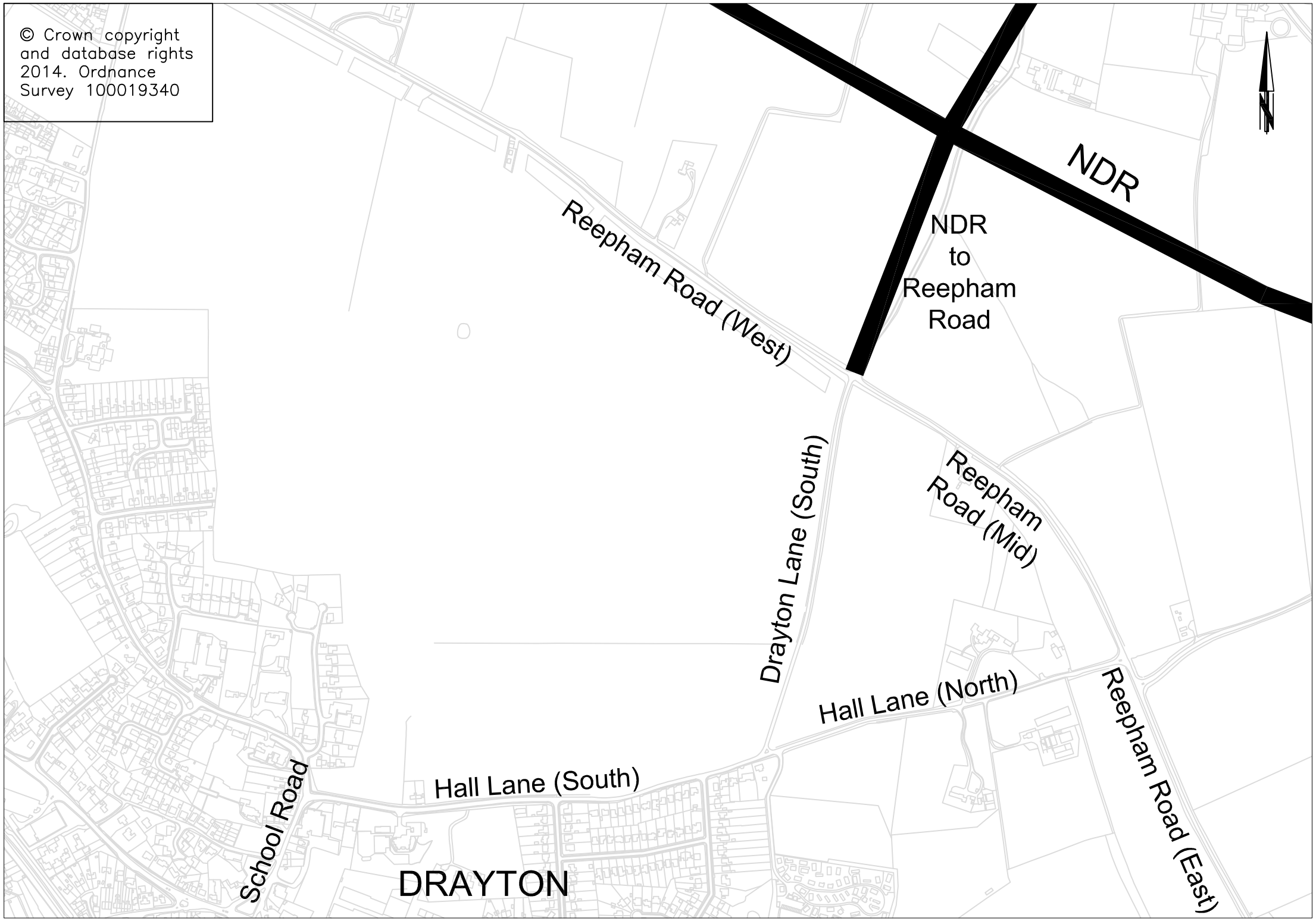
APPENDIX C

Summary of modelled traffic flows from tests

The traffic flows from the tests using the preliminary (August 2013) version are summarised in Table 1, including figures for the 2012 base case, no NDR (Do Min 32) and NDR 2032. Figures using the latest (October 2013) version of the model are also presented for the 2012 base case, no NDR (Do Min 32) and NDR 2032. The locations of the figures are shown in Figure 1.

Table 1. Summary of modelled traffic flows from tests

Test ref	Model	Reepham Rd junction type	Drayton Lane	Hall Lane (north)	Hall Lane calming	NDR to Reepham Road	Reepham Road (west)	Reepham Road (mid)	Reepham Road (east)	Drayton Lane (south)	Hall Lane (north)	Hall Lane (south)	School Road (Drayton)
2012	Aug 13	Priority	Open	Open	No	1700	7400	7300	8400	1100	5100	6300	10000
2012	Oct 13	Priority	Open	Open	No	1700	7800	7700	8800	1200	5400	6600	10500
DoMin32	Aug 13	Priority	Open	Open	No	2500	9200	8800	11100	1700	7100	8800	12300
DoMin32	Oct 13	Priority	Open	Open	No	2600	10000	9600	10700	1600	7200	8800	12600
NDR2032	Aug 13	Priority	Closed	Open	No	14800	2100	15400	12400	0	6800	6800	9800
NDR2032	Oct 13	Priority	Closed	Open	No	15500	2300	16100	13200	0	6800	6800	10200
C 2032	Aug 13	Roundabout	Open	Open	No	16900	3300	9500	11400	8100	1900	10000	12700
D 2032	Aug 13	Roundabout	Open	Closed	No	17200	3300	10500	10500	9600	0	9600	12900
E 2032	Aug 13	Roundabout	Open	Closed	Yes	16100	3400	10600	10600	8300	0	8300	11700
F 2032	Aug 13	Priority	Open	Open	Yes	13400	4900	10100	11800	5900	1700	7600	10500
G 2032	Aug 13	Priority	Open	Closed	Yes	13100	5100	11100	11100	7000	0	7000	10300


© Crown copyright and database rights 2014. Ordnance Survey 100019340
NDR
NDR to Reepham Road
Reepham Road (West)
Drayton Lane (South)
Reepham Road (Mid)
Hall Lane (North)
Reepham Road (East)
Hall Lane (South)
School Road
DRAYTON

APPENDIX D

NORFOLK CONSTABULARY
Our Priority Is You

SUFFOLK CONSTABULARY
Taking pride in keeping Suffolk safe

Road Defect/Improvement Notification

Email or send to Force Traffic Management Officer:

Norfolk - lawda@norfolk.pnn.police.uk - PHQ Wymondham

Suffolk - steve.griss@suffolk.pnn.police.uk - PHQ Martlesham

From: **Rank**:T.M.O **No:** **Name**: DAVID LAW **Station**: WYMONDHAM **Date:29/11/2013**

I wish to bring to your attention the following problem(s) at:

Parish: :DRAYTON

Road (Exact location, attach google type map if helpful): **REEPHAM ROAD / HALL LANE**

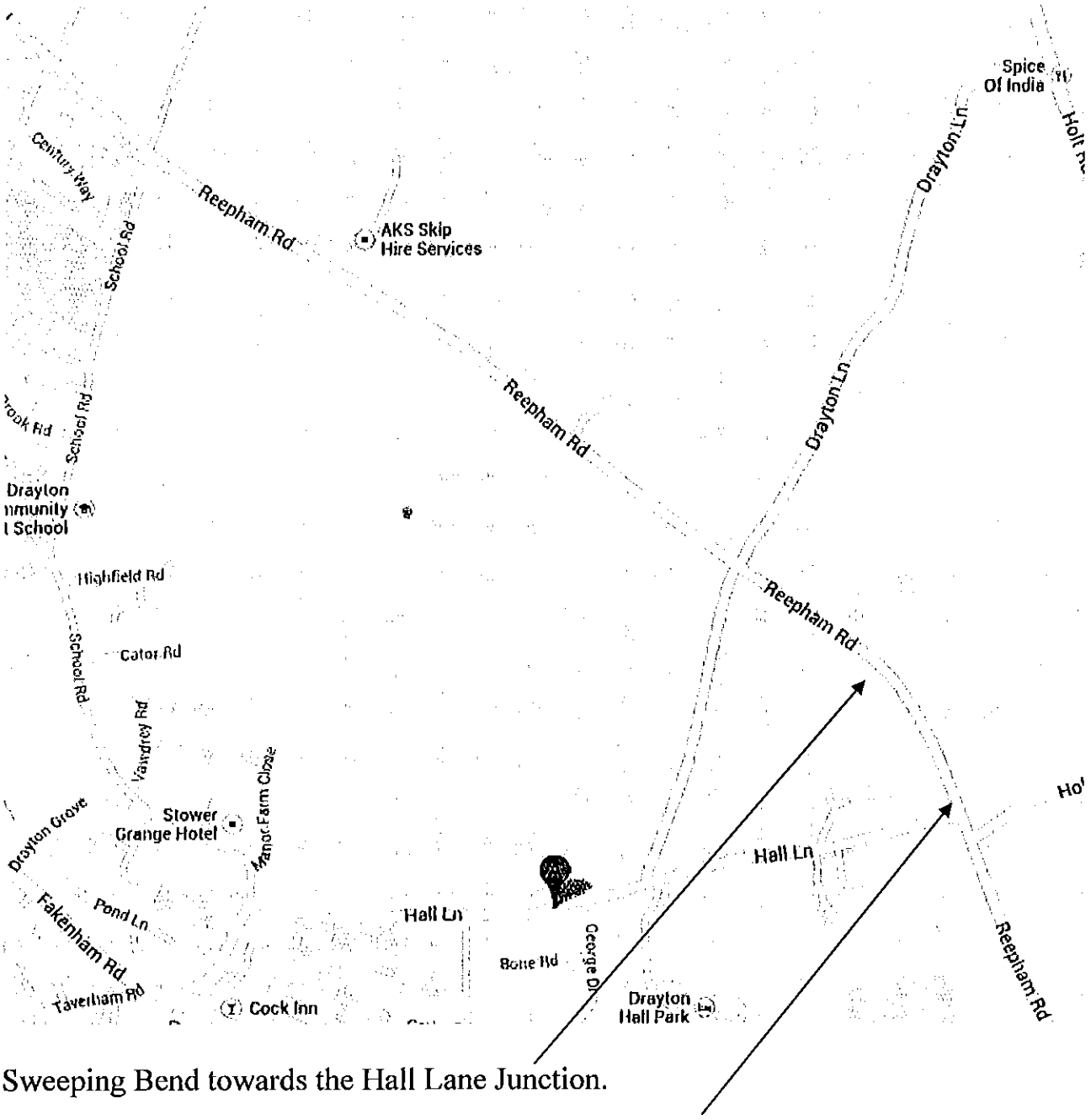
The problem(s) at this location appears to be: (If you have photographs please attach)
We have been contacted by a Concerned Resident of Hall Lane in relation to the proposed NDR, and the effects this may have on Hall Lane. I fully appreciate that projecting future vehicle movements is difficult, but at present most traffic travelling South towards the city currently turns right at Drayton Lane which under the NDR will be closed taking away a problem Junction, however vehicle wishing to go into or through Drayton will either use School Road or Hall Lane. At present very little traffic turns right into Hall Lane, but this could significantly increase once the NDR is complete. There is concern regarding the build up of traffic at peak times wishing to turn right into Hall lane, causing queuing on Reepham Road with a sweeping Bend to the approach with limited forward visibility. Hall Lane itself has apparent width problems in places causing large vehicles and buses to have limited space to pass each other. Speed is also a concern on Hall Lane especially with no footway for pedestrians or cyclists.

I suggest a possible remedy would be:

1. In order to reduce the impact of the NDR and to ensure safety for all road users, consider a Right Hand Lane on Reepham Road to facilitate right turning traffic and reduce queuing.
2. A reduced Speed Restriction on Reepham Road from the NDR to Hall Lane Junction.
3. I am told that there are plans for up to 200 houses off Hall Lane with access to School Road and Hall Lane, could consideration be given to additional work requirements to improve Hall Lane to form part of the planning consent.
4. Improvements required on Hall Lane, could be a speed reduction especially on the approach

To the built up area, but should also consider going back to the Junction of Reepham Road.

5. Improvements required for Cycle/Pedestrian Links into Drayton.
6. A review of Hall Lane usage, to consider the types of vehicles using it and whether the road needs upgrading to accommodate projected vehicle movements.



Sweeping Bend towards the Hall Lane Junction.

Junction Improvements to include Right Turn Lane to reduce queuing.

APPENDIX E

	AM			PM		
	Queue (PCU)	Delay (sec)	RFC	Queue (PCU)	Delay (sec)	RFC
	Hall Lane / Reepham Road - 2017 DS					
Hall Lane right turn	1	31	0.504	1	23	0.348
Hall Lane left turn	1	11	0.342	1	12	0.393
Reepham Road ahead and right	1	12	0.442	1	12	0.375
	Hall Lane / Reepham Road - 2032 DS					
Hall Lane right turn	1	34	0.421	1	32	0.423
Hall Lane left turn	1	15	0.495	1	15	0.478
Reepham Road ahead and right	2	16	0.557	2	18	0.576
	Hall Lane / Reepham Road - 2032 DS Sensitivity					
Hall Lane right turn	1	44	0.512	1	41	0.508
Hall Lane left turn	1	20	0.591	1	20	0.572
Reepham Road ahead and right	3	19	0.616	3	22	0.639

Summary of results from PICADY Assessment for Reepham Road / Hall Lane junction.

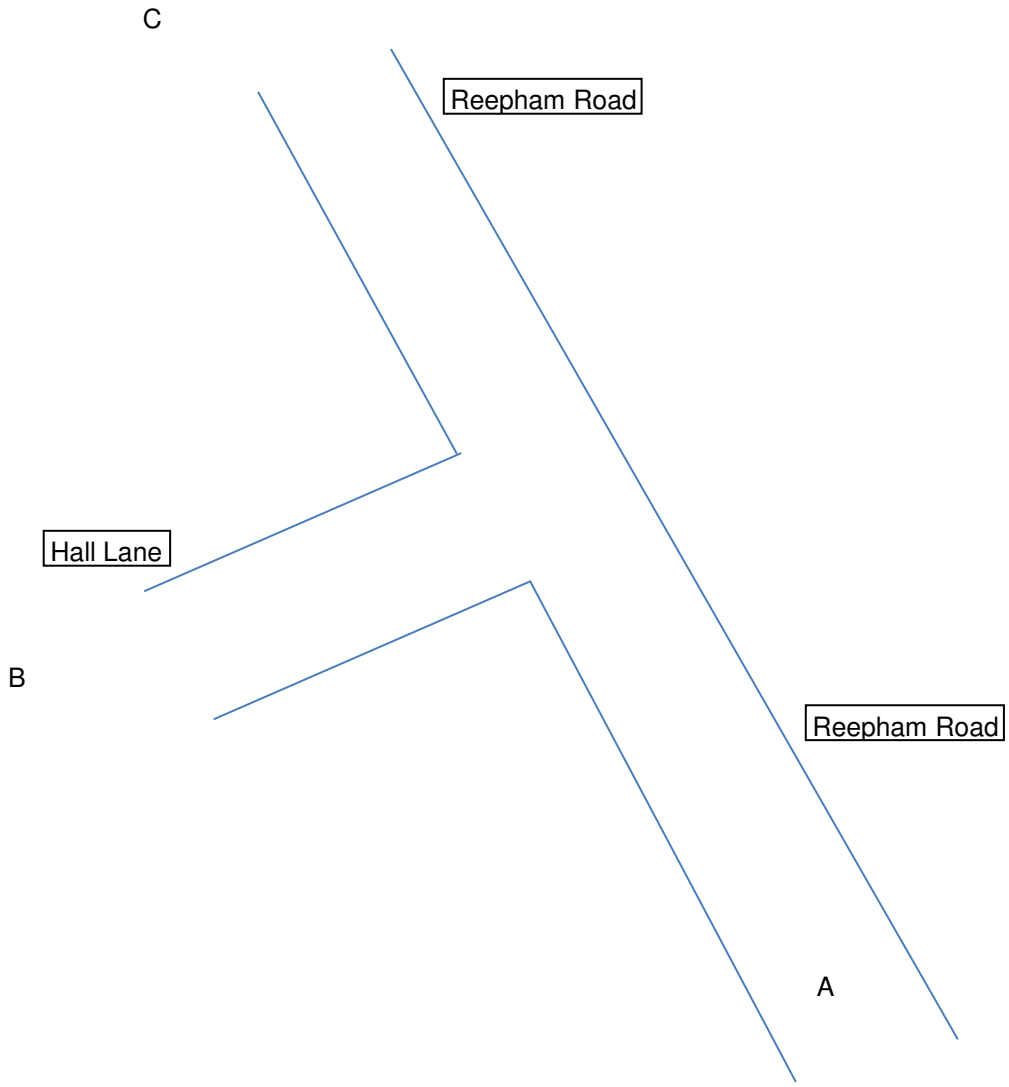


Diagram for traffic flows taken from the SATURN traffic model

AM	A	B	C	Total
A	0	84	481	565
B	106	0	149	254
C	511	219	0	731
Total	617	303	630	

IP	A	B	C	Total
A	0	76	484	560
B	60	0	115	175
C	363	107	0	470
Total	424	183	599	

PM	A	B	C	Total
A	0	140	635	776
B	75	0	172	247
C	322	164	0	486
Total	396	305	808	

Traffic flows taken from the 2017 Do Something SATURN traffic model

AM	A	B	C	Total
A	0	77	551	628
B	71	0	212	282
C	505	266	0	771
Total	576	343	763	

IP	A	B	C	Total
A	0	74	483	557
B	60	0	161	221
C	365	176	0	541
Total	425	250	644	

PM	A	B	C	Total	
A	0	156	623	779	777
B	75	0	199	273	274
C	339	251	0	590	596
Total	413	407	822		
	414	413	821		

Traffic flows taken from the 2032 Do Something SATURN traffic model

AM	A	B	C	Total
A	0	85	551	636
B	78	0	233	311
C	505	293	0	798
Total	583	378	784	

IP	A	B	C	Total
A	0	74	483	557
B	60	0	161	221
C	365	176	0	541
Total	425	250	644	

PM	A	B	C	Total	
A	0	171	623	794	777
B	82	0	219	301	274
C	339	276	0	615	596
Total	421	447	842		
	414	413	821		

uplift 10% as a sensitivity test

Traffic flows taken from the 2032 Do Something SATURN traffic model including a 10% uplift

INTRODUCTION

This report contains the results of a Stage 1 Safety Audit carried out on the above scheme. The Audit was carried out at the request of Norfolk County Council Highways Group.

The Audit Team membership was as follows:-

Nevil Calder BSc(Hons) CEng MICE MCIHT MSoRSA (Audit Team Leader)	Principal Consultant Mott MacDonald
Kevin Allen BEng(Hons) IEng MCIHT MSoRSA (Audit Team Member)	Project Engineer Network Analysis + Safety Norfolk County Council

Specialist Advisors:-

Andy Micklethwaite	Casualty Reduction Officer Norfolk County Council

The Audit took place at Carrow House on 27 January 2014. The audit comprised an examination of the Safety Audit submission document and a site inspection on 30 January 2014 by the Audit Team Leader. The weather was dull/showery and the road surface wet.

The terms of reference are as described in Environment, Transport and Development Highways Service Manual Procedure SP03-07. The Auditors have examined and reported only on the road safety implications of the scheme as presented and have not verified the compliance of the design to any other criteria.

ITEMS RAISED AT PREVIOUS AUDIT

No previous safety audit.

ITEMS RAISED AT THIS STAGE 1 AUDIT

1.0 General

1.1 Problem

Location: School Road/Hall Lane/Drayton Lane – All options
Summary: risks associated with orbital traffic demand

The modelled traffic data provided shows daily flows in 2032 of 10,000-12,000 veh on School Road, which is similar to the 2012 baseline flow of 10,500. This demonstrates a firm traffic demand between Reepham Road and Drayton village centre which is neither satisfied nor exacerbated by the proposed NDR. These figures vary little across all options, including the 'do minimum', indicating low sensitivity to deterrence; there is therefore a need for measures to help cater safely for this traffic movement.

The various modelled options do have a significant effect on the balance of flow between Drayton Lane (south) and Hall Lane (north); however this is seen as neutral in terms of safety, as these two roads are very similar in standard and alignment.

Recommendation

The recommended safety strategy should involve selection of an appropriate non built-up junction form to safely handle the orbital/radial conflict, together with robust traffic calming within the built-up area of Drayton in order to improve safety for vulnerable users. It is acknowledged that some of the options reduce traffic through Drayton village centre and this is an existing situation, not a consequence of the NDR. Nevertheless, the scheme should endeavour to mitigate them.

2.0 Alignment

2.1 Problem

Location: Drayton Lane (south) - Options C-G
Summary: increased flow on Drayton Lane (south)

These options transfer traffic for Drayton, from Hall Lane to Drayton Lane (south). Hall Lane currently has a 40mph speed limit as a buffer prior to the more built up length of Hall Lane, whereas Drayton Lane (south) does not.

Recommendation

Introduction of a 40mph speed limit on Drayton Lane (south) (as existing Hall Lane) is recommended to reduce the potential for conflict resulting from increased traffic flow and provide a consistent message to drivers.

2.2 Problem

Location: Hall Lane (south) – All options
Summary: existing accident problem on bend

There is a bend in the road (between the side road junctions of Carter Rd and George Drive) which has an existing record of head-on accidents. Increased traffic flows may exacerbate this.

Recommendation

Notwithstanding potential speed management measures (see 4.1 below), it is recommended that carriageway width and camber on the bend should be checked and improved as appropriate. Improvement of forward visibility across the verge on the inside of the bend and removal of the adjacent tree may also be beneficial.

3.0 Junctions

3.1 Problem

Location: Reepham Road/Hall Lane junction - NDR proposal

Summary: conflicts associated with high turning movement at simple junction

High turning volumes at the proposed simple T junction will result in a risk of serious right angled turning collisions and tail-end accidents at speeds of around 50mph at this non built-up location. Reference to Fig 2.2 in TD42/95 clearly illustrates that alternative junction forms should be considered for the anticipated flows.

Recommendation

The police T40 suggestion of a ghost island RTL would only partially address these concerns. The safest junction form for the anticipated flows is a small roundabout.

3.2 Problem

Location: Reepham Road/Drayton Lane junctions - Options F & G)
Summary: conflicts associated with high turning movements

High turning volumes at the proposed NDR link Road/Reepham Road T junction will result in a risk of serious right angled turning collisions at this non built-up location. This is exacerbated by the curving major road alignment. Reference to Fig 2.2 in TD42/95 clearly illustrates that alternative junction forms should be considered for the anticipated flows.

Close proximity of the second priority junction will add further potential confusion over signalling and driver intent.

Recommendation

The safest junction form for the anticipated flows is a small roundabout.

3.3 Problem

Location: Hall Lane (north) junctions with Reepham Rd and Drayton Lane - Option C
Summary: leaving Hall Lane open increases the potential conflict points

The proposed small roundabout at Reepham Rd/Drayton Lane junction is the safest junction form for the modelled flows. It is anticipated to operate with low accident

frequency and severity. Leaving Hall Lane (north) open perpetuates a significant number of turning movements at nearby less safe priority T junctions.

Recommendation

Hall Lane (north) should be closed to through traffic to concentrate all turning movements at the roundabout (as in options D & E).

3.4 Problem

Location: Drayton Lane/Hall Lane junction - Options D & E
Summary: inappropriate junction priority increases potential for collision

The traffic movement between Drayton Lane and Hall Lane (south) will become heavily dominant at this junction, making the current priority inappropriate. If retained, it would increase the risk of failure to give way and tail-end collisions.

Recommendation

Modify the junction layout to reflect dominant flow; changing the priority, realigning the minor arm approach and improving forward visibility on the bend of the major road.

Non-motorised Users

4.1 Problem

Location: School Road and Hall Lane (south) – All options
Summary: risk of serious injury to NMUs in conflict with heavy traffic

The level of traffic on Hall Lane (west of Drayton Lane) and School Road will continue to present a risk of serious injury to vulnerable users within the built-up area of Drayton. Several of the options propose traffic calming on Hall lane (west) which is seen as beneficial; however this needs to be sufficiently robust and targeted where NMU risk is greatest.

It is understood that a further 200 dwellings are planned to the northern side of Hall Lane which will increase exposure of vulnerable users as well as increasing the built-up character of the area.

Recommendation

A traffic calming scheme should be taken forward on Drayton Lane irrespective of the NDR. This should be extended to include School Rd, involving a review of crossing facilities to offset the lack of continuous footway.

The 30mph speed limit should be extended along Hall Lane (west) appropriate to existing and planned development. This will also assist in the introduction of more physical traffic calming along this length.

5.0 Signs, Lighting and Markings

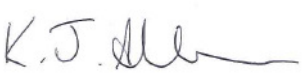
5.1 No comment at this stage

AUDIT TEAM STATEMENT

We certify that this audit has been carried out in accordance with Norfolk County Council Environment, Transport and Development Procedures.

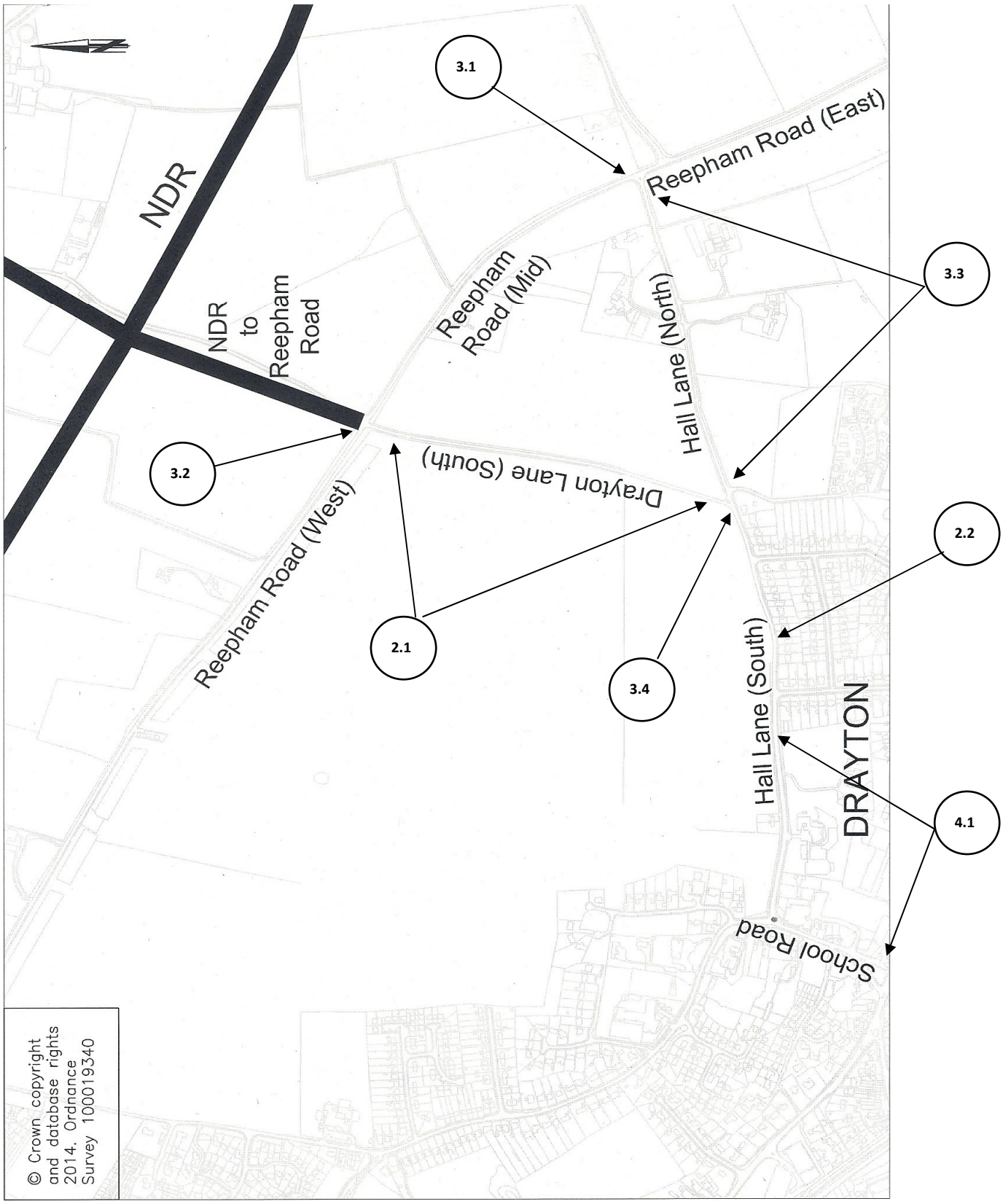
Signed (ATL)  Nevil Calder

Dated 12 February 2014

Signed  Kevin Allen

Dated 12 February 2014

APPENDIX A – Problem Location Plan



RESPONSE SHEET

Problem (para no.)	Agree/ Disagree	Reasons/Proposals

To:- Team Manager (Network Analysis + Safety): fao Kevin Allen

From.....

Signed.....…….Project Engineer Dated: .....

Note: If producing your own version of this page please include **SAFETY AUDIT FILE NO/DATE** & ATL name

RESPONSE SHEET

Problem (para no.)	Agree/ Disagree	Reasons/Proposals
1.1	Noted	The volume of traffic within the built up area of Drayton is not a direct result of the NDR scheme. Agree that a feasibility study should be progressed to investigate possible traffic calming measures irrespective of the NDR.
2.1	Noted	This will be considered as part of the traffic calming scheme if Drayton Lane remains open to traffic.
2.2	Noted	This is not a direct result of the NDR and could be progressed as part of a standalone assessment to investigate possible traffic calming measure.
3.1	Agree/ Disagree	Agree that a roundabout would be the safest form of junction. TD 42/95 suggests that Figure 2.2 is a starting point for junction choice. Disagree that it is the most appropriate, taking other factors in to consideration; 1) Increase in potential traffic through Drayton which will not be acceptable to the local community 2) The proposal improves safety at the existing junction by simplifying the existing crossroads 3) Operation assessment results 4) Cost of new junction
3.2	Agree/ Disagree	Agree that a roundabout would be safest form of junction but other factors should be taken into consideration. In this case a roundabout at this location would increase traffic flow through Drayton compared with the current NDR scheme.
3.3	Disagree	If this recommendation was accepted it would: 1) increase traffic into Drayton which will not be acceptable to the local community 2) require modification to Drayton Lane/Hall Lane junction (see 3.4 below) 3) Substantially increase scheme cost Whilst the current NDR scheme operates within its desirable capacity, it is accepted that at peak times it is forecast that predicted flows will result in a 3 car queue. Measures could be taken to reduce this risk such as the introduction of advanced junction warning signs. Taking into consideration the views of local residents & Parish Council on balance the NDR scheme could be modified to option F. This would: 1) Only marginally increase traffic into Drayton compared to the current NDR scheme 2) Retain Reepham Road/ Hall Lane Junction but with less right turning traffic and with a simplified three arm priority junction
3.4	Agree	If options D or E are taken forward
4.1	Agree	This could be considered as part of a feasibility study for a traffic calming scheme.

To:- Team Manager (Network Analysis + Safety): fao Kevin Allen

From.....Mark Kemp

Signed.....Project Engineer Dated: 10/4/14

Note: If producing your own version of this page please include **SAFETY AUDIT FILE NO/DATE** & ATL name

APPENDIX D: Example consultation letter and area

Norfolk County Council
at your service

Environment, Transport, Development
NDR Team
County Hall
Martineau Lane
Norwich
NR1 2SG
NCC contact number: 0344 800 8020
Textphone: 0344 800 8011

Your Ref:
Date: 27/03/2014

My Ref: HI/R1C093/MH/DL
Email: norwich.transport@norfolk.gov.uk

Dear

Norwich Northern Distributor Road (NDR), Application for Development Consent for Nationally Significant Infrastructure under the Planning Act 2008

Drayton - Drayton Lane (south) closure

Norfolk County Council is consulting on a potential minor alteration to our plans for the Norwich Northern Distributor Road (NDR), which we believe may affect you.

Ongoing discussions with residents, the Police and the parish council has resulted in a review of the proposed closure at Drayton Lane (south) at its junction with Reepham Road. We are considering a potential change to keep Drayton Lane (south) open. This change would address the local concerns raised in connection with highway safety on both Reepham Road and Hall Lane, and it is considered that the change may provide a more acceptable solution for the local community.

In order to assist you with your consideration of this potential amendment we enclose the following information:

- Plan showing changes to the scheme
- Plan showing modelled changes to traffic flows

The modelling completed for the NDR scheme indicates that the main traffic impact of keeping Drayton Lane open at its junction with Reepham Road, compared with the currently submitted scheme, is a change in traffic movements from Hall Lane to Drayton Lane. The model suggests that there is also a reduction through Drayton on School Road, but that there is not quite the same reduction with Drayton Lane (south) kept open. The modelled outputs, showing forecast figures, are included in the attached plan together with other changes as a result of the potential modification.

Continuation sheet to:1 *Dated : 27/03/2014* *-2-*

Continued…/

The key changes in Annual Average Daily Traffic (AADT) flows are also shown in the Table below.

Location (ref.)	2012 AADT	Without NDR AADT	NDR Proposed Scheme AADT	NDR with Drayton Lane (south) open AADT
		2017		
Drayton Lane South (A117)	1200	1300	0	4800
Hall Lane North(A115)	5400	6100	5600	1700
Reepham Road (A116)	7700	8500	14600	11300
School Road (A21	10500	11400	9400	10500
		2032		
Drayton Lane South (A117)		1600	0	5700
Hall Lane North(A115)		7200	6800	1700
Reepham Road (A116)		9600	16100	11500
School Road (A21		12600	10200	10800

The changes to the environmental impacts predicted to occur if Drayton Lane (south) is kept open, compared to the NDR scheme as submitted are as follows:

- An increase or decrease of 25% of traffic flows generally represents a significant change in relation to potential noise impacts. The area subject to keeping Drayton Lane (south) open would experience a significant increase on Drayton Lane (south) but significant reductions on Hall Lane (north) and Reepham Road. There are however no sensitive receptors along Drayton Lane (south), and the impact will therefore be negligible here. Elsewhere there are no significant changes.

- With regard to Air Quality, any changes to traffic flow are relatively local and are not predicted to alter the assessment of effects generally or in relation to any particular receptor, with air quality impacts producing widespread effects in any case. Therefore the changes to traffic flows in the area will not adversely impact on Air Quality. Carbon impacts will be similar to Air Quality and therefore no different impacts are predicted.

- There are no anticipated additional or different effects of significance with regard to water, landscape, ecology or social and economic impacts.

Continued…/

In consultation with representatives from the local community, the parish council and the Police, it is also proposed to implement traffic calming on Hall Lane and introduce a speed limit on Drayton Lane (south) irrespective of whether the NDR goes ahead to take account of existing local concerns about traffic flows and accidents. This is not part of the NDR scheme for which an application has been made, but it has been taken into account in the above forecast traffic flows. Norfolk County Council will undertake a separate consultation on the proposed traffic calming in the future. This will be separate from and ahead of the delivery of the NDR scheme.

We would very much welcome your comments on the potential proposal to keep Drayton Lane (south) open as part of the NDR scheme. We are inviting comments in writing by **5pm on Friday 25 April 2014.**

You can provide comments by:

- emailing:- norwich.transport@norfolk.gov.uk
- writing to:- Norwich Northern Distributor Road, Norfolk County Council, Department of Environment, Transport and Development, County Hall, Martineau Lane, Norwich, NR1 2DH

We will review the consultation responses received and consider whether to seek to alter the NDR scheme that was applied for in the application for a development consent order (DCO).

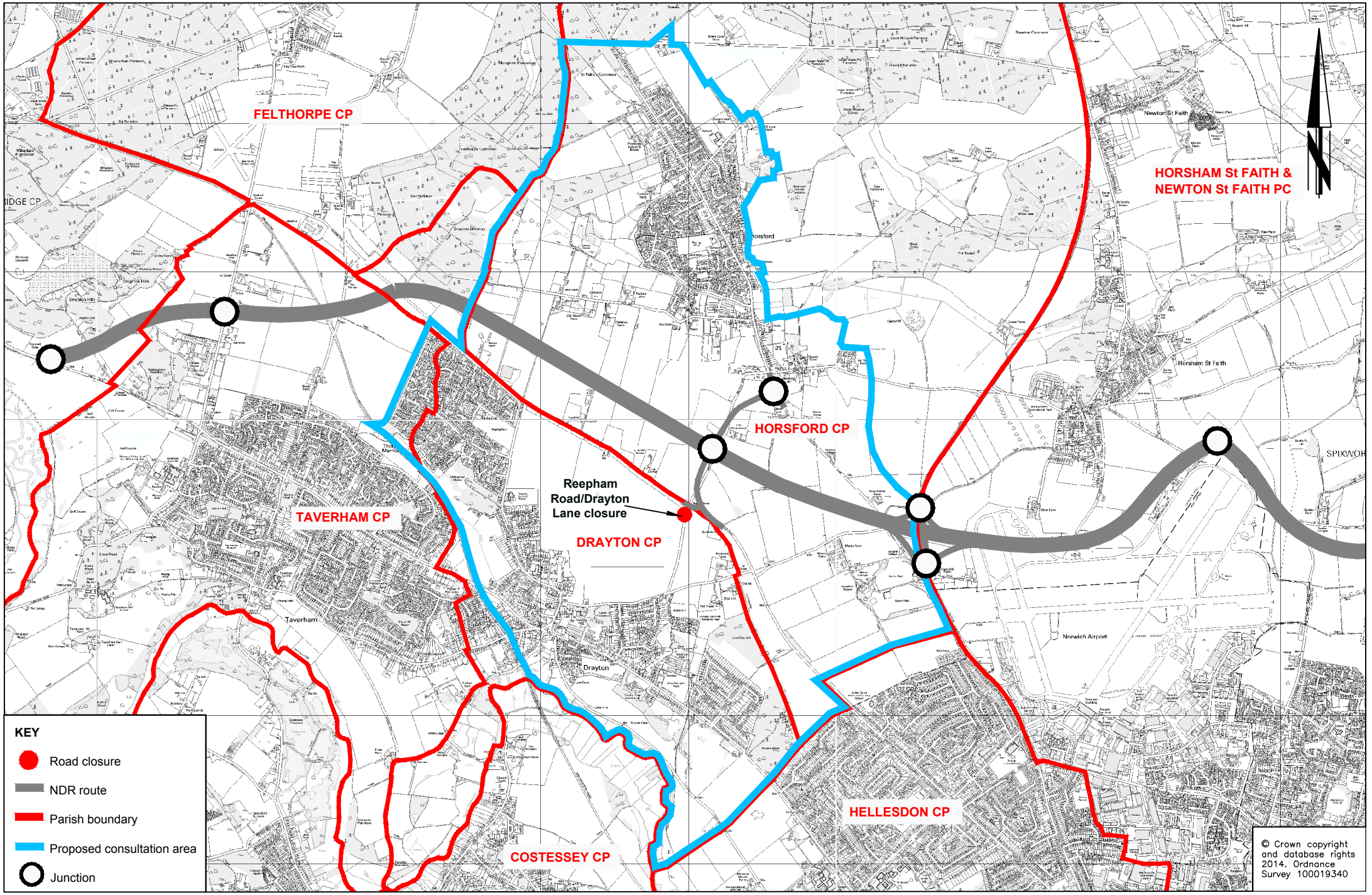
If we do seek to change the DCO application scheme following this consultation, then we will ask the Planning Inspectorate to permit an amendment to the NDR proposals. We would provide the Planning Inspectorate with revised or amended application plans and documents where relevant, and these would be made available for inspection.

If the scheme change is accepted by the Planning Inspectorate we expect that there would be another opportunity to make representations on it directly to them in due course.

Yours Sincerely

Matthew Harrison
Project Engineer

Encl.



Norfolk County Council

Tom McCabe
Interim Director of Environment, Transport and Development
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

NORWICH NORTHERN DISTRIBUTOR ROAD
DRAYTON LANE/REEPHAM ROAD CLOSURE
CONSULTATION AREA

REV.	DESCRIPTION	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY	OS	
DESIGNED BY	AC-J	03/14
DRAWN BY	AC-J	03/14
CHECKED BY	GB	03/14

DRAWING No. R1C093-R1-4801
PROJECT TITLE NORWICH NORTHERN DISTRIBUTOR ROAD
SCALE NTS @ A4
FILE No. R1C093

APPENDIX E: Report on Traffic, Safety and Economics for Drayton Lane (south) Modification

The Norfolk County Council (Norwich Northern Distributor Road (A1067 to A47(T))) Order

Report on Traffic, Safety and Economics for Drayton Lane (south) Modification

Planning Act 2008

Infrastructure Planning

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

PINS Reference Number: TR010015

Regulation Number: 5(2)(q)

Author: Mott MacDonald

Revision	Date	Description
0	28th April 2014	Revision for submission

Mott MacDonald Internal Audit			
Revision	**Originator**	**Checked By**	**Approved By**
0	S Sirivadidurage	G Gessa R Tyler	C White

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We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

MM filing ref: MM-*233906 DP01-Doc-011*

Table of Contents

List of Tables

List of Figures

1 Key Summary

1.1.1 Funding approval for the Norwich Northern Distributor Road (NDR) was sought in 2011 through the Department for Transport's (DfT) Development Pool process. A business case was developed and submitted in accordance with the guidance in the Treasury Green Book. Ministerial decisions were made in December 2011 to award funding.

1.1.2 The NDR is a project of national significance which requires a Development Consent Order (DCO) under the Planning Act 2008. The submission was made in January 2014.

1.1.3 The Transport Assessment for the Scheme is set out in submission document ref. 5.5. This included an operational assessment of the Scheme design with traffic forecasts based on the full implementation of JCS, as set out in the Traffic Forecasting Report document ref. 5.6 The forecasts were based on the transport model described in the Highway and Public Transport Local Model Validation Reports (document refs. 5.9 and 5.10) and showed that around Drayton the highway model was calibrated and validated to a reasonable standard. The transport assessment concluded that the Scheme design is considered to be the best possible balance between relieving the existing network whilst ensuring acceptable conditions on this new part of the network.

1.1.4 The Economic Appraisal Report (document ref. 5.7) shows that the Scheme would deliver very high value for money (VfM), the Benefit Cost Ratio (BCR) value exceeding 4, according to DfT's VfM criteria. In addition the Land Use and Economic Development Report (document ref. 10.3) sets out the substantial benefits of jobs, GVA and infrastructure investment that the Scheme would help to bring to the City.

1.1.5 Since the submission a modification to the Scheme at Drayton Lane (south) has been considered which would keep the junction open between the southern section of Drayton Lane and Reepham Road (it is closed in the proposed Scheme) and provide traffic calming measures on the local roads . This report contains the results of operational, safety and economic analyses which address this modification. This modification was subject to a public consultation in March/April 2014.

1.1.6 To assist in examining the proposed modification further traffic counts were conducted in November 2013 on Hall Lane (north) and Drayton Lane (south).

The report compares these as well as other count data with the modelled traffic.

1.1.7 Operational analysis results show that the junctions on Reepham Road with Drayton Lane (south), Hall Lane (north) and the link to the NDR will operate within desirable capacity in forecast years even with all traffic movements uplifted by an additional 10-20% in sensitivity tests. On these grounds it is concluded that the modification would be acceptable in operational terms.

1.1.8 A COBA accident analysis has been undertaken for the modified network. This shows that there would be fewer serious and slight casualties as a result of the shorter journey distance for traffic travelling between Drayton and Horsford and the NDR, as well as the effect of traffic management measures.

1.1.9 The economic analysis shows that with the modification the BCR will increase slightly to 4.22 (inclusive of accident benefits) and 5.41 when WEBs and JTR are included as can be seen from summary table below. Both of these represent very high value for money (BCR above 4) according to DfT's VfM criteria. It is not expected that the modification would have any impact on the economic development analysis.

Scenario	BCR (including accidents)	BCR (also including WEBs and JTR)
DCO submission	4.17	5.33
Scheme modifications for Drayton Lane	4.22	5.41

2 Introduction

2.1 Background

2.1.1 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.

2.1.2 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.

2.1.3 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. It is currently anticipated that the process will be completed in time for the Scheme to start construction in 2015 and to be opened in 2017.

2.1.4 This document is one of a number that support the DCO, each of which has its own unique document reference number, and should therefore be read in conjunction with the other documentation. The proposed layout of the NDR is shown in the General Arrangement Plans contained in document ref. 2.6, whilst the full needs case for the NDR is explained in the Statement of Reasons (document ref. 4.1) and the Environmental Statement (document ref. 6.1).

2.1.5 Funding approval for the NDR was sought in 2011 through the Department for Transport's (DfT) Development Pool process. A business case was developed and submitted in accordance with the guidance in the Treasury Green Book. Ministerial decisions were made in December 2011 to award funding.

2.1.6 The NDR DCO submission was submitted on 8th January 2014 and has been accepted for examination by the planning inspectorate on 4th February 2014. Since the submission there has been consideration of some modifications to the Scheme.

2.2 Purpose and Layout of Report

2.2.1 This report presents the results of analyses of the Scheme modification for Drayton Lane (south) and associated traffic management measures.

2.2.2 The report sets out:

- Examination of the highway model in the vicinity of Drayton
- The operational assessment of junctions affected by the proposed modification
- An assessment of the effect of the modification on accidents
- An assessment of economic benefits for consumer and business users.
- An assessment of the Scheme Value for Money (VfM). The Guidance on Value for Money describes the criteria used to determine the VfM of various types of schemes.

2.2.3 The methodology used to produce the economic appraisal is described in detail in DCO submission document ref. 5.7. This methodology was mainly retained for this sensitivity test.

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

- Section 3 – describes the proposed modification;
- Section 4 - presents the results of the analyses undertaken;
- Section 5 – presents conclusions from the appraisal.

2.2.5 Supporting information is included in a number of appendices in Section 6.

2.2.6 Sections 7 and 8 contain Abbreviations and Glossary.

3 Description of Drayton Lane (south) Modification

3.1.1 It is proposed to modify the published Scheme by leaving Drayton Lane South open at its junction with Reepham Road. Junction drawings and an overview plan of the area are included in Appendix A of this document. Table 3-1 summarises the key assumptions in terms of modelling and appraisal.

3.1.2 In consultation with representatives from the local community, the parish council and the Police, it is also proposed to implement traffic calming on Hall Lane and introduce a speed limit on Drayton Lane (south) irrespective of whether the NDR goes ahead to take account of existing local concerns about traffic flows and accidents. This is not part of the NDR scheme for which an application has been made, but it has been taken into account in analysis of the modification. Norfolk County Council will undertake a separate consultation on the proposed traffic calming in the future. This will be separate from and ahead of the delivery of the NDR scheme.

Table 3-1: Summary of Requirements – Drayton Lane Modifications

Scenario	Modelling required	Appraisal required	Additional requirements
Drayton Lane Open	Network modifications to 2017 and 2032 DS networks and rerunning assignments. Assume traffic calming on Hall lane and a 40 mph speed limit on Drayton Lane (south)	Economic appraisal. Safety appraisal. Comparison of traffic forecasts with DCO Scheme. Operational appraisal of three priority junctions.	No changes to DCO Scheme costs

4 Analyses of Drayton Lane (south) Modification

4.1 Base Traffic Flows

4.1.1 The traffic model developed for Norwich and for the appraisal of NDR is designed so that it is capable of forecasting the traffic impacts of the proposed measures, or alternatives to these, across the city network and surrounding area. To produce the most likely and credible forecasts it is necessary to start with a base model of sufficient accuracy and realistic assumptions about the changes in traffic demand and the behaviour of users. The Department for Transport (DfT) produce best practice guidance that sets standards that should be met in the development of the base model, and provides guidance and data for the realistic estimation of the future. The traffic model development has complied with this guidance and used the data made available by the DfT.

4.1.2 The traffic model was validated to meet DfT guidance targets and the validation results that support the latest traffic model are set out in the document 5.9 Highway Model - Local Model Validation.

4.1.3 This sets out how the latest survey data collected in 2012 has been used to build the traffic model shows that it provides a good representation of traffic behaviour in the study area. The base model is checked by comparing overall modelled flows across strategic cordons (rings) and screen lines. These global checks meet DfT criteria. On this basis it is considered that the base model forms a robust basis from which future year forecasts for the NDR scheme can be developed.

4.1.4 The calibration and validation in the local area around Drayton is considered to be good. This is illustrated by the results for the calibration screen line D shown in Tables S4, S15 and S26 for Drayton High Road (location D5), Reepham Road (D6) and Hall Lane (D7) and the validation screen line I shown in Tables S11, S22 and S33 for Hall Lane (I6) and School Road (I7).

4.1.5 Further counts were also carried out in 2013 on Drayton Lane (south) and Hall Lane (north) to support the investigation of a number of options to address the concerns raised regarding the closure of Drayton Lane. These showed noticeable differences on these two roads compared with the model although adding the two counts together produced corridor counts that matched very

closely with the validation count at location I6. Therefore it is considered that the model is acceptable for the appraisal of the Scheme and an alternative with Drayton lane kept open.

4.1.6 Table 6-6 to Table 6-8 in Appendix C compare observed and modelled flows for three local sites. These are Hall Lane west of George Drive, Hall Lane east of Drayton Lane (also referred to as Hall lane (north) and Drayton Lane (south). The observed data for Hall Lane west of George Drive were from 2012 surveys and refer to validation site I6 of the Document Ref. 5.9. The data for other two sites were collected in 2013 but used directly to compare against 2012 base model flows.

4.1.7 The results show that flow validation meets WebTAG validation criteria in terms of flow at all three sites. GEH at Drayton Lane is outside the acceptable range. It can also be seen that there is a local reassignment and Drayton Lane and Hall Lane are two alternative routes to get to Reepham Road north. In a strategic model like this calibration and validation are not heavily focussed at individual links at certain locations hence in our view the model represents a close fit with observed flows at strategic cordons and screenlines. It is also a reasonable fit for the Hall Lane corridor, so the tables show a comparison with Drayton Lane and Hall Lane (north) combined.

4.1.8 Whilst the two way total flow comparison at Hall Lane west of George Drive and Drayton Lane plus Hall Lane east of Drayton Lane meet the validation guidelines, these are necessarily more relaxed with roads that carry relatively low traffic flows such as these. The comparisons for the three time periods show that model flows are about 10% - 20% less compared to observed counts. Therefore junction operational assessments were also sensitivity tested with increases of 2032 turning flows by 10% and 20%.

4.2 Forecast Traffic Flows

4.2.1 The variable demand model (VDM) forecasts, which make allowance for traffic generation, redistribution and mode choice effects arising from introduction of the Scheme, have been prepared for the NDR proposed opening year of 2017 and the design year of 2032. These have been used in the assessment of the possible modification to Drayton lane (south).

4.2.2 The modelling completed shows that the main traffic impact of keeping Drayton Lane (south) open at its junction with Reepham Road, compared with the currently submitted Scheme, is a change in traffic movements from Hall

Lane (north) to Drayton Lane (south). The model suggests that there is also a reduction through Drayton on School Road, but that there is not quite the same reduction with Drayton Lane (south) kept open.

4.2.3 Figure 6.4 in Appendix A shows AADTs in the vicinity of Drayton. This compares AADTs with the Drayton Lane Scheme modification against submitted Scheme in which Drayton Lane (south) is closed. Table 6-1 and Table 6-2 contains peak hour flows at different locations in the network for 2017 and 2032 respectively.

4.2.4 The key changes in Annual Average Daily Traffic (AADT) flows are also shown in Table 4-1 below.

Table 4-1: Key Changes in AADT Flows

Location (Ref.)	2012 AADT	Without NDR AADT	NDR Proposed Scheme AADT	NDR with Drayton Lane (south) Open AADT
		2017		
Drayton Lane South (A117)	1,200	1,300	0	4,800
Hall Lane North (A115)	5,400	6,100	5,600	1,700
Reepham Road (A116)	7,700	8,500	14,600	11,300
School Road (A21)	10,500	11,400	9,400	10,500
		2032		
Drayton Lane South (A117)		1,600	0	5,700
Hall Lane North (A115)		7,200	6,800	1,700
Reepham Road (A116)		9,600	16,100	11,500
School Road (A21)		12,600	10,200	10,800

Notes: See Figure 6.4 for more details on site locations

4.3 Operational Assessment

4.3.1 **Error! Reference source not found.**Table 4-2 and Table 4-3 **Error! Reference source not found.**below contain summary operational assessment results for the local priority junctions most affected by the proposed modification (see Appendix B for detailed results). The Ratio of Flow to Capacity (RFC) output from PICADY is the primary measure of the performance (RFC<0.85 – junction arm operate within capacity, RFC>0.85 but <1.0 – junction arm is over its desired capacity but below theoretical capacity, RFC>1.0 – junction arm in excess of theoretical capacity). The tables present the highest RFC and queuing values for worst performing approach movement and the highest 15 minute period in the peak period. In

summary, the results show that the junctions will operate within desirable capacity in both the 2017 and 2032 forecast years.

Table 4-2: Summary operational assessment results – 2017

Priority junction	AM			PM		
	Queue (pcu)	Delay (sec)	RFC	Queue (pcu)	Delay (sec)	RFC
Drayton Lane/Reepham Road	1	11	0.39	1	14	0.50
Hall Lane/Reepham Road	0	14	0.32	0	13	0.21
NDR Link Road/Reepham Road	2	21	0.65	2	18	0.61

Notes: See Figure 6.1 for more details

4.3.2 The modelling results show that in 2017, the three Drayton Lane junctions will operate with minimal queuing and no congestion concerns.

4.3.3 The maximum RFC on the Drayton Lane/Reepham Road junction is 0.39 in the AM peak, and 0.50 in the PM peak. Both peak hours have a queue of one PCU.

4.3.4 The maximum RFC on the Hall Lane/Reepham Road junction is 0.32 in the AM peak, and 0.21 in the PM peak. The model shows that there would be no queueing in either peak hour.

4.3.5 The maximum RFC on the NDR Link Road/Reepham Road junction is 0.65 in the AM peak, and 0.61 in the PM peak. The model shows that there would be two queueing PCUs in each peak hour.

Table 4-3: Summary operational assessment results – 2032

Priority junction	AM			PM		
	Queue (pcu)	Delay (sec)	RFC	Queue (pcu)	Delay (sec)	RFC
Drayton Lane/Reepham Road	1	13	0.48	1	15	0.56
Hall Lane/Reepham Road	0	14	0.26	0	14	0.26
NDR Link Road/Reepham Road	2	21	0.64	2	20	0.66
10% increase in traffic volume						
Drayton Lane/Reepham Road	1	14	0.54	2	18	0.62
Hall Lane/Reepham Road	0	17	0.31	0	17	0.32
NDR Link Road/Reepham Road	3	30	0.73	3	29	0.75
20% increase in traffic volume						
Drayton Lane/Reepham Road	1	17	0.59	2	22	0.69
Hall Lane/Reepham Road	1	20	0.37	1	21	0.38
NDR Link Road/Reepham Road	5	53	0.82	5	48	0.85

Notes: See Figure 6.1 for more details

4.3.6 The results for 2032 using the traffic flows directly from the forecast model (the first three rows in Table 4-3) show that the three Drayton Lane junctions will operate within desirable capacity with minimal queues.

4.3.7 The maximum RFC on the Drayton Lane/Reepham Road junction is 0.48 in the AM peak, and 0.56 in the PM peak. Both peak hours have a queue of one PCU.

4.3.8 The maximum RFC on the Hall Lane/Reepham Road junction is 0.26 in both the AM peak and the PM peak. The model shows that there would be no queueing in either peak hour.

4.3.9 The maximum RFC on the NDR Link Road/Reepham Road junction is 0.64 in the AM peak, and 0.66 in the PM peak. The model shows that there would be two queueing PCUs in each peak hour.

4.3.10 The results show that for both future years, the three Drayton Lane junctions will operate within desirable capacity, with minimal queuing and no congestion concerns.

4.3.11 The results show that all junctions operate acceptably even when traffic levels are increased by 10% and 20%. The junctions would operate within the desirable capacity limit RFC of 0.85 and only small queues would form. The longest queue at the NDR Link Road/Reepham Road junction of five vehicles with a 20% uplift on all traffic movements would occur for the right turn movement into Reepham Road. The proposed layout would accommodate this queue in the ghost island refuge.

4.4 Safety Assessment

4.4.1 **Error! Reference source not found.**Table 4-4 below compares accident benefits from the COBA accident assessment for the Drayton Lane modification against the DCO Scheme.

Table 4-4: Drayton Lane Accident Assessment with Local Accident Rates

60 Year Appraisal Period		Scenario	
		DCO	Drayton Lane
Do Minimum			
Number of PIAs		70,984	70,984
Casualties	Fatal	1,890	1,890
	Serious	12,597	12,597
	Slight	91,490	91,490

Accident Costs		5,999,332	5,999,332
Do Something			
Number of PIAs		69,944	69,920
Casualties	Fatal	1,898	1,897
	Serious	12,488	12,483
	Slight	90,226	90,189
Accident Costs		5,958,113	5,955,940
Accident Benefits			
Number of PIA savings		1,041	1,064
Casualties	Fatal	-7	-7
	Serious	109	114
	Slight	1,263	1,301
Accident Savings £000s		41,219	43,392

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

4.4.2 This shows that there would be fewer serious and slight casualties as a result of the shorter journey distance for traffic travelling between Drayton and Horsford and the NDR, as well as the effect of traffic management measures. The results show that the scheme with Drayton Lane modification saves an additional 23 PIAs compared to the DCO Scheme over the 60 year appraisal period. With the reduction in accidents the modified Scheme would produce £43.39m of monetory benefits in 2010 prices discounted to 2010.

4.5 Economic Appraisal Results

4.5.1 The results of the assessment of user benefits and user charges are shown in the TEE table of the TUBA output file which is presented in Table 6.9 in Appendix D. All values quoted are in 2010 prices, discounted to 2010. The TEE table shows that the NDR scheme with Drayton Lane (south), including traffic management measures achieves total transport economic efficiency benefits of about £708m in the 60 year assessment period. The results of the Transport Economic Efficiency assessment, show significant efficiency benefits for all trip purposes. Business trips, constitute the highest proportion of the reported user benefits.

4.5.2 Table 6.10 in Appendix D shows total user benefits by time period. This shows that the NDR scheme with Drayton Lane (south), including traffic management measures has a large impact on all time periods. The Scheme will provide significant benefits to traffic movements in the inter peak as well as peak periods. The ratio of benefits per hour is about half in the inter peak compared with the AM peak and in the PM peak (2 hours) the benefits are

little lower than the AM peak. Therefore the profile of the benefits matches expectations for a scheme such as NDR.

4.5.3 Table 6.11 in Appendix D provides the public accounts summary in 2010 prices discounted to 2010.

4.5.4 Table 4-5 below compares monetised costs and benefits including accident benefits for modifications for Drayton Lane (south), including traffic management measures, against the DCO Scheme. The cost difference with the modification is inconsequential, so the scheme cost inputs remain the same (although note that PVC figures can be altered in other aspects).

Table 4-5: Analysis of Monetised Costs and Benefits – Scheme Modifications for Drayton Lane

Item	Accidents included (£000)	
	DCO	Drayton Lane
Accidents (not assessed by TUBA)*	41,219	43,392
Greenhouse Gases	-22,756	-22,433
Economic Efficiency: Consumer Users (Commuting)	51,164	52,160
Economic Efficiency: Consumer Users (Other)	380,623	383,798
Economic Efficiency: Business Users and Providers	267,797	271,935
Wider Public Finances (Indirect Taxation Revenues)	55,270	54,463
Present Value of Benefits (PVB)	773,317	783,315
Broad Transport Budget Present Value of Costs (PVC)	185,542	185,508
OVERALL IMPACTS		
Net Present Value (NPV)	587,775	597,807
Benefit to Cost Ratio (BCR)	4.168	4.223

Notes: All monetary values are expressed in 2010 prices discounted to 2010 and calculated using TUBA1.9.3. It is assumed that there are no changes to scheme costs due to Drayton Lane modifications.
* The lower conservative accident benefit is included based upon the use of local accident data, as explained in section 7 of Document ref. 5.7, See Section 4.2 for more details.

4.5.5 The results show that the Present Value of Benefits (PVB) with the Drayton Lane modification is estimated to be £783m (inclusive of accident benefits) about £10m higher than the DCO Scheme, outweighing the £186m Present Value of Costs (PVC).

4.5.6 The Benefit Cost Ratio (BCR) of the Scheme with the Drayton Lane modification is 4.22 including accidents. Under the DfT's value for money criteria, this represents a Very High value for money category.

4.5.7 Table 4-6 below compares summary economic appraisal results including wider impacts and journey time reliability for scheme modifications for Drayton Lane sensitivity test against the DCO Scheme.

Table 4-6: Summary of Economic Appraisal including Wider Benefits – Scheme Modifications for Drayton Lane

Item	Scenario also including WEBs and JTR (£000)	
	DCO	Drayton Lane
Present Value of Benefits (PVB)	989,063	1,003,786
Present Value of Costs (PVC)	185,542	185,508
Net Present Value (NPV)	803,521	818,278
Benefit to Cost Ratio (BCR)	5.331	5.411

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

4.5.8 The BCR is improved further to 5.41 once journey time reliability benefits (£29m) and wider economic benefits (£192m) are included in the appraisal. These additional benefits amount to £221m (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. Table 6.12 and Table 6.13 in Appendix D provide summary Wider impacts and Reliability benefits respectively.

5 Conclusion

5.1.1 An operational, safety and economic appraisal was undertaken for the Drayton Lane modification. The NATS transport model provides the required transport inputs for the analysis.

5.1.2 Operational analysis results show that associated junctions will operate within desirable capacity in forecast years even with an additional 10-20% of traffic. Operational analysis results also indicate that the effect of Drayton Lane changes are localised and that the three priority junctions tested operate acceptably in both peaks and forecast years.

5.1.3 An appraisal of accidents using COBA shows that the Scheme with the Drayton Lane modification saves an additional 23 PIAs compared to the DCO Scheme over the 60 year appraisal period.

5.1.4 The economic appraisal of the Scheme with the Drayton Lane modification shows a slight increase in the values for BCR and VfM. The BCR increases to 4.22 (inclusive of accident benefits) and 5.41 when WEBs and JTR are included. Both of these represent very high value for money (BCR above 4) according to DfT's VfM criteria.

6 Appendices

6.1 Appendix A – Drayton Lane Scheme Modifications

6.1.1 Figure 6.1 to Figure 6.3 below contains Scheme modifications for Drayton Lane. Figure 6.4 provides traffic flow comparisons with and without Drayton Lane closure. Table 6-1 and Table 6-2 contains peak hour traffic flows for 2017 and 2032 respectively.

Figure 6.1: Scheme Modifications for Drayton Lane_1

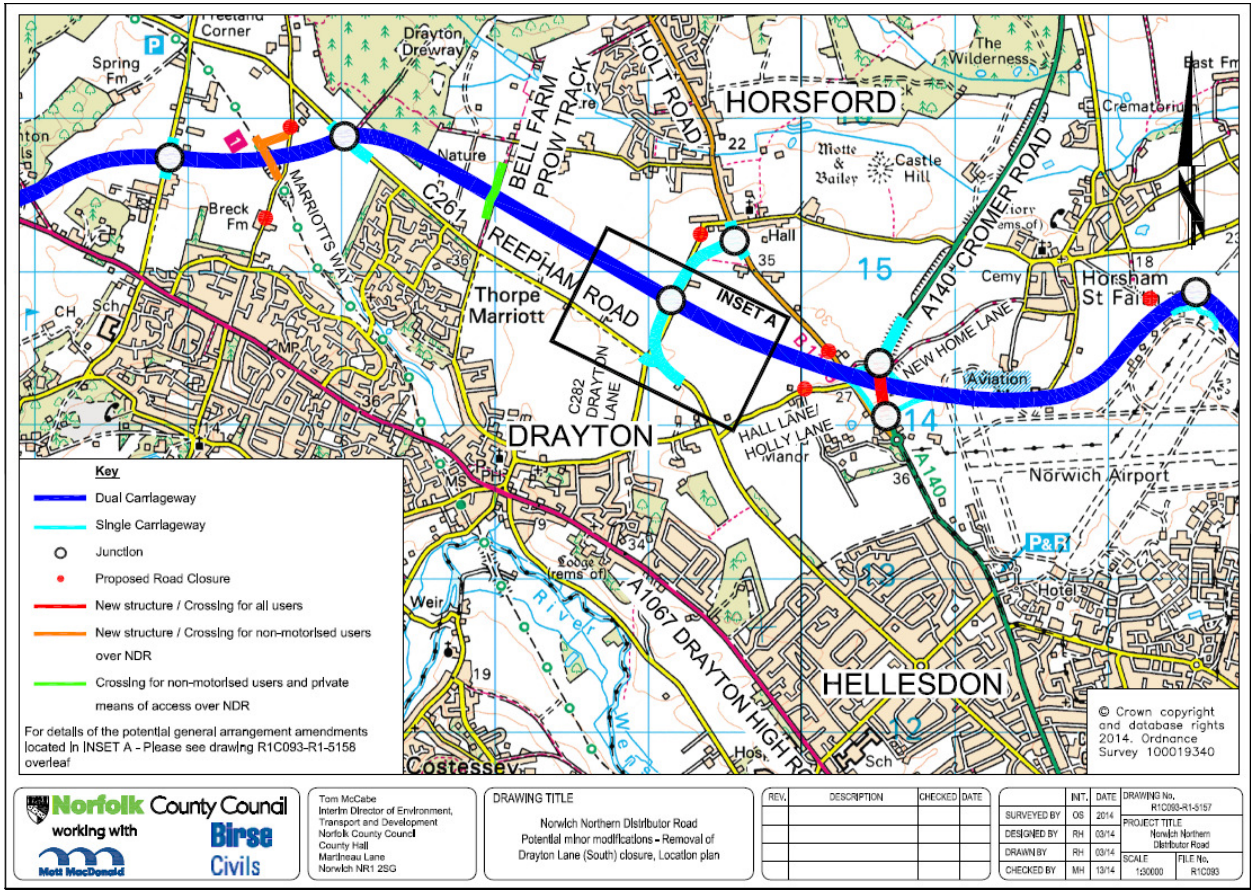

Figure 6.2: Scheme Modifications for Drayton Lane_2

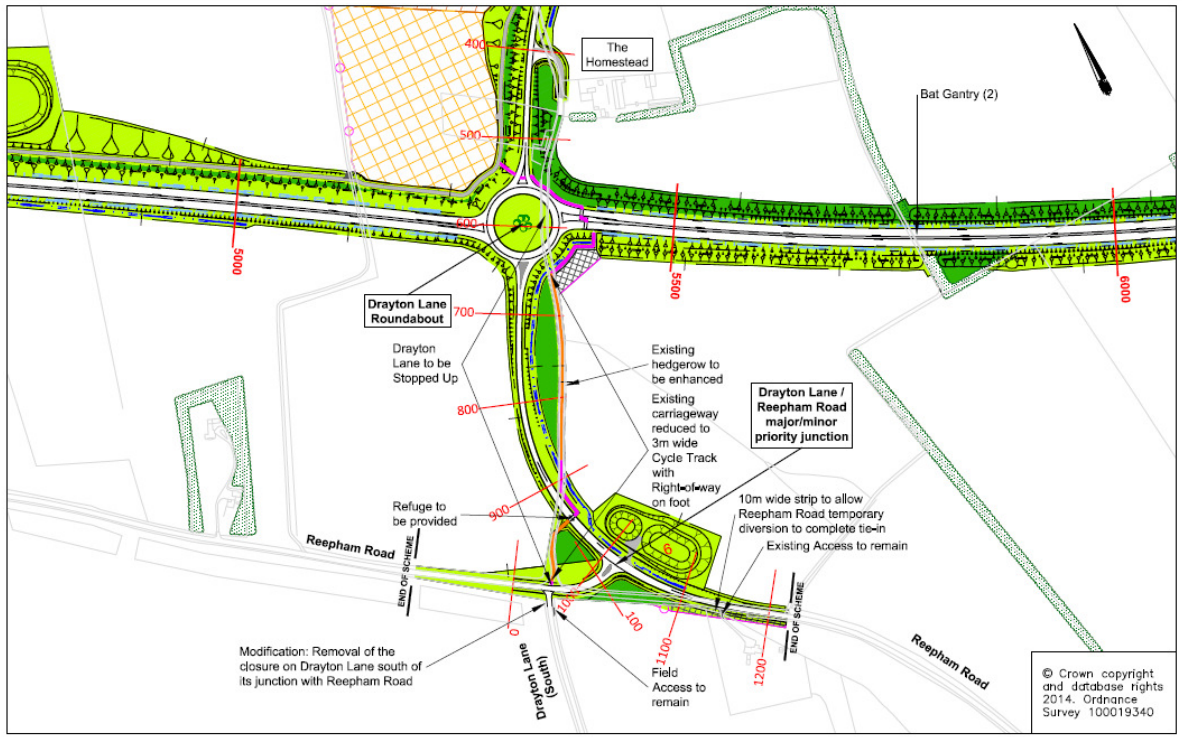

Figure 6.3: Scheme Modifications for Drayton Lane_3

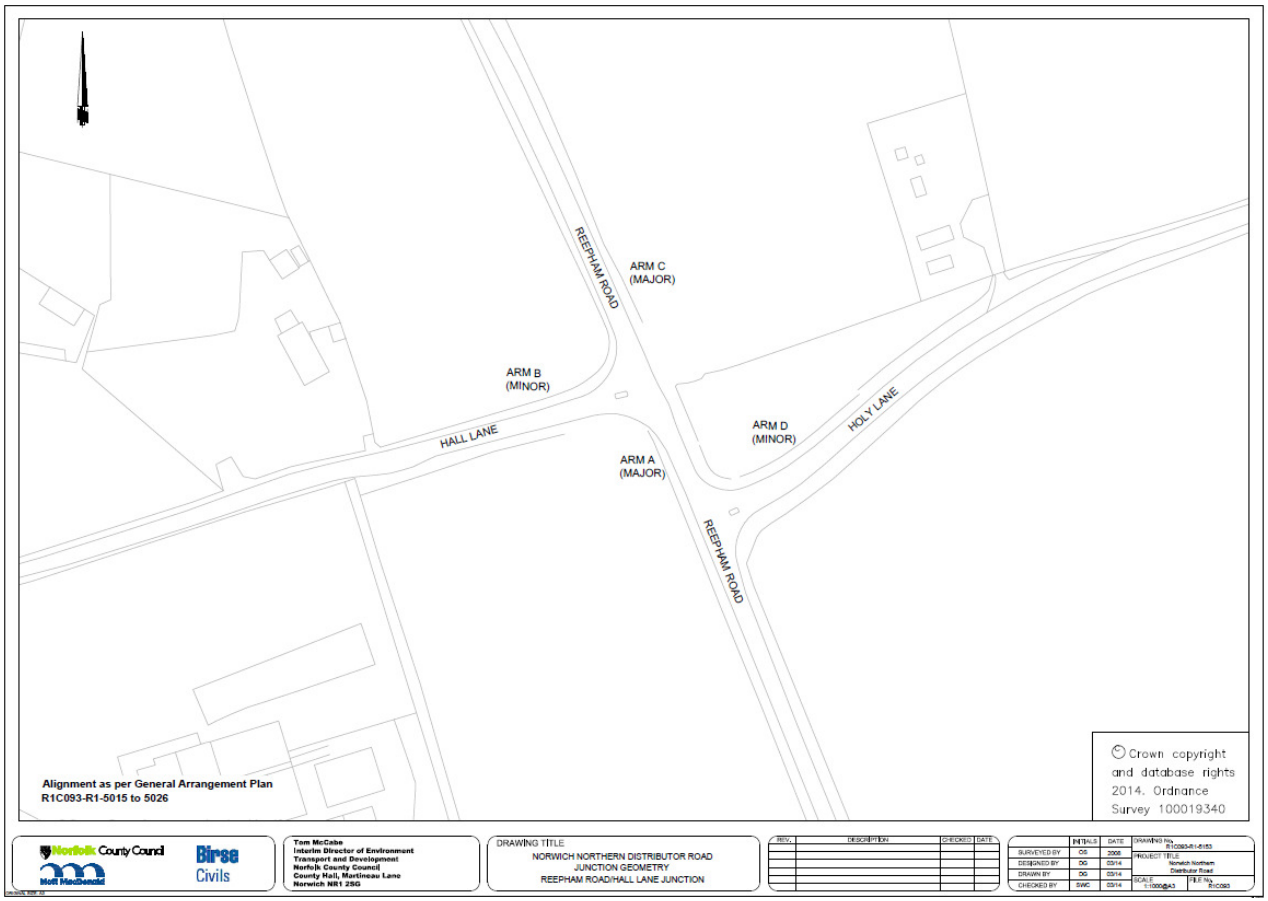

Figure 6.4: Flow comparison with DCO

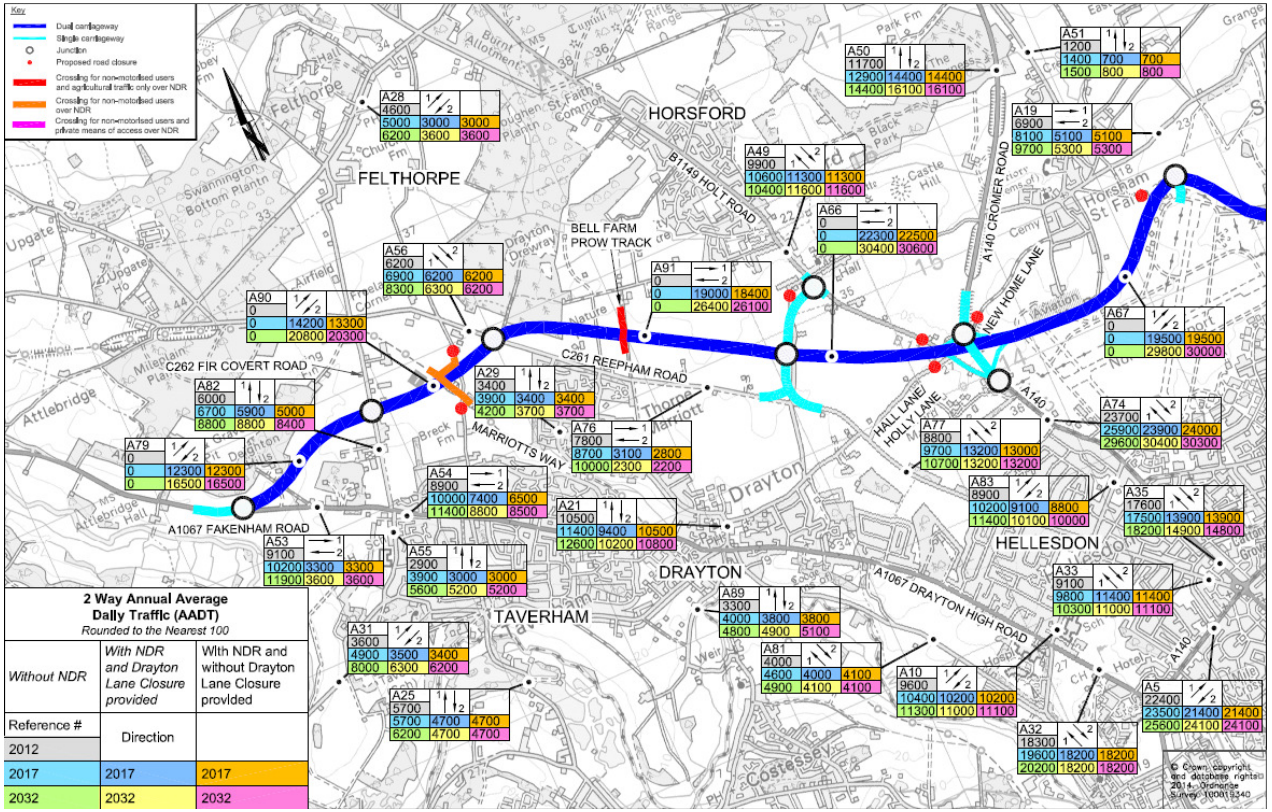

Table 6-1: 2017 Peak Hour Flows (vehicles)

Location	Movements (1/2)	2017 AM		2017 IP		2017 PM	
		1	2	1	2	1	2
A1	NB/SB	420	470	280	400	550	590
A2	WB/EB	230	80	100	70	170	220
A3	WB/EB	180	80	20	60	140	160
A4	WB/EB	100	40	0	20	10	60
A5	NEB/SWB	870	1110	630	830	930	1060
A6	WB/EB	1110	520	700	580	840	850
A7	NWB/SEB	1070	1170	680	710	1020	1050
A8	NWB/SEB	590	790	430	470	600	690
A9	NB/SB	290	630	270	320	400	340
A10	NEB/SWB	370	310	400	310	540	310
A11	WB/EB	670	510	240	350	350	820
A12	WB/EB	80	20	130	10	270	20
A13	WB/EB	120	100	80	90	170	130
A14	WB/EB	120	150	70	60	170	110
A15	NWB/SEB	60	70	50	40	100	60
A16	NWB/SEB	No link	No link	No link	No link	No link	No link
A17	NB/SB	120	120	80	70	150	130
A18	NWB/SEB	210	170	120	130	170	190
A19	WB/EB	230	250	140	200	200	300
A20	NB/SB	350	420	310	280	410	380
A21	NB/SB	370	670	320	390	450	460
A22	NB/SB	120	180	90	90	150	190

A23	NWB/SEB	No link	No link	No link	No link	No link	No link
A24	WB/EB	130	110	100	70	180	100
A26	NB/SB	1500	940	890	830	1000	1270
A27	WB/EB	1270	1350	850	930	1110	1260
A28	WB/EB	100	220	80	110	170	130
A29	NEB/SWB	160	110	140	80	200	150
A30	NB/SB	60	20	60	30	100	30
A32	NB/SB	620	740	680	550	840	500
A33	NEB/SWB	390	470	360	480	310	720
A34	NWB/SEB	670	700	630	560	800	630
A35	NWB/SEB	600	650	460	500	580	670
A36	NWB/SEB	70	30	60	60	50	140
A37	NWB/SEB	670	600	340	430	530	770
A38	NB/SB	220	150	180	230	310	220
A39	NB/SB	60	510	40	170	110	160
A40	NB/SB	110	200	80	30	150	140
A41	NB/SB	320	520	320	280	570	370
A42	NB/SB	500	710	480	460	690	490
A43	NB/SB	570	840	600	530	850	580
A44	NB/SB	320	490	370	390	530	390
A45	NEB/SWB	420	640	440	440	570	500
A46	NEB/SWB	540	630	510	550	600	590
A47	NEB/SWB	500	540	460	440	680	510
A48	NEB/SWB	490	410	420	350	580	460
A49	NEB/SWB	440	730	360	370	620	410
A50	WB/EB	510	800	490	510	700	540

A51	NWB/SEB	30	30	20	30	30	30
A52	NB/SB	160	390	110	140	290	220
A53	NB/SB	130	190	90	100	150	130
A54	NB/SB	340	360	190	210	300	350
A55	WB/EB	110	210	70	100	220	150
A56	WB/EB	250	360	190	190	360	290
A57	NB/SB	590	980	530	540	950	640
A58	NWB/SEB	410	540	300	300	540	340
A59	NB/SB	720	960	610	650	970	820
A60	NB/SB	370	470	300	300	460	390
A61	NEB/SWB	290	590	260	270	450	340
A62	NEB/SWB	470	650	410	380	570	520
A63	NEB/SWB	170	260	140	150	250	200
A64	NEB/SWB	2310	1650	1420	1490	1810	2350
A65	NEB/SWB	1690	800	800	750	1040	1570
A66	WB/EB	960	1370	660	760	1210	1140
A67	WB/EB	1100	910	620	640	950	980
A68	WB/EB	910	1100	640	620	980	950
A69	NEB/SWB	1180	1630	850	850	1460	1320
A70	WB/EB	1420	2010	1010	1050	1790	1570
A71	WB/EB	1440	2160	1080	1150	1930	1660
A72	NWB/SEB	1270	2050	1030	1050	1940	1470
A73	NWB/SEB	2020	1660	950	980	1610	1410
A74	NB/SB	850	1360	770	840	1290	980
A75	NB/SB	230	350	260	230	410	270
A76	NWB/SEB	90	90	110	100	160	60

A77	NWB/SEB	520	580	520	400	750	380
A78	WB/EB	50	50	40	30	60	50
A79	NWB/SEB	650	580	410	400	650	620
A80	NWB/SEB	80	160	100	100	150	100
A81	NEB/SWB	60	400	130	170	260	180
A82	NWB/SEB	250	310	140	170	290	280
A83	NWB/SEB	640	240	320	230	430	290
A84	NB/SB	310	380	240	280	320	410
A85	NEB/SWB	110	170	90	100	170	130
A86	NEB/SWB	10	40	10	10	20	30
A87	NEB/SWB	220	130	130	100	170	170
A88	NWB/SEB	80	100	50	60	80	130
A25	WB/EB	170	280	150	150	290	190
A31	WB/EB	130	240	90	110	260	170
A89	NB/SB	240	150	140	100	210	200
A90	NEB/SWB	740	620	420	430	710	720
A91	WB/EB	830	1070	590	560	1050	940
A92	NB/SB	240	580	340	280	580	270
A93	EB/WB	130	10	20	0	80	20
A94	EB/WB	140	10	30	10	90	30
A95	NWB/SEB	150	260	140	120	310	130
A96	NWB/SEB	140	330	160	130	360	140
A97	NWB/SEB	0	0	0	0	0	0
A98	NWB/SEB	110	80	120	90	150	120
A99	NWB/SEB	No link	No link	No link	No link	No link	No link
A100	NWB/SEB	No link	No link	No link	No link	No link	No link

A101	NWB/SEB	90	240	60	90	150	150
A102	EB/WB	240	80	80	60	140	150
A103	NB/SB	10	160	20	40	80	20
A104	NB/SB	20	140	10	40	60	30
A105	NB/SB	170	180	120	110	150	190
A106	NB/SB	200	160	110	110	180	170
A107	NB/SB	50	160	90	100	140	70
A108	NB/SB	160	40	30	20	80	120
A109	NB/SB	130	160	80	80	60	150
A110	NB/SB	20	0	0	20	0	20
A111	NB/SB	120	160	70	110	250	140

Table 6-2: 2032 Peak Hour Flows (vehicles)

Location	Movements (1/2)	2032					
		AM		IP		PM	
		1	2	1	2	1	2
A1	NB/SB	500	510	430	480	650	700
A2	WB/EB	270	70	130	130	220	330
A3	WB/EB	190	10	10	100	150	230
A4	WB/EB	80	10	0	20	0	110
A5	NEB/SWB	960	1220	730	930	1000	1150
A6	WB/EB	1220	630	760	680	870	870
A7	NWB/SEB	970	1200	720	800	980	1040
A8	NWB/SEB	500	760	420	510	520	740
A9	NB/SB	300	650	280	330	330	360

A10	NEB/SWB	420	310	440	320	520	320
A11	WB/EB	710	430	280	390	370	890
A12	WB/EB	60	20	100	10	170	20
A13	WB/EB	130	110	100	110	130	180
A14	WB/EB	120	160	90	80	170	130
A15	NWB/SEB	70	120	50	40	190	70
A16	NWB/SEB	No link	No link	No link	No link	No link	No link
A17	NB/SB	410	560	310	290	500	500
A18	NWB/SEB	200	180	140	140	130	200
A19	WB/EB	240	210	140	210	190	350
A20	NB/SB	240	430	250	310	370	480
A21	NB/SB	350	660	340	410	470	510
A22	NB/SB	110	340	90	120	140	170
A23	NWB/SEB	No link	No link	No link	No link	No link	No link
A24	WB/EB	120	110	120	100	140	100
A26	NB/SB	1570	1020	980	930	1010	1310
A27	WB/EB	1330	1380	940	1120	1190	1270
A28	WB/EB	110	270	100	130	200	150
A29	NEB/SWB	190	140	150	80	210	160
A30	NB/SB	60	110	70	20	210	90
A32	NB/SB	650	710	710	500	810	460
A33	NEB/SWB	390	470	350	470	340	630
A34	NWB/SEB	800	640	680	590	790	600
A35	NWB/SEB	720	560	510	540	660	660
A36	NWB/SEB	40	20	60	50	40	190
A37	NWB/SEB	680	580	360	450	510	820

A38	NB/SB	290	140	170	240	250	190
A39	NB/SB	80	480	50	140	130	140
A40	NB/SB	100	230	60	40	100	160
A41	NB/SB	280	400	350	220	560	360
A42	NB/SB	530	650	460	500	720	470
A43	NB/SB	630	960	690	630	950	740
A44	NB/SB	320	440	400	420	520	390
A45	NEB/SWB	580	680	510	490	580	580
A46	NEB/SWB	580	660	510	560	590	700
A47	NEB/SWB	440	520	440	450	530	550
A48	NEB/SWB	480	430	460	450	580	560
A49	NEB/SWB	450	660	390	400	580	410
A50	WB/EB	550	850	560	580	750	610
A51	NWB/SEB	40	30	30	30	30	30
A52	NB/SB	200	500	110	110	270	230
A53	NB/SB	140	190	110	100	170	140
A54	NB/SB	400	430	270	300	390	440
A55	WB/EB	360	280	120	150	380	280
A56	WB/EB	260	370	190	200	340	280
A57	NB/SB	680	890	650	660	990	710
A58	NWB/SEB	580	520	330	290	600	480
A59	NB/SB	1000	1090	790	830	1060	1120
A60	NB/SB	510	530	420	490	560	600
A61	NEB/SWB	530	790	480	500	880	900
A62	NEB/SWB	690	780	650	600	650	930
A63	NEB/SWB	160	460	140	160	350	210

A64	NEB/SWB	2490	1700	1730	1780	1770	2420
A65	NEB/SWB	1720	1020	1070	980	1030	1750
A66	WB/EB	1300	1830	960	1020	1600	1520
A67	WB/EB	1620	1500	950	980	1570	1370
A68	WB/EB	1500	1620	980	950	1370	1570
A69	NEB/SWB	1660	2030	1300	1320	1830	1880
A70	WB/EB	1890	2320	1480	1470	2010	2070
A71	WB/EB	1910	2470	1620	1700	1870	1610
A72	NWB/SEB	1800	2440	1710	1620	2230	1550
A73	NWB/SEB	2640	1830	1610	1420	2040	1020
A74	NB/SB	1240	1460	1030	1080	1470	1340
A75	NB/SB	210	460	280	260	410	310
A76	NWB/SEB	50	60	90	100	100	30
A77	NWB/SEB	580	540	530	400	760	420
A78	WB/EB	50	40	30	30	50	30
A79	NWB/SEB	750	820	560	590	830	810
A80	NWB/SEB	70	140	80	70	80	90
A81	NEB/SWB	90	350	130	180	250	220
A82	NWB/SEB	530	420	230	300	480	460
A83	NWB/SEB	610	300	380	290	430	320
A84	NB/SB	210	440	180	340	310	530
A85	NEB/SWB	100	380	90	100	290	150
A86	NEB/SWB	10	40	10	20	20	20
A87	NEB/SWB	390	140	130	110	220	240
A88	NWB/SEB	70	270	50	90	80	130
A25	WB/EB	150	280	160	150	280	160

A31	WB/EB	460	370	140	180	450	340
A89	NB/SB	260	250	170	150	270	280
A90	NEB/SWB	1140	920	640	720	1070	1070
A91	WB/EB	1200	1510	880	800	1430	1330
A92	NB/SB	240	560	320	310	580	280
A93	EB/WB	130	30	30	10	90	120
A94	EB/WB	340	90	100	80	150	260
A95	NWB/SEB	350	410	180	90	380	280
A96	NWB/SEB	270	630	250	160	530	270
A97	NWB/SEB	80	160	60	60	130	90
A98	NWB/SEB	290	410	270	230	470	310
A99	NWB/SEB	700	830	440	350	710	830
A100	NWB/SEB	500	1000	330	220	770	680
A101	NWB/SEB	180	870	170	240	510	340
A102	EB/WB	880	90	210	150	270	510
A103	NB/SB	40	630	110	140	460	160
A104	NB/SB	130	430	90	130	260	220
A105	NB/SB	300	150	220	180	240	260
A106	NB/SB	190	160	120	130	210	190
A107	NB/SB	250	260	140	150	210	150
A108	NB/SB	130	160	50	60	180	220
A109	NB/SB	140	160	100	90	70	170
A110	NB/SB	20	10	40	10	20	0
A111	NB/SB	220	190	130	160	370	230

6.2 Appendix B – Detailed Junction Analysis Results

6.2.1 Table 6-3 to Table 6-5 contain detailed junction analysis results. Sensitivity tests results are also included by increasing traffic movements by 10% and 20% in 2032. It should be noted that a zero entry in the tables is shown when there is no forecast traffic turning movement (for example from Drayton Lane to Reepham Road west) or that the turning traffic would not interrupt the freeflow straight ahead movement (for example Reepham Road west to Reepham Road east and Drayton Lane). This means there would be no queues or delays for these movements.

Table 6-3: Detailed Operational Assessment Results – Drayton Lane and Reepham Road Junction

Junction arm	AM			PM		
	Queue (pcu)	Delay (sec)	RFC	Queue (pcu)	Delay (sec)	RFC
2017						
Drayton Lane to Reepham Road east	1	11	0.386	1	14	0.502
Drayton Lane to Reepham Road west	0	0	0	0	0	0
Reepham Road west to Reepham Road east and Drayton Lane	0	0	0	0	0	0
2032						
Drayton Lane to Reepham Road east	1	13	0.483	1	15	0.556
Drayton Lane to Reepham Road west	0	0	0	0	0	0
Reepham Road west to Reepham Road east and Drayton Lane	0	0	0	0	0	0
2032 – 10% increase in traffic volume						
Drayton Lane to Reepham Road east	1	14	0.538	2	18	0.620
Drayton Lane to Reepham Road west	0	0	0	0	0	0
Reepham Road west to Reepham Road east and Drayton Lane	0	0	0	0	0	0
2032 – 20% increase in traffic volume						
Drayton Lane to Reepham Road east	1	17	0.593	2	22	0.687
Drayton Lane to Reepham Road west	0	0	0	0	0	0

Junction arm	AM			PM		
	Queue (pcu)	Delay (sec)	RFC	Queue (pcu)	Delay (sec)	RFC
Reepham Road west to Reepham Road east and Drayton Lane	0	0	0	0	0	0

Notes: See Figure 6.1 for more details

Table 6-4: Detailed Operational Assessment Results – Hall Lane and Reepham Road Junction

Junction arm	AM			PM		
	Queue (pcu)	Delay (sec)	RFC	Queue (pcu)	Delay (sec)	RFC
2017						
Hall Lane to Reepham Road SB	0	15	0.323	0	13	0.214
Hall Lane to Reepham Road NB	0	0	0	0	0	0
Reepham Road north to Reepham Road south and Hall Lane	0	0	0	0	0	0
2032						
Hall Lane to Reepham Road SB	0	14	0.259	0	14	0.262
Hall Lane to Reepham Road NB	0	0	0	0	0	0
Reepham Road north to Reepham Road south and Hall Lane	0	0	0	0	0	0
2032 – 10% increase in traffic volume						
Hall Lane to Reepham Road SB	0	17	0.311	0	17	0.316
Hall Lane to Reepham Road NB	0	0	0	0	0	0
Reepham Road north to Reepham Road south and Hall Lane	0	0	0	0	0	0
2032 – 20% increase in traffic volume						
Hall Lane to Reepham Road SB	1	20	0.374	1	21	0.380
Hall Lane to Reepham Road NB	0	0	0	0	0	0
Reepham Road north to Reepham Road south and Hall Lane	0	0	0	0	0	0

Notes: See Figure 6.1 for more details

Table 6-5: Detailed Operational Assessment Results – NDR Link Road and Reepham Road Junction

Junction arm	AM			PM		
	Queue (pcu)	Delay (sec)	RFC	Queue (pcu)	Delay (sec)	RFC
2017						
Reepham Road west to Reepham Road south	1	21	0.374	0	16	0.185
Reepham Road west to NDR Link Road	1	9	0.349	1	10	0.453
NDR Link Road to Reepham Road south and Reepham Road west	2	19	0.645	2	18	0.605
2032						
Reepham Road west to Reepham Road south	0	21	0.308	0	17	0.146
Reepham Road west to NDR Link Road	1	10	0.432	1	10	0.463
NDR Link Road to Reepham Road south and Reepham Road west	2	19	0.644	2	20	0.655
2032 – 10% increase in traffic volume						
Reepham Road west to Reepham Road south	1	30	0.412	0	22	0.193
Reepham Road west to NDR Link Road	1	13	0.513	1	12	0.531
NDR Link Road to Reepham Road south and Reepham Road west	3	26	0.732	3	29	0.747
2032 – 20% increase in traffic volume						
Reepham Road west to Reepham Road south	1	53	0.576	0	32	0.279
Reepham Road west to NDR Link Road	2	20	0.645	2	16	0.615
NDR Link Road to Reepham Road south and Reepham Road west	5	40	0.824	5	48	0.848

Notes: See Figure 6.1 for more details

6.3 Appendix C – Flow Comparison Results

6.3.1 Table 6-6 to Table 6-8 show observed and modelled flow comparison at three locations around Drayton.

Table 6-6: Base Flow Comparison Results – AM peak

Road name	Direction	Traffic flow (veh)							Cars (veh)						
							Validation							Validation	
		Count	Model	Diff	% Diff	GEH	Flow	GEH	Count	Model)	Diff	% Diff	GEH	Flow	GEH
Hall Lane west of George Drive*	EB	303	267	-36	-11.9%	2.14	✓	✓	261	223	-39	-14.8%	2.49	✓	✓
	WB	442	416	-26	-6.0%	1.27	✓	✓	373	360	-13	-3.5%	0.68	✓	✓
Hall Lane east of Drayton Lane	EB	229	236	8	3.3%	0.50	✓	✓	207	198	-9	-4.3%	0.63	✓	✓
	WB	224	232	8	3.6%	0.53	✓	✓	198	183	-15	-7.5%	1.08	✓	✓
Drayton Lane south of Reepham Road	NB	108	31	-77	-71.4%	9.27	✓	×	92	25	-67	-73.0%	8.76	✓	×
	SB	220	184	-36	-16.4%	2.54	✓	✓	202	178	-24	-11.8%	1.73	✓	✓
Two-way flow comparison															
Hall Lane west of George Drive*		745	683	-63	-8.4%	2.34	✓	✓	635	583	-52	-8.1%	2.09	✓	✓
Hall Lane east of Drayton Lane + Drayton Lane		781	683	-98	-12.5%	3.61	✓	✓	698	584	-115	-16.4%	4.52	✓	✓

Notes: *Site I6 of base validation screenline I

Table 6-7: Base Flow Comparison Results – Interpeak

Road name	Direction	Traffic flow (veh)							Cars (veh)						
							Validation							Validation	
		Count	Model	Diff	% Diff	GEH	Flow	GEH	Count	Model)	Diff	% Diff	GEH	Flow	GEH
Hall Lane west of George Drive*	EB	233	174	-58	-25.0%	4.08	✓	✓	196	140	-55	-28.3%	4.28	✓	✓

Road name	Direction	Traffic flow (veh)					Validation		Cars (veh)					Validation	
		Count	Model	Diff	% Diff	GEH	Flow	GEH	Count	Model)	Diff	% Diff	GEH	Flow	GEH
	WB	297	250	-47	-15.7%	2.82	✓	✓	252	211	-41	-16.2%	2.68	✓	✓
Hall Lane east of Drayton Lane	EB	145	151	6	3.8%	0.45	✓	✓	131	121	-9	-7.0%	0.82	✓	✓
	WB	206	221	15	7.2%	1.02	✓	✓	186	184	-1	-0.7%	0.10	✓	✓
Drayton Lane south of Reepham Road	NB	96	24	-72	-75.3%	9.33	✓	×	84	19	-65	-77.4%	9.05	✓	×
	SB	105	29	-76	-72.1%	9.26	✓	×	96	27	-69	-72.1%	8.82	✓	×
Two-way flow comparison															
Hall Lane west of George Drive*		530	425	-105	-19.8%	4.80	✓	✓	448	351	-96	-21.5%	4.82	✓	✓
Hall Lane east of Drayton Lane + Drayton Lane		553	425	-128	-23.1%	5.78	✓	×	496	351	-144	-29.1%	7.01	✓	×

Notes: *Site I6 of base validation screenline I

Table 6-8: Base Flow Comparison Results – PM peak

Road name	Direction	Traffic flow (veh)					Validation		Cars (veh)					Validation	
		Count	Model	Diff	% Diff	GEH	Flow	GEH	Count	Model)	Diff	% Diff	GEH	Flow	GEH
Hall Lane west of George Drive*	EB	300	234	-65	-21.8%	4.00	✓	✓	257	191	-67	-25.9%	4.45	✓	✓
	WB	452	378	-74	-16.4%	3.63	✓	✓	403	344	-59	-14.6%	3.05	✓	✓

Road name	Direction	Traffic flow (veh)							Cars (veh)						
							Validation							Validation	
		Count	Model	Diff	% Diff	GEH	Flow	GEH	Count	Model)	Diff	% Diff	GEH	Flow	GEH
Hall Lane east of Drayton Lane	EB	166	189	23	13.7%	1.71	✓	✓	152	150	-3	-1.7%	0.21	✓	✓
	WB	323	320	-3	-0.8%	0.15	✓	✓	300	290	-10	-3.3%	0.57	✓	✓
Drayton Lane south of Reepham Road	NB	129	45	-84	-65.0%	9.01	✓	×	113	41	-72	-63.6%	8.19	✓	×
	SB	123	58	-65	-53.1%	6.87	✓	×	112	54	-58	-51.9%	6.39	✓	×
Two-way flow comparison															
Hall Lane west of George Drive*		752	612	-139	-18.5%	5.33	✓	×	660	535	-126	-19.0%	5.14	✓	×
Hall Lane east of Drayton Lane + Drayton Lane		742	612	-129	-17.4%	4.97	✓	✓	677	535	-143	-21.1%	5.79	✓	×

Notes: *Site I6 of base validation screenline I

6.4 Appendix D – Additional Economic Analysis Results

6.4.1 Table 6.9 to Table 6.11 contain Transport Economic Efficiency, total user benefits by time period and Public Accounts tables respectively. Table 6.12 and Table 6.13 include wider economics and reliability summary tables.

Table 6.9: Transport Economic Efficiency (TEE)

Item	Benefit (£000s)
Consumer - Commuting user benefits	
Travel Time	62,407

Item	Benefit (£000s)
Vehicle operating costs	-13,137
User charges	2,891
During Construction & Maintenance	0
NET CONSUMER - COMMUTING BENEFITS	52,160
Consumer - Other user benefits	
Travel Time	302,078
Vehicle operating costs	-113,624
User charges	195,344
During Construction & Maintenance	0
NET CONSUMER - OTHER BENEFITS	383,798
Business Impacts	
Travel Time	410,027
Vehicle operating costs	-20,934
User charges	2,664
During Construction & Maintenance	0
Sub Total	391,757
Private Sector Provider Impacts	
Revenue	-119,822
Operating costs	0
Investment costs	0
Grant/subsidy	0
Sub Total	-119,822

Item	Benefit (£000s)
Other business Impacts	0
Developer contributions	271,935
NET BUSINESS IMPACT	
TOTAL	
Present Value of Transport Economic Efficiency Benefits (TEE)	707,893

Notes: All monetary values are expressed in 2010 prices discounted to 2010

Table 6.10: Total User Benefit by Time Period

Time Period	Annualisation	Total User Benefit (£m)
Weekday AM	246	78.5
Weekday PM	481	126.2
Weekday Inter Peak	2,298	336.1
Weekday Off Peak	3,056	80.9
Weekend (all hours)	3,667	206.0

Notes: All monetary values are expressed in 2010 prices discounted to 2010

Table 6.11: Summary of Public Accounts

Item	Cost (£000s)
Local Government Funding	

Item	Cost (£000s)
Revenue	28,801
Operating Costs	17,806
Investment Costs	62,333
Developer Contributions	0
Grant/Subsidy Payments	0
NET IMPACT	108,940
Central Government Funding: Transport	
Revenue	0
Operating costs	0
Investment costs	76,568
Developer Contributions	0
Grant/Subsidy Payments	0
NET IMPACT	76,568
Central Government Funding: Non-Transport	
Indirect Tax Revenues	-54,463
TOTALS	
Broad Transport Budget	185,508
Wider Public Finances	-54,463

Notes: All monetary values are expressed in 2010 prices discounted to 2010

Table 6.12: Summary Wider Economic Benefits of NDR

	Year 2017 (£)	Year 2032 (£)	Full Appraisal Period (£)
Agglomeration – manufacturing	378,542	220,589	12,214,134
Agglomeration – construction	310,155	192,957	10,540,175
Agglomeration - consumer services	952,786	737,712	38,697,610
Agglomeration - producer services	2,438,782	1,638,093	88,146,730
Agglomeration – Total	4,080,265	2,789,351	149,598,649
Labour supply impact	46,398	74,798	2,769,389
Increased output in imperfectly competitive market			39,175,700
The move to more/less productive jobs			Not assessed
Total	4,126,663	2,864,149	191,543,738

Notes: All entries are in £ in 2010 prices discounted to 2010

Table 6.13: NDR Reliability Benefits

Model Year	Reliability Benefits (£000s)
Full (60yrs) Appraisal	28,927

Notes: Benefits are in 2010 prices and discounted to 2010

7 Abbreviations

AADT	Annual Average Daily Traffic
ATC	Automatic Traffic Count
BAFB	The Best And Final funding Bid submitted by Norfolk County Council to the Department for Transport in 2011 for the combined Postwick and NDR Schemes
BCR	Benefit Cost Ratio
COBA	Cost Benefit Appraisal – software released by the Department of Transport that has been used to undertake an accident appraisal
DfT	Department for Transport
DIADEM	Dynamic Integrated Assignment and Demand Modelling - software released by the Department for Transport
GEH	A comparison statistic named after GE Havers
IP	Inter-peak
JCS	Joint Core Strategy
JTR	Journey Time Reliability
LMVR	Local Model Validation Report
NATS	Norwich Area Transportation Strategy
NCC	Norfolk County Council
NDR	Norwich Northern Distributor Road
NPV	Net Present Value – given by subtracting the Present Value Costs (PVC) from Present Value Benefits (PVB)
PIA	Personal Injury Accident
PPK	Pence Per Kilometre
PPM	Pence Per Minute
PT	Public Transport
PVB	Present Value Benefits – the stream of benefits over the appraisal period (60 years) that are converted to 2010 prices and discounted to 2010 to give a 'present value'
PVC	Present Value Costs – the costs of the Scheme over the construction period as well as maintenance and operational costs that are converted to 2010 prices and discounted to 2010 to give a 'present value'
P&R	Park and Ride
RFC	Ratio of Flow to Capacity
TA	Transport Assessment
TEMPRO	Trip End Model presentation Program is software released by the Department for Transport to allow detailed analysis of NTEM data
TUBA	Transport User Benefit Appraisal – software released by the Department for Transport that is used to assess transport user benefits of transport schemes
VDM	Variable Demand Modelling

VfM	Value for Money
VOT	Value Of Time
WEBs	Wider Economic Benefits
WebTAG	Web-based Transport Appraisal Guidance produced by the Department for Transport
WITA	Wider Impacts in Transport Appraisal

8 Glossary

Assignment	A process of loading a trip matrix onto routes through a network that accounts for travel costs on the network in identifying the optimum route choice for every trip
Calibration	A process of adjusting the model input data or model parameters to improve the model and its validation
Convergence	An equilibrium between model outputs, in assignment between the flows and travel costs and in demand models between the demand and the costs from the supply model
Cost matrix	A table of travel costs for journeys that may include travel time, operating costs and charges such as tolls or fares
Demand model	See variable demand model
Discounting	Discounting is a technique used to compare costs and benefits that occur in different time periods. It is based on the principle known as time preference that people prefer goods and services now rather than later. This preference for goods and services now rather than later applies to both individuals and society. By applying a discount rate, streams of costs and benefits are reduced to their present values.
Do Minimum	The forecast scenario without the proposed transport scheme, but that includes committed transport network improvements and developments
Do Something	The Do Minimum network but with the proposed transport scheme and developments added
Generalised cost	A combination of time and money costs (operating costs and charges) that are expressed in time or money units which are used to represent the total travel costs for a journey within the assignment or demand models
Network	A mathematical representation of a transport network in a supply-side assignment model, either a highway network which represents vehicle travel, or a public transport network that represents bus and rail services
Reference trip matrix	A forecast reference matrix based on applying growth from national (or other) datasets, but before the application of adjustments due to the impact of how travel costs will change with growth in travel
Trip matrix	A table representing travel in a model area between land areas or zones
Validation	A process of comparing the model data with independent data
Variable demand modelling	A model that forecasts changes in travel behaviour such as trip frequency, choice of mode, time of travel and trip distribution
Zone	An area of land or development which is used in a transport model to aggregate individual households or commercial premises into a manageable number of units that can be used to represent journey patterns in the study area. Usually the zone size will be relatively small in the study area, but progressively larger further away from it.