

# Post Opening Project Evaluation

## A1 Peterborough – Blyth Grade Separated Junctions Five Years After Study



**Final**  
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# Executive Summary

## Scheme Description

The A1 Peterborough – Blyth Grade Separated Junctions scheme is a major Highways England scheme to improve a 73 mile length the A1 trunk road in the East Midlands at Blyth, Apleyhead, Markham Moor, Gonerby Moor, Colsterworth and Carpenters Lodge. The scheme involved the construction of six new two level junctions, resulting in the removal of all the at-grade roundabouts on this section of the A1. The A1 improvements were carried out by Highways England to reduce congestion and accidents at these junctions. The schemes were appraised separately and have separate Appraisal Summary Tables (ASTs). This evaluation also reports the results separately for each junction wherever possible.

## Scheme Objectives

Objectives (from Environmental Statements, 2004/2005)	Objective Achieved?
<b>Reduce Delays</b>	✓
<b>Reduce Accidents</b>	✓
<b>Improve non-motorised user safety</b>	✓

## Summary of Scheme Impacts

### Traffic

#### Traffic Volumes

- Traffic on the A1 has shown year-on-year increase from 2009 when the scheme was completed to 2015. This is notably different from the trends seen on the local roads in all the areas of the junctions in this scheme, and on 'A' roads nationally which all saw a fall or negligible growth during this period, which is associated with economic conditions.
- Increases on the A1 traffic were observed at OYA and were linked with the combined effect of the junction improvements of this scheme improving the attractiveness of this route, leading to rerouting of traffic. This FYA study shows that in 2014 and early 2015 there were further large increases such that traffic on sections of the A1 near these junctions is between 16% and 36% higher than before start of construction. This most recent sharp rise is higher in the northern part and is probably caused by rerouting of some strategic traffic away from the parallel M1, more than 30 miles to the east, where there is a lengthy section of roadworks currently underway for a smart motorway scheme.
- HGV levels on this part of the A1 are at a high level for the strategic network at an average of 22% on weekdays. At FYA, the numbers of HGVs has increased from before, but as the numbers of other vehicles has increased at a greater rate, the proportion of HGVs has reduced slightly an average of 24%. This is likely to be due to more of the additional traffic being light vehicles and much less rerouting of HGVs.
- Local roads adjoining the junctions have shown varying levels of increase and some decreases. There is no clear pattern of traffic growth on these roads comparable with the growth rate observed on the A1.
- Some local traffic from the area east of the A1 may have rerouted to access the A1 at Apleyhead instead of the next junction to the north (Blyth).

## Journey Times

- Post opening journey times on the A1 are consistently lower in both directions at all times of the day in the post opening period, and the FYA journey times are an improvement on the OYA journey times, despite the increased traffic flows.
- The journey time data provides sufficient evidence to conclude that the scheme has achieved its objective in reducing delays.

## Forecasting Accuracy

- At FYA most traffic flows on the A1 and the adjoining roads are below the central growth forecast with the scheme.
- The net increase in traffic with the scheme (i.e. the difference between the Do Minimum and Do Something scenarios and growth between the years 2006 and 2015) on the A1 is much greater than predicted at Blyth, Apleyhead, Markham Moor and Gonerby Moor junctions.
- Discrepancies from the forecasts were caused by the 2006 observed data before the start of construction being lower than the forecast Do Minimum prior to any recession impacts on traffic flows. This meant that the forecast were already awry before construction started. Also A1 traffic at Gonerby Moor was mistakenly forecasted to be too high which appears to be due to an error in the baseline.
- Journey time savings on the length of the A1 between the junctions are between 8 and 10 minutes (northbound and southbound) which is close to the level of saving forecast.

## Safety

- Annual average number of collisions at all the junctions in the post opening period fell by 8.7 (13%). This is conservative as it takes into account the wider trend of collision reduction nationally during this period whereas there did not appear to be a trend of reduction at the A1 junctions.
- Although numbers of both fatal and serious collisions fell, the number of the much more frequent slight collisions fell at a greater rate, resulting in an increase in the severity index of the collisions which occurred (the proportion of collisions which were either fatal or serious).
- Considerable variation in the observed safety impact of each junction improvement.
- Net reductions in annual collision numbers have been observed at the three northerly junctions Blyth (3.7), Apleyhead (4.3), and Markham Moor (7.0). Analysis of collision rates at these junctions, which takes into account the extra traffic (PIC/mvkm), show these improvements are statistically significant.
- No improvement has been shown at the three southernmost junctions (Gonerby Moor, Colsterworth and Carpenters Lodge), although the small increase in collisions is not statistically significant.
- Fatal and serious collision numbers fell by 6 and 8 respectively, not including wider national trends.
- Analysis of the collision rate, taking into account the additional traffic (PIC/mvkm), shows an overall reduction in the rate of 26% which is significant.
- There is no significant change in the collision rate for traffic on full length of the A1.
- Forecast collision savings were accurate for the three northerly junctions, while the southern three did not have the expected savings. Overall the saving was 13% when 33% had been predicted. The lower success can be partly attributed to local trend not following national collision reduction trend and the additional traffic on the A1.

## Environment

- Impact of the junctions on the noise climate are considered to be generally better than expected based on difference between the forecasts and the observed traffic flows at FYA .
- Similarly, the air quality impacts are lower than or within +/-10% tolerance of the forecasts. The A1 south of Blyth is the only real exception where the flow traffic is worse than expected.
- Impacts on landscape are worse than expected due to problems with plant growth. Despite replacement planting having been undertaken, the current levels of plant growth and establishment

indicate that the visual screening, landscape integration, and visual amenity functions of the plant stock at all junctions is generally considered unlikely to be developing as well as would expected at this stage. Similarly, the slower plant growth is making the short term ecological impact worse than expected.

- The visual impact on the landscape at night is better than forecast due to the overbridges not being lit.
- Biodiversity impact is worse than expected in the short term due to the ecological impact of the slow establishment of the new tree and shrub planting. Offsite planting at Apleyhead for badger foraging has not been done. A significant section of the translocated hedgerow at Carpenters Lodge has failed. Some of the planned wildflower areas have been noted as successful but others are missing.
- There were no significant archaeological finds and the impact of cultural heritage is as expected.
- Drainage facilities constructed as part of the new junctions are largely working as expected and planted vegetative treatment systems (rushes) appeared to have generally established well.

## Accessibility and Integration

- Impacts of the junction on land use policies and other government policies are mainly neutral, as expected and as concluded at the OYA stage
- There has been no change in option values resulting from the scheme, therefore, the evaluated impact is neutral as concluded in the OYA and as expected.
- The scheme has not had an impact on the provision of transport interchange facilities, therefore a neutral impact has been observed as expected and as concluded in the OYA stage.

## Summary of Scheme Economic Performance

All monetary values in £m 2002 market prices, discounted		Forecast	Outturn re-forecast
Present Value Benefits	Journey Times	£1023.8 m	£397.1 m
	Vehicle Operating Costs (VOC)	-£6.7 m	-£8.2 m
	Safety	£42.6 m	£17.4 m
	Indirect Tax	£1.3 m	£1.6 m
	Total	£1061.0 m	£407.8 m
Present Value Costs		£66.4 m	£86.8 m
Benefit Cost Ratio (BCR)		16.0	4.7

- The investment cost of building the scheme was 13% above that predicted. Reasons for this include the additional maintenance following the collision involving the chemical spill and fire at Blyth junction, shortly after it opened.
- The journey time benefits are evaluated as £397.1 million over 60 years for the A1 corridor and turning movements at the junctions. This is much lower than the expected level of benefits and this is partly due to traffic being lower than expected, despite the traffic growth since before the scheme was built. Due to the nature of the improvements, journey time benefits would be expected from the opening of the scheme due the removal of delays to A1 through traffic at the junctions.
- BCR is lower than the very high forecast BCR partly due to the higher than expected costs, but primarily due to the lower than forecast journey time benefits as fewer vehicles use the A1 than expected. However the outturn BCR still represents over £4 benefits for every £1 spent which represents very high value for money.

# 1. Introduction

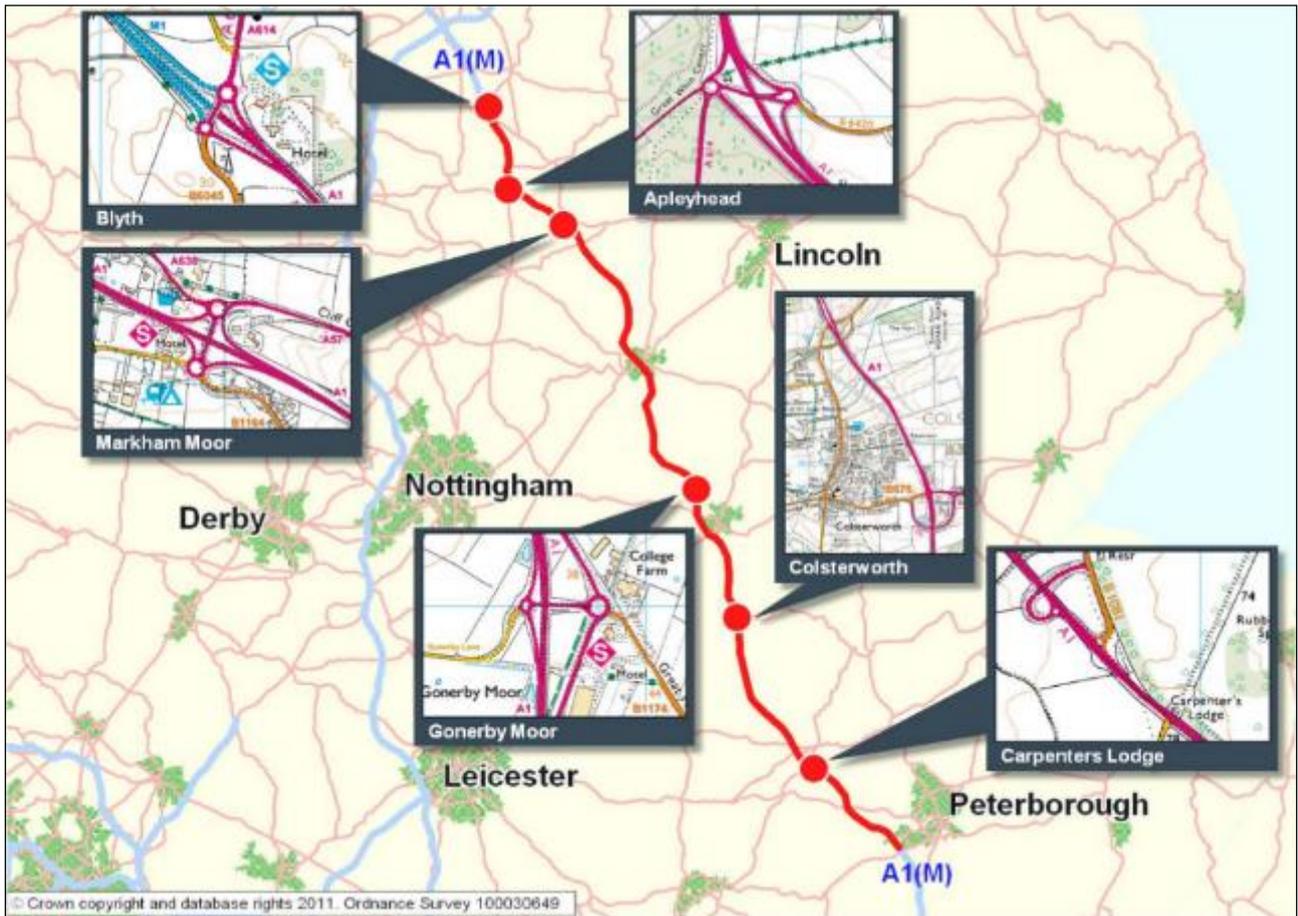
## Background to Scheme

- 1.1 The A1 Peterborough – Blyth Grade Separated Junctions scheme is a major Highways England scheme to improve a 73 mile (117km) length of the A1 trunk road in the East Midlands. The scheme involved the construction of six new grade separated junctions at the following locations, listed from north to south:
- **Blyth** (A1/A614);
  - **Apleyhead** (A1/A614/A57);
  - **Markham Moor** (A1/A57);
  - **Gonerby Moor** (A1/B1174);
  - **Colsterworth** (A1/A151) and the junction of A1/B6403; and
  - **Carpenters Lodge** (A1/B1081).
- 1.2 Throughout this report, the junctions are listed in this north-south order.
- 1.3 This report presents the results of the Five Years After study for all the junctions within the scheme (the final junction was completed in October 2009), and has been prepared as part of the Post Opening Project Evaluation (POPE) commission on behalf of Highways England.

## Scheme Location

- 1.4 The A1 is a route of national strategic importance, providing an alternative to the M1 for strategic north - south movements across the country. It also forms an important link between the communities along it and the rest of the country. It carries a mixture of local, long distance and seasonal holiday traffic.
- 1.5 The section of the A1 considered in this report connects two motorway-standard sections of the route, now designated A1(M), between Peterborough and South Yorkshire and it includes intersections with several strategic east-west routes including the A57, A46 and A52.
- 1.6 The scheme passes through Nottinghamshire, Lincolnshire and the Peterborough Unitary Authority, and lies mostly within Highways England Area 7 but with the southernmost junction within Highways England Area 6. The location of the scheme and its context within the road network is shown in **Figure 1.1** overleaf.

Figure 1.1 – Location Map



## Scheme Objectives

1.7 Each junction was appraised separately but they all shared common objectives. The scheme objectives stated in each of the Environmental Statements, dated variously 2004 or 2005, can be summarised as:

- **Reduce Delays** – The separation of the A1 and local traffic at the junctions will significantly reduce delays, for both through and local traffic;
- **Reduce Accidents** - The removal of the A1 through traffic from the junctions will remove the potential for accidents at the junction by reducing traffic volumes and potentially dangerous crossing movements; and
- **Improve Non-Motorised User (NMU) Safety** – The provision of appropriate facilities allow non-motorised users to negotiate the junction more safely, reducing severance.

## Historical Context

1.8 This report is the study of the single Major Scheme known as A1 Peterborough - Blyth. However each of the junction improvements within the scheme was originally developed separately. **Table 1.1** shows the history of the proposed improvements at the individual junctions. This also details the construction start and completion dates which illustrates that there were roadworks on this section of the A1 between September 2006 and October 2009.

**Table 1.1 – History of the Junction Improvements**

Stage	Blyth	Apleyhead	Markham Moor	Gonerby Moor	Colsterworth	Carpenters Lodge
Preferred Route Announcement	Spring 2003	Dec 04	Mar 05	Feb 05	Mar 05	Feb 05
Draft Orders Published	Feb 05	Feb 05	Jun 05	Mar 05	Jul 05	Mar 05
Public Inquiry	Sep 05	Sep 05	Mar 06	Nov 05	May 06	Nov 05
Secretary of State's Decision	Jan 06	Jan 06	Oct 06	May 06	Sep 06	Jul 06
Made Orders Published	Jun 06	Jul 06	Nov 06	Aug 06	Jan 07	Dec 06
Start of Works	Sep 06	Sep 06	Mar 07	Oct 06	Jul 07	Jul 07
Completion of Works	May 08 then Mar 2010 <sup>1</sup>	May 08	Mar 09	Jun 08	Oct 09	Nov 08

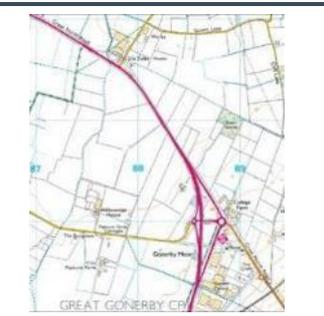
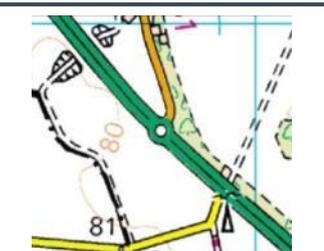
## Scheme Description

- 1.9 **Table 1.2** provides a summary of the works that were carried out at each junction within the scheme together with a map showing the before and after opening junction layouts. More detailed diagrams showing the post opening junction layouts are shown in **Appendix A (page 125)**.

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<sup>1</sup> A major lorry fire and chemical spill occurred at Blyth Junction (A1/A614) in August 2009 shortly after the completion of the junction improvements. Repairs have delayed the handover of the junction to the Area 7 MAC and Nottinghamshire County Council. The fire damage repairs had a limited impact on A1 traffic flows but had a greater impact on local traffic flows east-west across the junction.

Table 1.2 – Summary of works undertaken at each junction

Junction (opening date)	Junction Layout		Summary of works undertaken
	Before Scheme	After Opening	
<b>Blyth</b> (May 2008)			<ul style="list-style-type: none"> <li>• Removal of existing at-grade roundabout and replacement with two smaller roundabouts in 'dumb-bell' arrangement;</li> <li>• Provision of NMU routes over the A1; and</li> <li>• Lighting around the roundabouts.</li> </ul>
<b>Apleyhead</b> (May 2008)			<ul style="list-style-type: none"> <li>• Construction of new section of A1 carriageway and new dumb-bell junction;</li> <li>• Removal of existing A1 north of roundabout;</li> <li>• B6420 realigned to join with roundabout;</li> <li>• Provision of NMU routes over the A1; and</li> <li>• Lighting around the roundabouts.</li> </ul>
<b>Markham Moor</b> (March 2009)			<ul style="list-style-type: none"> <li>• Removal of existing at-grade roundabout and replacement with dumb-bell junction;</li> <li>• Realignment of connecting side roads;</li> <li>• Provision of NMU routes over the A1; and</li> <li>• Lighting around the roundabouts.</li> </ul>
<b>Gonerby Moor</b> (June 2008)			<ul style="list-style-type: none"> <li>• Construction of new section of A1 carriageway;</li> <li>• Previously existing A1 southbound carriageway converted to on/off slip for A1;</li> <li>• Additional arm provided;</li> <li>• Realignment of Gonerby lane;</li> <li>• Provision of NMU routes over the A1; and</li> <li>• Lighting around the roundabouts.</li> </ul>
<b>Colsterworth</b> (October 2009)			<ul style="list-style-type: none"> <li>• Removal of existing at-grade roundabout;</li> <li>• Construction of two smaller roundabouts and overbridge; and</li> <li>• Provision of NMU routes over the A1.</li> </ul>
<b>Carpenters Lodge</b> (November 2008)			<ul style="list-style-type: none"> <li>• Removal of roundabout and replacement with two pairs of slip roads; and</li> <li>• Construction of NMU routes over the A1.</li> </ul>

## Nearby Schemes

1.10 There are five Highways England Major Schemes in the vicinity of the A1 junction improvements considered in this study. The location of the schemes in relation to the A1 is shown in **Figure 1.2**. A summary of the key dates in relation to both of these schemes is contained in **Table 1.3**.

**Table 1.3 – Summary of Key Dates Relating to Nearby Schemes**

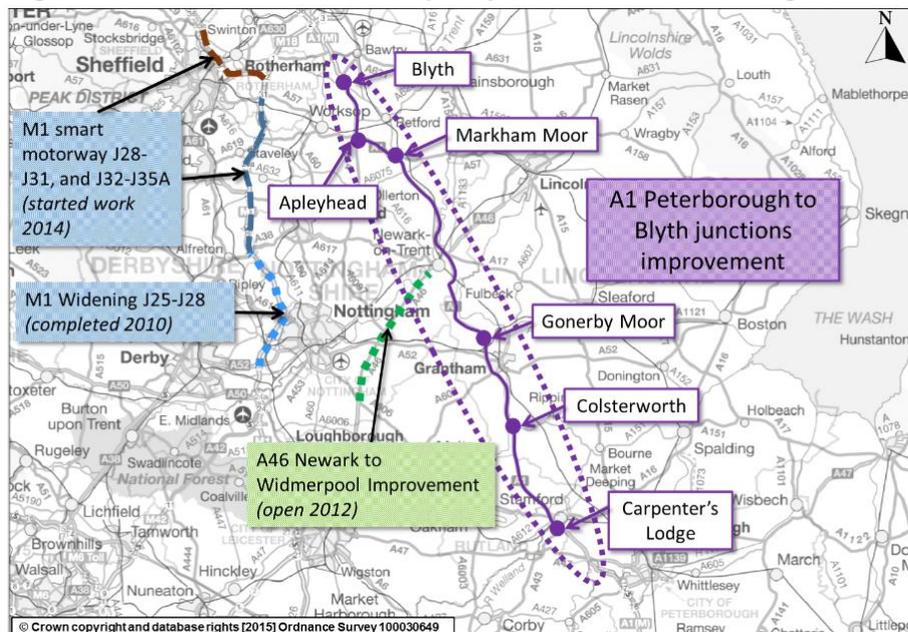
POPE stage	Scheme	Start of works	Opening Date
OYA study	M1 Junctions 25 to 28 Widening	October 2007	May 2010
	A46 Newark to Widmerpool Improvement	June 2009	March 2012
FYA study	M1 J28-31 Smart Motorway	March 2014	<i>expected Q3 2015</i>
	M1 J32-35a Smart Motorway	March 2014	<i>expected 2016/17</i>
	A1 Elkesley Junctions Improvement (new GSJ east of Apleyhead)	May 2015	-

1.11 In the OYA study of the A1 Peterborough to Blyth junction improvements scheme, it was not considered that the construction of the first two schemes, in the table above, would have had a significant impact on traffic flows on the A1. Throughout the construction period, the M1 and A46 remained open (albeit with speed limits). Also the A46 is likely to carry traffic with different origins and destinations, and to a lesser extent the M1 motorway is the same. Therefore even if traffic did reassign from these routes it is unlikely that many trips would divert to the A1.

1.12 During 2014 and 2015, there have been two smart motorway schemes under construction on the parallel M1. Although these schemes are more than 20km from the A1, they may well have led to some north-south strategic traffic rerouting to the A1.

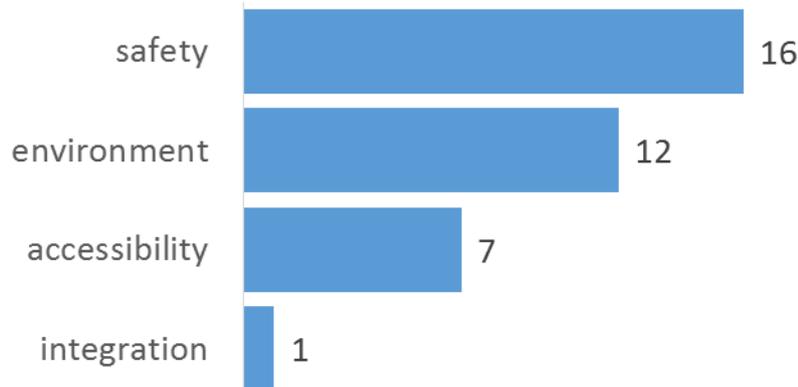
1.13 The new junction on the A1 being constructed south of Apleyhead has not affected the data used in this study which was all collected before this start of works.

**Figure 1.2 – Locations of Nearby Major Schemes in the Region**



- 1.14 Additionally there have been 36 LNMS (Local Network Management Schemes) which have been completed since 2009 along this section of the A1. These are primarily safety improvements, as shown in **Figure 1-3**, thus should have contributed towards overall improvement in safety on this part of the A1, although these schemes are minor by comparison with the grade-separated junctions (e.g. signing and lining).

**Figure 1-3 – Types of LNMS schemes along A1 between the junctions since 2009**



- 1.15 At the time of this study, works are underway on the A1 Elkesley Junctions Improvement scheme, which is providing a new grade-separated junction on the A1 to the south-east of the Apleyhead junction. Near Elkesley, the A1 has had a 50mph speed limit along a 2 mile section since the 1990s and the new junctions will enable the national speed limit to be restored on that section.

## Post Opening Project Evaluation (POPE)

### Purpose of this Report

- 1.16 The Highways Agency (HA) is responsible for improving the strategic highway network (motorways and trunk roads) by delivering the Major Schemes programme. At each key decision stage through the planning process, schemes are subject to a rigorous appraisal process to provide a justification for the project's continued development. When submitting a proposal for a major transport scheme, the Department for Transport (DfT) specifies that an Appraisal Summary Table (AST) is produced which records the degree to which the scheme meets the standard objectives for all transport schemes. At the time when these junction improvements were appraised, these objectives were grouped into Environment, Safety, Economy, Accessibility and Integration.
- 1.17 Although this is now treated as a single scheme within the Major Schemes programme, each of the junctions within the A1 Peterborough – Blyth scheme has its own AST and these are presented in **Appendix B** (commencing on page **129** of this report).

### Overview of POPE

- 1.18 POPE studies are undertaken for all Major Schemes. During the planning process, scheme effects are based on well informed predictions. However, it is vital to identify the strengths and weaknesses in the techniques used for appraising schemes so that improvements can be made in the future. For POPE, this is achieved by comparing information collected before and after a scheme opens to traffic, with predictions made during the planning process. Outturn impacts are summarised in an Evaluation Summary Table (EST). The EST summarises the extent to which the scheme objectives have been achieved. As each junction has its own AST,

individual ESTs have been produced for each and are included in **Appendix C** (commencing on page **137** of this report).

## Appraisal Approach

- 1.19 The following bullet points summarise the main key points regarding the appraisal. Any issues arising from the appraisal approach are considered later in this report:
- There was a separate appraisal undertaken for each junction (i.e. each junction has its own set of costs and benefits);
  - Therefore each junction had its own set of appraisal documentation, and its own public inquiry;
  - The study area for each appraisal was a 2km buffer around each junction. Therefore the impacts of the other junction improvements along the A1 were not considered; and
  - A combined detailed appraisal was not undertaken which examined the cumulative impact of all of the junction improvements within the scheme.

## Evaluation Approach

- 1.20 The detailed evaluation approach will be considered at the relevant stages of this report. However, given the complexities of the scheme appraisal, the following bullet points provide a broad outline of the approach undertaken:
- An evaluation of the traffic impacts at each individual junction was not possible as it was not possible to undertake traffic surveys to assess the impacts of each junction individually due to the staggered construction periods. However, it is considered that the impacts of an individual junction (whether under construction or open) would be minimal on the adjacent junction due to the limited opportunity to reassign to or from another route and the large distances between the junctions. This assumption is also supported by the scheme appraisal which also considered localised areas.
  - The economic evaluation will be based on the combined impact of all junction improvements as a single scheme. This approach is taken due to the practical difficulties in assessing journey time impacts by junction and because the set of junction improvements are considered as a single scheme for Highways England's accounting purposes;
  - The environment objectives will all be evaluated separately for each junction as these cover primarily localised impacts; and
  - Accessibility and integration objectives will be evaluated in combination.

## Information Sources

- 1.21 The sources upon which this study is based include the following individual documents for each
- Environmental Statement
  - Traffic and Economics Report and Addendum
  - Induced Traffic Appraisal Technical Note
  - Order Publication Report
  - Appraisal Summary Table

## Contents of this Report

- 1.22 Following this introduction, the report is divided into 11 further sections as follows:

- **Section 2 – Traffic Flow and Journey Time Impacts.** This section looks at how the scheme has impacted on the traffic volumes on the A1 and elsewhere and how this compares with the forecasts.
- **Section 3 – Safety.** This section compares the pre- and post opening collision numbers and the forecast impacts.
- **Section 4 – Economic Evaluation.** This section calculates the monetary value of any changes in travel time or injury collision numbers and compares these benefits with the costs.
- **Section 5 – Environment.** This section looks at the environmental impacts of the scheme and the success of any mitigation.
- **Section 6 – Accessibility and Integration.** This section contains a review of how the scheme has affected accessibility for non-motorised users.
- **Section 7 – Conclusions.** This section summarises the main findings of this study.

1.23 There are also a number of appendices listed below as follows:

- **Appendix A** – Detailed Scheme Layout Diagrams;
- **Appendix B** – Scheme Appraisal Summary Tables (ASTs);
- **Appendix C** – Scheme Evaluation Summary Tables (ESTs);
- **Appendix D** – Locations of Collisions;
- **Appendix E** – Data Requested for Section 5: Environment
- **Appendix F** – Photographic Record of Scheme
- **Appendix G** – Responses to Consultation
- **Appendix H** – Animal Mortality Data
- **Appendix I** – Traffic forecasts and observed FYA Annual Average Daily Traffic (AADT) flows
- **Appendix J** – AST/ ES Summaries
- **Appendix K** – Tables and Figures in this Report; and
- **Appendix L** – Glossary of Terms.

## 2. Traffic

***Scheme Objective: Reduce Delays***

### Introduction

2.1 In order to evaluate the traffic flow, journey time and reliability impacts of the scheme, the following section reports on:

- Data Collection;
- Background Traffic Changes;
- Traffic Volume Changes;
  - A1 Traffic; and
  - Local Traffic.
- Journey time changes
  - on the A1; and
  - on other routes.
- Comparisons between forecast and observed traffic impacts
  - A summary of the traffic modelling approach and forecast assumptions;
  - Forecast vs. observed traffic volumes; and
  - Forecast vs. observed journey times;
- Forecast Reliability impacts.

### Data Collection

#### Sources

2.2 Traffic flow data used in this report was collected from the following:

- Highways England's TRADS database for A1 locations;
- Count data collected by Nottinghamshire and Lincolnshire County Councils;
- Temporary ATC counts commissioned for the purpose of this study; and
- Turning count data at each junction collected for the purpose of the scheme appraisal.

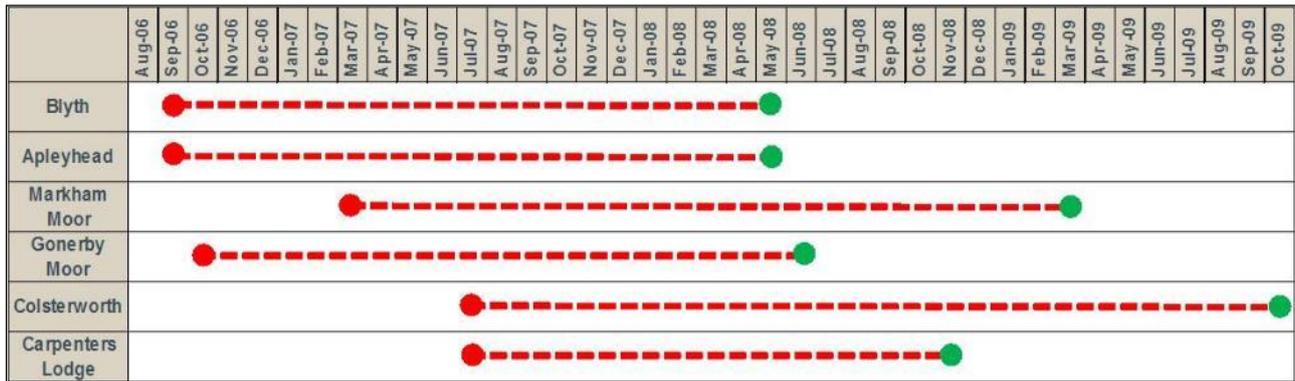
2.3 Journey Time data was obtained from Journey Time Database (JTDB), which contain average journey times and speeds for each 15 minute period throughout the year for each junction to junction link on the strategic road network.

2.4 The forecast traffic impacts for each junction are based on those given in the individual Traffic and Economics Reports for each junction within the scheme.

#### Time periods

2.5 **Figure 2.1** shows the construction start date (in red) and the opening date (in green) for each junction. This diagram has been presented to highlight the difficulty of using traffic data which avoids the construction periods at any of the junctions as there was inevitably some disruption during these periods.

**Figure 2.1 – Summary of Construction Start and Opening Dates by Junction**



### Traffic Modelling Approach and Forecast Assumptions

- 2.6 Before undertaking the analysis of traffic impacts and the comparison against those forecast, we briefly look at how the scheme was appraised and the key assumptions used. Greater detail on the modelling approach is covered in the One Year After report for this scheme.
- 2.7 The main point to note from the appraisal is that each junction was appraised independently of all the other junctions along the A1. There was no strategic traffic model as it was not a requirement due to the assumption that no reassignment was expected. Traffic growth rates at each junction were based on NTRF 1997 and TEMPRO 4.2 local to the area. Discussions with the local planning authorities did not identify any specific developments that would have significant local implications over and above the assumptions underpinning TEMPRO\NRTF for any of the junctions. The exception was the anticipated Doncaster Finningley Airport (now Robin Hood airport) near Blyth junction.
- 2.8 Induced traffic was forecast to be less than 2%, as noted in the MON1 appraisal forms.
- 2.9 The study area for each junction covered all junction approaches for a distance of 2km. The localised study areas were selected because it was assumed that the junction improvements would only have localised operational impacts, and not lead to a large scale redistribution of trips within the wider highway network.

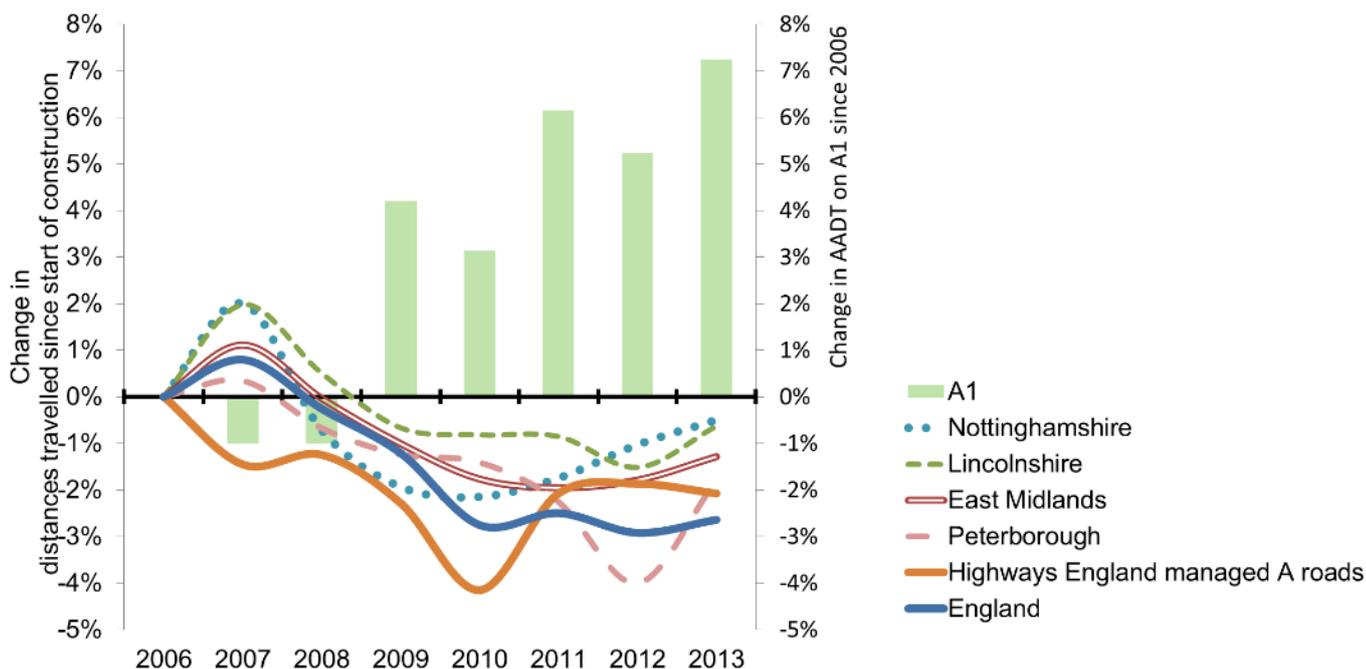
## Background Traffic Changes

- 2.10 Historically in POPE studies, the ‘before’ counts have often been factored to take account of background traffic growth so that they are directly comparable with the ‘after’ counts. This usually involves the use of **National Road Traffic Forecasts (NRTF)** with local adjustments made using **Trip End Model Presentation Program (TEMPRO)**.
- 2.11 However, due to the changes in the economic climate which has seen widespread reductions in motor vehicle travel in the UK as a whole since the latter part of 2008, it is no longer deemed appropriate to use this method of factoring ‘before’ counts to reflect background changes in traffic which were predicted before the economic downturn.

### National, Regional and Local Trends

- 2.12 The best measure of the wider trends in overall traffic levels both regionally and nationally is shown in DfT annual statistics for total distance travelled (million vehicle kilometres). Figure 2.2 shows the changes by year in the period from 2006 (at start of construction), and 2013 (the latest available) for the three local authorities in which the scheme lies the ‘A’ roads managed by Highways England and the Annual Average Daily Traffic (AADT) for a representative site on the A1 for England.

Figure 2.2 – A1, National and Regional Trends over time<sup>2</sup>



2.13 The long term trends shown in Figure 2.2 are:

- Traffic on the A1 has shown year-on-year increase from 2009 when the scheme was completed.
- Annual flows were 7% higher in 2013 than they were before construction started.
- The wider trends in the areas through which this part of the A1 passes and those nationally fell after 2008; this is linked with the economic downturn.
- The difference between the wider trends and those for the A1 suggests that the scheme resulted in extra traffic on the A1.

## Traffic Volume Changes

### A1 Traffic

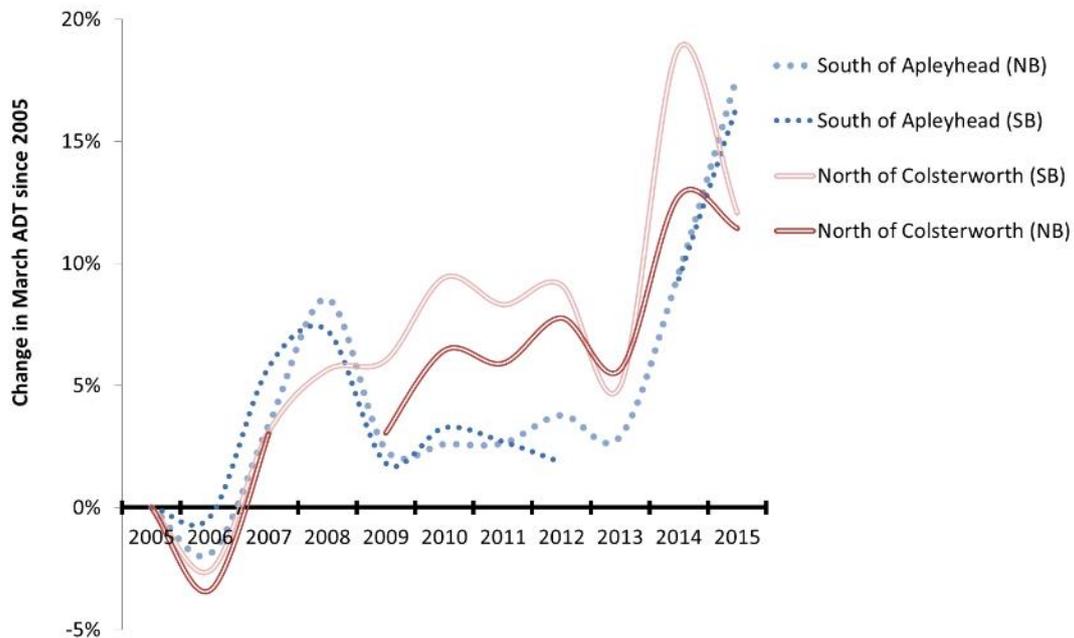
2.14 This section will firstly consider traffic flows on the A1 at the nearest locations to the junctions before examining the detail of changes in traffic flows at each junction.

#### Long term trend

2.15 All of the junctions in the scheme were appraised separately as each concerned addressing problems at the individual junction and there was no combined assessment of the impact of the improvements, however it is worth considering the general trend of strategic traffic to consider whether additional traffic is now using this parts of the A1. Long term trend data has is available for a couple of the locations and the trend for the daily flows (ADT) for March is shown in Figure 2.3.

<sup>2</sup> Graph based on data in DfT tables TRA8904 and TRA4112, and A1 data for the location near A57/A614.

Figure 2.3 – A1 trends since 2005 (March ADT)



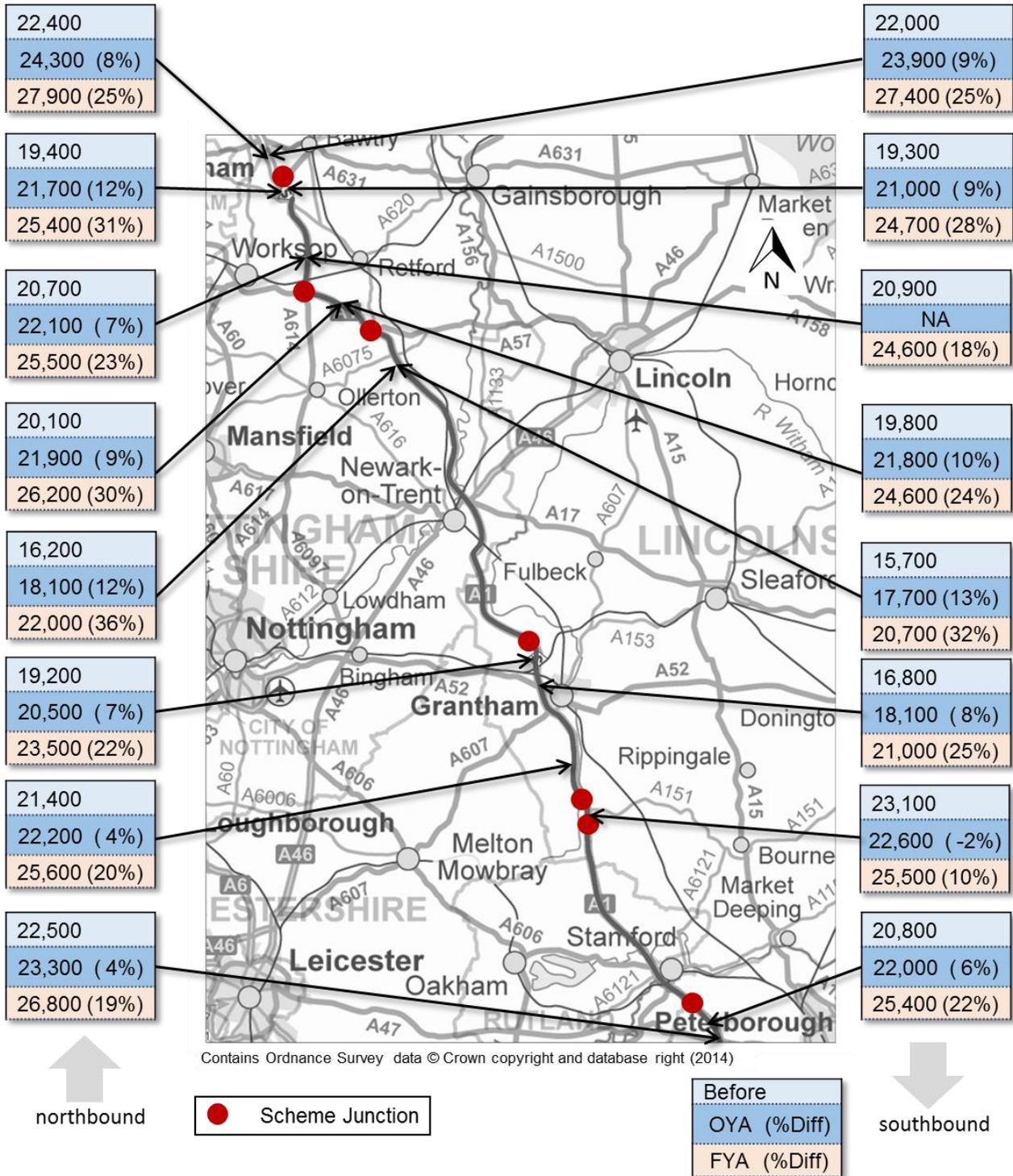
2.16 The key points shown here are:

- Following the completion of the junction improvements, there was an increase in A1 traffic compared with 2005 and 2006 before the start of construction.
- 2014 and 2015 saw a steep increase in flows compared with the earlier post opening years. This jump is of significance to this study as the timing means that it is not directly attributable to this schemes. Although there have been a considerable number of small improvement schemes (LNMS) along this route within this time, it is unlikely they could have alone led to this increase. It is considered that it is most likely that this is due to some strategic traffic rerouting away from major roadworks elsewhere on the network, particularly the M1, and possibly the A14.

### All Vehicles

2.17 Figure 2.4 shows a summary of the Average Weekday Traffic (AWT) volumes at locations on the A1 before construction (March 2006), OYA opening (2010) and FYA in 2015. **Table 2.1** references the counts shown giving more detailed descriptions of their locations.

Figure 2.4 – Traffic Volumes on the A1 by Direction (AWT)



**Table 2.1 – Before and After Opening Traffic Volumes on the A1 near Junctions (AWT)**

Jct.	Location	Site Description	Dir	Before (2007)	OYA (2010)	FYA (2015)	%diff before-OYA	%diff before-FYA
Blyth	N of junction	A1(M) between J34 & J35 (Blyth junction and M18)	NB	22,400	24,300	27,900	8%	25%
			SB	22,000	23,900	27,400	9%	25%
	S of junction	between A634 and A1(M)/A614	NB	19,400	21,700	25,400	12%	31%
			SB	19,300	21,000	24,700	9%	28%
Apleyhead	N of junction	between A620 and A614	NB	20,700	22,100	25,500	7%	23%
			SB	20,900	n/a	24,600	n/a	18%
	S of junction	between A614 and B6387	NB	20,100	21,900	26,200	9%	30%
			SB	19,800	21,800	24,600	10%	24%
Markham Moor	S of junction	between A6075 and A57/A638	NB	16,200	18,100	22,000	12%	36%
		within the A6075 junction	SB	15,700	17,700	20,700	13%	32%
Gonerby Moor	S of junction	between A52 and B1174 near Grantham (north)	NB	19,200	20,500	23,500	7%	22%
		within the A52 junction	SB	16,800	18,100	21,000	8%	25%
Colsterworth (2 junctions)	N of junctions	between B6403 and B1174 near Grantham (south)	NB	21,400	22,200	25,600	4%	20%
	Between junctions	between B6403 and A151	SB	22,000	22,600	25,500	3%	16%
Carpenters Lodge	N of junction	within the A6121 junction (next but one 'A' road jct)	NB	22,500	23,300	26,800	4%	19%
		Between the B1081 and A43	SB	20,800	22,000	25,400	6%	22%
	S of junction	S of Wittering	NB	24,600	25,700	29,500	4%	20%
		Burghley Park south of the B1081	SB	25,500	n/a	29,700	n/a	16%

2.18 The traffic data presented in **Figure 2.2** (and **Table 2.1**) shows:

- Traffic flows on the A1 increased at almost all locations, in both the northbound and southbound directions in 2010 following opening, and have all increased further in 2015.
- The observed increase should be considered in the context of the background changes in traffic in which occurred in the region between the before and after counts. Figure 2.2 shows that no increase occurred between 2006 and 2010 while this scheme was under construction, indeed it shows a slight decrease. It is therefore reasonable to assume that some of the observed increase at OYA can be attributed to the improvements.
- The further increases in flows by 2015, which is greater than the increase on scheme completion, may be partially due to increased awareness of the free-flow conditions on

these parts of the A1 but is likely to be in the main to be rerouting away from other routes especially the M1.

### Two-way flows

2.19 The TRADS count sites on the A1 as used for the data presented above are located at various positions on the north- and southbound carriageways but many do not have a direct equivalent count site on the opposite carriageway, without any intermediate road junctions. Table 2.2 shows the two-way flows at the points on the A1 where there are direct equivalents on each carriageway.

**Table 2.2 – A1/A1(M) two-way weekday flows (AWT)**

Jct.	Location	Site Description	Before	OYA	FYA	%diff before-OYA	%diff before-FYA
Blyth	N of junction	A1(M) between J34 & J35 (Blyth junction and M18)	44,400	48,200	55,300	9%	25%
	S of junction	between A634 and A1(M)/A614	38,700	42,700	50,100	10%	29%
Apleyhead	N of junction	between A620 and A614	41,600	n/a	50,100	n/a	20%
	S of junction	between A614 and B6387	39,900	43,700	50,700	10%	27%
<b>Average</b>						9%	25%

2.20 The results at the locations with two-way flows show:

- Two-way weekday flows on the northern part of the A1 in Nottinghamshire are around 50,000 vpd in 2015.
- Flows have increased by an average of 25% since before the junctions were improved.
- Most of this increase has occurred between the one and five year after periods which suggests that it may be linked with wider influences, possibly the wider economy, but as the regional trends in Figure 2.2 don't indicate this, it is most likely that some of this recent increase is linked with works on the M1 causing traffic to reroute to the A1.

## HGV Traffic

2.21 In the appraisal of the scheme, it was recognised that the A1 is used by a high proportion of HGVs (heavy goods vehicles). Table 2.3 shows how the proportions of these vehicles (as measured by length) have changed since before construction (2006) and one year after (2010).

**Table 2.3 – HGV flows (ADT) and proportions (vehicles > 6.6m in length)**

Jct.	Location	Site Description	Dir	Before (2006)		OYA (2010)		FYA (2015)	
				ADT	%	ADT	%	ADT	%
Blyth	N of junction	A1(M) between J34 & J35 (Blyth junction and M18)	NB	4,800	24%	4,900	22%	5,900	23%
			SB	4,700	23%	4,900	22%	5,700	22%
	S of junction	between A634 and A1(M)/A614	NB	4,600	26%	4,700	23%	5,200	22%
			SB	4,500	25%	4,600	23%	5,200	22%
Apleyhead	N of junction	between A620 and A614	NB	4,700	25%	4,900	24%	5,500	23%
			SB	4,700	25%	n/a	n/a	5,300	23%
	S of junction	between A614 and B6387	NB	4,700	25%	4,600	23%	5,600	23%
			SB	4,500	25%	4,600	23%	5,200	22%
Markham Moor	S of junction	between A6075 and A57/A638	NB	4,200	28%	4,300	26%	5,200	26%
		within the A6075 junction	SB	4,000	28%	4,000	24%	4,600	23%
Gonerby Moor	S of junction	between A52 and B1174 near Grantham (north)	NB	4,000	23%	4,000	21%	4,600	22%
		within the A52 junction	SB	3,800	25%	3,900	23%	4,300	22%
Col'wrth (2 jcts)	N of junctions	between B6403 and B1174 near Grantham (south)	NB	4,300	22%	4,100	20%	4,800	20%
	Between junctions	between B6403 and A151	SB	4,400	21%	4,200	20%	5,000	21%
Carpenters Lodge	N of junction	within the A6121 junction (next but one 'A' road jct)	NB	4,300	21%	4,200	20%	4,700	19%
		Between the B1081 and A43	SB	4,100	21%	3,900	19%	4,600	19%
	S of junction	S of Wittering	NB	3,900	17%	3,900	17%	4,800	18%
		Burghley Park south of the B1081	SB	5,200	22%	n/a	n/a	4,800	17%
Average					23.6%		21.8%		21.7%

2.22 The key points here are:

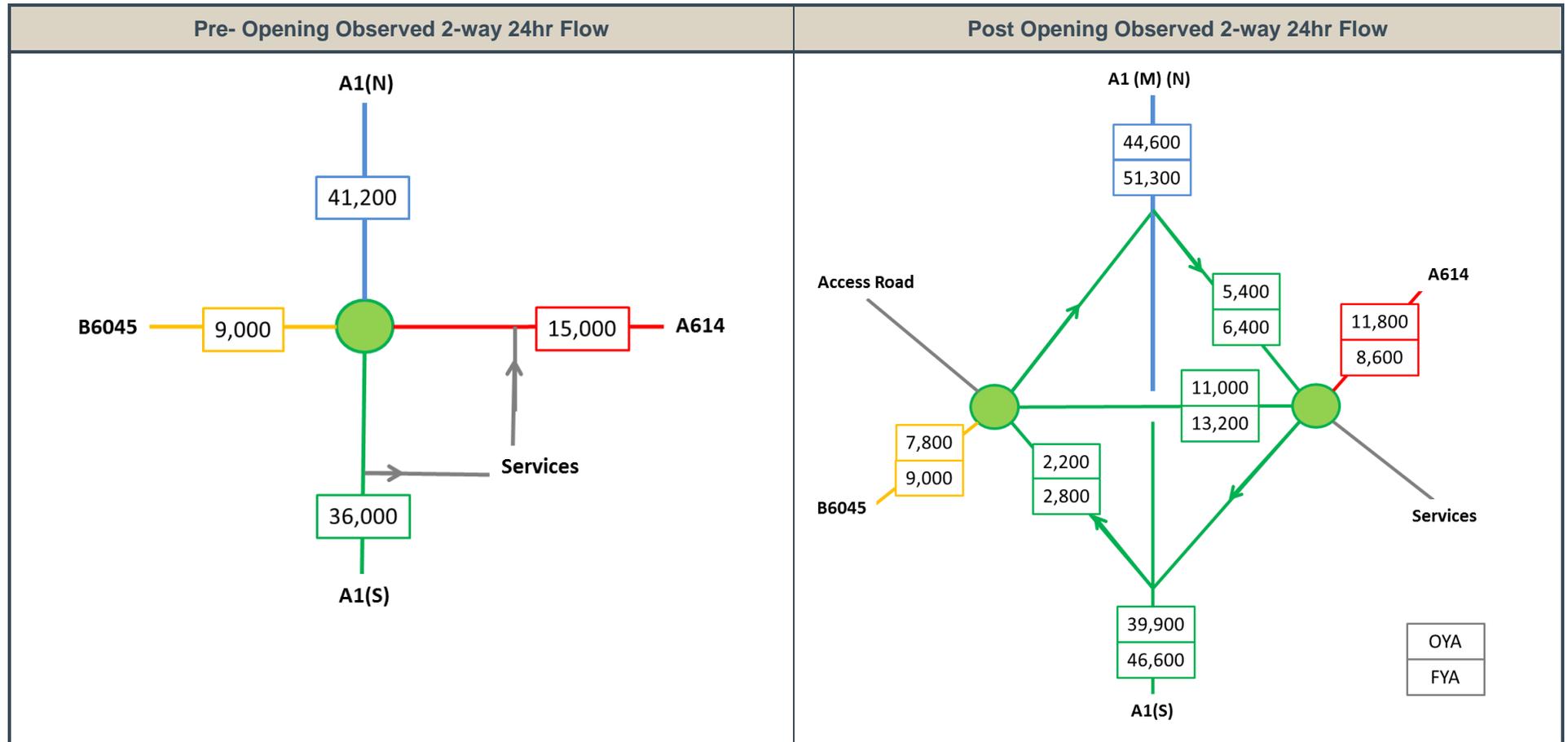
- HGVs form a high proportion of traffic along the length of the A1 where this scheme is located and comprise between a fifth and a quarter of all traffic on the A1;
- HGV flows are higher in 2015 than before the scheme was constructed at all locations listed here; and
- Despite the increase in absolute numbers, there are reductions in the proportion of HGVs as a proportion of all traffic from an average of 23.6% to 21.7%, due to the greater increases in other traffic.

## Local Traffic at the junctions

- 2.23 This section contains a summary of the before and after opening traffic volumes on the junction approaches where reliable data is available. Due to the changes in junction layout as a result of the schemes, in many instances it is not possible to provide 'like with like' before and after opening traffic volumes.
- 2.24 The junction diagrams show the observed 24 hour 2-way counts before opening (2006) and after opening (2010). The before construction counts have been obtained from:
- 2002 12hour weekday turning count data; and
  - TRADS for the A1 sites,
- 2.25 Both have been factored appropriately using the factors discussed earlier in this report.
- 2.26 The post scheme counts are from:
- Automatic Traffic Count (ATC) temporary surveys commissioned specifically for the POPE OYA and this FYA study,
  - Local authorities ATC permanent and temporary sites from Nottinghamshire and Lincolnshire County Councils; and
  - TRADS data collected in 2010 and 2015.
- 2.27 Due to the factoring of time periods and years required, an element of caution has been exercised when drawing conclusions from differences between the before and after traffic flows.
- 2.28 In 2015, due to nearby roadworks in progress, local roads at Gonerby Moor junction could not be surveyed.
- 2.29 The tables on the following pages summarise the before and after opening traffic flows for each junction as schematic diagrams including supporting analysis as follows:
- **Table 2.4:** Blyth;
  - **Table 2.5:** Apleyhead;
  - **Table 2.6:** Markham Moor;
  - **Table 2.7:** Gonerby Moor;
  - **Table 2.8:** Colsterworth; and
  - **Table 2.9:** Carpenters Lodge.
- 2.30 Schematic diagrams have been used here for clarity of the individual links. See the Ordnance Survey maps in Appendix A for the layouts of the junctions.

### Blyth Before and After Opening Observed Traffic Flows

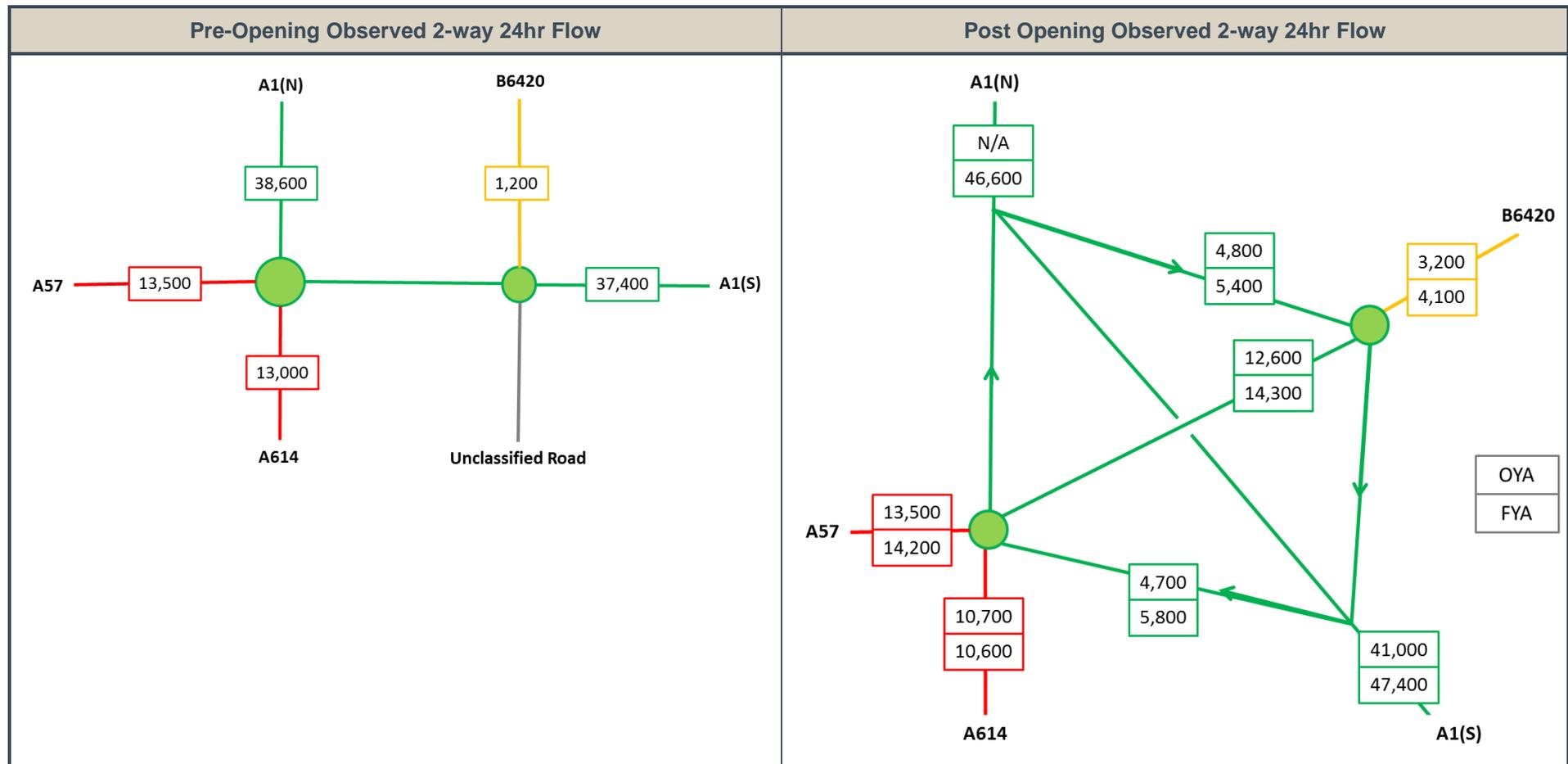
Table 2.4 – Before and After Opening Local Traffic Flows (ADT): Blyth Junction



- As noted earlier, the traffic on the A1 has shown a large increase.
- Traffic flows on the A1 are higher north of this junction by around 5,000 vpd and this has remained the same before and after scheme opening. This and the flows observed on the adjoining B6045 and A614 suggests that no new traffic has been attracted to use this junction to access the A1 as a consequence of the improvement.
- Traffic flows on the A614 have shown a decrease post opening, which is partially due to the pre-scheme data including the trips leaving the service station. However, this has continued to fall at FYA, which clearly shows that this route has not been impacted on by being a route between the A1 south and Doncaster's Robin Hood Airport (opened 2005).

### Apleyhead Before and After Opening Observed Traffic Flows

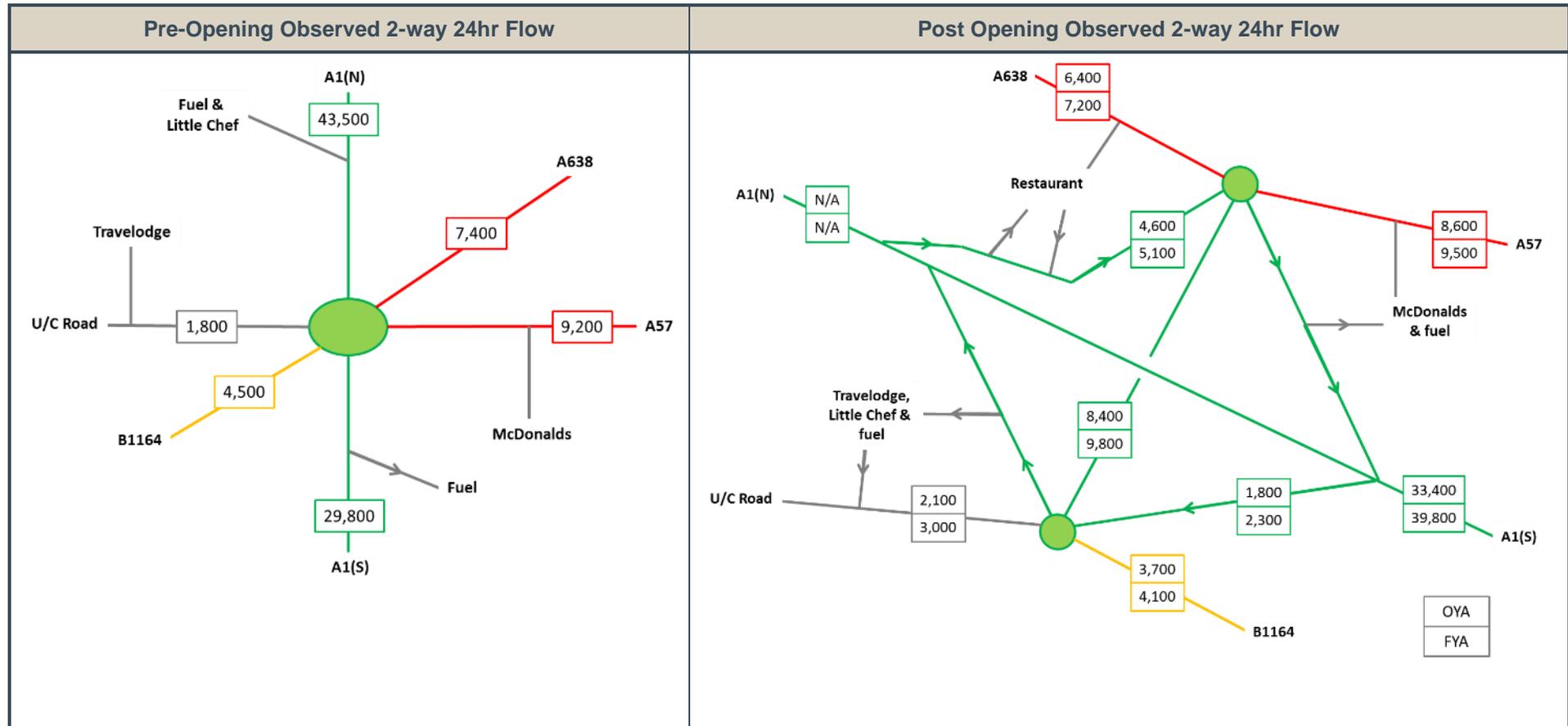
Table 2.5 – Before and After Opening Local Traffic Flows (ADT): Apleyhead Junction



- Traffic flows on the A57 have remained unchanged as a result of the scheme.
- Traffic flows on the B6420 east of the A1 have increased considerably. As the flows on the A road east of the A1 (A614) at the next grade-separated junction (Blyth) have fallen substantially, this suggests that some traffic from the east (e.g. town of Retford) has rerouted to access the A1 at Apleyhead instead of Blyth.
- Traffic flows on the A614 west of the junction have decreased. Despite further investigations the reasons for this decrease in traffic are unclear.
- As noted earlier, traffic has increased on the A1 both north and south of the junction which may be a result of the improvement of all six junctions.

### Markham Moor Before and After Opening Observed Traffic Flows

Table 2.6 – Before and After Opening Local Traffic Flows (ADT): Markham Moor Junction

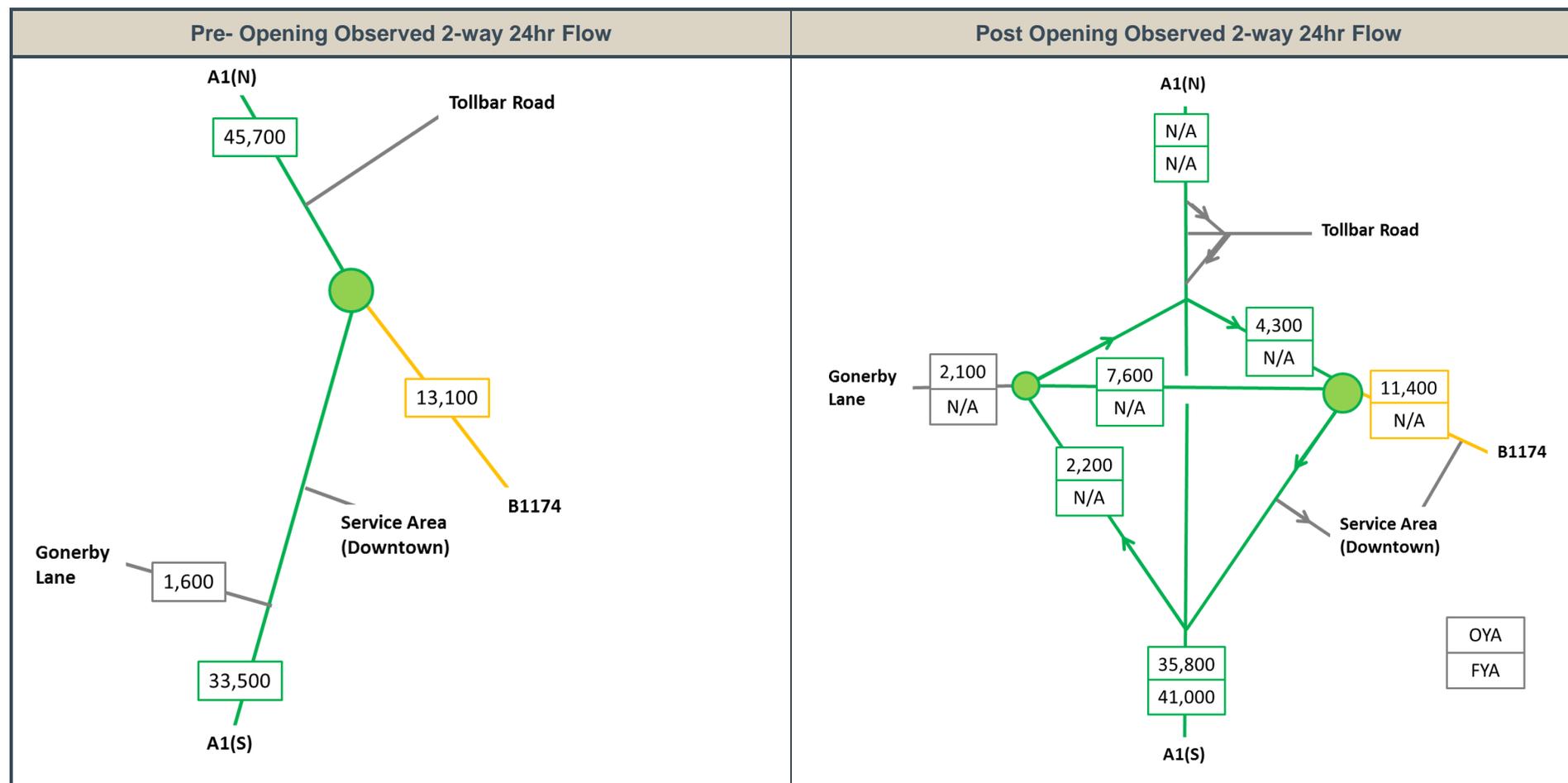


OYA  
 FYA

- The junction layout has changed considerably so it's not possible to undertake a 'like-for-like' comparison of the traffic flows at the majority of locations.
- More traffic is now using the unclassified road at the northbound services which may reflect the increase in longer distance traffic using the A1.
- Traffic levels have dropped on the B1164 to and from the village of West Markham which is unusual given that the access to the junction, from the minor roads, has improved. It is not clear from the traffic data why a decrease has been observed.

## Gonerby Moor Before and After Opening Observed Traffic Flows

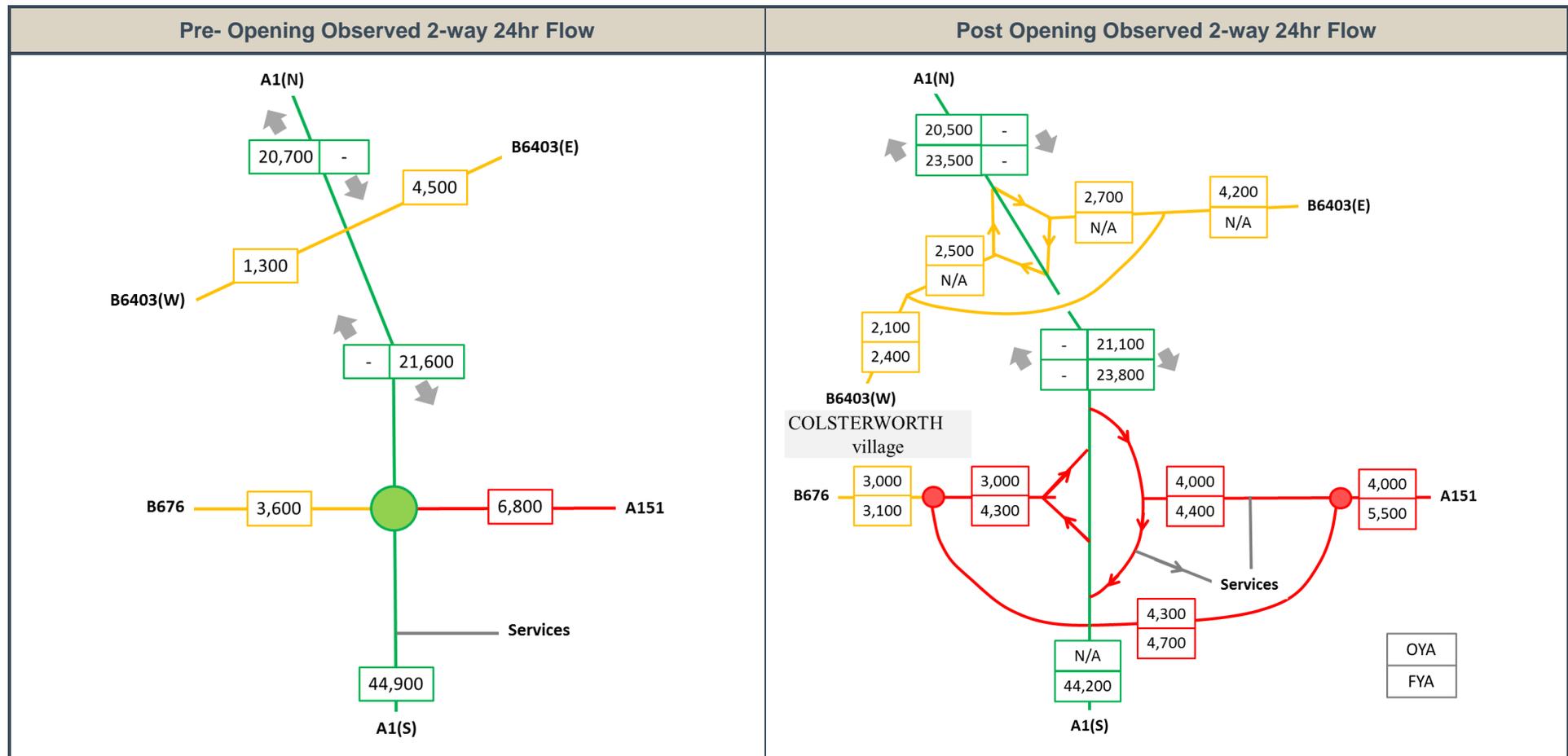
Table 2.7 – Before and After Opening Local Traffic Flows (ADT): Gonerby Moor Junction



- Note that due to major roadworks on the local authority roads in the area around Gonerby, in spring 2015, it was not possible to install temporary traffic counts to collect data on most of the non-strategic network near this location.
- Traffic flows on the A1 (south of the scheme) have increased slightly, which could be attributed to the improvements.
- At OYA, traffic flows had increased on the minor road, Gonerby Lane, which is likely to be as a result of the improved access to the A1 and B1174 (which can now be accessed without negotiating the A1 traffic).
- Conversely the FYA data showed that east of the junction (B1174 from the Grantham area) traffic has fallen but it is likely to have been a result of the revised access arrangements for the services.

### Colsterworth Before and After Opening Observed Traffic Flows

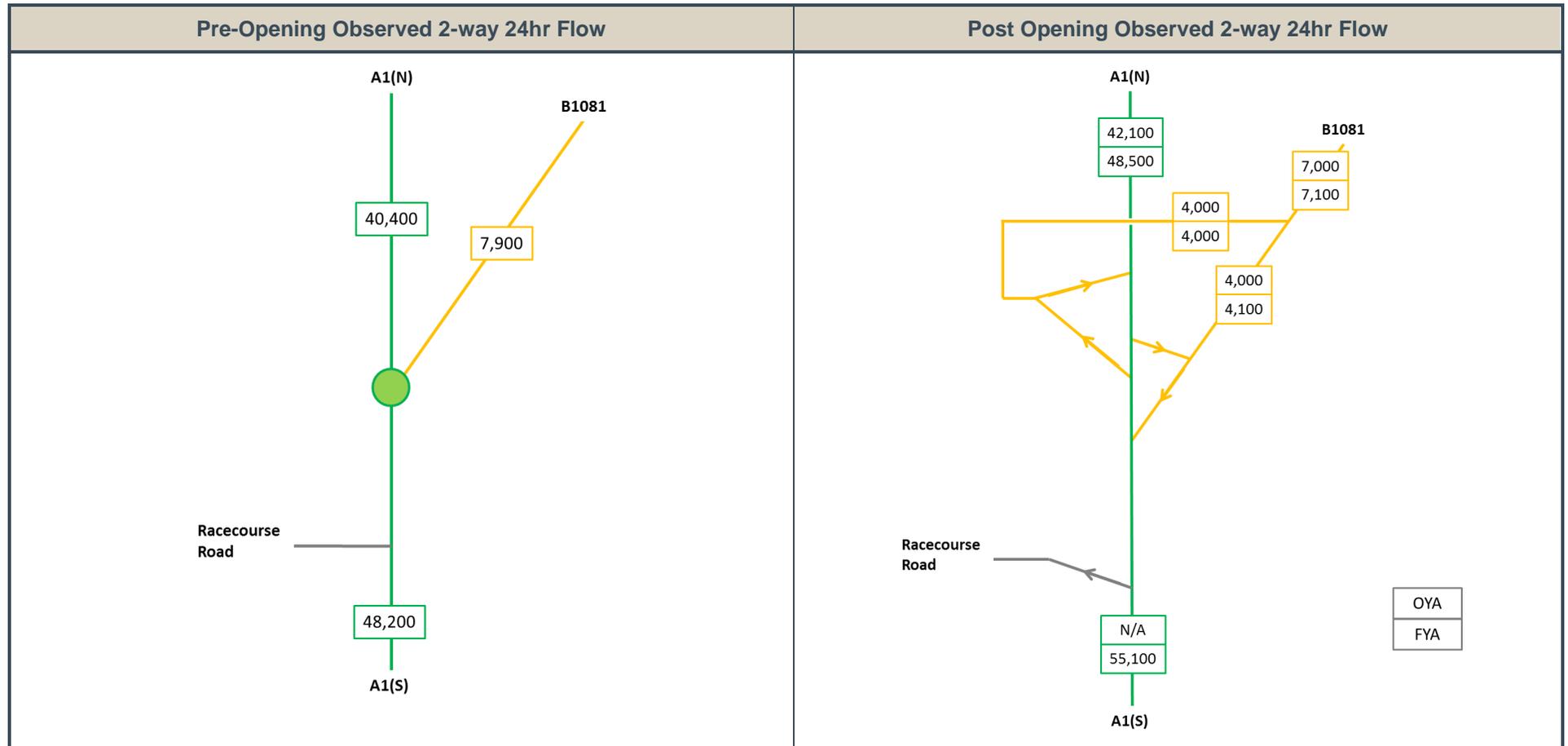
Table 2.8 – Before and After Opening Local Traffic Flows (ADT): Colsterworth Junction



- Northern Junction:** Traffic flows accessing the junction from the side roads have increased on the B6403(W) from Colsterworth village. However at OYA, they had decreased slightly on the B6403(E).
- Southern Junction:** Traffic flows on the roads both east and west of the junction (B676 and A151) fell at OYA compared with the before period and this trend continued at FYA.
- In general, traffic flows at the Colsterworth junctions have reduced since opening despite the improved access arrangements provided by the scheme, showing that the increased flow on the A1 are not from traffic joining the road at these junctions.

### Carpenters Lodge Before and After Opening Observed Traffic Flows

Table 2.9 – Before and After Opening Local Traffic Flows (ADT): Carpenters Lodge Junction



- Traffic on the B1081, in the vicinity of the junction, decreased slightly following opening. The reasons for this are unclear because it is now easier and safer for vehicles to join the A1 in either direction.
- As at the other junctions, traffic has increased on the A1 north and south of the junction which could be attributed to the improvements.

## Journey Time Impacts

2.31 The HATRIS Journey Time Database (JTDB) was used to provide before and after data for journey times on sections of the A1 for the following time periods:

- **Before Construction:** March 2006;
- **OYA Post Opening:** March 2010; and
- **FYA Post Opening:** March 2014 (as 2015 data was not available at time of writing).

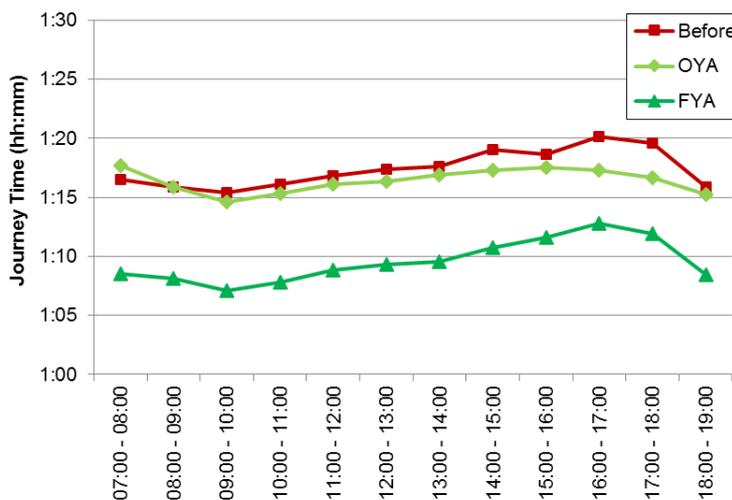
2.32 The above time periods were selected to avoid school holidays and construction works at all of the junctions as shown in **Figure 2.1**. Only data categorised as 'good' quality (as defined by the JTDB) has been used in the analysis.

## Journey Time Changes on the A1

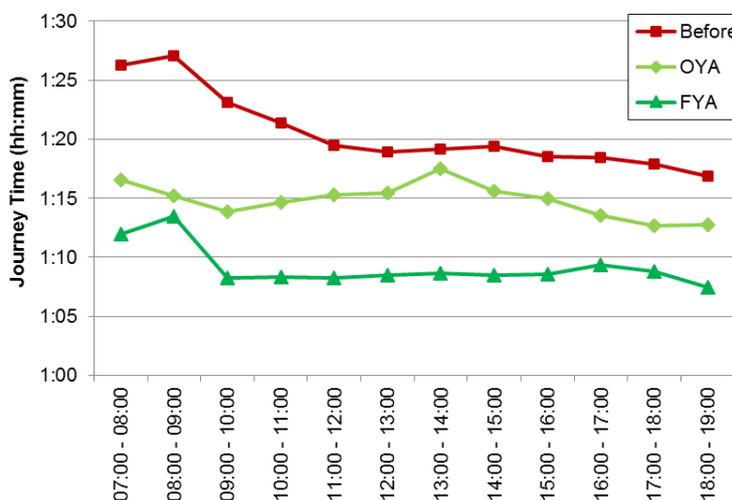
2.33 The large majority of the economic benefits are for the traffic on the A1, and this is the part of the network where there is good availability of data for the periods under consideration here.

2.34 Figure 2.5 and Figure 2.6 show the before and after opening journey times on the A1 from the A1(M) J17 on the Peterborough/Cambridgeshire border to the A1(M) J34 to the north of Nottinghamshire for the northbound and southbound directions respectively. This route is 117km (73 miles) long and encompasses all of the improved junctions in this scheme.

**Figure 2.5 – A1 Northbound total journey times, before and after opening**



**Figure 2.6 – A1 Southbound total journey times, before and after opening**



- 2.35 Key points on the A1 journey times shown in Figure 2.5 and Figure 2.6 are as follows:
- Post opening journey times on the A1 are consistently lower in both directions at all times of the day in the post opening period, and the FYA journeys are an improvement on the OYA results, despite traffic volumes being higher at OYA and FYA than in 2006.
  - There is less variability, since scheme opening, in journey times on the A1 throughout the day from the start of the AM peak to the end of the PM peak. Peak period journey times are now similar to those recorded in the inter peak period.
  - These results provide sufficient evidence to conclude that the scheme has achieved its objective of reducing delays.

## Journey Time Changes on Other Routes

- 2.36 As noted in the OYA report, the majority of the economic benefit derived from each of the junction improvements is likely to be from the removal of geometric delay for through traffic i.e. journey time improvements for A1 through traffic which no longer has to negotiate the six roundabouts following grade separation. It was, therefore, not considered necessary or practical to undertake a series of post opening journey times on routes other than the A1 approaching all of the junctions.
- 2.37 The bullet points below summarise evidence to suggest that traffic conditions have improved for users of the side roads intersecting the A1 at the improved junctions:
- Removal of A1 through traffic from the turning movements at the junctions means that the second level at each junction experiences less vehicle throughput, thereby reducing the conflicts (and delays) for vehicles which access the junctions from the side arms.
  - Site visit observations on a typical weekday during the AM peak undertaken for the purpose of this study, noted no delays at any of the approach roads leading to the improved junctions. This was supported by anecdotal evidence supplied by the local authority stakeholders consulted for this study at OYA.

## Journey Time Reliability

- 2.38 The reliability sub-objective concerns the impact of the scheme on improving journey time reliability for transport users.

### Forecast

- 2.39 Forecasts of the Reliability sub-objective are given in the ASTs for each junction. The assessment of reliability is recognised to be an evolving area and the predicted impacts of the junction improvements were limited to simple qualitative comments for each junction.

### Evaluation

- 2.40 POPE analysis has concentrated on the A1 mainline only for two reasons:
- The A1 is the main route passing through all junctions and carries the most traffic; and
  - Comprehensive data exists for the A1 whilst data for the other routes is limited.
- 2.41 The method used here to analyse reliability is to compare the standard deviations of journey times as shown in Figure 2.7 and Figure 2.8. Higher levels of deviation show greater unreliability in journey times. This measure is based on the variability of the average journey time between days in the study period.

Figure 2.7 – A1 Journey Time Standard Deviation - Northbound

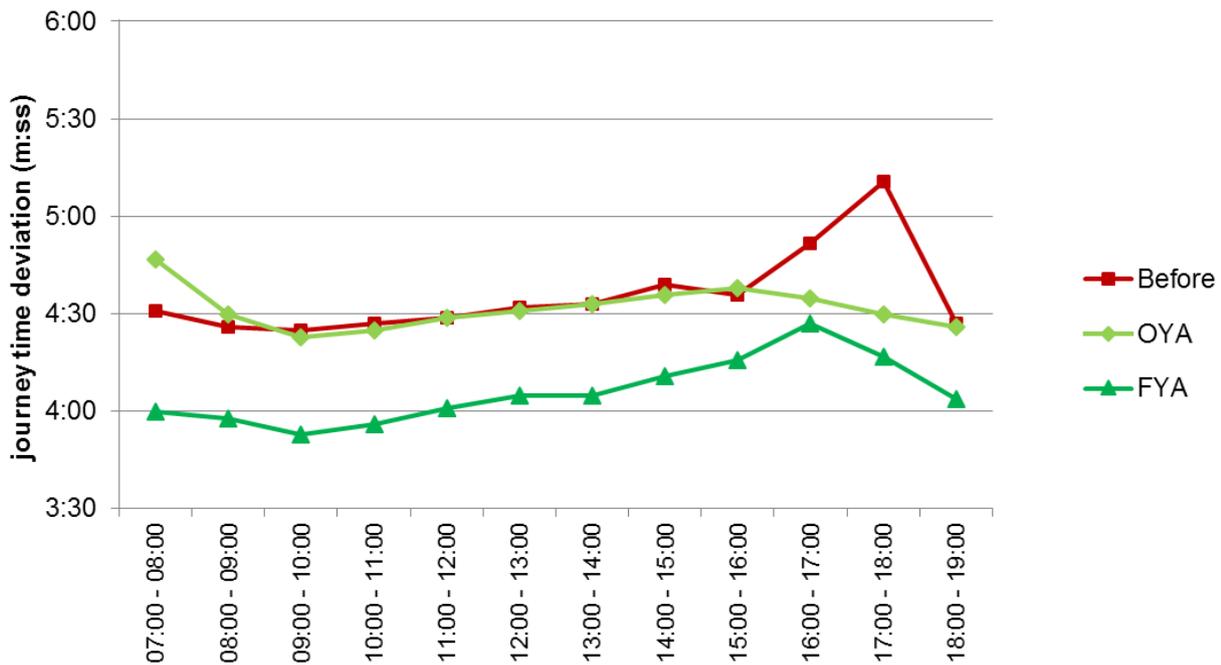
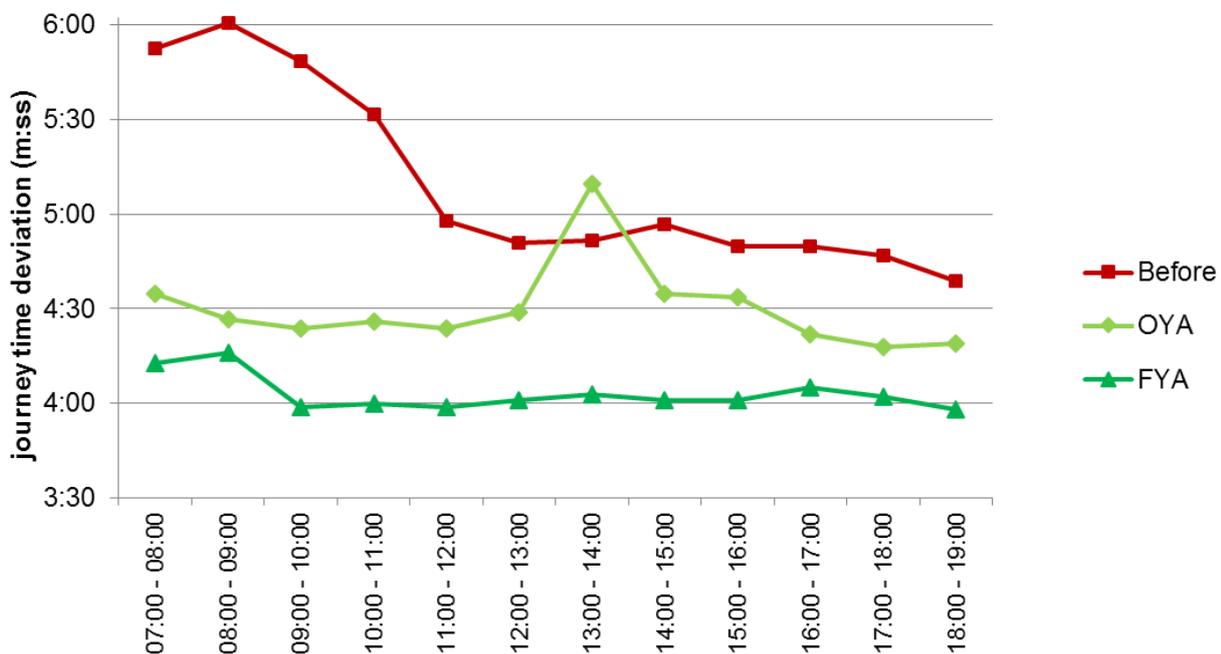


Figure 2.8 – A1 Journey Time Standard Deviation - Southbound



2.42 Figure 2.7 and Figure 2.8 show that:

- In both directions the standard deviation (and hence) variability of journey times has reduced from before the scheme was built.
- The greatest improvement is seen for northbound traffic in the AM peak.

## Forecast vs. Observed Traffic Volumes

- 2.43 Predicted traffic flows were given in the Traffic and Economics Report for each individual junction for the expected opening year of 2007, an intermediate year of 2010 (for the purpose of air quality assessments), and the design year of 2022, alongside the base year of 2002. Details were also given about the factors used to establish the forecast flows to 2007, 2010 and 2022 for both low and high growth scenarios. This data in these forecasting reports have been used in this FYA study to calculate proxy 2015 forecast flows for comparison with observed data. The forecasts presented here are the mid-point between the low and high growth forecasts.
- 2.44 To distinguish between differences caused post opening, and those that existed before construction started, we also compare the modelled Do Minimum for the opening year of 2007 against the observed traffic flows just prior to start of works, uplifted to from 2006 to 2007.
- 2.45 Note that in some cases, there is observed data available and for some Do Minimum scenarios at junctions it was not possible to extract the forecast flow from the turning count diagrams due to the nature of the junction layout.

### Blyth Forecast vs. Observed Traffic Volumes

- 2.46 Table 2.10 shows the forecast vs. observed traffic flows for the Blyth junction.

**Table 2.10 – Forecast vs. Observed Traffic Flows - Blyth (ADT)**

Road	Do Minimum / without scheme 2007				Do Something / With scheme 2015			
	Forecast	Observed	Diff	% Diff	Forecast	Observed	Diff	% Diff
A1 N of the junction	46,100	40,700	-5,400	-12%	50,300	51,300	1,000	2%
A1 S of the junction	37,000	36,000	-1,000	-3%	40,400	46,600	6,200	15%
A1 NB offslip	n/a				2,800	2,800	0	0%
A1 SB offslip					8,100	6,400	-1,700	-21%
Overbridge / cross-junction traffic	13,600	16,200	2,600	19%	14,700	13,200	-1,500	-10%
A614	15,400	15,000	-400	-3%	14,700	8,600	-6,100	-41%
B6045	9,100	9,000	-100	-1%	10,000	9,000	-1,000	-10%

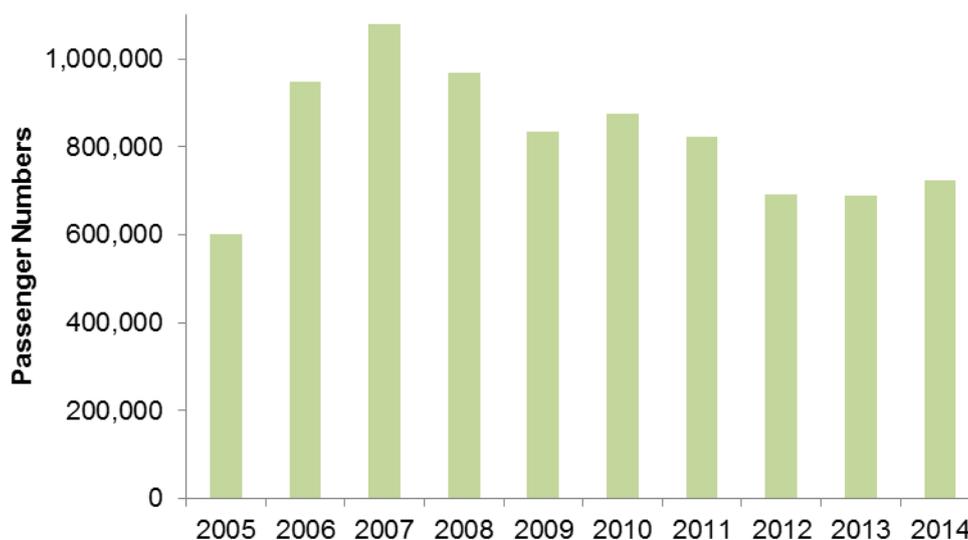
- 2.47 Table 2.10 shows that:

- A1 traffic flows are above the central prediction whilst the amount of traffic on the adjoining roads is generally lower than forecast and less than observed at OYA.
- The net increase in traffic with the scheme (i.e. the difference between the Do Minimum and Do Something flows and the years 2007 and 2015) on the A1 is much greater than predicted at around 10,000 vpd per direction instead of around 4,000 vpd.
- The flows without the scheme, before construction started, mostly align with the forecast for the Do Minimum scenario therefore the 2015 flows for the non-A1 routes being below average indicates that the additional traffic expected has not occurred.
- Traffic crossing over the A1, which now uses the overbridge had been forecast to increase with the scheme has actually shown a fall, but this is due to less traffic using the roads which join the A1 here.
- Doncaster's Robin Hood Airport lies 8 miles north-east of the Blyth junction. In the Traffic & Economics report, it was stated that the airport, opened in 2005, was likely to generate

a significant amount of traffic some of which would pass through the junction. It is not clear to what extent this traffic was modelled as the airport was not included in the local plan.

- The traffic flows on the A614 and B6045 are lower than forecast which could be related to lower than expected traffic accessing Robin Hood Airport, located north east of the junction. The appraisal documentation shows the number of airport trips forecast to pass through the junction but it does not relate this to air traffic or passenger growth at the airport. A possible explanation for the lower than forecast flows on the A614, in particular, is shown in **Figure 2.9**. This shows a considerable dip in passenger numbers (in excess of 20%) likely to be a result of the recession. It is highly unlikely that the appraisal which was completed in 2005 would have assumed a drop in passenger numbers over this time period.

**Figure 2.9 – Passenger Numbers at Robin Hood Airport Doncaster Sheffield by Year<sup>3</sup>**



### Apleyhead Forecast vs. Observed Traffic Volumes

2.48 Table 2.11 shows the forecast vs. observed traffic flows for the Apleyhead junction.

**Table 2.11 – Forecast vs. Observed Traffic Flows – Apleyhead (ADT)**

Road	Do Minimum / without scheme 2007				Do Something / With scheme 2015			
	Forecast	Observed	Diff	% Diff	Forecast	Observed	Diff	% Diff
A1 N of the junction	45,700	38,600	-7,100	-16%	49,900	46,600	-3,300	-7%
A1 S of the junction	42,200	37,400	-4,800	-11%	46,000	47,400	1,400	3%
A1 NB offslip	n/a				5,700	5,800	100	2%
A1 SB offslip					7,900	5,400	-2,500	-32%
Overbridge					13,800	14,300	500	4%
A57	13,700	13,500	-200	-1%	14,900	14,200	-700	-5%
A614	13,200	13,000	-200	-2%	14,700	10,600	-4,100	-28%
B6420	1,200	1,200	0	0%	1,300	4,100	2,800	215%

<sup>3</sup> Source: UK Civil Aviation Authority (UK Airport Statistics)

2.49 Table 2.11 of the forecast and observed flows at Apleyhead shows that:

- The majority of the observed flows on the A1, the slip roads and the overbridge are within 15% of forecast.
- On the A614 south of the junction, traffic had been expected to increase but actually fallen by several thousand suggesting that less traffic is choosing to access the A1 via this route.
- East of the junction, the minor road B6420 which had low flows and little change was expected has experienced an increase considerably greater than forecast. Despite closer examination of the traffic flows in this area it is unclear why there is such a large difference at this location.

### Markham Moor Forecast vs. Observed Traffic Volumes

2.50 Table 2.12 shows that the majority of the traffic flows are below the forecasts at the Markham Moor junction. However, it is important to note that almost all of the observed flows, in particular those in the Do Something scenario, are lower than forecast. This is in line with the general trend of overestimation of traffic flows at all of the junctions.

**Table 2.12 – Forecast vs. Observed Traffic Flows – Markham Moor (ADT)**

Road	Do Minimum / without scheme 2007				Do Something / With scheme 2015			
	Forecast	Observed	Diff	% Diff	Forecast	Observed	Diff	% Diff
A1 N of the junction	45,100	43,500	-1,600	-4%	49,200	n/a	-	-
A1 S of the junction	37,700	29,800	-7,900	-21%	41,100	39,800	-1,300	-3%
A1 NB offslip	1,400	1,300	-100	-7%	2,500	2,300	-200	-8%
A1 SB offslip	5,200	5,100	-100	-2%	6,800	5,100	-1,700	-25%
Overbridge	9,200	8,900	-300	-3%	10,000	9,800	-200	-2%
A57	10,600	9,200	-1,400	-13%	10,300	9,500	-800	-8%
A638	7,600	7,400	-200	-3%	8,300	7,200	-1,100	-13%
B6420	4,600	4,500	-100	-2%	5,000	4,100	-900	-18%
Main St (west of south rbt)	1,800	1,800	0	0%	2,500	3,000	500	20%

### Gonerby Moor Forecast vs. Observed Traffic Volumes

2.51 Table 2.13 highlights that before the scheme, traffic flows were already lower than the forecasts for the Do Minimum both on the A1 and the side roads. At FYA this continued to be true for the A1. The size of the discrepancy compared to that seen at the other junctions suggests an error in the baseline traffic here.

2.52 As noted earlier it was not possible to collect data for the other roads at this location in 2015.

**Table 2.13 – Forecast vs. Observed Traffic Flows – Gonerby Moor (ADT)**

Road	Do Minimum / without scheme 2007				Do Something / With scheme 2015			
	Forecast	Observed	Diff	% Diff	Forecast	Observed	Diff	% Diff
A1 N of the junction	56,200	45,700	-10,500	-19%	65,000	n/a	-	-
A1 S of the junction	49,700	33,500	-16,200	-33%	57,500	41,000	-16,500	-29%
A1 NB offslip	3,500	-			4,100	n/a	-	-
B1174	17,100	13,100	-4,000	-23%	19,800	n/a	-	-
Gonerby La	2,100	1,600	-500	-24%	2,400	n/a	-	-

### Colsterworth Forecast vs. Observed Traffic Volumes

2.53 Table 2.14 highlights a number of large differences between the forecast and observed traffic flows at the Colsterworth junction with all observed flows lower than forecast in both the do minimum and do something scenarios. It appears that there were inaccuracies in the forecasting for the Do Minimum scenario and this was carried forward to the Do Something scenario. On closer examination it is unclear why the forecasts are so inaccurate for this junction in comparison to the other junctions which used the same approach (as detailed earlier in this section).

**Table 2.14 – Forecast vs. Observed Traffic Flows – Colsterworth (ADT)**

Road	Do Minimum / without scheme 2007				Do Something / With scheme 2015			
	Forecast	Observed	Diff	% Diff	Forecast	Observed	Diff	% Diff
A1 N of the junction	49,300	46,400	-2,900	-6%	57,000	n/a		
A1 S of the junction	50,100	44,900	-5,200	-10%	58,000	n/a		
B6403 / A1 NB off-slip	3,100	2,700	-400	-13%	3,700	n/a		
B6403 / A1 SB off-slip	3,000	2,700	-300	-10%	3,600	n/a		
North Junction Overbridge	2,800	2,400	-400	-14%	3,400	N/A		
B6043 (west)	1,400	1,300	-100	-7%	1,600	2,400	800	50%
B6043 (east)	5,200	4,500	-700	-13%	6,000	N/A		
B676 / A1 NB offslip	6,300	4,600	-1,700	-27%	7,300	4,300	-3,000	-41%
A151 / A1 SB offslip	6,200	4,400	-1,800	-29%	7,200	4,400	-2,800	-39%
South Junction Overbridge	7,600	4,800	-2,800	-37%	8,600	4,700	-3,900	-45%
A151	11,100	6,800	-4,300	-39%	12,800	5,500	-7,300	-57%
B676	4,700	3,600	-1,100	-23%	5,400	3,100	-2,300	-43%

## Carpenters Lodge Forecast vs. Observed Traffic Volumes

2.54 Table 2.15 shows the forecast vs. observed traffic flows for the Carpenters Lodge junction.

**Table 2.15 – Forecast vs. Observed Traffic Flows – Carpenters Lodge (ADT)**

Road	Do Minimum / without scheme 2007				Do Something / With scheme 2015			
	Forecast	Observed	Diff	% Diff	Forecast	Observed	Diff	% Diff
A1 N of the junction	39,500	40,400	900	2%	46,200	48,500	2,300	5%
A1 S of the junction	48,700	48,200	-500	-1%	57,100	55,100	-2,000	-4%
Racecourse Road	700	0	-700	-100%	200	n/a		
Overbridge/ NB right turn traffic	5,100	4,800	-300	-6%	5,400	4,000	-1,400	-26%
B1081 (S of Overbridge)	4,400	5,200	800	18%	6,500	4,100	-2,400	-37%
B1081 (N of Overbridge)	8,400	7,900	-500	-6%	10,100	7,100	-3,000	-30%

2.55 Table 2.15 shows:

- Flows on the A1 near Carpenters Lodge junction are close to the forecast, with a net difference of around 7,000vpd more traffic south of the junction compared with before.
- Unlike the other four junctions with observed A1 traffic, the net difference between the before and after and Do Minimum and Do Something scenarios is largely as forecast.
- Traffic flows on the B1081 north-east of the junction and the use of the overbridge are all much lower than forecast.

## Forecast vs. Observed Journey Times

2.56 Each of the six junctions were modelled in isolation; there was no strategic model for the entire A1 route developed, therefore it is not possible to obtain a forecast through journey time on the A1 between the northernmost and southernmost junctions from the modelling undertaken for these schemes. However, the 'Induced Traffic Appraisal' document prepared for each junction included a short section relating to forecast journey times along the entire stretch of the A1.

2.57 The methodology employed for the evaluation at OYA and now at FYA can be summarised as follows:

- **Do Minimum:** the forecasts were based on the March 2005 journey times.
- **Do Something:** this journey time was based on a through route with no at-grade junctions to negotiate. The route between Blyth and Carpenters Lodge is approximately 60 miles. An average speed of 68mph was assumed for the majority of the route, with a 2 mile section of 50mph to account for the speed restriction at the Elkesley junction.

2.58 A summary of the forecast journey times and the average observed journey times on the same stretch of the A1 is contained in Table 2.16 for without the scheme, and Table 2.17 with the scheme in place one year and five years post opening.

**Table 2.16 – Summary of Forecast and Observed Journey Times (without scheme)**

Direction	Forecast Do Minimum	Observed Pre-scheme (2006)	Difference from forecast
NB	63 mins	64 mins	+ 1 min
SB	66 mins	68 mins	+2 min

**Note:** All figures presented in this table have been rounded to the nearest minute

**Table 2.17 – Summary of Forecast and Observed Journey Times (with scheme)**

Direction	Forecast Do Something	Observed Post opening (2010)	OYA Difference from forecast	Observed Post opening FYA	FYA Difference
NB	55 mins	63 mins	+ 8 mins	58 mins	+ 3 mins
SB		63 mins	+ 8 mins	58 mins	+ 3 mins
<b>Saving from Do Minimum / pre-construction</b>	8 – 11 mins	1 – 5 mins		8 – 10 mins	

**Note:** All figures presented in this table have been rounded to the nearest minute

2.59 The key points shown here are:

- The forecast journey time saving for A1 traffic was about 10 minutes.
- Observed pre-scheme journeys time were slightly longer than forecast.
- At FYA, the observed net journey time saving is similar to that forecast, whereas at OYA it was lower than forecast. It is not known why observed journey times became faster in the post opening period between one and five years despite extra traffic on this route.

2.60 It should be noted that there is no clear link between the forecast journey time savings presented here and the COBA modelling and the associated economic results derived.

## Key points – Traffic

### Traffic flows: before and after

- Traffic on the A1 has shown year-on-year increase from 2009 when the scheme was completed to 2015. This is notably different from the trends seen on the local roads in all the areas of the junctions in this scheme, and on 'A' roads nationally which all saw a fall or negligible growth during this period, which is associated with economic conditions.
- Increases on the A1 traffic were observed at OYA and were linked with the combined effect of the junction improvements of this scheme improving the attractiveness of this route, leading to rerouting of traffic. This FYA study shows that in 2014 and early 2015 there were further large increases such that traffic on sections of the A1 near these junctions is between 16% and 36% higher than before start of construction. This most recent sharp rise is higher in the northern part and is probably caused by rerouting of some strategic traffic away from the parallel M1, more than 30 miles to the east, where there is a lengthy section of roadworks currently underway for a smart motorway scheme.
- HGV levels on this part of the A1 are at a high level for the strategic network at an average of 22% on weekdays. At FYA, the numbers of HGVs has increased from before, but as the numbers of other vehicles has increased at a greater rate, the proportion of HGVs has reduced slightly an average of 24%. This is likely to be due to more of the additional traffic being light vehicles and much less rerouting of HGVs.
- Local roads adjoining the junctions have shown varying levels of increase and some decreases but with no clear pattern of traffic growth such as seen in the A1.
- Some local traffic from the area east of the A1 may have rerouted to access the A1 at Apleyhead instead of the next junction to the north (Blyth).

### Traffic flows forecast accuracy

- At FYA most traffic flows on the A1 and the adjoining roads are below the central growth forecast with the scheme.
- The net increase in traffic with the scheme (i.e. the difference between the Do Minimum and Do Something scenarios and growth between the years 2006 and 2015) on the A1 is much greater than predicted at Blyth, Apleyhead, Markham Moor and Gonerby Moor junctions.
- Discrepancies from the forecasts were caused by the 2006 observed data before the start of construction being lower than the forecast Do Minimum prior to any recession impacts on traffic flows. This meant that the forecast were already awry before construction started. Also A1 traffic at Gonerby Moor was mistakenly forecasted to be too high which appears to be due to an error in the baseline.

### Journey Times

- Post opening journey times on the A1 are consistently lower in both directions at all times of the day in the post opening period, and the FYA journey times are an improvement on the OYA journey times, despite the increased traffic flows.
- The journey time data provides sufficient evidence to conclude that the scheme has achieved its objective in reducing delays.

### Journey Time forecast accuracy

- Journey time savings on the length of the A1 between the junctions are between 8 and 10 minutes (northbound and southbound) which is close to the level of saving forecast.

### Reliability

- As noted at OYA; the variability in journey times on the A1 has decreased, and this continued to be the case at FYA, despite increased traffic. The changed layout at the junctions is also likely to have reduced delays for vehicles crossing over the junction via the overbridges or accessing or egressing the A1 at the junctions. The scheme's impact on journey time reliability is therefore moderate beneficial as expected.

## 3. Safety Evaluation

### Introduction

- 3.1 This section of the report examines how successful the junction improvements within the scheme have been in addressing the sub-objectives of reducing accident numbers and improving security. This is assessed by analysing the changes in Personal Injury Collisions (PICs) occurring in the five years before construction and five years after full opening of each of the improved junctions in the scheme. Evaluation of the scheme's impact on personal security has also been undertaken through use of observations made during a visit to sites.
- 3.2 The remainder of this section is structured as follows:
- Data sources;
  - Changes in PICs numbers for each junction;
  - PICs on the A1 and the rates, taking into account traffic levels;
  - Non-motorised users safety;
  - Forecast vs. observed change in PICs; and
  - Personal security.

### Sources

- 3.3 This section is based on the following data and documents:
- STATS19 records of personal injury collisions obtained from the DfT online database supplemented by before period data collected from the OYA study sourced from the area 6 and 7 MACs and the local authorities (Nottinghamshire CC, Lincolnshire CC, Peterborough City Council and Cambridgeshire CC).
  - ASTs and COBA models, all dated 2005, for each junction which provided the forecast safety impacts.
  - Roads Safety Audits for the post opening period.

### Data Collection

#### Forecasts

- 3.4 For each scheme, forecasts of the impact of the scheme on safety have been obtained from:
- AST; and
  - COBA (**CO**st **B**enefit **A**nalysis) model produced as part of the appraisal of the individual junctions.
- 3.5 The forecast impact on safety is expressed in terms of numbers of personal injury collisions saved with the associated numbers of casualties and the economic benefit of the saving. This section of the study concerns collision numbers; the economic impact is evaluated in the following section.

#### Observed data

- 3.6 The collision data is based on the records of personal injury collisions (PICs) recorded in the STATS19 data collected by the police when attending collisions. Damage-only collisions are not included in this dataset and are thus not considered in this evaluation.

- 3.7 For the purposes of this study, collision data has been obtained as follows:
- Before construction: September 2001 to August 2006 from the local authorities and the MACs for areas 6 and 7.
  - After completion: January 2009 to December 2013 from the DfT database.
- 3.8 The data available for use in this report does not have full details on collision causation factors and hence the evaluation is limited to consideration of collision dates, severities and locations only.
- 3.9 Analysis of the scheme's impact on personal security has been undertaken through the use of observations made during a site visit carried out in May 2015.

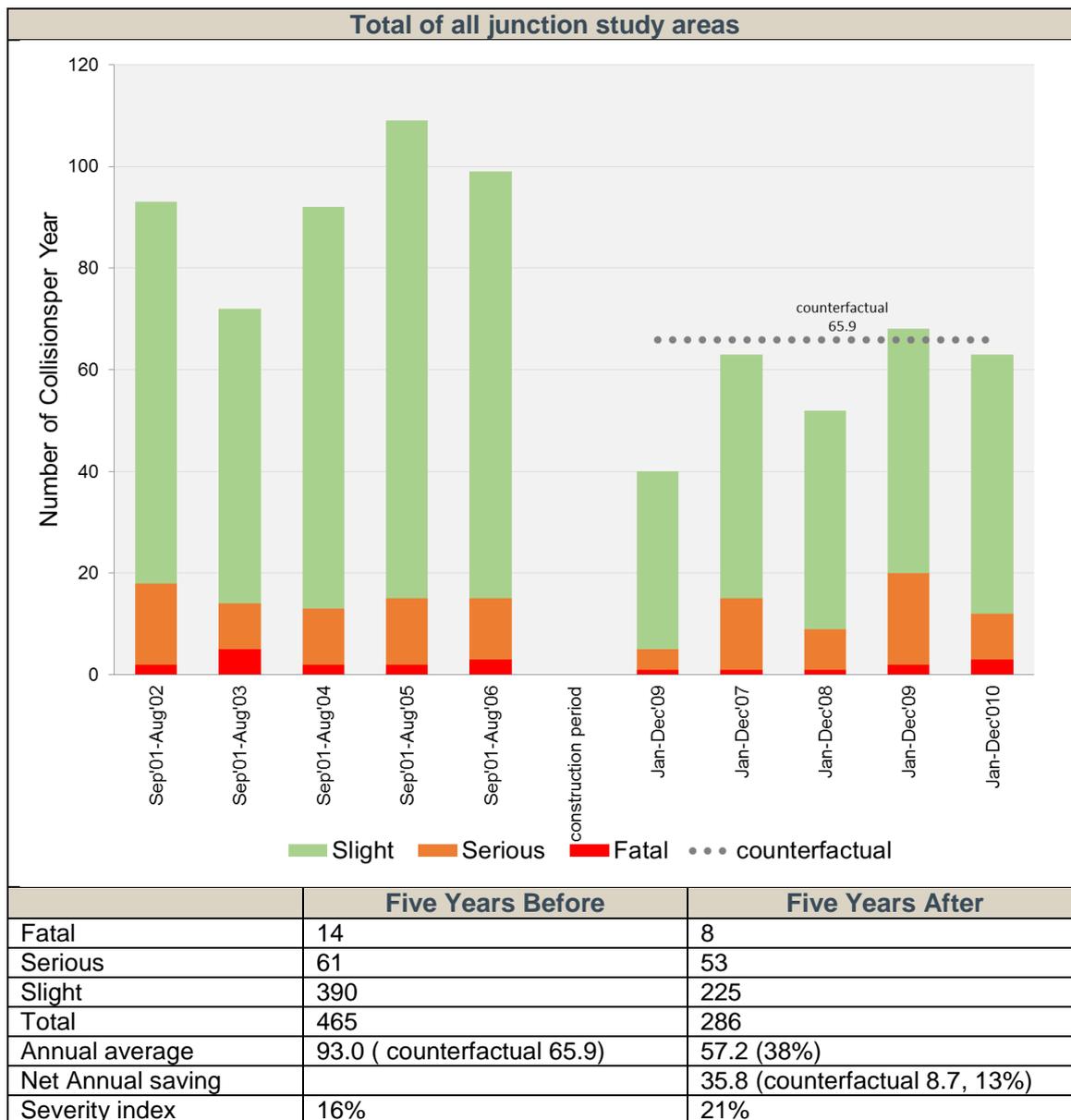
## Study Areas

- 3.10 Each junction scheme had its own COBA model which covers the junction and all approaches for a radius distance of 2km from the junction. These areas are shown in the location maps, for collisions, shown later for each junction.
- 3.11 The observed collision analysis has also been undertaken using the same study areas to ensure a like-with-like comparison with the appraisal. In addition, collisions on the entire stretch of the A1 between Peterborough and Blyth have been investigated.

## All junctions - Overall results for collision numbers and severity

- 3.12 The overall numbers of collisions by severity for all six junctions for the five years before and after construction are shown in Figure 3.1. Additionally, as noted previously, the number of collisions has been falling year on year nationally throughout the period studied here. Therefore, we must consider that had the scheme not been built, the safety record at these junction would have been influenced by wider trends, e.g. improved in-vehicle safety features such as air bags, thus we present the counterfactual figure to indicate a likely figure for the annual post opening collision rate, based on these trends.

**Figure 3.1 – Collision numbers in before and after periods (all junctions)**



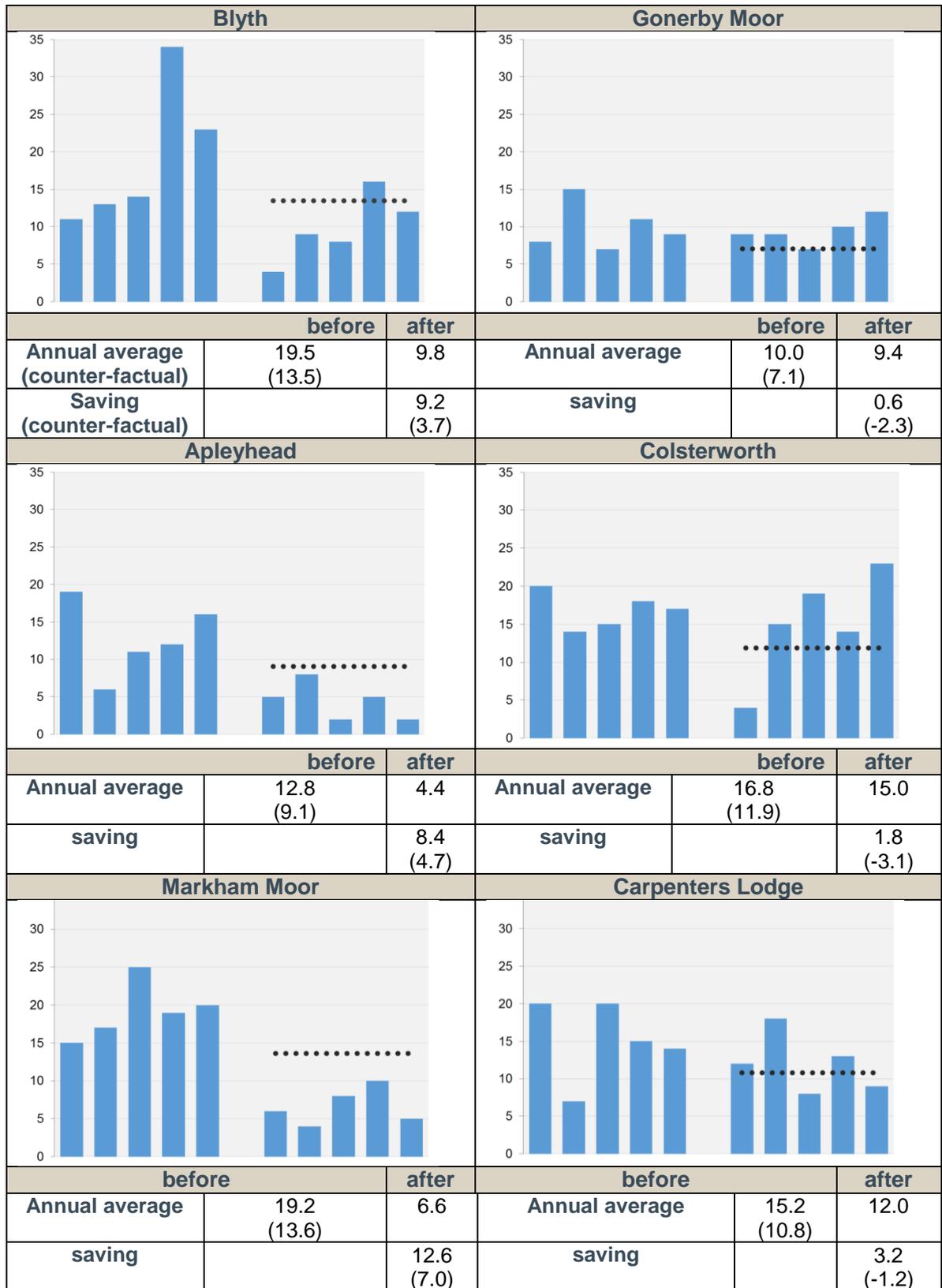
3.13 The key points on the total collision at all junctions shown here are:

- The annual average number of collisions in the post opening period fell by 35.8 (38%).
- When the wider trend of collision reduction nationally is taken into account, there is still a net saving of 8.7. This reduction, however, is not statistically significant, and it is worth noting that this does not take into account the net increase in traffic on the A1 which is covered later in this section, in Table 3.3, which looks at collision rates by traffic flows.
- In the five years before, there is no trend of general reduction on collision, contrary to the national average. Indeed the figures suggest more of a trend toward increased collisions in this time period which could indicate that the national trends were having less influence around these junctions.
- Although numbers of both fatal and serious collisions fell, the number of the much more frequent slight collisions fell at a greater rate, resulting in an increase in the severity index of the collisions which occurred (the proportion of collisions which were either fatal or serious).

### Individual junctions - collision numbers

3.14 The numbers of collisions for the individual junctions are relatively low, but it is worth examining to see whether there are any clear patterns. These are shown in Figure 3.2, including the counterfactual annual figure which is the estimated number expected had the junction not been improved but collision numbers had still declined at the rate seen nationally on 'A' roads.

**Figure 3.2 – Collision numbers in before and after periods, by junction with annual averages**



3.15 The key points shown by the collisions numbers by individual junctions are:

- All the schemes were the construction of grade separated junctions, however there is considerable variation in the safety impact of each improvement observed.
- There is a net reduction in the annual average of collisions at all junctions between the before and after periods, however, comparison against the counterfactual annual rate which assumes that national trends would have been followed, show small negative impacts.
- Blyth, Apleyhead, and Markham Moor, the three most northerly junctions show the clearest evidence of safety results both the graphs shown here and tests show that the reduction in collision numbers is statistically significant at Apleyhead and Markham Moor, irrespective of traffic flows.
- Conversely, the data shows that the three southernmost junctions (Gonerby Moor, Colsterworth and Carpenters Lodge) have not seen a fall in collisions numbers, once the background trend is accounted for, suggesting that they have not experienced a safety improvement.

3.16 The numbers presented in Figure 3.2 do not take into account the change in traffic levels. As shown earlier in the traffic analysis section, there is additional traffic on the A1 at every junction. This means that given no other changes to affect the collisions rate, we would expect additional collisions. Thus to examine whether the rate of collisions has changed, we have calculated the relative traffic levels in the two periods, as measured by million vehicle kilometres travelled (mvkm).

3.17 An evaluation of the before and after opening injury collision numbers by year for the A1 between Peterborough and Blyth (i.e. encompassing all of the improved junctions and the A1 in-between) is shown in Table 3.1.

**Table 3.1 – Collision rates on links around junctions, by junction**

Junction	PIC/mvkm			Difference (counterfactual vs after)	Statistically significant result?
	Before (five years)	Counterfactual rate (based on five years before)	After (five years)		
Blyth	0.254	0.201	0.129	-36%	Yes
Apleyhead	0.169	0.134	0.054	-59%	Yes
Markham Moor	0.279	0.220	0.090	-59%	Yes
Gonerby Moor	0.148	0.117	0.134	14%	No
Colsterworth	0.229	0.181	0.192	6%	No
Carpenters Lodge	0.239	0.189	0.179	-5%	No
All junctions combined	0.219	0.174	0.128	-26%	Yes

3.18 The key points regarding the collision rates are:

- When traffic flows are taken into account, the 3 most northerly junctions all show a statistically significant improvement.
- Changes in the rate at the 3 most southerly junctions including a worsening at two, are not significant.
- All junctions combined show a reduction in the rate of 26% which is significant.

3.19 The locations of PICs by junction are detailed in Appendix D. The key points from the location maps are:

- At Blyth, collisions have reduced on the mainline A1 post opening indicating that the removal of access directly to the A1 has improved safety. There is still a cluster of collisions at Blyth junction, but these are now focussed around the new roundabouts, and are likely to be rear end shunts and not an issue for concern.
- At Apleyhead there is a large reduction in collisions seen as a result of the removal of the at grade roundabout. A small cluster of collisions is seen on at the roundabout with the A1 slip roads and the B6420.
- At Colsterworth the location of collisions still show a large cluster at the junction, although these have changed from collisions related to the roundabout, to collisions related to the slip roads.
- At Carpenters Lodge the large cluster of collisions related to the roundabout has been resolved, however there is a cluster of collisions post opening around the northbound on/off slips.
- At Markham Moor there has been a significant reduction in collisions on the mainline A1 as result of the removal of the at grade roundabout. Post opening there is a noticeable cluster of collisions around the new roundabout to the north east of the A1. This is discussed later in this chapter when reviewing the Road Safety Audit.

3.20 For the collisions shown in Figure 3.2, the numbers in which the most seriously injured person was fatal or seriously injured is shown Table 3.2. Note that these number are not adjusted for counterfactual.

**Table 3.2 – Fatal and serious collisions numbers by junction**

Junction	Fatal			Serious		
	before	after	diff	before	after	diff
Blyth	5	4		15	10	
Apleyhead	2	0		6	3	
Markham Moor	3	1		13	8	
Gonerby Moor	0	1		8	9	
Colsterworth	2	1		9	10	
Carpenters Lodge	2	1		10	13	
All junctions combined	14	8	6 (43%)	61	53	8 (13%)

3.21 There key points regarding the numbers of fatal or serious collisions are:

- Five junctions saw a fall in fatal collision numbers, which in total dropped by 43%.
- Serious collisions also fell although by only 13%.
- However neither of these falls are statistically significant, nor the combined total of fatal or serious collisions.

## Non-Motorised User Casualties

3.22 Collisions which included injury to non-motorised users have not been analysed. This is because the number of these users at the junctions was very low, before these junction improvements due to the difficulty crossing the A1 and rural nature of the vicinities. Post opening there may be more users now that the road presents less of a barrier at these junctions which could release suppressed demand from these users. Also the low numbers involved makes it unlikely that the result of any analysis would be statistically significant.

## Collision Rates on the whole section of the A1

3.23 The number of collisions along a length of road together with its AADT can be used to calculate a collisions rate, known as PIC/mvkm (Personal Injury Collisions per million vehicle kilometres). This enables before and after comparisons which allow for the impact of additional traffic in the corridor as noted earlier in the traffic section of this report.

- 3.24 Table 3.3 shows the before and after collision rates for the full length of the A1 which included the junctions improvements, from the most northerly to the most southerly of the junctions analysed in this report, a length of 117 km.

**Table 3.3 – Collision rates on A1**

	Before (five years)	After (five years)	Difference
Number of collisions (PIC)	817	630	-23%
Mvkm (million vehicle kilometres)	8125	8554	5%
Collision rate PIC/mvkm	0.101	0.074	-27%
Counterfactual rate PIC/mvkm	0.071		4%

- 3.25 Table 3.3 shows that the observed collision rate in the post opening period was 27% lower than in the post opening period, despite the traffic flows being higher. However once the background trend of collision reduction by distance travelled is accounted for, the rate is 4% above that expected. This slight difference is not statistically significant<sup>4</sup>.

## Forecast vs. Observed Numbers of Collisions

- 3.26 This section compares the number of observed collisions discussed earlier with those predicted to occur. Each junction was modelled in COBA and each forecast from the model included a prediction of the number of collisions in the Do Minimum and Do Something scenarios for the opening year and for 60 years.
- 3.27 For the observed data, the annual average collisions for the analysed periods are used here.
- 3.28 The 'without scheme' data is the annual average of five years data before the scheme construction started adjusted to be the counterfactual allowing for the background trend, whilst the 'with scheme' figures are based on the annual average of the observed data in the post opening period.
- 3.29 Table 3-4 compares the forecast and observed collision savings by the individual junctions improved by this scheme, and the combined total from all the improved junctions.

**Table 3-4 – Comparison of Predicted Opening Year and Observed Annual Average Collisions**

Junction	COBA Forecast for opening year				Observed data Annual average for 5 years			
	Do minimum	Do Something	saving	%	Without scheme counter-factual *	With scheme (post opening)	saving	%
Blyth	6.2	4.1	2.1	34%	13.5	9.8	3.7	27%
Apleyhead	12.3	7.5	4.8	39%	9.1	4.4	4.7	51%
Markham Moor	15.1	9.8	5.3	35%	13.6	6.6	7.0	51%
Gonerby Moor	8	5.5	2.5	31%	7.1	9.4	-2.3	-33%
Colsterworth	10.7	9	1.7	16%	11.9	15.0	-3.1	-26%
Carpenters Lodge	11.5	6.6	4.9	43%	10.8	12.0	-1.2	-11%
All junctions total	63.8	42.5	21.3	33%	65.9	57.2	8.7	13%

<sup>4</sup> Chi-square test shows the change to be not significant with a 95% confidence interval.

\*observed pre-scheme data adjusted for counterfactual

- 3.30 The key points from the analysis of the forecasting accuracy are:
- The expected number of collisions without the scheme (Do minimum) is a close match for the counterfactual based on observed data which gives a good basis for the validity of comparison of the net change.
  - The northerly 3 junctions clearly all showed savings and these were similar or better than expected.
  - Conversely, the southern 3 junctions all showed a net increase in annual collisions, when the counterfactual adjustment of the number of collisions is taken into account, especially Gonerby Moor and Colsterworth junctions.
  - Overall, the total saving for the collisions in the areas around the 6 junctions is 8.7 (13%) which is lower than forecast.

## Road Safety Audit RSA4 (Stage 4 – 36-month monitoring report)

- 3.31 Stage 4 Road Safety Audits (36 month reports) were produced for each junction and copies have been obtained for the purpose of this study. A summary of key issues is shown here for each junction.

### **RSA4b, Blyth Junction (October 2011)**

- 3.32 This report notes that 'No accident clusters or trends have been identified within the 'after' accidents records. None of the individual accidents raise specific concerns'. This report does include a short summary of a fatal pedestrian collision post opening, noting that this was a pedestrian crossing the A1 under the influence of alcohol, and concludes that this was not related to the scheme.

### **RSA4b, Apleyhead Junction (November 2011)**

- 3.33 This report notes that overall collision rates were in line with expectation, however *'Two accident problems have been identified as part of this study. The first relates to unprotected trees on the A1 and the second the accident cluster at the eastern roundabout.'*
- 3.34 *The A1 has a large number of trees which are not protected by RRS [Road Restraint System] and these may result in the increased severity of accidents involving vehicles leaving the carriageway. The provision of RRS to protect these trees is likely to increase the risk of vehicles colliding with an object if they leave the carriageway, as it would be continuous and closer to the carriageway than the existing trees. Therefore the protection of the trees may have a negative effect on safety.*
- 3.35 *The number of accidents at the eastern roundabout is significantly higher than predicted. Four of the five accidents at this junction involved shunt type accidents on the southbound exit slip. During the site visit road users were observed approaching the roundabout at high speeds having judged that the roundabout will be clear. Road users at the roundabout were also observed being slow to pull away from the give way line, this may be because of the entry angle they have to check for approaching traffic. This differential in speeds may be resulting in the high number of shunt type accidents at the junction.*
- 3.36 The RSA recommended that 'screening is provided to reduce approach speeds' at the eastern roundabout. It is not known to POPE whether this has been actioned.

#### **RSA4b, Markham Moor Junction (September 2013)**

- 3.37 This report notes that *'no accident clusters have been identified. Three of the seven accidents involved loss of control, however, no pattern was identified within these.*
- 3.38 *There was a severe accident involving a pedestrian on the A1, the Audit Team has not identified any desire line which could have resulted in the pedestrian crossing in this location and there are pedestrian facilities on the overbridge, therefore this can be considered a one off incident.*
- 3.39 *A statistically significant number of accidents occurred on an icy surface, however, these accidents occurred during a particularly cold period, therefore, this can be considered a one off event'.*

#### **RSA4b, Gonerby Moor Junction (September 2013)**

- 3.40 This report noted that *'overall the accidents within the study area are broadly in line with predicted values and national averages'* and did not identify any areas of concern which required treatment.

#### **RSA4b, Colsterworth Junction (September 2013)**

- 3.41 This report notes that *'overall collisions within the study area the north junction are slightly above the predicted values, and a high proportion of incidents have been recorded as having occurred on a wet road surface, however, no connection between the causes of these incidents has been identified.*
- 3.42 *The accident rate at the south junction has slightly reduced since the schemes introduction. It is significantly above the predicted rate. Two clusters within the accidents were identified, however, further review of these shows no common causation.*
- 3.43 *Although the accident rate is high at the south junction it is noted that there is a high proportion of incidents which could be considered as one-off events. Four incidents were recorded involving vehicles merging and merge warning signs may help alleviate these, however, these may increase the risk of road user confusion at the diverge'.*

#### **RSA4b, Carpenters Lodge Junction (September 2013)**

- 3.44 This report notes that based on 3 years of collision data, there was one accident cluster observed. The report says that *'this cluster is located in the vicinity of the northbound merge and diverge where five of the thirteen accidents occurred. Although there is a concentration of accidents in the vicinity of the northbound junction, no pattern within the accidents has been identified and two of the accidents involved specific circumstances'* (one alcohol and one roadworks).
- 3.45 Overall, no patterns were identified at any of the junctions based on three years of post-opening data.

## **Security**

- 3.46 The Security sub-objective for highways concerns the perception of risk from personal injury, damage to or theft of vehicles and theft of property from individuals or from vehicles. The forecast security impact of the schemes were stated in the ASTs and these are summarised in Table 3-5 alongside the evaluation.

**Table 3-5 – Security Impacts: Forecasts and Evaluations**

Junction	Forecast description (and assessment)	Evaluation
Blyth	Less delay and queuing at the junction will reduce exposure to crime Assessment : <b>neutral</b>	As noted in the OYA evaluation, the traffic evaluation shows that journey times on the A1 have reduced, hence reducing exposure to crime for queuing traffic Assessment : <b>As expected</b>
Apleyhead		
Markham Moor		
Gonerby Moor	Pedestrians, riders and cyclists would be diverted onto longer routes, possibly unlit but with good intervisibility. Very few movements would be involved – assumed less than 100 per day. Assessment : <b>slight adverse.</b>	As noted in the OYA evaluation, there remain few non-motorised user movements to be negatively affected by the longer journey times across the junction. Assessment : <b>As expected</b>
Colsterworth		
Carpenters Lodge		

3.47 In summary, although there are small benefits in terms of reduced crime risk whilst queuing as the junctions are in rural locations and the low numbers of non-motorised users experiencing disbenefits from longer journeys mean that the overall security assessment is neutral, as expected.

## Key points – Safety

### Collisions

- Annual average number of collisions at all the junctions in the post opening period fell by 8.7 (13%). This is conservative as it takes into account the wider trend of collision reduction nationally during this period whereas there did not appear to be a trend of reduction at the A1 junctions.
- Although numbers of both fatal and serious collisions fell, the number of the much more frequent slight collisions fell at a greater rate, resulting in an increase in the severity index of the collisions which occurred (the proportion of collisions which were either fatal or serious).
- Considerable variation in the observed safety impact of each junction improvement.
- Net reductions in annual collision numbers have been observed at the three northerly junctions Blyth (3.7), Apleyhead (4.3), and Markham Moor (7.0). Analysis of collision rates at these junctions, which takes into account the extra traffic (PIC/mvkm), show these improvements are statistically significant.
- No improvement has been shown at the three southernmost junctions (Gonerby Moor, Colsterworth and Carpenters Lodge), although the small increase in collisions is not statistically significant.
- Fatal and serious collision numbers fell by 6 and 8 respectively, not including wider national trends.

### Collision rate

- Analysis of the collision rate, taking into account the additional traffic (PIC/mvkm), shows an overall reduction in the rate of 26% which is significant.
- There is no significant change in the collision rate for traffic on full length of the A1.

### Forecast Accuracy

- Forecast collision savings were accurate for the three northerly junctions, while the southern three did not have the expected savings. Overall the saving was 13% when 33% had been predicted. The lower success can be partly attributed to local trend not following national collision reduction trend and the additional traffic on the A1.

### Security

- Security impacts are as expected and unchanged from the OYA report. For all junctions, the reduction in queuing at the new layout, reduces the risk of crime; however, pedestrians wishing to cross the A1 at the Gonerby Moor, Colsterworth and Carpenters Lodge junctions are now diverted onto longer routes.

## 4. Economy Evaluation

### Introduction

- 4.1 This section presents an evaluation of how the scheme is performing against the economy objective. The five economic sub-objectives are to:
- Get good value for money in relation to impacts on public accounts;
  - Improve transport economic efficiency for business users and transport providers;
  - Improve transport economic efficiency for consumer users;
  - Improve reliability; and
  - Provide beneficial wider economic impacts.
- 4.2 When a scheme is appraised, an economic assessment is used to determine the scheme's value for money. This assessment is based on an estimation of costs and benefits from different sources:
- Transport Economic Efficiency (TEE) benefits (travel times and vehicle operating costs);
  - Accident costs (changes in the numbers and severity level of collisions); and
  - Costs to users due to construction and maintenance.
- 4.3 This section provides a comparison between the outturn costs and benefits and the forecast economic impact, as well as evaluating reliability and the scheme's wider economic impacts.

### Sources

- 4.4 The economic forecasts presented in this section is based upon:
- Forecast costs of the individual junctions, which have been taken from the Traffic and Economics Report for each junction, dated 2005 and 2006.
  - Forecasts of the economic benefits are likewise based on the figures presented in the same appraisal documents, Addendums and the associated COBA models which were presented at the public inquiry. Note that for this scheme, all the economic benefits were modelled using COBA, not just the safety benefits which has been the normal practice for major schemes in recent years.
  - ASTs.
- 4.5 The outturn results are sourced from:
- Outturn costs from the Regional Finance Manager in March 2015.
  - Benefits are based on the observed findings of the impacts on the traffic and collisions, as detailed in the preceding traffic and safety sections of this report, monetised to create re-forecasts of the long term impacts.
- 4.6 The reports provide forecasts of the benefits for a 60 year appraisal period. All costs presented in the EAR and this chapter are in 2002 prices discounted to 2002 unless otherwise stated.

### Evaluation Approach

- 4.7 The following tables set out the forecast of the total costs and benefits and the evaluation approach taken in this study.
- 4.8 Although each junction was modelled separately, as they were treated as a single major schemes, the outturn costs has only been recorded for the combined costs. All of the six schemes have been treated as one combined scheme in the outturn evaluation.

**Table 4-1 – Summary of Economic Costs of Scheme**

Cost	Predicted Costs (all junctions combined) £m	Evaluation Approach	
Investment Cost	63.8	✓	Obtained from regional finance manager
Operating Costs for Highways England	2.5	✗	Not within remit of POPE to assess the long term costs to Highways England of operating the junctions
Indirect Tax Revenue	-1.3*	✓	Ratio between total of COBA forecasts and POPE re-forecast changes in fuel consumption
Total	64.9		
Total excluding indirect tax impact	66.3		

\*Indirect tax revenue in costs was a negative value reducing the cost

**Table 4-2 – Summary of Economic Benefits of Scheme**

Benefit stream	Predicted Benefits (all junctions combined) £m	Evaluation Approach	
Journey time	1,023.8	✓	Observed vehicle hours saved per annum based on the OYA journey times and traffic flows.
Vehicle Operating Costs (VOC)	-6.7	✓	Ratio between EAR forecast and POPE re-forecast changes in indirect tax as measured by fuel consumption applied to the monetary forecast VOC in order to calculate a proxy outturn reforecast value of VOC.
TEE Impact of construction and future maintenance periods	Not appraised	✗	Reanalysis of long term maintenance plans not within the remit of POPE.
Private Sector Operating Costs	-0.01	-	Negligibly small impact for bus operators So assume no benefits as forecast.
Safety	42.6	✓	Observed change in collision numbers
Total as appraised	1,017.0		
Total including Indirect Tax Revenue	1,018.4		See above

## Costs

4.9 Costs of the scheme are considered for the full appraisal period of 60 years such that they can be compared with the benefits over the same period. Investment costs are considered in terms

of a common price base of 2002 for comparison with forecast. For comparison with the benefits, overall costs are expressed in terms of present value, termed Present Value Cost (PVC).

### Investment Cost

4.10 The investment cost is the cost to Highways England of the following:

- costs of construction;
- land and property costs;
- preparation and supervision costs; and
- allowance for risk and optimism bias.

4.11 The forecast scheme costs are taken from the Traffic and Economics Addendum Report for each junction as presented at the public inquiries, and have been confirmed by the Programme Services Group.

4.12 The outturn investment costs as of March 2015 for building the scheme have been obtained from the Regional Finance Manager at Highways England covering the period 2002 – 2015. For the purpose of comparison between forecast and actual, as with other major schemes, prices have been converted to 2002 prices. This figure can then be compared with the forecast cost on a comparable basis. These figures are shown below in Table 4-3, alongside the latest outturn scheme costs.

**Table 4-3 – Investment Cost of Scheme (2002 prices)**

Cost		Works / Preparation / Supervision	Land	TOTAL
Forecast by jct	Blyth	£12.0m	£3.5m	£15.5m
	Apleyhead	£12.4m	£0.2m	£12.6m
	Markham Moor	£10.7m	£4.3m	£15.0m
	Gonerby Moor	£12.5m	£0.3m	£12.8m
	Colsterworth	£8.8m	£0.8m	£9.6m
	Carpenters Lodge	£7.3m	£0.1m	£7.4m
	Total	£63.8m	£9.2m	£73.0m
Outturn (all junctions)	£68.3m (plus £2.1m for maintenance)	£11.6m	£82.1m	

4.13 This shows that the cost of the scheme was 13% higher than expected, which was due to higher construction costs, high land purchase costs and additional maintenance costs.

### Indirect tax impact

4.14 In the context of highway scheme appraisal, assessment of the indirect tax impact is the forecast change in the Government's taxation revenue as a result of a scheme. It relates to the amount of fuel duty and VAT paid by consumers and business users of the scheme over the 60 year assessment period. The amount of indirect tax revenue provided to the Government will increase if a road scheme induces an increase in the volume of traffic, changes the speed of traffic or if there is an increase in scheme length.

4.15 For each junction in the scheme; there was a forecast impact produced by the COBA model. In total the combined impact was forecast at a net impact of £1.3m additional revenue. At the time of the appraisal this was treated as part of the costs, and thus a *reduction* in the cost to central Government.

4.16 Evaluation of the long term indirect tax impact by POPE methodology is based on the assumptions that:

- Observed trends in the first five years are indicative of long term trend.
- Fuel consumption is directly related to Indirect Tax, and therefore the WebTAG method of calculating the change in fuel consumption before and after scheme opening is compared to the predicted change in fuel consumption between the Do Minimum and Do Something scenarios.

4.17 The ratio of the observed change in fuel consumption to the predicted change in fuel consumption is then applied to the predicted Indirect Tax monetary benefit to derive an outturn estimate of Indirect Tax monetary benefit.

4.18 The outturn calculation has been based on A1 traffic only, as this is where the majority of the impact would be expected though the change in traffic free-flowing through the junctions rather than slowing or stopping at the roundabouts.

4.19 Table 4-4 shows the forecast and outturn indirect tax revenue for the all six junctions combined.

**Table 4-4 – Predicted vs. Outturn Indirect Tax Revenue (£m)**

Costs in £m 2002 market prices, discounted	Forecast	Outturn
Indirect taxation impact on costs	-1.3	-1.6

4.20 The indirect tax impact has been evaluated to be slightly greater than expected and this is due to the increase in traffic due to the scheme being more than forecast. This impact is still relatively low in proportion to the overall costs and benefits.

#### **Future Maintenance and operating costs**

4.21 In the appraisal, these were not appraised and have likewise not been evaluated. However it should be noted that there was an additional maintenance cost in the early post opening period due to the serious incident at Blyth junction, necessitating £1.9m repairs.

### **Present Value Costs (PVC)**

4.22 Cost benefit analysis of a major scheme requires all the costs to be considered for the whole of the appraisal period and they need to be expressed on a like-for-like basis with the benefits. This basis is termed Present Value. Present Value is the value today of an amount of money in the future. In cost-benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.

4.23 Following current Treasury Green Book guidance, calculation of the present value entails the conversion to market prices, then discounting by year. This using a rate of 3.5% for the first 30 years and 3% thereafter. Note that the base year used here is 2002, not 2010 as in current guidance. This is to permit comparison across schemes in the meta-analysis of the POPE results.

4.24 Table 4-5 shows the total of the present value costs, both with and without the indirect tax element.

**Table 4-5 – Summary of Present Value Costs (£m)**

Costs in £m 2002 market prices, discounted	Forecast	Outturn
Investment cost	63.9	84.3 (includes maintenance)
operating costs	2.5	2.5
Indirect Tax impact as cost	-1.3	-1.6
Total PVC (as appraised including indirect tax impact)	65.1	85.2
Total PVC according to recent guidance	66.4	86.8

4.25 These values for the costs are used in the calculation of the Benefit Cost Ratio in Table 4-10.

## Present Value Benefits

4.26 All the economic benefits were modelled using COBA software (Cost Benefit Analysis) and each junction had its own model covered a small area around the junction, as shown in the maps of the collisions in Appendix D.

### Journey Time Benefits

4.27 The evaluation is based on monetising the vehicle hour savings derived from the A1 and the side roads approaching the improved junctions. The outturn 60 year vehicle hour benefits have been calculated based on observed journey times and traffic flows using a Project Appraisal Report (PAR) approach. The PAR method of calculating journey time benefits is based on the vehicle hours saved in the first year, monetised by using a Value of Time (VOT), then converted to a forecast for the whole appraisal period using capitalisation. Values for the VOT of an average vehicle per hour and capitalisation factors are specified in the PAR guidance. The PAR approach is typically adopted by Highways England for the appraisal of much smaller schemes. Given the complexities of the scheme appraisal considered earlier, it is considered that this is the most appropriate approach for evaluating the journey time impacts of the scheme.

4.28 The Traffic section of this report showed that journey times had reduced on the A1, and it is expected that the vast majority of the economic benefit would be derived from traffic on the A1, no longer having to queue at the roundabouts. However, it would also be expected that the other routes approaching the junctions would also experience benefits resulting from the improved junctions.

4.29 Calculating the vehicle hour benefits attributable to the scheme is not a simple calculation. A number of logical assumptions were therefore required and these are summarised below:

- The traffic already using the routes included in the assessment (in the before period) receives the full journey time benefit observed at this one year after stage;
- Any additional traffic receives half of the journey time benefits. (This concept is known as the 'rule of a half' and is the standard approach for dealing with extra traffic);
- No post opening journey time or delay data is available for roads approaching the junction other than on the A1. It has been assumed that there are no longer any delays due to the following:
  - On site observations during the peak periods confirmed that there were no delays at the junctions; and
  - Discussions with the relevant local authorities confirmed that this was the case.
- It has been assumed that there is no change in the journey times (i.e. no benefit) during the night time on the A1 (a conservative assumption because the appraisal considered benefits over the full 24 hours). There is no congestion in the night time hours but it would be

expected that small benefits would be achieved for A1 through traffic due to the removal of geometric delay.

- Side road benefits have been calculated for the AM and PM peaks only with no change assumed at other times of the day.
- A capitalisation factor derived from the PAR guidance document v5.0 has been used to extrapolate the benefits to 60 years based in NRTF07 traffic growth.

4.30 The calculation of the vehicle time saving is shown in Table 4-6.

**Table 4-6 – Journey Time Savings and Monetary Benefit (2002 prices)**

	Calculation
Annual Vehicle Hours saved five years after on A1 and for traffic making turning movements to/from local roads	772,404
Value Of Time per hour for opening year, at 2002 market prices	£12.66
Annual Time Saving at 2002 prices	£9.779m
60-Year Capitalisation Factor (NRTF Traffic Growth)	49.884
60-Year Time Saving	£487.8m
Discount factor	0.814
60-Year Time Saving discounted to 2002 in market prices	£397.1m

4.31 This shows that based on the observed savings at FYA for both through traffic on the A1 and for traffic making turning movements at the junctions, the long term journey time benefits for the 60 years post opening are reforecast to be nearly £400m. This may be an overestimate as it does include the beneficial impacts of other more minor improvements (LNMS) along this section of the A1 in the past five years as noted in Figure 1-3.

#### Vehicle Operating Costs (VOC) Benefit

4.32 For most highway schemes including this one, the VOC and indirect tax impacts are both very closely linked to changes in fuel consumption (e.g. changes in speeds) which has similar magnitude of impacts, but from opposite sides of the benefits balance. That is, if there is a decrease in fuel consumption, VOC will decrease due to users paying less for fuel (i.e. a benefit to road users) but as indirect tax will be collected by the Treasury this is considered to be a negative benefit to public accounts according to current guidance. For this evaluation, the ratio used for the reforecast indirect tax impact calculation (as shown in Table 4-4) has been applied to the calculation of the monetary value for VOC.

4.33 The forecast and the outturn vehicle operating costs comparison is shown in Table 4-7.

**Table 4-7 – Predicted vs. Outturn VOC Benefits (£m)**

Costs in £m 2002 market prices, discounted	Forecast	Outturn
Vehicle Operating Costs (VOC)	-6.7	-8.2

4.34 As for indirect tax impact, the VOC has been evaluated to be slightly greater than expected and this is due to a greater net increase in traffic on this route than forecast.

#### Safety Benefits

4.35 When appraising trunk road schemes, the economic impact of changes in safety are calculated by assigning monetary values to the reduction over the appraisal period of the:

- Numbers of collisions; and

- Severity of casualties.

4.36 The evaluation of the safety benefits is shown in Table 4-8. This is based on the combined impact of all six junction improvements in their surrounding immediate areas. Forecast and observed collision savings are taken from the COBA model forecast and the comparable outturn results presented in Table 3-4, in the previous section. The collision rate saving for all junctions combined was statistically significant, thus providing a sound basis on which to re-forecast long term safety benefits in line with the POPE methodology.<sup>5</sup>

4.37 The forecast monetary value of the safety improvements is taken from the COBA models of each junction.

**Table 4-8 – Predicted vs. Outturn Safety Benefits**

		Value
Collisions saved	Forecast combined saving in opening year for all 6 junctions	21.3
	Outturn annual average saving in five years post opening period, taking into account the background reduction	8.7
	Ratio of success in collision saving	41%
Monetary value	Forecast 60 year monetary benefit (£m present value 2002 prices & values)	£42.6m
	FYA evaluation of outturn	£17.4m

4.38 The key points from the evaluation of the safety benefits are:

- Due to the level of collision saving being much lower than forecast, the long term monetary benefits are expected to be similarly reduced.
- Although traffic on the A1 is lower than expected, it was modelled with negligible induced traffic whereas, the traffic growth on the A1 since before construction is greater than expected, which had led to additional collisions despite the reduction in the collision rate (as noted in Table 3.3).

#### Summary of Present Value Benefits

4.39 Table 4-9 summarises the forecast and outturn evaluation of the monetised benefits:

**Table 4-9 – Summary of Present Value Benefits (£m)**

Benefit (all values in £m 2002 market prices, discounted)	Forecast	Outturn reforecast
Journey Time saving	1023.8	397.1
Vehicle Operating Costs (VOC)	-6.7	-8.2
Private Sector Operating Costs	0.0	0.0
Safety	42.6	17.4
Total	1059.7	406.2
Indirect tax revenue impact treated as a benefit	1.3	1.6
Total including indirect tax	1061.0	407.8

4.40 The key points here are:

- Monetary benefits have been evaluated to be derived overwhelmingly from journey time savings (97%), which is in line with expectation.

<sup>5</sup> Note that here, due to the impact of the extra traffic which was not in the forecasts, the method of using PAR collision values for the net difference between forecast and observed savings has not been used.

- The total outturn benefit is less than half the forecast and that this is primarily due to lower journey time savings.

4.41 Additionally it should be noted that the POPE OYA report for this scheme included a detailed analysis of the reasons for the difference in the outturn evaluation from the much higher forecast. The economic appraisal of each of these junctions were based on the use of ARCARDY and COBA software and it is considered that alternative approaches with JUICE and TUBA would have supplied more conservative forecasts.

## Benefit Cost Ratio

4.42 The benefit-cost ratio (BCR) is an indicator used in the cost-benefit analysis of a road scheme that attempts to summarize the overall value for money of a project or proposal. The BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs are expressed in present values as detailed in the above sub-sections and summarised in Table 4-5 and Table 4-9.

4.43 This is presented with the indirect tax impact included in the benefits rather than the costs in accordance with the current guidelines. As its value is low, we do not show the alternative approach where it is part if the costs as it make negligible impact here.

**Table 4-10 – Benefit Cost Ratio**

	Forecast	Outturn reforecast
Present Value Benefits (including indirect tax impact)	£1061.0m	£407.8m
Present Value Costs	£66.4m	£86.8m
Benefit Cost Ratio	<b>16.0</b>	<b>4.7</b>

4.44 The key points regarding the evaluated BCR are:

- The outturn BCR of 4.7 represents a return of over £4 for every £1 spent.
- The outturn BCR represents very high value for money.
- It is lower than the very high BCR forecast main due to the benefits being lower than expected, but remains in the very high value for money category.

4.45 It should be noted that the BCR ignores non-monetised impacts. In the former NATA assessment used at the time this scheme was appraised, and its current replacement, the Transport Business Case, the impacts on wider objectives must be assessed but are not monetised. The evaluation of the environmental, accessibility and integration objectives of each junction improvement are covered in the following sections.

## Wider Economic impacts

4.46 The appraisal of the wider economics for each junction was either not undertaken, or consisted of a short qualitative statement in the AST stating neutral benefit.

4.47 The OYA report for this scheme stated that:

*None of the six junctions sit within a regeneration area and no developments were dependant on the junction improvement taking place. Therefore no detailed appraisal of the wider economic impacts of the scheme was required.  
The impacts of the A1 junction improvements are likely to be localised, and the improvements have not facilitated the opening up of land for development opportunities. Therefore the evaluation of the wider economic impacts of the scheme can be considered to be neutral as expected.*

4.48 At the FYA stage the OYA assessment still holds and therefore we conclude that the wider economic impact of the scheme is neutral as expected.

### Key points – Economic Impacts

#### Costs

- The investment cost of building the scheme was 13% above that predicted. Reasons for this include the additional maintenance following the collision involving the chemical spill and fire at Blyth junction.

#### Benefits

- The journey time benefits are evaluated as £397.1 million over 60 years for the A1 corridor and turning movements at the junctions.
- The monetary benefits of the savings in the number of injury collisions is evaluated as £17.4 million over 60 years, lower than forecast due to a greater net increase in traffic on the A1 than expected and the impact of background reduction in collisions over this period being greater than modelled.

#### Benefit Cost Ratio

- The outturn evaluation of the BCR is 4.7.
- This assessment represents over £4 of benefits for every £1 spent which is considered as very high value for money according to DfT criteria.
- The BCR is lower than the very high forecast BCR partly due to the higher than expected costs, but primarily due to the lower than forecast journey time benefits as fewer vehicles use the A1 than expected.

#### Wider Economic Impacts

- It was not an objective of the scheme to facilitate development at the junctions.

## 5. Environment Evaluation Summary

***Scheme Objective:*** For each of the junctions forming part of the improvements to the A1 trunk road between Peterborough and Blyth, the objective stated in the respective Environmental Statement (ES) was to minimise the environmental impact of the scheme on the locality.

### Introduction

- 5.1 This section documents the evaluation of the environmental sub-objectives, only focussing on those aspects not fully evaluated at the One Year After (OYA) stage or where suggestions were made for further study.

#### Summary of OYA Evaluation Recommendations

The OYA evaluation identified a number of areas where further analysis was required at the Five Year After (FYA) stage to confirm the longer term impacts of the schemes on the surrounding environment. These are summarised as follows:

##### **Landscape**

- Blyth: The reduction in planting in the vicinity of the northern roundabout has resulted in the roundabout and associated lighting being more visible than expected within the surrounding landscape in the short term. This planting was noted as important at OYA, and the ongoing establishment of this planting should be re-evaluated at FYA.
- Colsterworth: The wildflower areas on exposed limestone at the northern junction had not germinated at the time of the OYA site visits, and the establishment of this seeding should be reviewed as part of the FYA evaluation.
- Carpenters Lodge: It was considered that it was too soon to evaluate effectiveness of the new planting at OYA, and this aspect of the scheme should be reconsidered at the FYA stage.

##### **Biodiversity**

- Blyth: It was considered too soon at OYA to determine the effectiveness of the ecological mitigation measures, and re-evaluation at the FYA stage was suggested.
- Apleyhead: It was considered at OYA that biodiversity should be reassessed at the FYA stage, and that the reassessment should ascertain whether remedial measures had been implemented by the Contractor (where wildflower seeding had been substituted with amenity grassland) and whether offsite planting by agreement has taken place in adjacent woodland and hedgerows (to provide greater quantity and quality of feeding habitat for badgers).
- Markham Moor: It was understood at OYA that where the wildflower grassland had not been created around the junction as proposed, the Contractor would be required to undertake remedial work which would be re-evaluated at the FYA stage.
- Gonerby Moor: It was understood at OYA that where the proposed wildflower grassland had been substituted for amenity grassland, the Contractor would be required to undertake remedial work which would be re-evaluated at the FYA stage.
- Colsterworth: The re-establishment of diverse grassland on the translocated soil from Colsterworth Bank Protected Road Verge (PRV) was considered very poor at OYA, and it was understood that the Contractor would be required to undertake remedial work and that the management of the translocated grassland would be reconsidered at the FYA stage.

- 5.2 For each junction, the respective ES assessed the potential impacts of disruption during construction and the operation of proposals designed to improve safety and reduce congestion, and described the range of measures that were to be implemented to off-set adverse environmental effects which were not able to be removed from the design.
- 5.3 In terms of mitigation, measures were stated to include proposals designed to provide new wildlife habitat, decrease water pollution, and make the junction easier to use for pedestrians, horse riders and cyclists (also known as Non-motorised Users - NMUs).
- 5.4 The ESs demonstrated that in general terms, the junction improvements would have limited adverse environmental effects as each scheme had been designed as far as practicable to avoid adverse environmental effects.
- 5.5 A summary of what was completed at each junction is given in Chapter 1 of this report.

## Evaluation of Environmental Sub-Objectives

- 5.6 For each junction, the following environmental sub-objectives were appraised in the ESs and in the Appraisal Summary Tables (ASTs) according to appraisal guidance at that time:
- Noise;
  - Local Air Quality;
  - Greenhouse Gases;
  - Heritage;
  - Landscape/ Townscape;
  - Biodiversity;
  - Water Environment;
  - Physical fitness; and
  - Journey Ambience.
- 5.7 For each of these environmental sub-objectives, the evaluation in this section assesses the environmental impacts predicted in each scheme's AST and ES against those observed five years after opening.
- 5.8 In the context of the findings from the OYA evaluations and using new evidence collected five years after opening, this section presents:
- An evaluation of the ongoing effectiveness of the mitigation measures implemented as part of the scheme;
  - An updated summary of key impacts against all of the nine environment WebTAG sub-objectives, with particular focus on the assessment of sub-objectives where it was too early for conclusions to be drawn at the OYA evaluation stage; and
  - Additional analysis relevant to close out issues/ areas for further study identified at the OYA stage for consideration at the FYA stage.

## Methodology

- 5.9 This section only focuses on the environmental aspects of the scheme that were not fully evaluated at OYA, or where at OYA, suggestions were made for further study. Any issues that have arisen since the OYA evaluation are also discussed.
- 5.10 Although the detail of the OYA evaluation is not repeated here, reference is made to the OYA evaluation where required and key points are incorporated into this FYA report to provide contextual understanding where appropriate.

- 5.11 No new modelling or survey work has been undertaken for this FYA environmental evaluation.

## Data Collection

- 5.12 ASTs, ESs (Volumes 1, 2 and 3) and final Handover Environmental Management Plans (HEMPs) were supplied for each GSJ, and have been used for this FYA evaluation. A full list of the background information requested and received to help with the compilation of this report is provided in Appendix E.

## Site Visit

- 5.13 As part of the FYA evaluation, a site visit was undertaken in early May 2015; this included a review of the physical aspects of the junctions and inspection from publicly accessible locations (e.g. footpaths, overbridges, subways), along with the taking of photographs to provide comparison with material produced for the ES and at OYA (found in Appendix E).

## Consultation

- 5.14 Statutory environmental organisations (Natural England, English Heritage/ Historic England<sup>6</sup>, and the Environment Agency), local authorities, and Parish Councils were contacted as part of the FYA evaluation regarding their views on the impacts they perceive the scheme has had on the environment as shown in Appendix G.
- 5.15 The relevant Asset Support Contractor (ASC) and Managing Agent Contractors (MACs) have also been consulted with regard to animal mortality figures which have been made available for the A1 route corridor between Blyth and Carpenters Lodge for the six year period between 2009 (when the final junction opened) and 2014 inclusive; these figures are presented in Appendix H, and are discussed in the biodiversity section of the Environmental chapter.

## Traffic Forecast Evaluation

- 5.16 Three of the environmental sub-objectives (Noise, Local Air Quality, and Greenhouse gases) are directly related to traffic flows. No new noise or air quality surveys are undertaken for Post-Opening Project Evaluation (POPE) and an assumption is made that the level of traffic and the level of traffic noise and local air quality are related.
- 5.17 For each individual junction, the traffic forecasts used in the Noise and Local Air Quality appraisals, along with the observed FYA Annual Average Daily Traffic (AADT) flows, are summarised in Appendix I.
- 5.18 In line with the Traffic Analysis chapter of this report, the Do Something forecasts for the schemes have been taken from the Traffic and Economics Report, and have been interpolated to date using a straight line projections between Opening Years and Design Years.
- 5.19 Although no Heavy Goods Vehicle (HGV)/ traffic speed forecast data were available for this FYA evaluation, the Traffic Analysis chapter of this report notes despite the increase in absolute numbers of HGVs, there are reductions in the percentage proportions of HGV traffic due to the increases in non-HGV traffic.

### Blyth

- 5.20 Traffic flows were greater than forecast by 2% and 15% on the A1 to the north and south of the junction respectively. Traffic flows on the A1 northbound exit-slip road were as forecast, and

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<sup>6</sup> Following the changes to English Heritage's structure that moved the protection of the National Heritage Collection into the voluntary sector in April 2015, the body that remained was rebranded as Historic England. The Consultation request sent to English Heritage in March 2015 was answered by Historic England in April 2015.

traffic flows on the A1 southbound exit- slip road, the overbridge, the A614, and the B6045 were between 10% and 57% less than forecast.

#### **Apleyhead**

- 5.21 Traffic flows were 215% greater than forecast on the B6420, and between 2% and 4% greater than forecast on the A1 south of the junction, the A1 northbound exit-slip road, and on the overbridge. Traffic flows were between 10% and 57% less than forecast on the A1 north of the junction, the A1 southbound exit-slip road, the A57, and the A614.

#### **Markham Moor**

- 5.22 Traffic flows were 20% greater than forecast on Main Street. Traffic flows were between 3% and 25% less than forecast on the A1 south of the junction, both the northbound and southbound A1 exit-slip roads, the overbridge, the A57, the A638, and the B6420. No data was available for traffic flows on the A1 north of the junction.

#### **Gonerby Moor**

- 5.23 Traffic flows were 29% less than forecast on the A1 to the south of the junction. No other data was available as it was not possible to extract the forecast flow from the turning count diagrams due to the nature of the junction layout (as noted in the Forecast vs. Observed Traffic Volumes section of the Traffic chapter of this report).

#### **Colsterworth**

- 5.24 At the northern junction, traffic flows were less than forecast by 17% and 24% on the A1 to the north and south of the junction respectively. No data was available for traffic flows on the northbound and southbound exit-slip roads, or the overbridge.
- 5.25 At the southern junction, traffic flows were greater than forecast by 50% on the B6043 (west). Traffic flows were between 41% and 57% less than forecast on the northbound and southbound A1 exit-slip roads, the overbridge, the A151, and the B676. No data was available for traffic flows on the A1 north of the junction.

#### **Carpenters Lodge**

- 5.26 Traffic flows were 5% greater than forecast on the A1 north of the junction. Traffic flows were between 26% and 37% less than forecast on the overbridge, the B1081 south of the overbridge, and the B1081 north of the overbridge. No data was available for traffic flows on the A1 south of the junction or on Racecourse Road.

## **Five Years After Environmental Assessment**

- 5.27 Included in Appendix J is a brief summary of statements from the AST and the ESs for all the junctions.
- 5.28 This section summarises the OYA evaluations (including close out/ key issues identified for further reporting at the FYA stage), which have been included to provide the context for the FYA evaluation.

## **Noise**

### **OYA Summary**

- 5.29 The OYA noise evaluation summary confirmed that in general, traffic flows were lower than forecast at all of the junctions and summarised the impact(s) at each junction as follows:

- **Blyth:** The noise environment was better than expected because traffic volumes were lower than forecast on the A1 exit slip roads and flow changes were similar to forecast on the A614;
- **Apleyhead:** Traffic flows were lower than expected on the A1 north bound off-slip, and flow changes were higher than expected on the B6420. An earth bund was provided as proposed and it was therefore considered that the noise climate for the Apleyhead Wood property should have improved as expected;
- **Markham Moor:** Although forecast to increase, traffic flows had decreased since opening on the A1(S) Northbound, A1(S) Southbound, B1164, and A638. The noise climate for Cleveland Hill Farm and Sibthorpe was therefore considered likely to be better than expected;
- **Gonerby Moor:** Traffic flows were lower than expected for the B1174 and A1 south of the junction, and therefore College Farm was considered likely to have experienced a decrease in noise as expected. The change in traffic flows on Gonerby Lane was greater than expected, and therefore the impact was considered better than expected;
- **Colsterworth:** Noise was considered worse than expected on the B6403 because traffic flows were higher than forecast. Flows were lower than expected for the A151, but the observed decrease was less than forecast. Noise levels had improved on B676, which was considered to have benefited properties in the southern part of Colsterworth and around the southern junction; and
- **Carpenters Lodge:** Noise levels were similar to those expected for A1 George Farm, and were better than expected for the B1801 and New Bridge.

5.30 As no properties were eligible for noise insulation and the Road Surface Influence (RSI) value of the road surface installed at each of the junctions was confirmed to be -3.7dB(A), the OYA evaluation therefore assumed that the mitigation was performing as expected.

### Consultation

5.31 In terms of comments relevant to the scheme, Blyth Parish Council responded that most villagers are not able to have their windows open at night due to the increase in noise, and queried whether a noise survey could be conducted and whether resurfacing with a noise reducing Tarmac could be considered.

5.32 Great Gonerby Parish Council responded that that the impact of the Gonerby Moor junction was as expected.

5.33 Colsterworth Parish Council responded that dwellings adjacent to the A1 had reported an increase in noise levels, the perception being that traffic (especially HGVs) using the A1 had significantly increased in the five years since construction. The council noted that Mondays and Fridays were deemed the busiest pre- scheme, but now the perception is that “*every day is the same*”. Colsterworth Parish Council also stated that they would be interested in seeing traffic statistics pre and post scheme.

5.34 No other responses to consultation requests were received.

### Evaluation

5.35 In the absence of any HGV/ traffic speed forecast data, an assumption is made by POPE methodology that if traffic flows vary by 25% more or 20% less when compared with what was originally forecast in a particular year, then it would be assumed that the local noise impact is likely to be respectively ‘worse than’ or ‘better than’ expected.

5.36 Comparisons of both the predicted and observed AADT flows for all the junctions are presented in Appendix I.

### Blyth

- 5.37 In terms of the comments received from Blyth Parish Council, no new noise surveys have been undertaken for this evaluation, and the OYA evaluation confirmed that the RSI value of the road surface installed at the junction -3.7dB(A), as expected.
- 5.38 The observed traffic flows are:
- Less than predicted at 3 locations (the A1 southbound exit-slip road, the A614 and the B6045), with the percentage difference between the mean forecasts and the observed flows exceeding the -20% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location; and
  - As predicted at 4 locations (the A1 both north and south of the junction, the A1 northbound exit-slip, and the overbridge), with percentage differences between the mean forecasts and the observed flows within the +25/-20% tolerances assumed by POPE.
- 5.39 Overall, it is considered that the impact of the junction on the noise climate is likely to be generally as expected, but better than expected on the A1 southbound exit-slip road, the A614 and the B6045.

### Apleyhead

- 5.40 The observed traffic flows are:
- Less than predicted at 2 locations (the A1 southbound exit-slip road and the A614), with the percentage difference between the mean forecasts and the observed flows exceeding the -20% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location;
  - As predicted at 5 locations (the A1 both north and south of the junction, the A1 northbound exit-slip, the overbridge, and the A57), with percentage differences between the mean forecasts and the observed flows within the +25/-20% tolerances assumed by POPE; and
  - Greater than predicted at 1 location (the B6420), with the percentage difference between the mean forecast and the observed flows at exceeding the +25% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT.
- 5.41 Overall, it is considered that the impact of the junction on the noise climate is generally as expected, although it is likely to be better than expected on the A1 southbound exit-slip road and the A614, and worse than expected on the B6420.

### Markham Moor

- 5.42 The observed traffic flows are:
- Less than predicted at 1 location (the A1 southbound exit-slip road), with the percentage difference between the mean forecasts and the observed flows exceeding the -20% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT; and
  - As predicted at all other 7 locations, with percentage differences between the mean forecasts and the observed flows within the +25/-20% tolerances assumed by POPE.
- 5.43 Overall, it is considered that the impact of the junction on the noise climate is likely to be generally as expected, but better than expected on the A1 southbound exit-slip road.

### Gonerby Moor

- 5.44 The observed traffic flows were less than predicted at the single location where traffic flow data was available (the A1 south of the junction), with the percentage difference between the mean forecast and the observed flows exceeding the -20% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT.

5.45 Based on the information available, it is considered that the impact of the junction on the noise climate is likely to be better than expected at the A1 south of the junction.

### Colsterworth

5.46 In terms of the comment from Colsterworth Parish Council regarding the perceived significant increase in HGVs using the A1 since the scheme opened, the Traffic Analysis chapter of this report notes that despite the increase in absolute numbers of HGVs, there has been a reduction in the percentage proportion of HGV traffic north of the junctions (i.e. between the B6403 and B1174) from 22% in 2006, pre-scheme, to 20% at FYA in 2015, and that between the junctions (i.e. between the B6403 and A151), the percentage proportion of HGVs was recorded at 21% in both 2006 & 2015.

5.47 Although it can be seen that HGVs form a high proportion of traffic comprising between a fifth and a quarter of all traffic on the A1 at this location, it is considered that the changes in percentage proportions of HGVs are unlikely to be significant, and that any changes in the absolute numbers of HGVs are likely to correlate with the predicted AADT flows.

5.48 The observed traffic flows are:

- Less than predicted at six locations (the A1 south of the junction, the B676/ A1 northbound exit-slip road, the A151/ A1 southbound exit-slip road, the south junction overbridge, and both the A151 and B676), with the percentage difference between the mean forecasts and the observed flows exceeding the -20% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location;
- As predicted at one location (the A1 north of the junction), with percentage difference between the mean forecast and the observed flows within the +25/-20% tolerances assumed by POPE; and
- Greater than predicted at one location (the B6043 (west) at Colsterworth south), with the percentage difference between the mean forecast and the observed flows at exceeding the +25% tolerance assumed by POPE. However the absolute number of vehicles does not exceed 1,000 AADT and as such, this not considered to be significant.

5.49 Overall, it is considered that the impact of the junction on the noise climate is likely to be generally better than expected, although it is likely to be as expected on the A1 north of the junction and on the B6043 (west) at Colsterworth south.

### Carpenters Lodge

5.50 The observed traffic flows are:

- Less than predicted at 3 locations (the overbridge, and the B1081 both north and south of the overbridge), with the percentage difference between the mean forecasts and the observed flows exceeding the -20% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location; and
- As predicted at 1 location (the A1 north of the junction), with percentage differences between the mean forecast and the observed flows within the +25/-20% tolerances assumed by POPE.

5.51 Overall, it is considered that the impact of the junction on the noise climate is likely to be generally better than expected, although likely to be as expected on the A1 north of the junction.

### Summary

5.52 The percentage difference between the mean forecasts and the observed traffic flows at FYA are, predominantly, less than or within the tolerances assumed by POPE and as such, the impacts of the junctions on the noise climate are considered to be generally as, or better than, expected.

5.53 Traffic flows are greater than predicted on the B6420, with the percentage difference between the mean forecasts and the observed flows exceeding the +25% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT; the impact of the junction on the noise climate is therefore considered likely to be worse than expected at this location.

**Table 5.1 – Evaluation Summary: Noise**

<b>Sub-Objective Noise: Location</b>	<b>AST</b>	<b>FYA</b>
<b>Blyth</b>	Estimated population annoyed by Noise would be reduced by 2.3	Generally as expected, but better than expected on the A1 southbound exit-slip road, the A614 and the B6045
<b>Apleyhead</b>	Estimated population annoyed by Noise would be reduced by 0.3	Generally as expected, but better than expected on the A1 southbound exit-slip road and the A614, and worse than expected on the B6420
<b>Markham Moor</b>	Estimated population annoyed by Noise would be reduced by 2.4	Generally as expected, but better than expected on the A1 southbound exit-slip road
<b>Gonerby Moor</b>	Estimated population annoyed by Noise = +0.4	Better than expected at the A1 south of the junction (no other data available)
<b>Colsterworth</b>	Estimated population annoyed by Noise would increase by 25.3	Generally better than expected, but as expected on the A1 north of the junction and on the B6043 (west) at Colsterworth south
<b>Carpenters Lodge</b>	Estimated population annoyed by Noise would not change	Generally better than expected, but as expected on the A1 north of the junction

## Air Quality

### OYA Summary

- 5.54 The OYA noise air quality evaluation summary noted that as with noise, local air quality is heavily influenced by changes in traffic volumes, and stated that the impact(s) were broadly in line with those presented (at OYA) for the noise objective (above). For the locations where traffic flows were available, the OYA evaluation summarised the impact(s) at each junction as follows:
- Blyth: Air quality was considered better than expected, because traffic volumes were lower than forecast on the A1 exit slip roads and flow changes were similar to those expected on the A614 after opening;
  - Apleyhead: Properties are located near the A1 northbound exit slip road where traffic flow was lower than forecast. Traffic flow changes were higher than forecast on the B6420, but no properties are located on this route. The overall impact was therefore considered to be better than expected;
  - Markham Moor: Although forecast to increase, traffic flows had decreased since opening on the A1(S) Northbound, A1(S) Southbound, B1164, and A638 - the impact was therefore considered to be better than expected;
  - Gonerby Moor: Air quality was considered likely to have improved for the 9 properties along the B1174. Traffic flows were the same as forecast on Gonerby Lane but as a greater change was observed than predicted, the impact was considered to be better than expected. Post opening traffic flows on the A1 were considerably lower than forecast but as the change between the pre and post scheme situations was similar to forecast, the impact was therefore considered to be as expected;
  - Colsterworth: Local air quality was considered likely to be better than expected for properties close to the southern junction at Colsterworth due to the decrease in traffic flows on the B676. Air quality was considered worse than expected on the B6043 and A151; and
  - Carpenters Lodge: Based on the traffic volume changes observed, local air quality was considered likely to be similar to that expected for the A1 at George Farm and Carpenters Lodge, and better than expected for the B1081 and New Bridge.

### Consultation

- 5.55 Babworth Parish Council commented that there is much more traffic on the B6420 at Apleyhead, and so the local air quality will be worse.
- 5.56 Great Gonerby Parish Council responded that that the impact of the Gonerby Moor junction was as expected.
- 5.57 No other responses to consultation requests were received.

### Evaluation

- 5.58 In the absence of any HGV/ traffic speed forecast data, an assumption is made by POPE methodology that if observed after opening traffic flows identified by POPE vary by more than +/- 10% AADT, it would be assumed that local air quality is likely to be either '*worse than*' or '*better than*' expected.
- 5.59 Comparisons of both the predicted and observed AADT flows for all the junctions are presented in Appendix I.

### Blyth

- 5.60 The observed traffic flows are:

- Less than predicted at 3 locations (the A1 southbound exit-slip road, the A614 and the B6045), with the percentage difference between the mean forecasts and the observed flows exceeding the -10% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location;
- As predicted at 3 locations (the A1 north of the junction, the A1 northbound exit-slip, and the overbridge), with percentage differences between the mean forecasts and the observed flows within the +/-10% tolerances assumed by POPE; and
- Greater than predicted at 1 location (the A1 south of the junction), with the percentage difference between the mean forecast and the observed flows at exceeding the +10% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT.

5.61 Overall, it is considered that the impact of the junction on local air quality is generally as or better than expected, although likely to be worse than expected on the A1 south of the junction.

#### **Apleyhead**

5.62 The observed traffic flows are:

- Less than predicted at 2 locations (the A1 southbound exit-slip road and the A614), with the percentage difference between the mean forecasts and the observed flows exceeding the -10% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location;
- As predicted at 5 locations (the A1 both north and south of the junction, the A1 northbound exit-slip, the overbridge, and the A57), with percentage differences between the mean forecasts and the observed flows within the +/-10% tolerances assumed by POPE; and
- Greater than predicted at 1 location (the B6420), with the percentage difference between the mean forecast and the observed flows at exceeding the +10% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT.

5.63 Overall, it is considered that the impact of the junction on local air quality is generally as expected, although likely to be better than expected on the A1 southbound exit-slip road and the A614, and worse than expected on the B6420 (the latter location tying in with local concerns).

#### **Markham Moor**

5.64 The observed traffic flows are:

- Less than predicted at 3 locations (the A1 southbound exit-slip road, the A638 and the B6420), with the percentage difference between the mean forecasts and the observed flows exceeding the -10% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at all locations except the B6420. The absolute number of vehicles falling short of the predicted figure at the B6420 is less than 1,000 AADT and as such, is not considered to be significant;
- As predicted at 4 locations (the A1 south of the junction, the A1 northbound exit-slip, the overbridge, and the A57), with percentage differences between the mean forecasts and the observed flows within the +/-10% tolerances assumed by POPE; and
- Greater than predicted at 1 location (Main Street), with the percentage difference between the mean forecast and the observed flows at exceeding the +10% tolerance assumed by POPE. However the absolute number of vehicles does not exceed 1,000 AADT and as such, this not considered to be significant.

5.65 Overall, it is considered that the impact of the junction on local air quality is likely to be generally as expected, although likely better than expected on the A1 southbound exit-slip road and the A638.

### **Gonerby Moor**

5.66 The observed traffic flows were less than predicted at the single location where traffic flow data was available (the A1 south of the junction), with the percentage difference between the mean forecast and the observed flows exceeding the -10% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT.

5.67 Based on the information available, it is considered that the impact of the junction on local air quality is likely to be better than expected at the A1 south of the junction.

### **Colsterworth**

5.68 The observed traffic flows are:

- Less than predicted at all locations except one, with the percentage difference between the mean forecasts and the observed flows exceeding the -10% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location; and
- Greater than predicted at 1 location (the B6043 (west) at Colsterworth south), with the percentage difference between the mean forecast and the observed flows at exceeding the +10% tolerance assumed by POPE. However the absolute number of vehicles does not exceed 1,000 AADT and as such, this not considered to be significant.

5.69 Overall, it is considered that the impact of the junction on local air quality is likely to be generally better than expected, but likely as expected on the B6043 (west) at Colsterworth south.

### **Carpenters Lodge**

5.70 The observed traffic flows are:

- Less than predicted at 3 locations (the overbridge, and the B1081 both north and south of the overbridge), with the percentage difference between the mean forecasts and the observed flows exceeding the -10% tolerance assumed by POPE with the overall number of vehicles falling short of the predicted figures by over 1,000 AADT at each location; and
- As predicted at 1 location (the A1 north of the junction), with percentage differences between the mean forecast and the observed flows within the +/-10% tolerances assumed by POPE.

5.71 Overall, it is considered that the impact of the junction on local air quality is likely to be generally better than expected, although likely as expected on the A1 north of the junction.

### **Summary**

5.72 The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than, or within, the tolerances assumed by POPE and as such, the impact of the junctions on local air quality are considered to be generally as or better than expected.

5.73 Traffic flows are greater than predicted on the A1 south of the junction at Blyth and on the B6420 at Apleyhead, with the percentage difference between the mean forecasts and the observed flows exceeding the +10% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT at both locations; the impact on local air quality at these locations is therefore considered likely to be worse than expected.

**Table 5.2 – Evaluation Summary: Local Air Quality**

Quality: Location	AST	FYA
<b>Blyth</b>	PM <sub>10</sub> (2007): -66 NO <sub>2</sub> (2007): -102	Generally as or better than expected, but likely worse than expected on the A1 south of the junction
<b>Apleyhead</b>	PM <sub>10</sub> (2007): -1.2 NO <sub>2</sub> (2007): -2.5	Generally as expected, but better than expected on the A1 southbound exit-slip road and the A614, and worse than expected on the B6420
<b>Markham Moor</b>	PM <sub>10</sub> : -50 NO <sub>2</sub> : -103	Generally as expected, but better than expected on the A1 southbound exit-slip road and the A638
<b>Gonerby Moor</b>	PM <sub>10</sub> (2007): -2.2 NO <sub>2</sub> (2007): -5.4	Better than expected at the A1 south of the junction (no other data available)
<b>Colsterworth</b>	PM <sub>10</sub> (2007): -0.07 NO <sub>2</sub> (2007): +24.4	Generally better than expected, but as expected on the B6043 (west) at Colsterworth south
<b>Carpenters Lodge</b>	PM <sub>10</sub> (2007): -0.2 NO <sub>2</sub> (2007): +0.9	Generally better than expected, but as expected on the A1 north of the junction

## Greenhouse Gases

- 5.74 For transport, Carbon Dioxide (CO<sub>2</sub>) is considered the most important greenhouse gas therefore it has been used as the key indicator for the purposes of assessing the impacts of a road scheme on climate change. Changes in CO<sub>2</sub> levels are considered in terms of equivalent tonnes of Carbon released as a result of the scheme under evaluation.

### Appraisal

- 5.75 Each junctions ES contained a forecast impact of the improvement on annual carbon emissions in the opening year. All were assessed using the DMRB air quality methodology covering the local road network around the junction, 200m from the centre line of the A1 however it is not known exactly what links were covered in all cases.

### Evaluation

- 5.76 The carbon impact for each junction improvement has been evaluated using same DMRB air quality spreadsheet as used in the appraisal based on the links in and immediately adjacent to each junction. The comparison of the outturn results for the actual emissions are shown in Table 5-3.

**Table 5-3 – Carbon Emissions by junction**

Junction	Forecast (2007)		Outturn With scheme vs counterfactual without (2015)	
	Net (tonnes)	%	Net (tonnes)	%
Blyth	256	28%	166	26%
Apleyhead	-57	-2%	221	34%
Markham Moor	-125	-11%	161	26%
Gonerby Moor	-188	-18%	28	4%
Colsterworth	-27	-1%	20	2%
Carpenters Lodge	-27	-3%	104	17%

- 5.77 Table 5-3 shows the following in relation to the accuracy of the forecast emissions:
- Only one junction was expected to show a real increase (Blyth) and this outturn assessment has matched this.
  - One showed negligible change, as expected (Colsterworth).
  - The other four showed increases net emissions compared with the forecast.
- 5.78 The differences between forecast and outturn net change in carbon emissions is primarily due to the differences between forecast and outturn traffic flows identified earlier in this report.
- 5.79 The total impact of the forecast and outturn emissions for all junctions combined is summarised in Table 5-4.

**Table 5-4 – Summary of Carbon Emissions for All Junctions Combined**

Scenario	Forecast (2007)	Outturn (2015)
Do minimum / without scheme (tonnes)	11,132	4,422
Do something / with scheme (tonnes)	10,963	5,122
Net difference (tonnes)	-169	700
%	-2%	16%

- 5.80 Table 5-4 shows that when considered as a whole, the best estimate impact of the scheme is an increase of 700 tonnes of carbon, a 16% increase. This is above the forecast change of carbon emissions, due to:
- Forecast impact being based on much longer sections of road.
  - Extra traffic in the A1 corridor and does not take into account the effect over a wide area of the rerouting traffic.

## Landscape/ Townscape

### OYA Summary

- 5.81 The OYA landscape evaluation summary noted that a major change to the scheme had been the decision not to include lighting on the overbridges at both the Colsterworth and Carpenters Lodge junctions in response to local affected parties who had concerns regarding the visual intrusion of the proposals as presented with the Draft Orders.
- 5.82 Summaries of the OYA landscape evaluations for each of the junctions are presented below.

#### Blyth

- 5.83 The OYA report stated that mitigation measures had generally been provided as proposed, except there was less planting (due to size/ safety constraints) in the vicinity of the northern roundabout. This reduction in planting was considered to result in the roundabout and associated lighting being more visible than expected within the surrounding landscape in the short term. The OYA evaluation considered that the establishment of this planting was important, and stated that it should be re-evaluated at FYA. Overall, the OYA report concluded that the landscape impacts were worse than expected.

#### Apleyhead

- 5.84 Mitigation was stated as having generally been provided as expected, but it was noted that plant growth had been slow/ average due to localised naturally existing poor topsoil conditions. It was also noted that while additional plant species had been planted (e.g. oak), these species were common in woodlands within the Sherwood Landscape Character Area. Overall, it was concluded that the landscape impacts were slightly worse than expected at OYA.

### Markham Moor

- 5.85 The effects of the scheme were considered to be generally as expected at OYA, except there was approximately 3000m<sup>2</sup> less planting on the northern side of the scheme. This was considered to result in a reduced screening of views to the scheme from the north, although it was noted that there were few visual receptors to the north. Approximately 8,000m<sup>2</sup> more trees and shrubs than proposed had been planted around the overbridge, and it was considered that this would give this area a more enclosed landscape character in time. Overall, it was concluded that the impact of the scheme was worse than expected at OYA.

### Gonerby Moor

- 5.86 Despite comments from Lincolnshire County Council that the nearby motocross track and equestrian centre had become more visible and concerns expressed by Great Gonerby Parish Council that the impact of the lighting was worse than expected, mitigation measures were stated at OYA as generally having been provided as proposed, although the additional planting provided along the south bound A1 entry-slip road was considered to help reduce impacts of the scheme. On balance, the landscape impacts of the scheme were considered to be as expected at OYA.

### Colsterworth

- 5.87 Lighting was considered to have less visual impact than expected at OYA, as it had not been provided at the overbridges at both junctions in response to local affected parties who had concerns regarding visual intrusion (including Lincolnshire County Council who commented that the truck stop area was visible). However, it was stated that visual impacts for Colsterworth (southern junction) may be slightly worse than expected, as approximately 2,000m<sup>2</sup> of planting had been omitted from along the A1 northbound carriageway (possibly due to lack of space in which to accommodate both planting and drainage). Wildflower areas on exposed limestone were reported as un-germinated at the northern junction, and the OYA report considered that re-evaluation would be appropriate at the FYA stage.
- 5.88 Overall, it was concluded that the landscape impacts were slightly better than expected at OYA in relation to the lighting omitted from the overbridges, but worse than expected in relation to visual impacts for Colsterworth village, due to the omitted planting along the A1 northbound carriageway at the southern junction and the un-germinated wildflower areas on the exposed limestone at the northern junction.

### Carpenters Lodge

- 5.89 The lighting omitted at the overbridge was considered to have resulted in the visual impact of the scheme being better than expected for several visual receptors, including Burghley Park and the Grandstand Listed Building. The OYA report considered it too soon to evaluate effectiveness of the new planting, and stated that this aspect should be reconsidered at the FYA stage. Despite Peterborough City Council comments that the overbridge had no sense of locality and the new planting would shortly hide views of the Burghley estate stone wall (a feature of local significance) with resultant loss to the local character of the road, on balance the OYA evaluation concluded that the impact of the scheme was as expected in terms of landscape character, and better than expected in terms of visual impact.

### Consultation

- 5.90 Natural England responded that they were satisfied that there has not been any adverse impact upon internationally/ nationally designated sites or protected landscapes.
- 5.91 Blyth Parish Council responded that the landscape at one of the (unspecified) roundabouts at Blyth was much neglected and did not create a favourable impression for people entering Blyth from the A1, and that “*the litter finding a home on that part of the roundabout is appalling*”.

- 5.92 Babworth Parish Council responded that at Apleyhead, hedges, bushes and trees were growing slowly, and that no wildflower areas had been planted.
- 5.93 Great Gonerby Parish Council responded that that the impact of the Gonerby Moor junction was as expected.
- 5.94 Colsterworth Parish Council responded that in terms of landscape and visual impact, hedgerows were taking longer to mature than expected.
- 5.95 No other responses to consultation requests were received.

## **Evaluation**

### **All Junctions**

- 5.96 The mitigation proposals outlined by the ESs included measures designed to decrease water pollution and to make the junction easier to use for NMUs, but the primary landscape mitigation measures presented were in the form of grassland and tree/ shrub planting.
- 5.97 Although no post-construction survey information regarding the species composition/ diversity of the wildflower grasslands were available for this evaluation, the wildflower grasslands observed during the FYA site visit appeared to have generally established well; scrub cover was insignificant, and there was no evidence to suggest that the management regimes specified by the HEMPs were not being adhered to.
- 5.98 The FYA site visit observed localised areas of plant stock that were not as well developed as would be expected at this stage, with many planting plots containing plants which appear less than vigorous (Figure 5.1, below) and with occasional gaps evident within hedgerows (Figure 5.1, also below). Potential contributing factors could include poor/ unsuitable soil, bad handling of plant stock, and exposure.

**Figure 5.1 – Typical views of a planting plot with a stand of poorly established plants on the northern embankment of the overbridge/ southbound exit-slip road at Apleyhead (left), and of a hedgerow gap adjacent to the northbound carriageway at Carpenters Lodge (right).**



- 5.99 Where established however, individual plants around the junctions were found to be progressing satisfactorily at the time of the FYA site visit, with the under planted sward areas free of weeds/ significant scrub cover, and the established plant stock appearing to be generally healthy and free from pests and diseases. Vegetative treatment systems (rushes) appeared to have generally established well where planted at the balancing ponds.
- 5.100 Despite not being mentioned in any of the HEMPs, it should be noted that some areas of new planting were observed, presumably where plants had either failed to establish fully or had been damaged, or where areas not planted at OYA had subsequently been planted; examples of (the largest) areas of new planting are illustrated by Figure 5.2, below.

**Figure 5.2 – Large areas of new planting flanking the northbound entry-slip road at Gonerby Moor.**



- 5.101 Although some localised new planting operations had been undertaken as noted above, as tree and shrub establishment/ development comprising the mitigation proposals were observed to vary between slow and average within a significant number of planting plots/ hedgerows outside of the newly planted locations, it is considered that the plant stock is generally developing slower (i.e. worse) than expected overall at all of the junctions.
- 5.102 Recent maintenance of planting plots was generally not evident during the FYA site visit, although the condition and appearance of the sward in both grassland and planting plots suggests that the maintenance operations detailed in the HEMPs have generally been undertaken as specified during the five year aftercare maintenance period, and have included amenity/ wildflower grass cutting, vegetation cutting/ strimming, and control of broadleaved/ noxious weeds.

- 5.103 The FYA site visit found the road corridors around the new junctions to be generally free of broadleaved/ noxious weeds and although occasional stands of nettles and thistles were observed, the localised nature of these infestations was such that they are not considered to be significant at this time; other than as noted in the sections concerning individual junctions below, road corridors around the junctions were found to be generally tidy and litter free.
- 5.104 Plant shelters remain in place throughout planted areas and along hedgerows at all junctions and although not currently appearing to be adversely affecting the planting, the removal and disposal of tree/ shrub protection (including stakes, ties and guards) was specified by the HEMPs to be undertaken in Year 5 of the Landscape Aftercare Maintenance for each junction, and should have been completed at all junctions by March 2015.
- 5.105 The ASTs for the junctions at Apleyhead, Markham Moor, Gonerby Moor and Colsterworth (north and south) stated that townscape was not applicable, and as such, the townscape impact of these junctions has not been assessed by this report. As regards townscape at Blyth and Carpenters Lodge, no issues were outstanding at the time of the OYA report, and no changes were identified during the FYA site visit; it is therefore considered that the Townscape impact of these junctions is likely to be as expected.

### Blyth

- 5.106 Regarding the establishment of the planting plots in the vicinity of the northern roundabout (adjacent to the southbound carriageway) considered to be important by the OYA evaluation:
- At FYA significant proportion (c.35-40%) of the trees adjacent Blyth Wood to the south-east and south of the junction were observed to be missing, dead, or failing to develop as would be reasonably expected at this FYA stage (see Figure 5.3, below). It is therefore considered that these plots are unlikely to link visually with the surrounding woodland, reinforce the landscape character of the area, or provide screening for receptors to the north and south as predicted in the ES and as such, the landscape impact is likely to be worse than expected at this location;

**Figure 5.3 – Trees adjacent to Blyth Wood to the south-east and south of Blyth junction were observed to be missing, dead, or failing to develop as would be reasonably expected during the site visit.**



- The tree and shrub planting plots flanking A614 Bawtry Road on the approach to the northern roundabout are considered to be developing broadly as would be expected at this stage, and starting to perform the screening, landscape integration, and visual amenity functions for which they were intended; this is illustrated by Figure 5.4, below.

**Figure 5.4 – Planting plots at the A614 Bawtry Road entry to the northern roundabout at Blyth (left) and at the A614 Bawtry Road exit from the northern roundabout (right).**



- Hedgerow planting to the northwest and southeast of the junction along the A1, B6045, A614 and Blyth Road approaches are generally establishing well and in the main are greater than the 1.0m high by 1.5m wide specified by the HEMP following the completion of the five year aftercare period (see Figure 5.5, below). However, despite replacement hedgerow planting (as indicated by hedgerow age structure and variable plant shelter condition), the hedgerow adjacent to the southbound entry-slip road exhibits occasional gaps (see Figure 5.5, below) and a gap greater than 5.0m remains evident in along the balancing pond boundary (Figure 5.5, below). However, these are not considered to be particularly significant at this stage in light of the observed replacement planting and overall, hedgerows are broadly developing as expected and subject to careful ongoing management and maintenance operations, the landscape integration and nature conservation functions of these hedgerows are likely to be realised by design year.

**Figure 5.5 – Hedgerows are generally developing well (as illustrated on the approach to the southern roundabout from Blyth, top left), and although replacement planting has been undertaken (in the plot adjacent to the southbound entry-slip road, top right), a gap greater than 5.0m remains evident in the hedgerow surrounding the balancing pond (lower centre).**



- 5.107 Regarding the comment received at consultation concerning the neglected landscape at one of the (unspecified) roundabouts and the build-up of litter at the same location, the OYA evaluation noted that planting was omitted from the southern roundabout and that the Contractor had confirmed that although the original planting had been damaged by a Road Traffic Accident (RTA) involving a chemical spill and fire, the roundabout was due to be replanted. The FYA site visit observed that contrary to the as built drawings indicating tree, shrub, and grass/ bulb planting on both roundabouts, both roundabouts comprised predominantly amenity grassland with the southern roundabout remaining free of significant planting; see Figure 5.6, below.

**Figure 5.6 – Amenity grassland with minimal planting on the northern roundabout adjacent to the southbound carriageway (left), and on the southern roundabout adjacent to the northbound carriageway (right) at Blyth.**



5.108 Although both roundabouts appeared to be maintained at the time of the site visit, it is considered that were the planting to correlate with the As-Built drawings, the approach to Blyth from the southern roundabout would be aesthetically more favourable than the existing situation, and the northern roundabout would be better integrated into the surrounding environment on the approach from Bawtry along the A614 Bawtry Road; as such, it is considered that the absence of planting on these roundabouts has resulted in a landscape impact that is likely to be worse than expected.

5.109 There was no litter on either roundabout during the FYA site visit, although some litter was observed on the banks of the approach to the southern roundabout from Blyth (see Figure 5.5, above).

#### **Apleyhead**

5.110 Regarding the comment made by Babworth Parish Council about wildflower areas, none of the swathes of wild daffodils (*Narcissus pseudonarcissus*) in the grassland areas indicated on the As-Built drawings were observed during the site visit to these junctions in early May, despite it being specified in the HEMPs that grassland areas containing bulbs should be cut no earlier than six weeks after flowering in early June. At the time of the FYA site visit all areas that were indicated as having been planted with bulbs appeared to be managed as amenity grassland, the maintenance regime of which would effectively remove daffodils from the grassland.

5.111 In terms of areas of planting considered to be performing worse than expected (as already noted) and therefore unlikely to achieve the design functions for which they were intended, the hedgerows either side of the carriageways leading south from the overbridge (Figure 5.7, below) and the planting plot on the embankment at the eastern roundabout adjacent to the bridleway (Figure 5.7, also below) are notable examples.

**Figure 5.7 – The hedgerows south of the Apleyhead overbridge adjacent to the northbound (top left) and southbound (top right) carriageways are performing significantly worse than expected, as is the planting plot adjacent to the bridleway at the eastern roundabout (lower centre).**



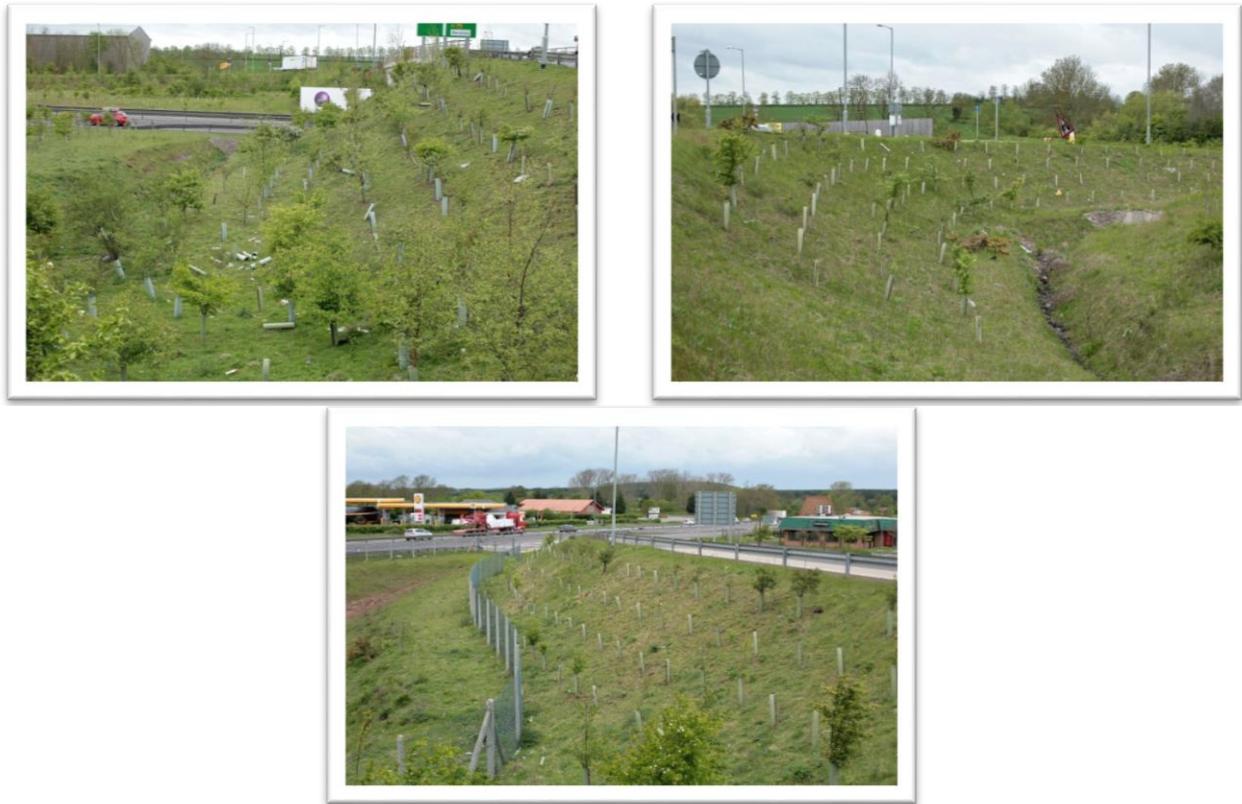
5.112 From Figure 5.7 (top right and lower centre), above, it can also be seen that litter was present adjacent to the southbound carriageway south of the overbridge and on the embankment at the eastern roundabout adjacent to the bridleway, the latter location also exhibiting evidence of fly tipping.

#### **Markham Moor**

5.113 None of the swathes of wild daffodils (*Narcissus pseudonarcissus*) in the grassland areas indicated on the As-Built drawings were observed during the site visit, for the reasons discussed under Apleyhead regarding this aspect of mitigation.

5.114 In terms of areas of planting considered to be performing worse than expected (as already noted) and therefore unlikely to achieve the design functions for which they were intended, the planting plots on the southern embankments of the overbridge (Figure 5.8, below) and those adjacent to the service area/ northbound entry-slip road and the balancing pond/ southbound exit-slip road (Figure 5.8 respectively, also below) are notable examples.

**Figure 5.8 – The planting plots on the southern embankments of the Markham Moor overbridge (top left) and those adjacent to the service area/ northbound entry-slip road and the balancing pond/ southbound exit-slip road (top right and lower centre respectively) are performing particularly poorly.**



5.115 From Figure 5.8 (top left), above, it can also be seen that litter was present adjacent to the southbound carriageway on the southern embankment of the overbridge; a significant quantity of litter was also observed between the northbound entry-slip road and the northbound carriageway (Figure 5.9, below).

**Figure 5.9 – A significant quantity of litter was observed between the northbound entry-slip road and the northbound carriageway at Markham Moor.**



### **Gonerby Moor**

5.116 None of the swathes of wild daffodils (*Narcissus pseudonarcissus*) in the grassland areas indicated on the As-Built drawings were observed during the site visit, for the reasons discussed under Apleyhead regarding this aspect of mitigation.

### Colsterworth

- 5.117 Although the OYA evaluation considered that the visual impacts for Colsterworth (southern junction) to be slightly worse than expected due to the omission of approximately 2,000m<sup>2</sup> of planting from along the A1 northbound carriageway, the FYA site visit observed that this planting has now been implemented and is establishing satisfactorily (see Figure 5.10, below). Subject to ongoing management and maintenance the visual impacts at this location are now likely to be on track to be mitigated as expected.

**Figure 5.10 – The planting omitted from the A1 northbound carriageway at Colsterworth south has now been implemented, and is starting to mitigate the visual impact of the junction for the edge of Colsterworth village.**



- 5.118 In terms of the wildflower areas on the exposed limestone banks at the northern junction reported as not having germinated at OYA, the FYA site visit observed that wildflower species were now beginning to colonise the area (Figure 5.11, below); it is therefore considered that this aspect of mitigation is now starting to develop as expected.

**Figure 5.11 – Wildflower species colonising the exposed limestone banks at Colsterworth (north).**



- 5.119 Regarding the comment received at consultation that hedgerows were taking longer to mature than expected, the FYA site visit observed that in accordance with the HEMP at the end of the five-year aftercare period, hedgerows at Colsterworth north were generally at least 1.0m tall by 1.5m wide with less than 10% gaps which did not exceed 5.0m, and that the bases of the hedgerows were approximately 0.5m above ground level. A typical view is shown in Figure 5.12, below and as such, it is considered that the hedgerows at Colsterworth north are generally developing in line with expectations at this stage.

**Figure 5.12 – Typical view of established hedgerow at Colsterworth north.**



- 5.120 Hedgerow development at Colsterworth south was observed to be variable, with establishment ranging from satisfactory and in accordance with the HEMP at the end of the five-year aftercare period (north of the junction and adjacent to the northbound carriageway, Figure 5.13, below) to areas where gaps exceed 5.0m and comprise greater than 10% of the hedgerow length (around the balancing pond directly north of the overbridge and adjacent to the northbound carriageway, Figure 5.13, below), and to areas where the hedgerow cross section is less than 1.0m tall by 1.5m wide (on the approach to the overbridge from the new roundabout on the A151 to the east of the junction, Figure 5.13, also below).

**Figure 5.13 – Typical views of hedgerows at Colsterworth (south), showing the range of establishment observed; adjacent to the northbound carriageway (top left); at the balancing pond (top right); and to the east of the overbridge (lower centre).**



- 5.121 Although replacement hedgerow planting was observed (as indicated by age structure and the variable condition of the protective guards), it is considered that hedgerow development at Colsterworth south is generally less than would be expected at the FYA stage, and that careful ongoing management and maintenance will be required to ensure that the landscape

integration and nature conservation functions of the less developed (sections of) hedgerows are fully realised by design year.

### Carpenters Lodge

5.122 Regarding the effectiveness of the new planting that was not fully evaluated at the OYA stage, as noted above:

- Wildflower/ amenity grasslands appear to have generally established well; scrub cover was insignificant, and there was no evidence to suggest that the management regimes specified by the HEMPs were not being adhered to;
- Tree and shrub establishment/ development varies between slow and average growth within planting plots (particularly on the southern side of the overbridge embankments as illustrated by Figure 5.14, below) and as such, it is considered that the plant stock is generally not developing in line with expectations at this stage.

**Figure 5.14 – Planting plots on the southern embankments of the Carpenters Lodge overbridge are less vigorous than would reasonably be expected at the FYA stage.**



5.123 Newly planted hedgerows are generally at least 1.0m tall by 1.5m wide with less than 10% gaps which do not exceed 5.0m, and the bases of the new hedgerows are approximately 0.5m above ground level; it is therefore considered that the new hedgerows are generally developing in line with expectations at this junction (as illustrated by Figure 5.15, below).

5.124 The establishment of a section of ancient hedgerow translocated from the B1081 to the south side of the overbridge approach from the Old Great North Road into Stamford, has been only partially successful as although re-growth has occurred, a significantly long section has failed; see Figure 5.15, also below.

**Figure 5.15 – Although the newly planted hedgerows are generally developing as expected (either side of the carriageways north of the Carpenters Lodge overbridge (left), a significant section of the translocated hedgerow appears to have failed (right).**



## FYA Summary

### All Junctions

- 5.125 Despite evidence of replacement planting having been undertaken, the current levels of plant growth and establishment indicate that the visual screening, landscape integration, and visual amenity functions of the plant stock at all junctions do not appear to be developing as well as would be expected at FYA, and may not fulfil their objectives by the design year.
- 5.126 Where applicable, the townscape impacts of the junctions are considered to be as expected.
- 5.127 In addition to these issues noted as relevant to all junctions the following subsections summarise additional junction specific issues.

### Blyth

- 5.128 The landscape and visual impact of the roundabout and associated lighting is likely to remain more visible (i.e. worse) than expected within the surrounding landscape in the long term as;
- The plant failures adjacent to Blyth Wood to the south-east and south of the junction indicate that the plot as a whole is unlikely to be on track to link visually with the surrounding woodland, reinforce the landscape character of the area, or provide screening for receptors to the north and south as predicted in the ES; and
  - Replanting at the southern roundabout following the collision with serious spillage on first opening appears not to have been undertaken;
  - The approach to Blyth from the southern roundabout would act as an attractive gateway feature and be more favourable than the existing situation and the northern roundabout would be better integrated into the surrounding environment on the approach from the A614 Bawtry Road if the planting on the roundabouts (as indicated on the As-Built drawings) was present.

### Apleyhead/ Markham Moor/ Gonerby Moor

- 5.129 None of the swathes of wild daffodils in grasslands indicated on the As-Built drawings were observed during the FYA site visit, and the areas appeared to be managed in such a way that would actively exclude daffodils from surviving at these locations.

### Colsterworth

- 5.130 There has been an improvement on the situation noted at OYA:
- The planting omitted from along the A1 northbound carriageway has now been implemented and subject to ongoing management and maintenance, it is considered that

the visual impacts for the edge of Colsterworth village (at the southern junction) are now on track to be mitigated as expected; and

- Wildflower species are now beginning to colonise Colsterworth Bank at the northern junction as expected.

5.131 Although the omission from the scheme of lighting of the overbridges has benefitted the local landscape character and visual amenity, this is offset by the variable establishment of the plant stock in general and particularly by the slow development of the new hedgerows at Colsterworth south; it is therefore concluded that the overall impact remains slight adverse as expected.

#### **Carpenters Lodge**

5.132 Although Landscape character and visual amenity have benefitted as a consequence of providing lighting along the B1081 and not at the overbridge, this is offset by the slow development of the plant stock on the southern embankments of the overbridge and by the failure of a section of the translocated hedgerow; it is therefore concluded that the overall impact remains slight adverse as expected.

**Table 5.5 – Evaluation Summary: Landscape/ Townscape**

<b>Sub-Objective Landscape/ Townscape: Location</b>	<b>AST</b>	<b>FYA</b>
<b>Blyth</b>	Landscape: Slight Beneficial Townscape: Neutral	Landscape: Worse than expected Townscape: As expected
<b>Apleyhead</b>	Landscape: Slight Beneficial Townscape: N/ A	Landscape: Worse than expected
<b>Markham Moor</b>	Landscape: Slight Adverse Townscape: N/ A	Landscape: Worse than expected
<b>Gonerby Moor</b>	Landscape: Slight Adverse Townscape: N/ A	Landscape: Worse than expected
<b>Colsterworth</b>	Landscape: Slight Adverse Townscape: N/ A	Landscape: As expected
<b>Carpenters Lodge</b>	Landscape: Slight Adverse Townscape: Neutral	Landscape: As expected Townscape: As expected

## **Biodiversity**

### **OYA Summary**

5.133 The OYA evaluation summary stated that it was understood from Highways England that where mitigation such as wildflower seeding and management of translocated grassland had not been undertaken, the Contractor would be required to undertake remedial work and that this would be reconsidered at the FYA stage. Summaries of the OYA biodiversity evaluations are provided below.

#### **Blyth**

5.134 The OYA evaluation summary stated that mitigation measures appeared to have been implemented as proposed, including the seeding of cutting slopes with wildflowers and the planting of hedgerows. However, it was considered too soon at OYA to determine the

effectiveness of these mitigation measures, and re-evaluation at the FYA stage was suggested. Overall, the impact of the scheme on biodiversity was concluded to be as expected at OYA.

#### **Apleyhead**

- 5.135 The OYA evaluation stated that on-site planting appeared to have been undertaken as expected to offset vegetation losses and provide habitat, and Great Crested Newts were confirmed as having not been impacted by the scheme. Although it was reported that some mitigation measures had not been provided (specifically the mosaic of species-rich acid grassland with scattered scrub and shallow pools on the land enclosed by the slip road in the south-west corner, and the proposed wildflower areas substituted with amenity grassland), the OYA report noted that the habitats affected were of low biodiversity value.
- 5.136 It was also stated that the ES had included for the provision of reedbeds in the balancing ponds, but the OYA evaluation noted that while Bulrush/ Reedmace was observed by the Designer during a (pre-HEMP) site visit, no reedbeds were found to be present at that time. Overall, the impact of the scheme on biodiversity was concluded to be worse than expected at OYA, and it was considered that biodiversity should be reassessed at the FYA stage, and that the reassessment should ascertain whether remedial measures had been implemented by the Contractor, and whether offsite planting by agreement had taken place in adjacent woodland and hedgerows to provide greater quantity and quality of feeding habitat for badgers.

#### **Markham Moor**

- 5.137 It was understood at OYA that the receptor sites for the translocated orchid populations had not received any management. It was also understood that the wildflower grassland had not been created around the junction as proposed, although it was noted that remedial works were due to rectify this. There was less hedge planting than expected at the western end of the scheme, and overall it was concluded that the impact of the scheme on biodiversity was worse than expected at OYA.

#### **Gonerby Moor**

- 5.138 The OYA evaluation confirmed that supervision was undertaken during construction to minimise the impact of the scheme on water voles. It was apparent at OYA that the proposed wildflower grassland seed mix had been substituted throughout the scheme for an amenity grassland seed mix, although it was understood that remedial works were due to rectify this. The OYA evaluation also noted that there had been two badger deaths at the junction since construction, further noting that badgers were not mentioned in the ES and that badger fencing was not included in the scheme proposals. Overall, it was concluded that the impact of the scheme was worse than expected at OYA.

#### **Colsterworth**

- 5.139 Effects were generally considered to be as expected, although the re-establishment of diverse grassland on the translocated soil from Colsterworth Bank Protected Road Verge (PRV) at the northern junction was considered very poor and it was considered appropriate that this aspect of mitigation should be re-evaluated at the FYA stage. It was concluded that the impacts of the scheme were generally as expected at OYA, although slightly worse than expected at OYA for the translocated soil from Colsterworth Bank PRV.

#### **Carpenters Lodge**

- 5.140 Mitigation was considered to have generally been provided as proposed, although hedgerow translocation establishment was considered patchy and it was noted that some of the proposed wildflower areas had been seeded with an amenity grassland mix. Overall however, the impact of the scheme was concluded to be as expected at OYA.

## Consultation

- 5.141 Natural England responded that a European protected species licence was sought at the Colsterworth junction, and that badger and water vole licences were sought across the other junctions. Natural England had no further comment to make on ecological mitigation, and stated that it was satisfied, owing to the requirements of Natural England licences where sought and granted, that impacts upon legally protected species had been mitigated.
- 5.142 Babworth Parish Council responded that at Apleyhead, some (unspecified) mitigation measures in the south west corner had not been provided.
- 5.143 Great Gonerby Parish Council responded that that the impact of the Gonerby Moor junction was as expected.
- 5.144 No other responses to consultation requests were received.

## Evaluation

### All Junctions

- 5.145 In terms of habitat, it is considered that although the proposals have been implemented broadly in line with the ecological mitigation proposals as stated in the ESs, as noted in the landscape sub-objective, above, the establishment of the tree and shrub planting is such that the full ecological potential of a significant number of the planting plots has likely not been realised resulting in localised ecological effects that are worse than expected in the short term.
- 5.146 As confirmed by the FYA site visit, balancing ponds afford a varied wetland habitat for a range of wildlife, and the land surrounding each pond has been engineered to provide a range of habitats where possible, thus maximising wildlife potential.
- 5.147 The HEMPs confirmed that no Section 253 Off-site Planting Agreements were in place and no ecological infrastructure had been installed.
- 5.148 Animal mortality figures received from the Area 7 MAC are shown in Appendix H, and date from when the final junction to be constructed opened; as such, no direct conclusions can be drawn regarding the impacts of the junctions in terms of animal mortality pre and post scheme. However, given that mortality numbers are generally low and are spread out over time, it is considered that the effects of the scheme on recorded species (legally protected or otherwise) are unlikely to be significant.
- 5.149 In addition to these issues noted as relevant to all junctions, the following sub-sections summarise additional, junction specific issues.

### Apleyhead

- 5.150 As confirmed by the HEMP, no off-site planting by agreement has taken place and as such, replacement of the lost badger foraging habitat has not been implemented in the woodland and hedgerows at Green Lane adjacent to the north east of the junction as per the ecological mitigation proposals stated in the ES. Consequently, it is considered that the impact of the scheme in terms of improving foraging opportunities for badgers is worse than expected.
- 5.151 Contrary to the lack of provision of reedbeds in the balancing ponds as noted by the OYA evaluation, the FYA site visit observed healthy and established reed beds to be present at the southern balancing pond (illustrated by Figure 5.16, below), and areas of relatively tall vegetation (see Figure 5.16, also below) within the northern balancing pond. On balance, it is considered that while remedial measures to implement reedbeds have likely been undertaken, the success of these measures at the northern pond cannot be confirmed in the absence of species confirmation.

**Figure 5.16 – Healthy and established reedbed at the southern balancing pond at Apleyhead (left), and an area of tall vegetation at the northern balancing pond (right).**



### Markham Moor

- 5.152 Regarding the lack of management of the translocated orchid populations noted at OYA, the HEMP specified that along with the spot treatment of weeds, all scrub (including bramble) should be removed from the site in early spring, and the grassland should be cut in early March and again in mid/ late September, with all arisings to be removed off-site.
- 5.153 The FYA site visit observed that the site contained some scrub (including bramble), and so it appears unlikely that this aspect of maintenance is being undertaken in accordance with the HEMP. Clumps of dead (rooted) vegetation were also observed, and this is taken to indicate that the early March cut has not been undertaken either; it is therefore considered likely that the area is not being managed in accordance with the HEMP. A general view of the area is illustrated in Figure 5.17, below.
- 5.154 Although several wildflower species other than Pyramid Orchid were observed at the receptor site (see Figure 5.17, below), the timing of the FYA site visit in early May did not coincide with the Pyramid Orchid flowering period (June and July) and so the success or otherwise of the translocation of this species cannot be confirmed at this time.

**Figure 5.17 – Bramble and clumps of dead (rooted) vegetation in the Pyramid Orchid translocation receptor site at Markham Moor (left). Although Pyramid Orchids were not observed during the FYA site visit, several other wildflower species were noted (right).**



- 5.155 In terms of the remedial works to rectify the proposed wildflower grassland seed mix being substituted for an amenity grassland seed mix as noted at OYA, no obvious areas of wildflower grassland were observed throughout the Markham Moor site visit and although it remains unconfirmed at the time of writing, it would appear unlikely that these remedial works have been undertaken.

### Gonerby Moor

- 5.156 In terms of the remedial works to rectify the proposed wildflower grassland seed mix being substituted for an amenity grassland seed mix as noted at OYA, the site visit observed that in terms of the areas indicated as wildflower grassland on the As-built drawings, both the grassland to the south of the western approach to the western roundabout (see Figure 5.18, below) and that within the central reserve (see Figure 5.18, also below) appeared to comprise different species. Although neither area was able to be directly accessed, due to the larger area of the grassland adjacent to the western roundabout and closer proximity to accessible land during the site visit, it would appear possible that remedial works have been undertaken in this area; however, it was unable to be confirmed whether a similar situation existed regarding the central reserve.

**Figure 5.18 – Grassland to the south of the western approach to the western roundabout at Gonerby Moor (left) and that within the central reserve (right) appear to comprise different species to the amenity grassland roundabout.**



### Colsterworth

- 5.157 Regarding the re-establishment of diverse grassland on the translocated soil from Colsterworth Bank (northern junction) considered very poor at OYA, the FYA site visit found that plants are now starting to colonise the exposed limestone banks (see Figure 5.11 in the landscape sub-objective, above), and Lincolnshire Wildlife Trust signs now designate the area (Colsterworth Bank) to be a Roadside Nature Reserve and note it to be an important wildlife site (see Figure 5.19, below); this is considered to be an improvement on the OYA situation, and this habitat is now considered to be starting to develop as expected.

**Figure 5.19 – Lincolnshire Wildlife Trust signage designating Colsterworth Bank to be a Roadside Nature Reserve and an important wildlife site.**



### Carpenters Lodge

- 5.158 As noted in the landscape sub-objective, above, a significant section of the translocated hedgerow has failed and consequently, the full habitat potential of the translocated hedgerow has not been realised; as such, it is considered that this aspect of mitigation is worse than expected at this stage.
- 5.159 In terms of some of the proposed wildflower areas having been seeded with an amenity grassland mix as noted by the OYA evaluation, wildflower grasslands were observed during the FYA site visit round the junction with Racecourse Road (Figure 5.20, below) and directly south of the overbridge adjacent to the northbound carriageway (also Figure 5.20) as indicated by the Landscape and Ecology construction drawings.

**Figure 5.20 – Wildflower grasslands in accordance with the Landscape and Ecology construction drawings were observed at the junction with Racecourse Road (left) and directly south of the overbridge adjacent to the northbound carriageway (right) at Carpenters Lodge.**



### FYA Summary

#### All Junctions

- 5.160 It is considered that although the proposals have been implemented broadly in line with the ecological mitigation proposals as stated in the ESs. The variable and in some locations poor establishment of the new tree and shrub planting is such that the full ecological potential of these habitats have likely not been realised, and this has resulted in localised ecological effects that are slightly worse than expected in terms of habitat in the short term.
- 5.161 Animal mortality numbers are generally low and are spread out over time, so it is considered that the effects of the scheme on recorded species (legally protected or otherwise) are unlikely to be significant.
- 5.162 In addition to these issues noted as relevant to all junctions, the following sub-sections summarise additional, junction specific issues.

#### Apleyhead

- 5.163 The replacement of the badger foraging habitat lost to the proposals by off-site planting has not been implemented as per the ecological mitigation proposals stated in the ES and as such, foraging opportunities for badgers could be worse than expected.
- 5.164 The presence of healthy and established reed beds at the southern balancing pond, and areas of relatively tall vegetation within the northern balancing pond indicate it likely that remedial measures to implement reedbeds have been undertaken.

### Markham Moor

- 5.165 Scrub (including bramble) and clumps of dead (rooted) vegetation were observed at the receptor site for the translocated Pyramid Orchids, and so it would appear unlikely that maintenance is being carried out in accordance with the HEMP; as such, habitat management at this location is likely to be worse than expected.
- 5.166 No obvious areas of wildflower grassland were observed throughout the Markham Moor site visit and although it remains unconfirmed, it would appear unlikely that the remedial works to replace the amenity grassland with wildflower grassland have been undertaken.

### Gonerby Moor

- 5.167 Although unable to be confirmed, it would appear possible that remedial works have been undertaken to replace amenity grassland with wildflower grassland to the south of the western approach to the western roundabout.

### Colsterworth

- 5.168 In an improvement on the situation at the time of the OYA evaluation, wildflower species are now starting to colonise the exposed limestone banks at the northern junction (Colsterworth Bank), and Lincolnshire Wildlife Trust signs designate the area to be a Roadside Nature Reserve and note it to be an important wildlife site.

### Carpenters Lodge

- 5.169 A significant section of the translocated hedgerow has failed and consequently, the full habitat potential of the translocated hedgerow is unlikely to have been realised.
- 5.170 Wildflower grasslands were observed during the FYA site visit round the junction with Racecourse Road and directly south of the overbridge adjacent to the northbound carriageway as expected.

**Table 5.6 – Evaluation Summary: Biodiversity**

Sub-Objective Biodiversity: Location	AST	FYA
Blyth	Neutral	Slightly worse than expected in the short term
Apleyhead	Slight Adverse	Slightly worse than expected in the short term
Markham Moor	Slight Adverse	Slightly worse than expected in the short term
Gonerby Moor	Neutral	Slightly worse than expected in the short term
Colsterworth	Slight Adverse	Slightly worse than expected in the short term
Carpenters Lodge	Neutral	Slightly worse than expected in the short term

- 5.171 Short term here is defined as up to 10 years. Beyond that, is much less certain.

## Cultural Heritage and Archaeology

### OYA Summary

- 5.172 The OYA evaluation also confirmed that in terms of impacts on built heritage (i.e. Listed, buildings, features of historic interest, and designated sites):
- There were no impacts at Blyth or Gonerby Moor;
  - Impacts at Apleyhead and Markham Moor were as expected;
  - The listed milestone was left untouched at Colsterworth; and
  - Although mitigation measures had generally been implemented as proposed at Carpenters Lodge, establishment of the translocated hedge was patchy.
- 5.173 The OYA evaluation therefore concluded that the impacts of the scheme were generally better than, or as expected.

### Consultation

- 5.174 Babworth Parish Council responded that there were no archaeological finds at Apleyhead.
- 5.175 Great Gonerby Parish Council responded that that the impact of the Gonerby Moor junction was as expected.
- 5.176 No other responses to consultation requests were received.

### Archaeological Evaluation

#### All Junctions

- 5.177 As stated in the ESs, archaeological mitigation included field evaluation and Archaeological Watching Briefs during topsoil stripping.
- 5.178 POPE methodology assumes that all popular and academic archaeological reports should have been published and finds deposited in an agreed archive for future reference by the FYA stage, and it was confirmed at OYA that In terms of the information requested to evaluate the Environment objective, there were no significant finds and no (popular or academic) archaeological reports were produced for any of the grade separated junctions.

#### Blyth/ Markham Moor

- 5.179 No Client reports produced as part of the scheme have been made available for this evaluation, and the deposition of any such documents cannot be confirmed at this stage.

#### Apleyhead/ Carpenters Lodge

- 5.180 Client reports produced as part of the scheme have been deposited as follows:
- Dodds, Dan, "*A1 Peterborough to Blyth Grade Separated Junctions Scheme A1/A57 **Apleyhead** Interchange*", Client Archaeological Evaluation Report (Unpublished). Deposited with Bassetlaw and Percy Laws Memorial Gallery and Museum in 2008, no accession number provided.
  - Oxford Archaeology Unit, "*A1 Peterborough to Blyth Grade Separated Junctions Scheme A1/B1081 **Carpenters Lodge** Interchange*", Client Archaeological Evaluation Report (Unpublished). Deposited with Peterborough Museum in 2010, no accession number provided.

#### Gonerby Moor/ Colsterworth

- 5.181 Client reports produced as part of the scheme are awaiting deposition at the Lincolnshire Museum as follows:

- Matthews, Bryan, “A1 Peterborough to Blyth Separated Junctions Scheme A1/B1174 **Gonerby Moor Interchange**”, Client Archaeological Evaluation/ Archaeological Watching Brief Reports, (Unpublished). Ready for deposition with Lincolnshire Museum (Collections GM06 LCNCC 2006.207 and LCNCC 2004.102).
- Dodds, Dan, “A1 Peterborough to Blyth Grade Separated Junctions A1/A151 & A1/B6403 **Colsterworth Interchange**”, Client Archaeological Evaluation Report (Unpublished). Ready for deposition with Lincolnshire Museum (Collection GM06 LCNCC 2004.103).

## Built Heritage Evaluation

### Apleyhead/ Markham Moor/ Carpenters Lodge

- 5.182 As noted in the Landscape sub-objective, above, the plant stock does not appear to be developing as well as would be expected at FYA, and this may have resulted in localised slight adverse effects on the landscape settings of the heritage resources that are worse than those reported at OYA, at least in the short term. It should be noted that these slight adverse effects can be rectified by ongoing management and maintenance of the plant stock as prescribed by the respective HEMPs.

### Markham Moor

- 5.183 It should be noted that since the OYA report, the former petrol station (and later roadside restaurant) canopy adjacent to the southbound carriageway to the north of the junction has been given listed building status (Grade II). The principal reasons for listing are that it dates from a period when the standardisation of petrol stations was introduced as an aid to product recognition, and the dramatic concrete canopy is one of the few extant hyperbolic paraboloid shell structures from that period (1950's and 1960's); the canopy is illustrated by Figure 5.21, below.

**Figure 5.21 – The dramatic canopy at the former petrol station adjacent to the southbound carriageway to the north of Markham Moor junction has been given listed building status.**



## FYA Summary

### All Junctions

- 5.184 All aspects of proposed mitigation have been addressed as reported at OYA, and there were no unresolved issues at FYA.
- 5.185 In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected.

### Apleyhead/ Markham Moor/ Carpenters Lodge

- 5.186 The plant stock does not appear to be developing as well as would be expected at FYA, and this may have resulted in localised slight adverse effects on the landscape settings of the heritage resources that are worse than those reported at OYA, at least in the short term.

**Table 5.7 – Evaluation Summary: Cultural Heritage and Archaeology**

Sub-Objective Cultural Heritage and Archaeology: Location	AST	FYA
<b>Blyth</b>	Neutral – possibly rising to Slight Adverse or Moderate depending on the nature and importance of potential buried remains at the balancing pond footprint.	Archaeology: Better than expected Built Heritage: As expected
<b>Apleyhead</b>	Slight Adverse	Archaeology: Better than expected Built Heritage: Slightly worse than expected
<b>Markham Moor</b>	Slight Adverse	Archaeology: Better than expected Built Heritage: Slightly worse than expected
<b>Gonerby Moor</b>	Slight Adverse	Archaeology: Better than expected Built Heritage: As expected
<b>Colsterworth</b>	Slight Adverse	Archaeology: Better than expected Built Heritage: As expected
<b>Carpenters Lodge</b>	Slight Benefit	Archaeology: Better than expected Built Heritage: Slightly worse than expected

## Water Quality and Drainage

### OYA Summary

- 5.187 Although the OYA evaluation summary confirmed that mitigation measures had been provided as proposed at the Blyth junction, it was noted that there was a major incident shortly after the junction opened involving a chemical spill and fire resulting from a road traffic accident (RTA). Intensive remedial works were stated as having been required, which included the replacement of many of the drainage channels. The impact of the scheme for this junction was therefore considered to be worse than expected at OYA.
- 5.188 For the Apleyhead, Markham Moor, and Colsterworth junctions, mitigation measures were confirmed at OYA as having been provided as proposed. No information was provided at OYA to indicate that the drainage systems were not performing as intended, and the impact of the scheme was therefore considered to be as expected for these junctions.
- 5.189 The OYA report noted that at Gonerby Moor, vegetative treatment systems at the balancing ponds, membrane treatment options for salts, and bio-blocks for the treatment of hydrocarbons had not been provided as a spillage risk assessment did not require any mitigation measures to be implemented and none were required by the EA. It was also noted that at Carpenters Lodge, the proposed storage pond was not required due to the discovery of an existing drain. No information was provided at OYA to indicate that the drainage systems were not performing as intended, and the impact of the scheme was therefore considered likely to be as expected at these junctions.

## Consultation

- 5.190 The Environment Agency responded that for Blyth, Apleyhead, and Markham Moor, the agency was “*not aware of any impacts on groundwater quality or levels in any of the improved junctions. This would indicate that the impacts are as expected or better*”, and that there was “*no evidence that work at Markham Moor has had an impact on the river Maun<sup>7</sup> in the vicinity of the works*”. The agency had no comments regarding Gonerby Moor, Colsterworth, or Carpenters Lodge
- 5.191 Babworth Parish Council responded that drainage appears to be as intended at Apleyhead.
- 5.192 The Upper Witham Internal Drainage Board responded that the board were not aware of any issues as a result of the junction improvements at Gonerby Moor, and that maintenance appeared to have been carried out on the drainage system. The board also noted that it was essential that the regular inspections and maintenance were carried out to ensure that the drainage system functions to the design standard.
- 5.193 Great Gonerby Parish Council responded that that the impact of the junction was as expected.
- 5.194 Colsterworth Parish Council responded that flooding occurs on land north of B676 (southern) junction.
- 5.195 No other responses to consultation requests were received.

## Evaluation

### All Junctions

- 5.196 Other than as noted below, the drainage facilities within the scheme viewed during the FYA site visit appeared to be generally clear of vegetation, maintained, and able to function as would be expected; vegetative treatment systems (rushes) appeared to have generally established well where planted.
- 5.197 No information (since the OYA evaluation) has been received at FYA regarding any incidents that may have affected the drainage system, and no information regarding water quality monitoring has been made available for this report.

### Blyth

- 5.198 Maintenance/management appears to be necessary to clear encroaching vegetation which was observed to be partially blocking an inlet/ outlet grille of the balancing pond located north of the junction on the A614 Bawtry Road; see Figure 5.22, below. The protective grille should be kept clear on a regular basis to ensure efficient drainage during/ following a storm event.

**Figure 5.22 – Vegetation encroaching on the balancing pond inlet/ outlet grille at Blyth.**



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<sup>7</sup> The only site where surface water monitoring is close enough to easily identify any impact from road improvement works.

- 5.199 Evidence of ponding in the form of silt build-up was observed at the junction of Whitewater Lane with the southern roundabout (see Figure 5.23, below), which may indicate that maintenance of the surface drainage system is required.

**Figure 5.23 – Ponding evidence in the form of silt build-up at the entrance to Whitewater Lane from the southern roundabout at Blyth.**



- 5.200 On balance, it is considered that the evidence observed during the site visit indicates that the drainage system is likely to be able to perform as expected, although ongoing maintenance is required to ensure that drainage efficiency is maximised.

#### **Apleyhead**

- 5.201 During the FYA site visit debris was seen to be partially blocking the protective grille of an inlet/outlet at the southern balancing pond (see Figure 5.24, below), and one of the inlets/ outlets of the swale at the same location was significantly silted up (see Figure 5.24, also below). Adjacent to the northbound carriageway, south of the overbridge, one inlet/ outlet of the swale appeared to be completely blocked, and standing water (as illustrated by Figure 5.24, below) was also observed.

**Figure 5.24 – Ponding evidence in the form of silt build-up at the entrance to Whitewater Lane from the southern roundabout at Blyth. Partially blocked inlets/ outlets at the southern balancing pond at Apleyhead (top left) and adjacent swale (top right), and standing water at the swale adjacent to the northbound carriageway, just south of the overbridge (lower centre).**



5.202 One of the inlets/ outlets at the northern balancing pond appeared to have suffered damage from erosion and the effects of burrowing rabbits (see Figure 5.25, below), and silt and litter were observed to be building up within a drainage channel adjacent to the bridleway (near the corral) at the eastern roundabout; see Figure 5.25, also below.

**Figure 5.25 – Damage to the inlet/ outlet at the northern balancing pond (left), and litter/ silt building up near the roundabout to the east (right) at Apleyhead.**



5.203 Evidence of ponding in the form of silt build-up was also observed at the eastern roundabout (see Figure 5.26, below), again perhaps indicative that maintenance of the surface drainage system is required to maximise drainage efficiency at this location.

**Figure 5.26 – Ponding evidence in the form of silt build-up at the eastern roundabout at Apleyhead.**



- 5.204 Partially blocked inlets/ outlets aside, given the standing water at the swale adjacent to the northbound carriageway, it is considered likely that aspects of the drainage system may be unable to perform as expected at the time of writing, and that more than routine maintenance may be required to enable the drainage system as a whole to perform in line with expectations; it is therefore considered that the impact of the scheme is slightly worse than expected at this time.

#### **Markham Moor**

- 5.205 The FYA site visit observed damage to the kerb drainage system at 3 locations; 2 on the northbound entry-slip road/ adjacent to the southern roundabout (Figure 5.27 below), and one at the entrance/ exit road on to the A57 from the service area adjacent to the southbound carriageway (Figure 5.27, also below). Although not fully blocked at the service area, silt was observed to be blocking the damaged drainage systems on the northbound entry-slip road/ roundabout; consequently, it is considered that maintenance of the drainage system is required.

**Figure 5.27 – Damage to the kerb drainage system at the two locations on the northbound entry-slip road/ roundabout (top left and top right), and at the entrance to the southbound service area (lower centre) at Markham Moor.**



5.206 Litter was also observed by the FYA site visit to be building up in a swale inlet/ outlet adjacent to the southbound entry-slip road (Figure 5.28, below), and at within the channel to the north of the A57 junction with the northern roundabout (Figure 5.28, also below); although these are not yet perhaps significant problems, it is considered that they have the potential to become so should the litter not be cleared to allow the drainage systems to function as efficiently as intended.

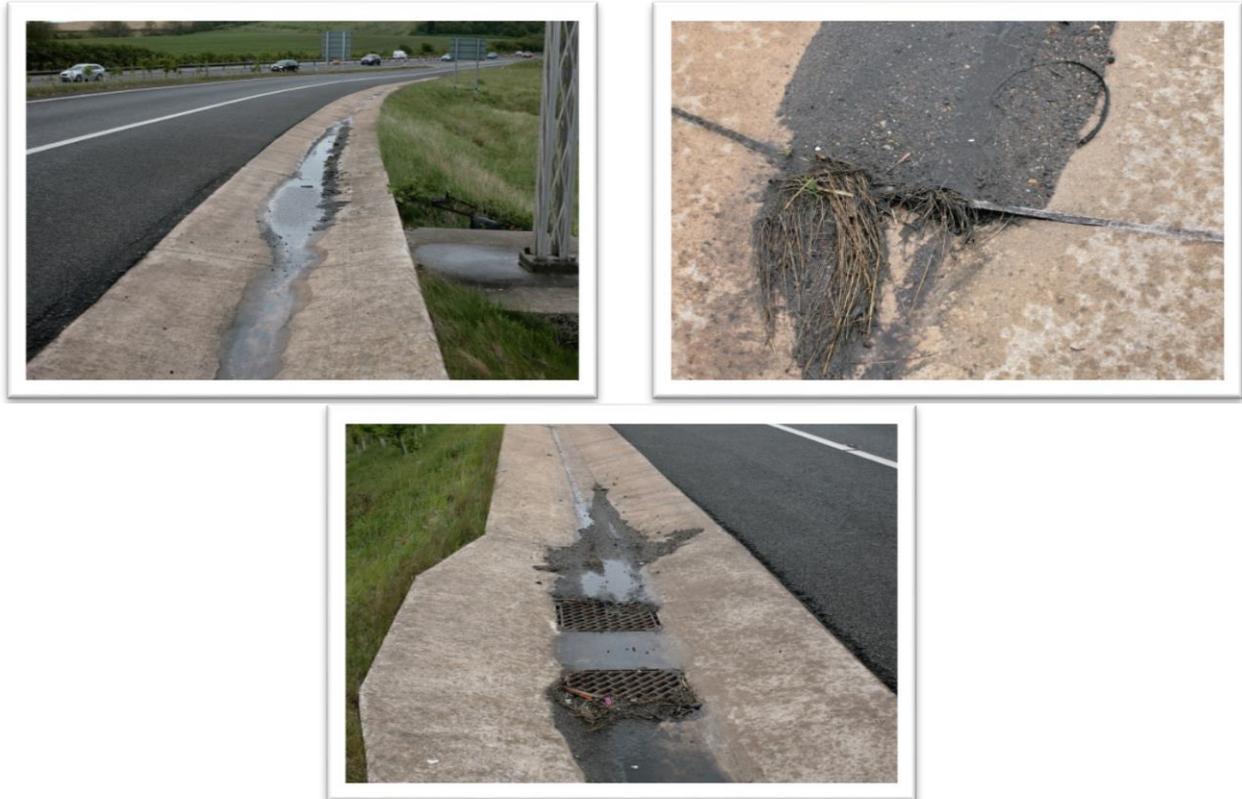
**Figure 5.28 – Litter build-up within the drainage system at Markham Moor, adjacent to the southbound entry-slip road (left), and at the A57 junction with the northern roundabout (right).**



5.207 Evidence of ponding in the form of silt build-up (similar to that observed at Blyth; see Figure 5.23, above) was observed on the northbound entry-slip road/ roundabout, and may indicate that the surface drainage system is perhaps not functioning as efficiently as intended at this location.

- 5.208 Despite the light nature of the shower experienced during the site visit, ponding was observed along the length of the drainage channel on the northbound exit-slip road, likely as a result of the joints between the channel units becoming detached and thereby trapping vegetation and debris leading to silt build-up; this is illustrated by Figure 5.29, below.

**Figure 5.29 – Ponding within the drainage system at Markham Moor, adjacent to the northbound exit-slip road (top left) caused by detached drainage unit joints (top right), and silt/ vegetation building up at the protective grilles on the drains at the same location (lower centre).**



- 5.209 Based on the observed evidence, it is considered that although the drainage system is likely able to perform as expected overall, maintenance is required to ensure that the system is able to operate as efficiently as intended.
- 5.210 Although not directly connected with the drainage system, as a separate issue with public health and safety implications, the perimeter fence of the balancing pond adjacent to the access road/ car park of the Chinese restaurant was observed to have been breached; see Figure 5.30, below.

**Figure 5.30 – The breached fence enclosing the balancing pond adjacent to the access road/ car park of the Chinese restaurant at Markham Moor.**



### Gonerby Moor

- 5.211 Damage to areas of the kerb drainage system (similar to that observed at Markham Moor) was noted at the western roundabout, and this is illustrated by Figure 5.31, below.

**Figure 5.31 – Damage to the kerb drainage system at the western roundabout at Gonerby Moor.**



- 5.212 As illustrated by Figure 5.32, below, one of the inlets/ outlets at the balancing pond adjacent to the northbound carriageway to the south of the junction appears to be eroding (i.e. damaging) the balancing pond bank.

**Figure 5.32 – Erosion at the inlet/ outlet of the balancing pond to the southwest of the junction at Gonerby Moor.**



- 5.213 Based on the observations above, it is considered that the drainage system is likely able to perform as expected, although there are localised areas where maintenance is required.

### Colsterworth

- 5.214 Due to damage to an area of the kerb drainage system (similar to that observed at Markham Moor and Gonerby Moor) observed during the site visit on the northbound entry-slip road at the southern junction (see Figure 5.33, below), and evidence of ponding in the form of silt build-up also observed around the roundabout to the northeast of the overbridge (see Figure 5.33, also below), it is considered that based on these observations, there are localised areas where the drainage system is likely to require maintenance to ensure that drainage efficiency is maximised.

**Figure 5.33 – Damage to the kerb drainage system at the roundabout to the northeast of the overbridge at Colsterworth south.**



- 5.215 Regarding the comment received from Colsterworth Parish Council pertaining to flooding on the land north of the B676 (southern) junction, none was observed during the FYA site visit.

### Summary

#### All Junctions

- 5.216 On the whole and other than as noted below, the drainage facilities within the scheme noted during the FYA site visit appeared to be clear of vegetation, maintained, and able to function as would be expected; vegetative treatment systems (rushes) appeared to have generally established well where planted.

#### Blyth, Markham Moor, Gonerby Moor, and Colsterworth

- 5.217 Evidence observed during the site visit indicates that localised parts of the drainage system require maintenance to ensure that drainage efficiency is maximised.

#### Apleyhead

- 5.218 Several of the swale/ balancing pond inlets/ outlets are either partially or fully blocked and as such, it is considered likely that more than routine maintenance is required to ensure that the drainage system as a whole can perform in line with expectations. NDD Midlands has identified that is due to 130m of drainage ditch not being constructed as the MP 'as-builts indicate'.

#### Markham Moor

- 5.219 In terms of public health and safety, the perimeter fence of the balancing pond adjacent to the access road/ car park of the Chinese restaurant has been damaged (breached).

**Table 5.8 – Evaluation Summary: Water Quality and Drainage**

Sub-Objective Water Quality and Drainage: Location	AST	FYA
Blyth	Neutral	Generally as expected, but requires maintenance
Apleyhead	Neutral	Slightly worse than expected
Markham Moor	Neutral	Generally as expected, but requires maintenance
Gonerby Moor	Neutral	Generally as expected, but requires maintenance
Colsterworth	Neutral	Generally as expected, but requires maintenance
Carpenters Lodge	Neutral	As expected

## Physical Fitness

### OYA Summary

- 5.220 The OYA evaluation summary considered that safer and more pleasant crossings had been provided at all junctions, mainly via the provision of vehicular overbridges that Non-Motorised Users (NMUs) were also able to utilise. Although these NMU routes were stated as often being of greater distance than before the scheme, it was considered that the previous conflict of NMUs crossing the A1 at grade had been removed.
- 5.221 Mitigation measures were stated as generally having been provided as proposed at each of the junctions, except as follows:
- Apleyhead: The bridge parapet was noted to be less than the 1.8m height proposed in the ES, and was therefore not considered to meet the DMRB requirements for equestrians;
  - Markham Moor: An additional footpath was provided on the north side of the A57, due to evidence noted during the detailed design phase that pedestrians used the soft verge of this area;
  - Gonerby Moor: A recommendation from the Inspector at the Public Inquiry resulted in the provision of a 1.8m high parapet on the overbridge at this junction;
  - Colsterworth/ Carpenters Lodge: In agreement with the British Horse Society, the proposed equestrian facilities identified in the ES were not provided as equestrian usage (including suppressed demand), was not considered to be high enough to justify specific equestrian measures; and
  - Carpenters Lodge: Lighting was not provided along the footway/ cycleway due to concerns raised by local affected parties concerning visual intrusion.
- 5.222 Overall, the OYA evaluation summary concluded that impact was beneficial for the junctions at Markham Moor and Gonerby Moor, slightly worse than expected at Apleyhead junction, and as expected for the junctions at Blyth, Colsterworth, and Carpenters Lodge.

### Consultation

- 5.223 Blyth Parish Council commented that connectivity between the two halves of Blyth village (either side of the A1) had vastly improved since construction of the Blyth GSJ.

- 5.224 Babworth Parish Council responded that the safer crossing of the A1 at Apleyhead had been used by walkers and cycles, but no horses had been seen.
- 5.225 Great Gonerby Parish Council responded that that the impact of the Gonerby Moor junction was as expected.
- 5.226 Colsterworth Parish Council commented that the pedestrian/ cycle path (B676/ A151) had not been continued to Twyford Wood (400 metres), and that this should have been in the original specification and would have been hugely beneficial for the public in terms of safely accessing this recreational feature.
- 5.227 No other responses to consultation requests were received.

## **Evaluation**

### **All Junctions**

- 5.228 No Non-Motorised User (NMU) audits or Vulnerable User (VU) studies have been undertaken specifically for this report.
- 5.229 In general, safer, more pleasant crossings over the A1 have been provided as expected at all junctions, and it is considered that there is likely to have been a reduction in the traffic encountered by NMUs due to the grade separations, also as expected.
- 5.230 Footpaths, bridleways and cycleways viewed during the FYA site visit appeared (in general) to be maintained and capable of performing broadly as expected, although no NMUs or evidence of equestrian use was observed on any of the NMU routes around any of the junctions.

### **Blyth**

- 5.231 In a change to the measures implemented as part of the scheme as noted in the OYA (Severance) evaluation, the NMU route (combined footpath/ cycle path) on the northern side of the overbridge is c.1m wide rather than 2.5m as stated. However, this is not considered to be significant as there is a clear improvement for residents living north of the junction who wish to travel to Blyth village.
- 5.232 Evident at the junction of Whitewater Lane with the southern roundabout and as illustrated in the Water Quality and Drainage section (see Figure 5.23, above), silt build-up is partially obscuring the tactile (blister) paving and pavement signs indicating traffic direction; as such it is considered that maintenance is required to ensure clarity of the NMU signage.

### **Apleyhead**

- 5.233 In a change to the measures implemented as part of the scheme as noted in the OYA report, the bridleway along the redundant carriageway (adjacent to the northbound exit-slip road) has a tarmac, rather than gravel, surface (see Figure 5.34, below); although the route appeared to be maintained and clear of encroaching vegetation, the lack of evidence regarding equestrian use may suggest that the tarmac surface may not be attractive to equestrian users<sup>8</sup>.

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<sup>8</sup> Horses can slip on tarmac.

**Figure 5.34 – A tarmac, rather than gravel, surface has been provided along the bridleway adjacent to the northbound exit-slip road at Apleyhead.**



- 5.234 A significant area of gorse has become established within the western corral (shown in Figure 5.35, below), and one of the corral rails has been dislodged and not repaired (Figure 5.35, also below); the height and established nature of the vegetation at the corral, along with the state of disrepair, could indicate that this corral is not regularly used by horse riders and that the expected significant rise in the number of equestrian users through suppressed demand following completion of the works has not been realised.

**Figure 5.35 – The western corral at Apleyhead, showing the vegetation within (left) and the dislodged rail (right).**



- 5.235 On the opposite side of the road to the western corral, the NMU directional sign has suffered damage and was not upstanding (see Figure 5.36, below), and at the eastern roundabout and as illustrated in the Water Quality and Drainage section (see Figure 5.26, above), silt build-up is partially obscuring the tactile (blister) paving and pavement signs indicating traffic direction, and therefore compromising the clarity of the NMU signage.

**Figure 5.36 – Damaged NMU signage opposite the western corral at Apleyhead.**



### Markham Moor

- 5.236 At the eastern roundabout adjacent to the northbound entry-slip road, the NMU directional sign was also found to be not upstanding (see Figure 5.37, below), and silt build-up was also observed to be partially obscuring the tactile (blister) paving at the same location (see Figure 5.37, also below); as such, it is considered that the maintenance is required to ensure clarity of the NMU signage.

**Figure 5.37 – The NMU directional sign at the eastern roundabout adjacent to the northbound entry-slip road at Markham Moor (left), and silt build-up partially obscuring the tactile paving at the same location (right).**



### Colsterworth

- 5.237 Silt build-up was observed to be partially obscuring the tactile (blister) paving at the roundabout to the northeast of the overbridge (see Figure 5.38, also) and as such, it is considered that maintenance is required to ensure clarity of the NMU signage. Debris on the NMU route at the same location was also observed, and it is considered that the quality of maintenance of the provided NMU route is also slightly worse than expected.

**Figure 5.38 – Silt and debris partially obscuring the tactile paving on the NMU route at the roundabout to the northeast of the overbridge at Colsterworth south.**



- 5.238 In terms of the consultation comment regarding the continuation of the pedestrian/ cycle path (B676/ A151) to Twyford Wood, it was noted in the *Pedestrians, Cyclists, Equestrians, and Community Effects* chapter of the ES that Twyford Wood provided recreational space to the east of the junction, although no mention was made regarding the provision of a footpath/ cycleway from the junction to Twyford Wood. Although it could be deemed that this should have been covered by the ES, the construction issue drawings contain no such NMU route and as such, the impact of the accepted proposals cannot be considered to be anything other than as expected.

### Carpenters Lodge

- 5.239 It was noted during the FYA site visit that the pedestrian parapet above the northbound carriageway on the northern side of the overbridge has been damaged, and that approximately 1 metre of vertical mesh was missing. Although it would appear that temporary measures (in the form of orange Netlon) have been taken to replace the missing mesh, this is ineffective in its present form and as such, the damaged parapet potentially constitutes a serious hazard to both NMUs and traffic on the northbound carriageway below – see Figure 5.39, below.

**Figure 5.39 – Damage to the pedestrian parapet above the northbound carriageway on the overbridge at Carpenters Lodge.**



### Summary

#### All Junctions

- 5.240 Generally as expected, as safer, more pleasant crossings over the A1 have been provided, it is considered that there has been a reduction of traffic encountered by NMUs, as expected.

#### Blyth and Colsterworth

- 5.241 Silt and debris is partially obscuring the tactile paving at the junction of Whitewater Lane with the southern roundabout (Blyth, and at the roundabout to the northeast of the overbridge (Colsterworth south); as such, it is considered that maintenance is required to ensure clarity of the NMU signage.

#### Apleyhead

- 5.242 The western corral does not appear to have been subject to equestrian use for a period of time, and the bridgeway along the redundant carriageway (adjacent to the northbound exit-slip road) has a tarmac, rather than gravel, surface.
- 5.243 The NMU directional sign is not upstanding at the western corral, and silt build-up is partially obscuring the tactile (blister) paving and pavement signs indicating traffic direction at the eastern roundabout; as such it is considered that maintenance is required to ensure clarity of the NMU signage.

#### Markham Moor

- 5.244 Silt and debris is partially obscuring the tactile paving at the eastern roundabout adjacent to the northbound entry-slip road (Markham Moor), and an NMU directional sign is not upstanding at the same location; as such, it is considered that maintenance is required to ensure clarity of the NMU signage.

#### Carpenters Lodge

- 5.245 The damage that has occurred to the pedestrian parapet of the overbridge requires repair.

**Table 5.9 – Evaluation Summary: Physical Fitness**

Sub-Objective Physical Fitness: Location	AST	FYA
<b>Blyth</b>	Not provided	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
<b>Apleyhead</b>	Neutral	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
<b>Markham Moor</b>	Not provided	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
<b>Gonerby Moor</b>	Slight Benefit	As expected
<b>Colsterworth</b>	Neutral	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
<b>Carpenters Lodge</b>	Neutral	Generally as expected, although the damaged pedestrian parapet on the overbridge constitutes a serious hazard to NMUs and the northbound carriageway below.

## Journey Ambience

### OYA Summary

- 5.246 The journey ambience sub-objective considers traveller care (facilities and information), traveller views, and traveller stress (route uncertainty, frustration, and fear of potential accidents).
- 5.247 Traveller care and traveller views were considered to be as expected at all junctions, except at Apleyhead and Markham Moor where the landscape character around the overbridges was considered likely to become more enclosed than expected due to changes in the planting implemented.
- 5.248 For all junctions, the OYA evaluation summary considered that driving conditions were less stressful, as expected, as the A1 through traffic was segregated from other traffic. The report stated that there was no congestion on the approaches to the junctions at OYA, and further stated that there was evidence that accidents had been reduced.

### FYA Consultation

- 5.249 Babworth Parish Council responded that driver stress on the A1 had improved due to much reduced queuing, although the increased use of the B6420 has led to frequent queues at Babworth where the B6420 joins the A620.
- 5.250 Great Gonerby Parish Council responded that the impact of the Gonerby Moor junction was as expected, although there were (unspecified) issues with the length of the slip road going north from Great Gonerby. Great Gonerby Parish Council also consider the length of the slip road crossing to Marston to be “*very dangerous*” and that it would have been far safer to use the old road as a way of accessing Marston from Great Gonerby as originally planned.
- 5.251 Regarding the northern junction at Colsterworth, Colsterworth Parish Council commented that:
- The A1 (northbound) entry-slip road from the B6403 is very short and combined with the A1 exit-slip road to the B6403 immediately to the south of this entry-slip road, it can be difficult to join the A1. The council also noted that it would like to see accident statistics pre and post scheme.

5.252 In terms of comments relevant to the scheme regarding the southern junction at Colsterworth, Colsterworth Parish Council responded as follows:

- Similar to the northern junction, the A1 (northbound) entry-slip road from the B676 is very short and combined with the A1 exit-slip road to the B676/ garage immediately to the south of this entry-slip road, makes it very difficult to join the A1 at peak times; and
- The mini-roundabouts to the east and west of the A1 at the southern junction (B676 & A151) are not fit for purpose. The roundabouts are continually being driven over/ damaged by HGV traffic (photos provided).

5.253 No other responses to consultation requests were received.

## **FYA Evaluation**

### **All Junctions**

5.254 Traveller Care/ Traveller Views

- No issues were outstanding from the OYA evaluation, and no further issues were identified during the FYA site visit; as such, no further evaluation has been undertaken as impacts are considered to remain as expected.

5.255 Traveller Stress

- *Route uncertainty*: The FYA site visit found the route to be well signed and the junctions providing clear access and egress points to and from the A1.
- *Frustration*: The standard deviation (and hence) variability of journey times in both directions has reduced from before the scheme was built, and these changes in journey times and reliability are likely to have had a beneficial impact in terms of traveller frustration; these issues are examined in detail within the Traffic Analysis and Journey Times chapters of this report..
- *Fear of potential accidents*: The FYA site visit observed that the High Friction Surfacing (HFS) on the slip road approaches to many of the roundabouts was significantly worn and in a state of disrepair, and that loose HFS aggregate had built up on the carriageways at locations where the HFS was worn; typical views are illustrated by Figure 5.40, below. Although no direct increase in traveller fear regarding accidents may be attributable to worn HFS under normal circumstances, it is considered possible that the degree of fear experienced during an extreme braking event may be greater than expected on the approaches to roundabouts, due to loose HFS build-up increasing skid risk at these locations.

**Figure 5.40 – Worn High Friction Surfacing on the southbound exit-slip road at Blyth (left), and on the approach to the A638/ A57 roundabout at Markham Moor (right).**



### **Blyth, Apleyhead, and Markham Moor**

#### **5.256 Traveller Stress**

- *Fear of potential accidents:* The Accident/ Safety data in the Traffic section of this report shows that the junctions showed savings similar or better than expected in terms of annual collisions, when the counterfactual adjustment of the number of collisions was taken into account; as such, it is considered that the beneficial effects are likely to be as expected.

### **Gonerby Moor**

#### **5.257 Traveller Stress**

- *Fear of potential accidents:* Notwithstanding the comments made by Great Gonerby Parish Council concerning the length and safety of the slip roads, no evidence has been provided for this evaluation to indicate any Departure from DMRB<sup>9</sup> standards and in the absence of such evidence, there is no reason to suggest that the length of the slip roads are anything other than what would be expected. However, the injury collision data in the safety section of this report shows a net increase in annual collisions, when the counterfactual adjustment of the number of collisions is taken into account; as such it is considered that the expected beneficial effects may not have been realised, as reflected by local concerns.

### **Colsterworth**

#### **5.258 Traveller Stress**

- *Frustration:* Concerning the comment made by Colsterworth Parish Council regarding the roundabouts to the east and west of the A1 at the southern junction (B676 & A151) being driven over/ damaged by HGV traffic, the site visit observed damage consistent with the consultation response; this damage is illustrated by Figure 5.41, below. Given the nature and extent of the damage observed and the proximity of the HGV services (within 100m of the eastern roundabout), it is considered likely that HGV drivers are having difficulty in negotiating these roundabouts, although further information is required to evaluate whether this constitutes an issue with roundabout layout.

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<sup>9</sup> Design Manual for Roads and Bridges - a comprehensive manual system which accommodates all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways).

**Figure 5.41 – Damage to the roundabouts at Colsterworth south: at two locations on the roundabout to the east of the A1 (top left and top right), and at the roundabout to the west of the A1 (lower centre), where it can also be seen that HFS on the approach to the roundabout is significantly worn.**



- *Fear of potential accidents:* In terms of the comments made by Colsterworth Parish Council concerning the length of the entry-slip roads at both the northern and southern junctions making it difficult for vehicles to join the A1 at peak times, no evidence has been provided for this evaluation to indicate any Departure from DMRB standards and in the absence of such evidence, there is no reason to suggest that the length of the entry-slip roads are anything other than as would be expected. However, the Accident/ Safety data in the Traffic section of this report shows a net increase in annual collisions, when the counterfactual adjustment of the number of collisions is taken into account; as such it is considered that the expected beneficial effects may not have been realised, as reflected by local concerns.

### **Carpenters Lodge**

#### **5.259 Traveller Stress**

- *Fear of potential accidents:* Accident/ Safety data shows that in summary, the junction showed a net increase in annual collisions, when the counterfactual adjustment of the number of collisions was taken into account; as such, it is considered that the expected beneficial effects may not have been realised.

## Summary

### All Junctions

#### 5.260 Traveller Care/ Traveller Views

- The impacts are considered to be as expected.

#### 5.261 Traveller Stress

- *Route uncertainty/ frustration*: As expected, as the A1 through traffic is segregated from other traffic and congestion has been reduced; and
- *Fear of potential accidents*: Generally as expected, although the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts.

### Gonerby Moor

#### 5.262 Traveller Stress

- *Fear of potential accidents*: The expected beneficial effects may not have been realised, due to the net increase in annual collisions; this is reflected by local concerns.

### Colsterworth

#### 5.263 Traveller Stress

- *Frustration*: The nature and extent of the damage observed at both eastern and western roundabouts suggests that HGV drivers are having difficulty in negotiating these roundabouts; and
- *Fear of potential accidents*: The expected beneficial may not have been realised, due to the net increase in annual collisions; this is reflected by local concerns.

### Carpenters Lodge

#### 5.264 Traveller Stress

- *Fear of potential accidents*: The expected beneficial effects may not have been realised, due to the net increase in annual collisions.

**Table 5.10 – Evaluation Summary: Journey Ambience**

<b>Sub-Objective Journey Ambience: Location</b>	<b>AST</b>	<b>FYA</b>
<b>Blyth</b>	Substantial Beneficial	<u>Traveller Care/ Views</u> : As expected. <u>Traveller Stress</u> : Generally as expected.
<b>Apleyhead</b>	Large Beneficial	<u>Traveller Care/ Views</u> : As expected <u>Traveller Stress</u> : Generally as expected
<b>Markham Moor</b>	Large Beneficial	<u>Traveller Care/ Views</u> : As expected <u>Traveller Stress</u> : Generally as expected
<b>Gonerby Moor</b>	Large Beneficial	<u>Traveller Care/ Views</u> : As expected <u>Traveller Stress</u> : Generally as expected, although beneficial effects regarding fear of accidents are unlikely to have been realised
<b>Colsterworth</b>	Large Beneficial	<u>Traveller Care/ Views</u> : As expected <u>Traveller Stress</u> : Generally as expected, although beneficial effects regarding fear of accidents are unlikely to have been realised
<b>Carpenters Lodge</b>	Large Beneficial	<u>Traveller Care/ Views</u> : As expected <u>Traveller Stress</u> : Generally as expected, although beneficial effects regarding fear of accidents are unlikely to have been realised

## Key points – Environment Impacts

### Noise

- The percentage difference between the mean forecasts and the observed traffic flows at FYA are generally less than, or within, the tolerances assumed by POPE and as such, the impact of the junctions on the noise climate are considered to be generally better than expected.
- At Apleyhead, traffic flows are greater than predicted on the B6420 with the observed flows exceeding the +25% tolerance assumed by POPE therefore noise is considered likely to be worse than expected at this location.

### Air Quality

- The percentage difference between the mean forecasts and the observed traffic flows at FYA are generally less than, or within, the tolerances assumed by POPE and as such, the impact of the junctions on local air quality are considered to be generally better than expected.
- Traffic flows are greater than predicted on the A1 south of the junction at Blyth and on the B6420 at Apleyhead, with observed flows exceeding the +10% tolerance assumed by POPE, therefore the impact on local air quality at these locations is therefore considered likely to be worse than expected.

### Landscape

- Despite replacement planting having being undertaken, the current levels of plant growth and establishment indicate that the visual screening, landscape integration, and visual amenity functions of the plant stock at all junctions is generally considered unlikely to be developing as well as would expected; and
- Where applicable, it is considered likely that the townscape impacts of the junctions are as expected.

#### Blyth

- The plant failures adjacent to Blyth Wood to the south-east and south of the junction indicate that the plot as a whole is unlikely on track to link visually with the surrounding woodland, reinforce the landscape character of the area, or provide screening for receptors to the north and south as predicted in the ES;
- Replanting at the southern roundabout following the collision including the chemical spill which occurred shortly after opening in 2009 does not appear to have been undertaken; and
- The approach to Blyth from the southern roundabout would be more favourable than the existing situation and the northern roundabout would be better integrated into the surrounding environment on the approach from the A614 Bawtry Road if the planting on the roundabouts (as indicated on the As-Built drawings) were present.

#### Apleyhead/ Markham Moor/ Gonerby Moor

- None of the swathes of wild daffodils in grasslands indicated on the As-Built drawings were observed during the FYA site visit, and the areas appear to be managed in such a way that would actively exclude daffodils from surviving at these locations.

### Colsterworth

- The planting omitted from along the A1 northbound carriageway has now been implemented and subject to ongoing management and maintenance, it is considered that the visual impacts for the edge of Colsterworth village (at the southern junction) are now on track to be mitigated as expected;
- Wildflower species are now beginning to colonise Colsterworth Bank at the northern junction as expected; and
- Although landscape and visual impacts remain slightly better than expected as a consequence of the lighting being omitted from the overbridges, this is offset by the variable establishment of the plant stock in general and particularly by the slow development of the new hedgerows at Colsterworth south.

### Carpenters Lodge

- Although landscape and visual impacts remain slightly better than expected as a consequence of providing lighting along the B1081 and not at the overbridge, this is offset by the slow development of the plant stock on the southern embankments of the overbridge and by the failure of a section of the translocated hedgerow.

## **Biodiversity**

### All junctions

- The establishment of the new tree and shrub planting is such that the full ecological potential of these habitats have likely not been realised, and this is likely to have resulted in localised ecological effects that are worse than expected in the short term; and
- Animal mortality numbers are generally low and spread out over time, and therefore considered unlikely to be significant.

### Apleyhead

- The replacement of the badger foraging habitat lost to the proposals by off-site planting has not been implemented as per the ecological mitigation proposals stated in the ES; and
- The presence of healthy and established reed beds at the southern balancing pond and areas of relatively tall vegetation within the northern balancing pond indicate it likely that remedial measures to implement reedbeds have been undertaken.

### Markham Moor

- It would appear unlikely that habitat maintenance work at the receptor site for the translocated Pyramid Orchids is being carried out in accordance with the HEMP; and
- No obvious areas of wildflower grassland were observed and it would appear unlikely that the remedial works to replace amenity grassland with wildflower grassland have been undertaken.

### Gonerby Moor

- It would appear possible that remedial works have been undertaken to replace amenity grassland with wildflower grassland to the south of the western approach to the western roundabout.

### Colsterworth

- Wildflower species are now starting to colonise the exposed limestone banks at the northern junction, and Lincolnshire Wildlife Trust signs designate the area to be a Roadside Nature Reserve and note it to be an important wildlife site.

## **Cultural Heritage and Archaeology**

### **All Junctions**

- All aspects of proposed mitigation have been addressed as reported at OYA; and
- In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected.

### **Apleyhead/ Markham Moor/ Carpenters Lodge**

- The plant stock does not appear to be developing as well as would be expected at FYA, and this may have resulted in localised slight adverse effects on the landscape settings of built heritage resources that are worse than those reported at OYA.

## **Water Quality and Drainage**

- Other than as noted below, the drainage facilities noted during the FYA site visit appeared to be clear of vegetation, maintained, and able to function as would be expected; vegetative treatment systems (rushes) appeared to have generally established well where planted.
- Evidence observed during the site visit indicates that localised parts of the drainage system require ongoing management and maintenance to ensure that drainage efficiency is maximised.
- Several of the swale/ balancing pond inlets/ outlets at Apleyhead are either partially or fully blocked and as such, it is considered likely that ongoing management and maintenance is required to ensure that the drainage system as a whole can perform in line with expectations.

## **Physical Fitness**

- Crossings over the A1 are now more pleasant due to the provided facilities.
- Some maintenance issues remain to be addressed with the new facilities at some locations to ensure the continuing benefits. These include clarity of the NMU signage and silt and debris partially obscuring the tactile paving at the junction.
- The damage that has occurred to the pedestrian parapet of the overbridge at Carpenters Lodge requires repair.

## **Journey Ambience**

- Traveller Stress is reduced through segregation of the A1 through traffic and congestion has been reduced; and
- Fear of potential accidents: Generally as expected, although the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts.
- Frustration: The nature and extent of the damage observed at both eastern and western roundabouts at Colsterworth suggests that HGV drivers are having difficulty in negotiating these roundabouts.

## 6. Accessibility and Integration Evaluation

**Scheme Objective:** Improve non-motorised users safety

### Introduction

- 6.1 The accessibility and integration objectives are concerned with how the scheme has affected the ability of people in different locations to reach different types of facility, using any mode of transport and with how the scheme integrates with transport and wider policies. The accessibility objective consists of three sub-objectives. These are:
- Option values;
  - Access to the transport system; and
  - Severance.
- 6.2 And the integration objective:
- Transport Interchange;
  - Land-use policies; and
  - Other government policies.
- 6.3 Forecasts of the impacts of the scheme in terms of these objectives were given in the individual ASTs for each of the junction improvements as shown in Appendix B.
- 6.4 All of the junction improvements included varying levels of provisions to enable pedestrians and cyclists to cross over the A1, where there had previously been no specific provision.
- 6.5 Table 6.1 illustrates some of these features.

### Colsterworth

- 6.6 At the time the junctions were appraised, the dismantled railway line near the Colsterworth north junction was the subject of plans for conversion to a Sustrans cycle route, as noted in the T&EAR. These plans were formally dropped in 2009. The former railway bridge over the A1 at this location was demolished as part of these junction improvements.

Figure 6.1 – Photos of NMU features

<p>Blyth:</p> 	<p>Blyth</p> 	
<p>Apleyhead: path adjacent to the northbound exit-slip road is tarmac rather than gravel</p> 	<p>Apleyhead: Corral at western roundabout</p> 	<p>Apleyhead: Corral at the eastern roundabout has significant gorse</p> 

Markham Moor- shared use path alongside A57, east of junction



Markham Moor- footpath alongside A57



Markham Moor- footpath alongside A57



Gonerby Moor: Shared use path crossing



Colsterworth: shared use path on overbridge



Carpenters Lodge: shared use path linking overbridge to lane south of junction



## Transport Interchange

- 6.7 None of the junction improvements were expected to have an impact on passenger interchange in the study areas, hence a **neutral** impact was expected. The OYA evaluation showed that as there was no changes in facilities, the impacts were all neutral, as expected,
- 6.8 At FYA, a desktop study has shown there to be no change in this aspect since, so the impact is the same as at OYA, neutral, as expected.

## Land-use policies

- 6.9 The widely dispersed nature of the scheme means that not only are junctions are located within several different local authorities, but they are spread across the East Midlands and East Anglia regions.
- 6.10 The OYA report evaluated the land use impacts and there has been no change in land use since the construction of the junctions was completed. The impacts at FYA are the same as at OYA and are given in the individual junctions' ESTs in Appendix C.
- 6.11 These are summarised in Table 6.1.

**Table 6.1 – Summary of Land use Impact**

Junction	Forecast description (and assessment)	FYA Evaluation
Blyth	Supported by land use policies.	Economic benefits shown in this report  Assessment : <b>Beneficial as expected</b>
Apleyhead	Expected to provide social and economic benefits while minimising the impact on the environment  Assessment : Beneficial	
Markham Moor	Land take required for the junction was expected to have adverse impact on business near the junction but this would be outweighed by the wider economic benefits of reducing congestion Adverse environmental impacts would be mitigated to comply with land use policy Assessment : Beneficial	Desktop study and site visit showed that the businesses around the junction, which are primarily serving travellers, remain in business. Road signs indicate services at the junction on the A1. Mitigation measures are largely successful. Assessment : <b>Beneficial, As expected</b>
Gonerby Moor	Policies hindered expected to be similar to approximately the number facilitated  Assessment : Neutral	Assessment : <b>Neutral, As expected</b>
Colsterworth		
Carpenters Lodge		

## Other government policies

- 6.12 As for the land use sub-objective, the impact on other government policies were evaluated in the OYA as largely being as expected, and as we are comparing against the policies at the time the scheme was built, there has been nothing to change during this evaluation at FYA.
- 6.13 The forecast impacts were mainly neutral, as each junction improvement was seen as a localised scheme. Two of the junctions had an assessment of beneficial impact due to benefits to the economy. It is not clear why the assessment is not the same for all six.
- 6.14 The impacts at FYA are the same as at OYA and are given in the individual junction ESTs in Appendix C.

### Key points – Accessibility and Integration

- Impacts of the junction on land use policies and other government policies are mainly neutral, as expected and as concluded at the OYA stage
- There has been no change in option values resulting from the scheme, therefore, the evaluated impact is neutral as concluded in the OYA and as expected.
- The scheme has not had an impact on the provision of transport interchange facilities, therefore a neutral impact has been observed as expected and as concluded in the OYA stage.

## 7. Appraisal Summary Table (AST) & Evaluation Summary Table (EST)

### Appraisal Summary Table (AST)

- 7.1 The Appraisal Summary Table (AST) is a brief summary of the main economic, safety, environmental and social impacts of a highway scheme. Appendix B presents the ASTs for each of the junction improvements prepared at the time of their appraisals as individual schemes.
- 7.2 The AST presents a brief description of the scheme, a problem statement detailing the problems that the scheme planned to address, and makes an assessment of the predicted qualitative and quantitative impacts against the following core objectives:
- **Environment** – an estimate of scheme impact upon factors such as noise, local air quality, landscape, biodiversity, heritage and water;
  - **Safety** – measured reduction in the number and severity of accidents and qualitative assessment of impacts on security;
  - **Economy** – estimated impact of the scheme upon Journey Times, Vehicle Operating Costs, scheme cost and journey time reliability;
  - **Accessibility** – a review of scheme impact upon access to the public transport network, community severance and non-motorised user impact; and
  - **Integration** – a description of how a scheme is integrated with wider local planning, regional and national policy objectives.

### Evaluation Summary Table (EST)

- 7.3 The Evaluation Summary Table (EST) was devised for the POPE process, to record a summary of the outturn impacts against the standard objectives, compared to the predictions in the AST.
- 7.4 Drawing on results presented in this report, Appendix C presents the ESTs for the six improved junctions. An assessment for each of the objectives at the FYA stage is given. Where possible, the format of the EST mirrors the appearance and process of the AST to enable direct comparison between the two.

## 8. Conclusions

- 8.1 The conclusion of this report considers how the scheme has performed against the scheme specific objectives outlined in Chapter 1.
- 8.2 The Evaluation Summary Tables (see Appendix C) summarises the impacts of the scheme against the standard objectives: Environment, Safety, Economy, Accessibility and Integration.

### Scheme Specific Objectives

- 8.3 The scheme specific objectives are presented in Table 8.1.

**Table 8.1 – Success against Scheme Objectives**

Source	Objective	Achieved?
Environmental Statement (2004/2005)	<b>Reduce Delays</b> – The separation of the A1 and local traffic at the junctions will significantly reduce delays, for both through and local traffic.	Journey times for A1 traffic have improved. Variability of journey times has fallen since the scheme opened and the improved geometry of the junction layouts means reduced delays for traffic accessing or egressing the A1. 
	<b>Reduce Accidents</b> - The removal of the through traffic from the junctions will remove the potential for accidents at the junction by reducing traffic volumes and potentially dangerous crossing movements.	Number of collisions has decreased significantly at three junctions since scheme completion and the other three show no significant change. 
	<b>Improve Non-Motorised User Safety</b> – The provision of appropriate facilities allow non-motorised users to negotiate the junction more safely.	All of the junctions have improved crossing facilities by segregating non-motorised users from traffic. 

### Conclusions

- 8.4 The main findings from this evaluation are summarised below:
- Traffic flows have increased on the A1 which is both a result of the improvements to the corridor by the scheme and some rerouting of traffic due to major roadworks of the M1.
  - Post opening journey times are consistently lower on the A1 in both directions at all times of the day since the schemes opened. There is also evidence to suggest that journey times have become more reliable.
  - Three of the six junctions have experienced a significant decrease in collision rate since opening while the other three show no real safety impact.
  - Although the combined benefits are lower than forecast, the scheme still achieves a benefit cost ratio (BCR) in excess of four, representing very high value for money.
  - Although environment mitigation measures have mostly been put in place in accordance with the relevant ES, there are some outstanding problems with the success of planting and there is less wildflower areas than originally planned.
  - All junctions have generally provided improved and safer crossing provision for an, albeit small, number of non-motorised users (NMUs).

# Appendix A – Detailed Scheme Layout Diagrams

Figure A.1 – Blyth Junction Improvements



Figure A.2 – Apleyhead Junction Improvements

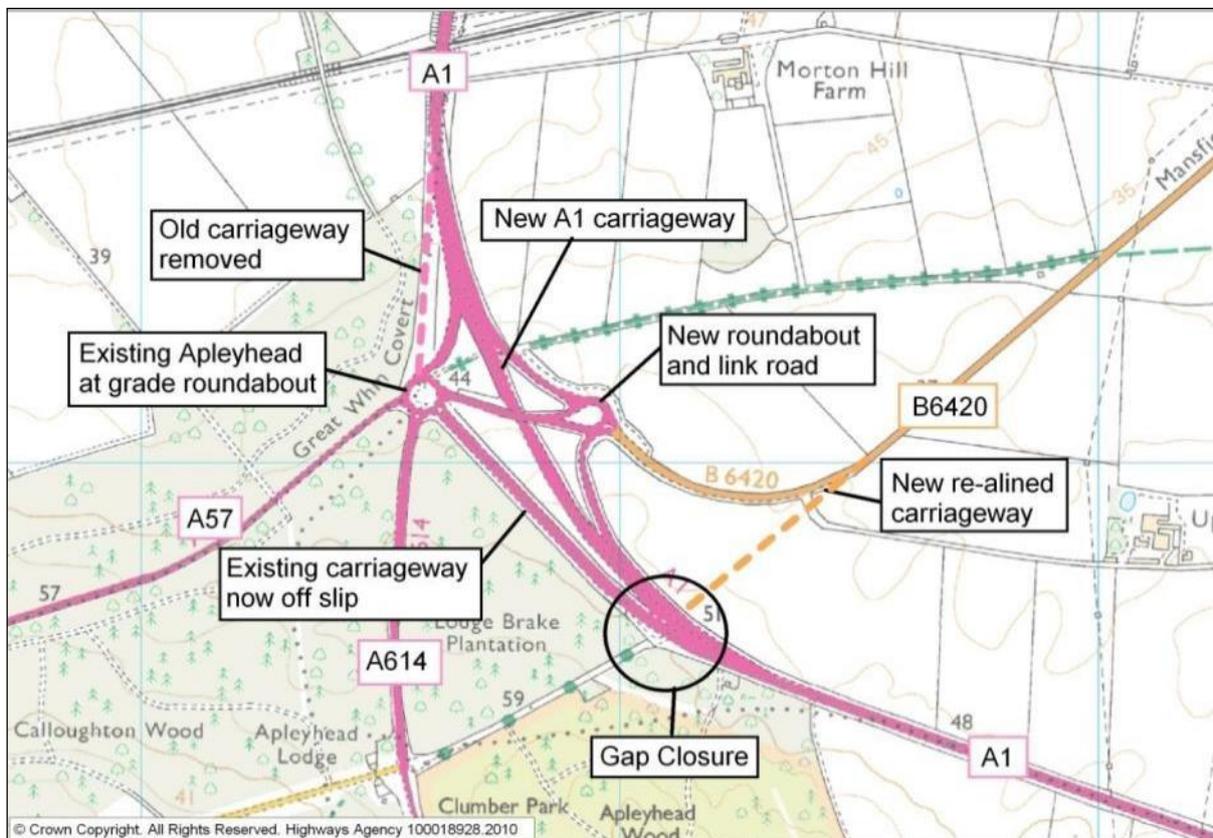


Figure A.3 – Markham Moor Junction Improvements

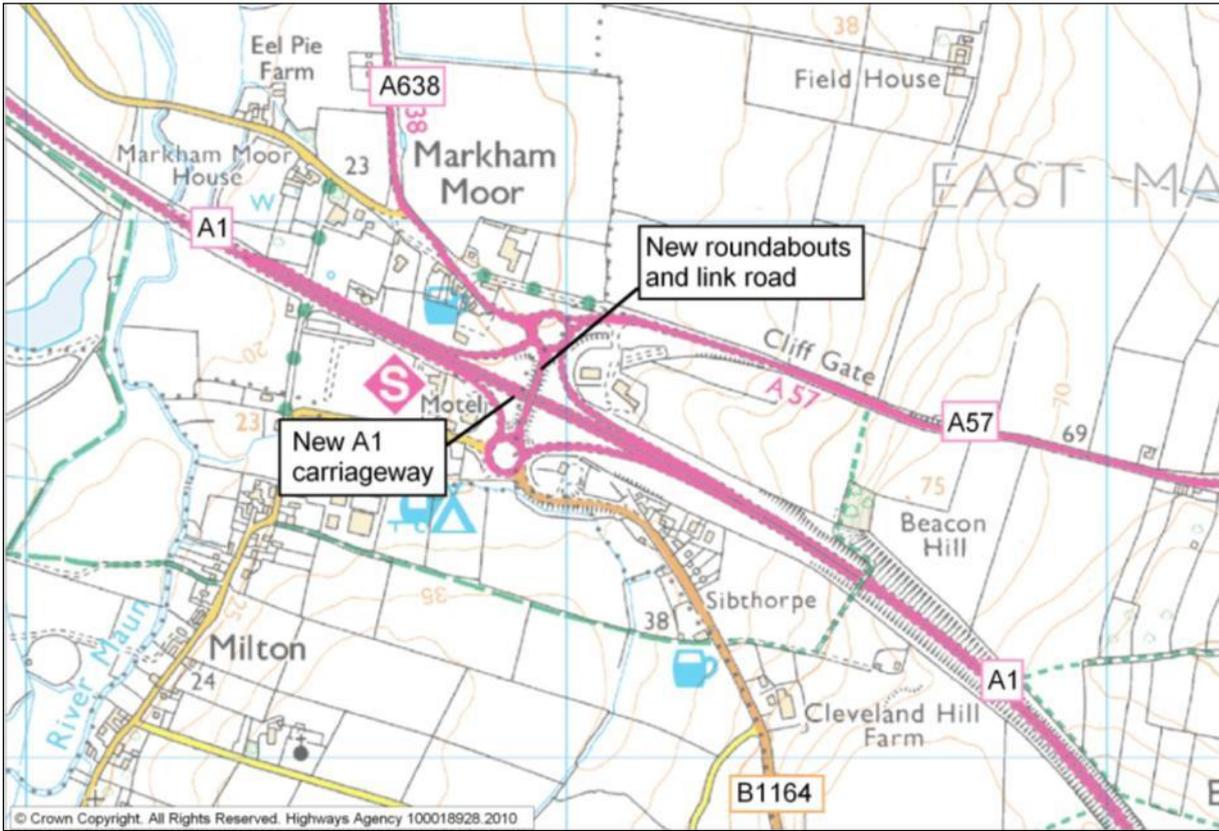


Figure A.4 – Gonerby Moor Junction Improvements

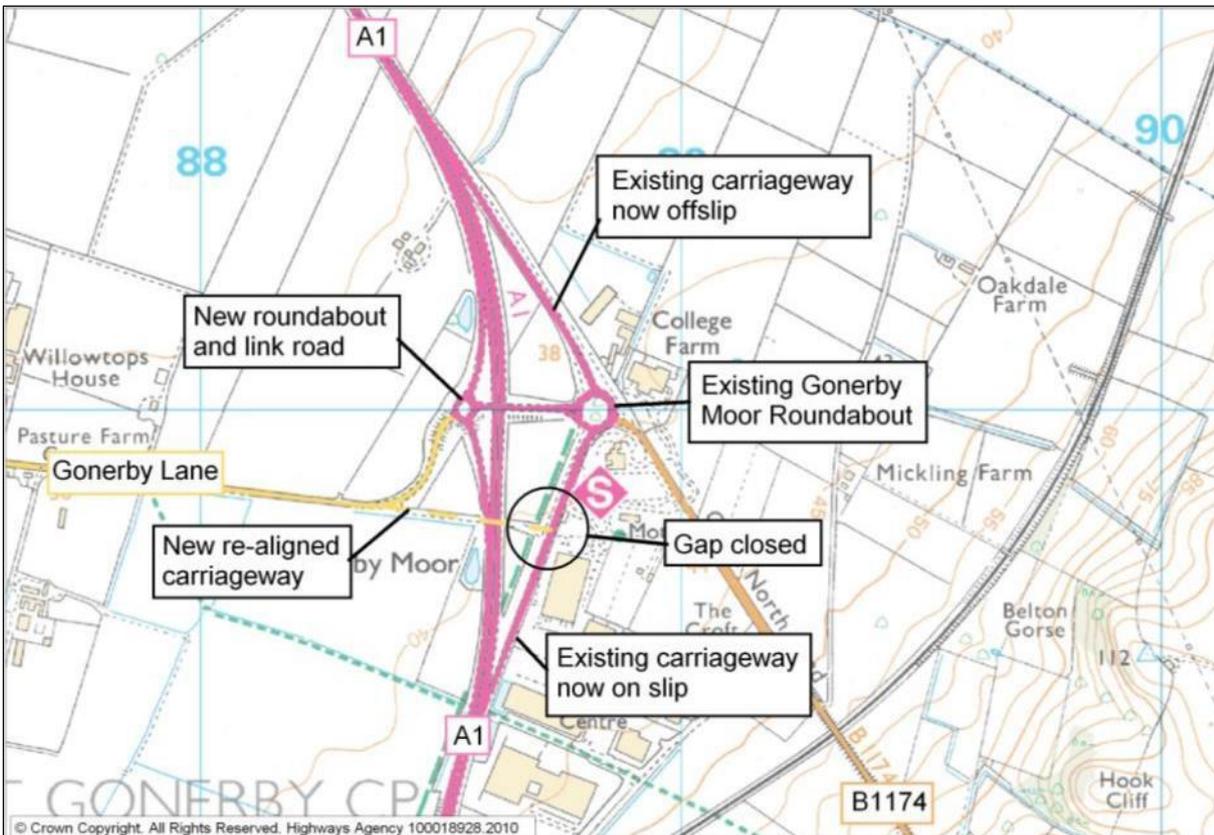


Figure A.5 – Colsterworth Junction Improvements

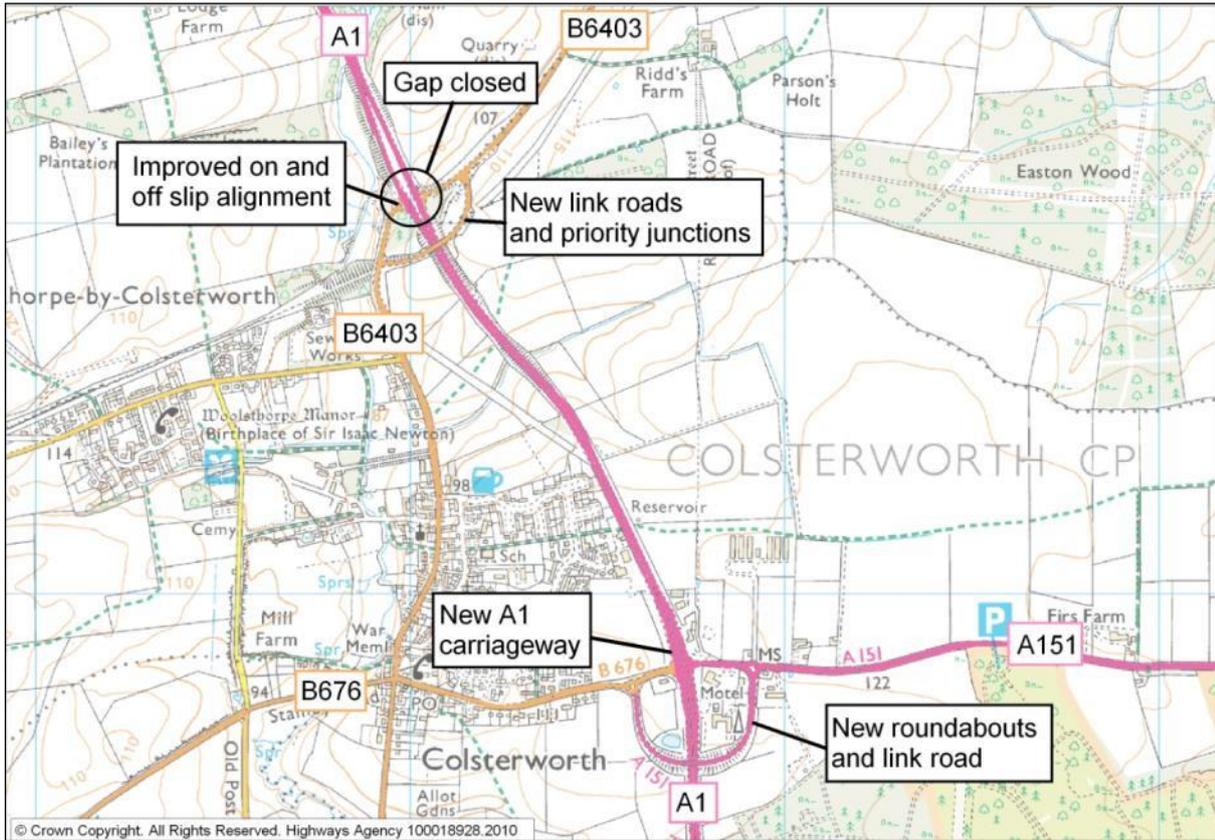
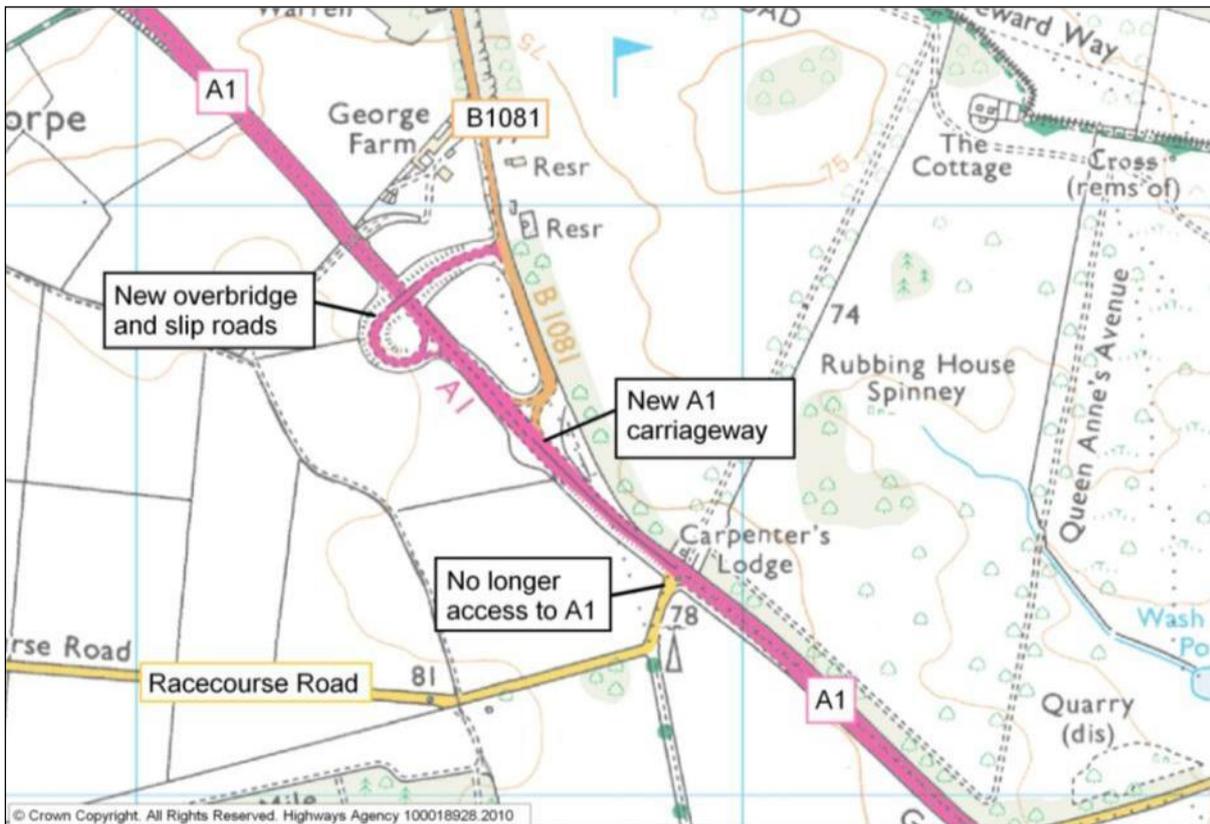


Figure A.6 – Carpenters Lodge Junction Improvements



## Appendix B – Scheme Appraisal Summary Tables (ASTs)

**Table B.1 – Appraisal Summary Table: Blyth Junction**

<b>Option</b>		<b>Description</b>	<b>Problems: SAFETY AND CONGESTION.</b>	<b>Present Value Costs to Public Accounts</b>
A1 BLYTH GSJ		Grade separated junction provided on the A1 at Blyth (A1/A614/B6045).	Congestion at the roundabout causes queuing and delays to the A1 traffic during peak periods. The existing junctions and approaches suffer from road traffic accidents (30 in 5 years).	<b>£17.245m</b>
<b>OBJECTIVE</b>	<b>SUB-OBJECTIVE</b>	<b>QUALITATIVE IMPACTS</b>	<b>QUANTITATIVE MEASURE</b>	<b>ASSESSMENT</b>
<b>ENVIRONMENT</b>	<b>Noise</b>	Noise increases of 1 to 2 dB could be expected at the most exposed facades of the properties to the south of proposed scheme. Slight reduction in noise levels at the most exposed façade of Mandalay. Two properties to be demolished not included in assessment with scheme.	Number of people bothered by noise: Do minimum : 4.5 Do something : 2.2	Estimated Population Annoyed by Noise would be reduced by 2.3
	Local Air Quality	Five properties within range of effects	General improvement	PM10 (2007): -66 NO2 (2007): -102
	<b>Greenhouse Gases</b>	Increase due to predicted higher proportion of HGVs	2007: Do Nothing: 3400t Do Something:4100 t	Slight adverse
	<b>Landscape</b>	Avoidance of designated areas and landscapes of high quality; Character and appearance of area already influenced by existing A1 and adjacent development; Mitigation measures provide opportunities for screening existing and proposed A1 and extending adjacent attractive woodland character.	N/A	Slight Beneficial
	<b>Townscape</b>	There will be no direct impact on Blyth village; The junction location is within a largely rural landscape; Townscape is not considered to be an issue.	N/A	neutral
	<b>Heritage of Historic Resources</b>	The proposals have no appreciable impacts, either positive or negative, on any known heritage assets. However, the land at the proposed location of the balancing pond to the north of the junction is believed to be previously undisturbed, and so a programme of field evaluation will be undertaken, followed by possible archaeological supervision and monitoring during topsoil removal if necessary. Remains are likely to be of local or possibly regional value. Therefore, dependent on the results of the evaluation, the proposals may 'damage locally or regionally significant heritage features'.	N/A	Neutral – possibly rising to Slight Adverse or Moderate depending on the nature and importance of potential buried remains at the balancing pond footprint.
	<b>Biodiversity</b>	Loss of species poor (but ecologically valuable) hedgerows and small area of semi-improved neutral grassland will be replaced through habitat creation. There are no predicted impacts on Blyth Wood ancient woodland or the heathland inventory site. Habitats created within landscape areas will reflect the base poor vegetation that is characteristic of the area.	N/A	Neutral
	<b>Water Environment</b>	No significant effect on water quality from road drainage or accidental spillage, and no discharge to groundwater	N/A	Neutral

	<b>Physical Fitness</b>	The proposed junction with dedicated crossing space will provide a safer more pleasant crossing of the A1. The grade separation would cause a large reduction in traffic encountered by non-motorised users. The new junction will promote physical exercise although the number of people who would benefit is likely to be small.	N/A	N/A	
	<b>Journey Ambience</b>	The journey would be safer and more pleasant, and travellers, including public transport users, would experience less delay and frustration.	N/A	Substantial beneficial	
<b>SAFETY</b>	<b>Accidents</b>	<b>Reduced accidents:</b> The number of personal injury accidents will reduce as will the number of casualties.	PIA's and casualties savings over 60 years:		
			PIAs	159.2	PVB £2.1m
			Slight	184.8	
			Serious	-0.6	
Fatal	-1.2				
	<b>Security</b>	Less delay and queuing at the junction will reduce exposure to crime	N/A	Neutral	
<b>ECONOMY</b>	<b>Public Accounts</b>	Construction and maintenance (dis)benefits have not been assessed.	Central Govt PVC £17.2m Local Govt PVC £0	PVC £17.2m	
	<b>Business Users &amp; Providers</b>	The scheme will reduce geometric and queuing delays at the Blyth roundabout. Reduced journey times for through traffic on A1 will be achieved	Users PVB £133.4m Providers PVB £0.088m Other PVB £0	PVB £133.5m	
	<b>Consumer Users</b>	The scheme will reduce geometric and queuing delays at Blyth roundabout. Reduced journey times for through traffic on A1 will be achieved.	N/A	PVB £85.7	
	<b>Reliability</b>	More reliable journey times	N/A	N/A	
	<b>Wider Economic Impacts</b>	N/A	Serves designated regeneration area – NO. Development depends on scheme - NO	N/A	
<b>ACCESSIBILITY</b>	<b>Option values</b>	No change	N/A	N/A	
	<b>Severance</b>	Improvements specifically for local communities	N/A	Moderate beneficial	
	<b>Access to the Transport System</b>	No change	N/A	Neutral	
<b>INTEGRATION</b>	<b>Transport Interchange</b>	N/A	N/A	Neutral	
	<b>Land-Use Policy</b>	The junction improvement will not directly reduce the need to travel but will promote more sustainable transport choices. The proposed scheme provides social and economic benefits while minimising the impact on the environment and is supported by regional and local planning policy.	N/A	Beneficial	
	<b>Other Government Policies</b>	Scheme does not adversely affect other government policies, although may not reduce car dependency	N/A	Neutral	

Table B.2 – Appraisal Summary Table: **Apleyhead Junction**

Option <b>A1 APLEYHEAD GSJ</b>		Description Grade separated junction provided on the A1 at Apleyhead (A1/A614/AS7/£64200).	Problems: <b>SAFETY AND CONGESTION</b> Congestion at the junction, queuing and delays to the A1 traffic during peak periods. The existing junctions and approaches suffer from road traffic accidents (65 personal injury accidents recorded during 5 years June 1998 - July 2003).	Present Value of Costs to Public Accounts Central Growth £10.5
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	Only one property within 300m of the scheme has been identified. Up to 3 dB reductions at the northern and eastern facades of the property.	Only one property within 300m of the scheme has been identified. Up to 5 dB reductions at the northern and eastern facades of the property.	Estimated Population Annoyed by Noise would be reduced by 0.3
	Local Air Quality	Single property within range of effects	Improvement at single property	PM10 (2007): -1.2 NO2 (2007): -2.5
	Greenhouse Gases	Reduction due to shorter journey lengths on realigned A1	2007: Do Nothing: 10600 t Do Something: 10600 t	Slight Benefit
	Landscape	Avoidance of designated areas and landscapes of high quality. New landform in an otherwise flat and open landscape provides an inconspicuous element. Elevated lighting is difficult to mitigate and 'urbanises' a rural landscape, although this is already influenced by the existing A1 corridor. Mitigation measures provide opportunities for screening existing and proposed A1 and extending attractive woodland character.	N/A	Slight beneficial.
Heritage of Historic Resources	Townscape	N/A	N/A	N/A
	Heritage of Historic Resources	Buried archaeological remains, identified through cropmarks visible on aerial photographs, are likely to be impacted upon by the scheme proposals. The remains are likely to consist of ditches which may be associated with evidence of settlement remains. Therefore based on our current understanding of the resource the proposed scheme will damage locally significant heritage features for which designation may be considered. However, investigation currently being undertaken to confirm the presence or absence of further features. This may affect the current score.	N/A	Slight Adverse
Biodiversity	Biodiversity	Habitats affected by the proposed scheme are of value in a local context. Appropriate mitigation, including habitat creation works as illustrated in the environmental design, will mitigate any loss of or damage to habitats. No new habitats created near (potentially) are not predicted to be significant, and can be mitigated.	N/A	Slight Adverse
	Water Environment	Scheme passes close to Source Protection Zone II but no significant effect on groundwater quality from road drainage or accidental spillage, and no discharge to surface water courses	N/A	Neutral
Physical Fitness	Physical Fitness	The proposed junction will provide a safer more pleasant crossing of the A1. The grade separation would cause a large reduction in traffic encountered by non-motorised users however the number of people who would benefit is likely to be small.	N/A	Neutral
	Journey Ambience	In the long term all travellers would benefit from improved views. The segregation of A1 through-traffic from other traffic means the cure of a current congestion gap would reduce stress for a large number of travellers.	N/A	Large Beneficial
SAFETY	Accidents	Reduced accidents: The number of personal injury accidents will reduce as will the number of casualties.	PIA's and casualties savings over 60 years (CG): PIA's Slight 315.9 Serious 422.7 Fatal 31.9 2.8	PVB £11.8m CG
	Security	Less delay and queuing at the junction will reduce exposure to crime	N/A	Neutral
	Public Accounts	Construction and maintenance (as benefits have not been assessed)	Central Govt PVC: £10.5m CG Local Govt PVC: £0 CG	PVC £10.5m CG
	Business Users & Providers	The scheme will reduce geometric and queuing delays at the Apleyhead roundabout. Reduced journey times for through traffic on A1 will be achieved	Users PVB £89.1m CG Transport Providers PVB -£0.025m CG Other PVB £0 CG	PVB £89.1m CG
ACCESSIBILITY	Consumer Users	The scheme will reduce geometric and queuing delays at Apleyhead roundabout. Reduced journey times for through traffic on A1 will be achieved.	Users PVB £47.5 CG	PVB £47.5m CG
	Reliability	More reliable journey times	N/A	Moderate Beneficial
INTEGRATION	Wider Economic Impacts	N/A	Serves designated regeneration area - NO. Development depends on scheme - NO.	N/A
	Severance	No change	N/A	N/A
INTEGRATION	Access to the Transport System	Improvement especially for local communities	N/A	Moderate Beneficial
	Transport	No change	N/A	Neutral
Land Use Policy	Transport	N/A	N/A	Neutral
	Land Use Policy	The junction improvement will not directly reduce the need to travel but will provide more sustainable transport choices. The improved road conditions will provide benefits while minimising the impact on the environment and is supported by regional and local planning policy.	N/A	Beneficial
Other Government Policies	Other Government Policies	Scheme does not adversely affect other government policies, although may not reduce car dependency	N/A	Neutral

**Table B.3 – Appraisal Summary Table: Markham Moor Junction**

Option		Description	Problems	Present Value of Costs to Public Accounts
Markham Moor		Grade separated junction provided on the A1 at Markham Moor(A1/A57/A638).	Congestion at the roundabout causes queuing and delays to the A1 traffic during peak periods. The existing junction and approaches suffer from road traffic accidents (75 personal injury accidents recorded in 5 years Aug 1998 – July 2003).	<b>£11.6m</b>
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
ENVIRONMENT	Noise	Noise reductions at Walnut View (up to 10dB), Sibthorpe Kennels (up to 5 dB), Rosalie and adjacent property (up to 5 dB). No noise increases at any properties.	Number of people bothered by noise: Do minimum : 30.3 Do something : 27.9	Estimated Population Annoyed by Noise would be reduced by 2.4
	Local Air Quality	General improvement.	Slight improvement at 8 properties; the remaining are largely unaffected.	PM10: -50 NO2: -103
	Greenhouse Gases	Slight reduction	2007: Do Nothing 4100 t Do Something 3900 t	Slight benefit
	Landscape	The junction improvements will be confined to an area already influenced by large scale commercial developments and lighting. Land take will be largely confined within the area of the existing roundabout with associated vegetation loss and a slight increase in wider landscape character impacts, particularly to the north and south. There will be adverse changes in views to the residential properties to the southeast and northwest largely due to the elevated bridge and associated lighting. Full cut off lighting will be provided to mitigate the impacts. The adjacent commercial developments and proposed landscape mitigation measures will screen many of the wider impacts although the elevated structures, including lighting will be difficult to mitigate fully.	N/A	Slight adverse
	Townscape	N/A	N/A	N/A
	Heritage of Historic Resources	There will be a visual impact on 3 nationally important Listed Buildings and 2 buildings of local historic interest, all of which are less than 500 metres from the embanked over bridge. There are no known sites of archaeological interest within the scheme footprint. Cropmarks have been identified within 500 metres of the scheme and so suggest the potential of as yet unknown remains located in the area. However due to the limited new land take there is a low potential for as yet unknown remains located within the scheme footprint.	N/A	Slight adverse
	Biodiversity	Loss of the SINC and other orchid populations within the proposed scheme is mitigated by the translocation in combination with improvement the declining orchid populations of Cliffgate SINC. The benefits here offset some of the effects giving an overall score of slight adverse.	N/A	Slight adverse
	Water Environment	No significant effect on river water quality from road drainage or from accidental spillage. No discharge to groundwater.	N/A	Neutral
	Physical Fitness	The scheme would speed up A1 traffic thereby disadvantaging users of the at-grade bridle crossing (West Drayton 2 & 2A) approximately 1km north west of the junction. Lower traffic volumes and dedicated crossing space at the junction would reduce the severance effect of the A1 for non-motorised users. The existing and latent demand for crossing the A1 is considered to be low.	N/A	N/A
	Journey Ambience	Once constructed the new junction layout would reduce traffic congestion and segregate local traffic from A1 traffic. These changes would reduce fear of accident and frustration currently felt by a large number of travellers.		Large Beneficial
SAFETY	Accidents	The number of personal injury accidents will reduce as will the number of casualties.	PIA's and casualty savings over 60 years	
				Central Growth
PIAs	402.7			
Slight	519.3			
Serious	17.9			
Fatal	0.3			
	Security	Less delay and queuing at the junction will reduce exposure to crime	n/a	Neutral
ECONOMY	Public Accounts	Delays during construction and future maintenance have not been assessed.	Central Govt PVC £11.6m Local Govt PVC £0m	PVC £11.6m
	Transport Economic Efficiency: Business Users & Transport Providers	The scheme will reduce geometric and queuing delays associated with the Markham Moor roundabout. Reduced journey times for through traffic on the A1 will be achieved.	Users PVB £88.48m Transport Providers PVB -£0.03m Other PVB £0m	PVB £88.46m
	Transport Economic Efficiency: Consumers	The scheme will reduce geometric and queuing delays associated with the Markham Moor roundabout. Reduced journey times for through traffic on the A1 will be achieved.	Users PVB £44.67m	PVB £44.67m
	Reliability	More reliable journey times	N/A	Moderate beneficial
	Wider Economic Impacts	N/A	Serves designated regeneration area – NO Development depends on scheme - NO	N/A
ACCESSIBILITY	Option values	No change	N/A	N/A
	Severance	Improvement especially for local communities	N/A	Moderate beneficial
	Access to the Transport System	No change	N/A	Neutral
INTEGRATION	Transport Interchange	N/A	N/A	Neutral
	Land-Use Policy	The revised junction would contribute to planning policy by promoting sustainable transport choices for those crossing the A. Land-take and diversion of A1 traffic would have an adverse effect on local businesses at the junction however reducing congestion would contribute to wider economic and environmental policy objectives. The adverse environmental impacts can be mitigated to comply with planning policy. Overall more policies are facilitated than hindered.	N/A	Beneficial
	Other Government Policies	The scheme would be of limited benefit to people without access to a car by providing a safer crossing of the A1. The scheme is consistent with Government aims to invest in transport infrastructure, to improve the competitiveness and productivity of the UK economy and is consistent with the Highways Agency's environmental policy.		Beneficial

**Table B.4 – Appraisal Summary Table: Gonerby Moor Junction**

Scheme Name: A1 GONERBY MOOR GSJ		Description of Option C (InterserveAtkins) : A1 realigned as a D2AP road to the west of existing roundabout and a grade separated junction provided.	Problems : SAFETY AND CONGESTION  The existing roundabout and A1 approaches suffer from road Traffic accidents (41 personal injury accidents recorded during 5 years 1999-2003). Congestion at the roundabout causes queuing and delays to the A1 traffic during peak periods.	Present Value Costs to Public Accounts  £24.9m								
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT								
ENVIRONMENT	Noise	No change in traffic flow on A1. Very few inhabited buildings around the existing road. No perceivable change in noise expected. Road moved further away from all but one property.	Estimated number of people likely to be annoyed by noise levels are: 1.3 for the do-minimum , 0.9 for scheme	Estimated Net Population Annoyed by Noise = +0.4								
	Local Air Quality	Single property within range of effects	Improvement at single property	PM10 (2007): -2.2 NO2 (2007): -5.4								
	Greenhouse Gases	Reduction due to shorter journey lengths on realigned A1.	2007: Do Nothing 8,800 t Do Something 7,400 t	Slight Benefit								
	Landscape	Loss of characteristic landscape features; increase in road structures including bridge and lighting will increase the perception of the road corridor on the wider landscape character and increase views from receptors.	-	Slight Adverse								
	Townscape	Given the rural character of the area, townscape is not considered to be an issue.	-	-								
	Heritage of Historic Resources	Damaging to potential locally significant heritage assets, resulting in the loss of features such that their integrity is compromised, but not destroyed, and adequate mitigation can be specified.	-	Slight Adverse								
	Biodiversity	Not an especially sensitive area. Potential minor impacts on birds and watervoles.	-	Neutral								
	Water Environment	No amenity features affected, any increase in surface water run-off would be stored so that there is no increase in the rate of discharge to Foston Beck. There is no effect on the foston beck flood plain.	-	Neutral								
	Physical Fitness	Scheme would create safer crossings of the A1 however few peds/riders/cyclists are likely to benefit	-	Slight Benefit								
SAFETY	Journey Ambience	Generally improved conditions for a large number of travellers, including safer journey with fewer delays and improved view.	-	Large benefit								
	Accidents	<b>Reduced accidents:</b>  The number of personal injury accidents will reduce as will the number of casualties.	PIA's and casualty savings over 60 years <table border="1"> <tr> <td>PIAs</td> <td>140.9</td> </tr> <tr> <td>Slight</td> <td>171.2</td> </tr> <tr> <td>Serious</td> <td>-2.5</td> </tr> <tr> <td>Fatal</td> <td>-1.9</td> </tr> </table>	PIAs	140.9	Slight	171.2	Serious	-2.5	Fatal	-1.9	PVB £1.032m
	PIAs	140.9										
Slight	171.2											
Serious	-2.5											
Fatal	-1.9											
Security	Peds. riders & cyclists diverted onto longer routes possibly unlit but with good intervisibility. Very few movements involved - assumed less than 100 per day.	-	Slight Adverse									
ECONOMY	Public Accounts	Construction and maintenance (dis)benefits have not been assessed.	Central Govt PVC £24.4m Local Govt PVC £0	PVC £24.4m								
	Business Users & Providers	The scheme will reduce geometric and queuing delays at the Gonerby Moor roundabout. Reduced journey times for through traffic on A1 will be achieved	Users PVB £204.985m Providers PVB £0.350m Other PVB £0	PVB £205.335m								
	Consumer Users	The scheme will reduce geometric and queuing delays at the Gonerby Moor roundabout. Reduced journey times for through traffic on A1 will be achieved.	PVB £155.160m	PVB £155.160m								
	Reliability	Existing peak delays would be eliminated and reliability improved.	-	Moderate benefit								
	Wider Economic Impacts	No impact envisaged by this localised scheme	-	Neutral								
ACCESSIBILITY	Option values	Unlikely to affect transport options available.	-	Neutral								
	Severance	Improvement from 'severe' for most. Assumed less than 100 pedestrians per day.	-	Slight benefit								
	Access to the Transport System	Unlikely to affect access to the transport system.	-	Neutral								
INTEGRATION	Transport Interchange	No effect on level of facilities provided at interchanges.	-	Neutral								
	Land-Use Policy	More key policies would be facilitated than hindered	-	Neutral								
	Other Government Policies	No impact envisaged by this localised scheme	-	Neutral								

**Table B.5 – Appraisal Summary Table: Colsterworth Junction**

Scheme Name:		Description (Option B (Interserve/Atkins) :	Problems: SAFETY AND CONGESTION.	Present Value Costs to Public Accounts	
<b>A1 COLSTERWORTH GSJ</b>		Removal of A1 roundabout, replaced by a compact grade separated junction. Closure of central reservation gap at A1/B6403 junction with a new link over the A1 at the B6403.	Congestion at the roundabout causes queuing and delays to the A1 traffic during peak periods. The existing junctions and approaches suffer from road traffic accidents (62 personal injury accidents recorded during 5 years 2000-2005).	<b>£4.878m</b>	
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT	
ENVIRONMENT	Noise	Generally slight decrease in noise for properties in the north of Colsterworth and A151, slight increase for properties in the south of Colsterworth and one property on the A151	Number of people bothered by noise:SHORT LINK - Do minimum = 112.7 Do something = 138.0; LONG LINK - Do minimum = 112.7 Do something = 137.5	Estimated Population Annoyed by Noise would be increased by 25.3	
	Local Air Quality	Overall slight deterioration in air quality due to link road	78 properties receive a slight improvement, 128 experience a slight deterioration in air quality	PM10 (2007): - 0.07 NO2 (2007): + 24.4	
	Greenhouse Gases	Negligible change in journey distances due to new road layout	2007: Do Nothing 14,344 t Do Something 14,164 t	Slight decrease in CO2 emissions	
	Landscape	The proposals will impact on landscape character, both directly through land take and indirectly through the greater perception of the road network on the wider landscape character, which has been designated as an Area of Great Landscape Value. A few scattered properties to the north and residential properties to the south of Colsterworth and within the industrial area to the south east will experience a change in view. Mitigation measures over time will limit the impacts.	-	Slight Adverse	
	Townscape	Townscape not applicable to this rural setting	-	-	
	Heritage of Historic Resources	No known Ancient monuments or listed structures affected. Potential impact on remains to the south of A1/A151 junction	-	Slight Adverse	
	Biodiversity	Slight adverse impact on non-statutory designated road verge at northern end of proposed improvement.	-	Slight Adverse	
	Water Environment	Headwaters of River Witham and local field ditches would receive additional water from the scheme, but no special problems envisaged.	-	Neutral	
	Physical Fitness	Small numbers of pedestrians riders and cyclists crossing at roundabout will have a safer route via Loop Road bridge. New bridge at B6403 would provide a safer crossing. No material change in the level of physical activity is predicted.	-	Neutral	
	Journey Ambience	The grade-separated junctions will enable a large number of travellers to make better progress along the route they are travelling on thereby reducing traveller frustration. Fear of accident would be significantly reduced at the A1/B6403 junction as a grade separated junction would replace the existing junction with its difficult turning manoeuvres.	-	Large benefit	
SAFETY	Accidents	<b>Reduced accidents:</b> The number of personal injury accidents will reduce as will the number of casualties.	PIA's and casualties savings over 30 years:		
			Central Growth		
			PIA's	80.2	PVB £0.678m
			Slight	97.4	
			Serious	-1.5	
Fatal	-1.0				
Security	Peds. riders & cyclists diverted onto longer routes possibly unlit but with good intervisibility. Very few movements involved - assumed less than 100 per day.		Slight Adverse		
ECONOMY	Public Accounts	Construction and maintenance (dis)benefits have not been assessed.	Central Govt PVC £4.878m Local Govt PVC £0	PVC £4.878m	
	Business Users & Providers	The scheme will reduce geometric and queuing delays at the Colsterworth roundabout. Reduced journey times for through traffic on A1 will be achieved	Users PVB £88.701m Providers PVB -£0.076 Other PVB £0	PVB £88.625m	
	Consumer Users	The scheme will reduce geometric and queuing delays at Colsterworth roundabout. Reduced journey times for through traffic on A1 will be achieved.	-	PVB £71.514m	
	Journey Time Reliability	Scheme will reduce peak delays at roundabout and improve reliability	-	Moderate benefit	
	Wider Economic Impacts	Areas served are not identified in any official plans for regeneration	-	Neutral	
	Option values	Unlikely to affect transport options available.	-	Neutral	
	Severance	Improvement from 'severe' for most users. Assumed less than 100 pedestrians per day.	-	Slight benefit	
ACCESSIBILITY	Access to the Transport System	Unlikely to affect access to the transport system.	-	Neutral	
	Transport Interchange	No effect on level of facilities provided at interchanges.	-	Neutral	
	Land-Use Policy	The number of key policies hindered by the proposed improvements is approximately the same as the number of policies facilitated.	-	Neutral	
	Other Government Policies	The scheme will not directly benefit people without access to a car. The scheme is consistent with Government aims to invest in transport infrastructure, to improve the competitiveness and productivity of the UK economy and is consistent with the Highways Agency's environmental policy.	-	Beneficial	

**Table B.6 – Appraisal Summary Table: Carpenters Lodge Junction**

<b>Scheme Name:</b> A1 CARPENTER'S LODGE GSJ		<b>Description</b> Removal of A1 roundabout, replaced by a compact grade separated junction.	<b>Problems: SAFETY AND CONGESTION.</b> Congestion at the roundabout causes queuing and delays to the A1 traffic during peak periods. The existing junctions and approaches suffer from road traffic accidents (51 personal injury accidents recorded during 5 years 1997-2001).	<b>Present Value Costs to Public Accounts</b> £ 5.0 m												
<b>OBJECTIVE</b>	<b>SUB-OBJECTIVE</b>	<b>QUALITATIVE IMPACTS</b>	<b>QUANTITATIVE MEASURE</b>	<b>ASSESSMENT</b>												
<b>ENVIRONMENT</b>	<b>Noise</b>	Two properties within 300m of the scheme. Up to 1 dB noise reduction at George Farm, no change in noise levels at Carpenters Lodge due to scheme.	Number of people bothered by noise: Do minimum = 2.0 Do something = 1.9	Estimated Population Annoyed by Noise would not change												
	<b>Local Air Quality</b>	Two properties within range of effects	Slight deterioration for NO <sub>2</sub> only at one receptor	PM <sub>10</sub> (2007): -0.2 NO <sub>2</sub> (2007): +0.9												
	<b>Greenhouse Gases</b>	Negligible change in journey distances due to new road layout	2007: Do Nothing 4950 t Do Something 5000 t	Slight increase												
	<b>Landscape</b>	The proposals will impact on the wider landscape character of the 'Area of Best Landscape Value' which includes the setting of the adjacent designated Burghley Park. 2 properties will experience a change in view.	-	Slight Adverse												
	<b>Townscape</b>	No townscape.	-	Neutral												
	<b>Heritage of Historic Resources</b>	Allowing for the successful implementation of several programmes of mitigation works (see above in Section 5.6.4) it is likely that the scheme proposals could 'restore or enhance the...sense of place of the heritage resource through good design and mitigation'.	-	Slight Benefit												
	<b>Biodiversity</b>	Minor adverse impacts on hedges and potentially badger that can be mitigated.	-	Neutral												
	<b>Water Environment</b>	High quality watercourse and sensitive aquifer in close proximity	-	Neutral												
	<b>Physical Fitness</b>	NO CHANGE IN THE LEVEL OF PHYSICAL ACTIVITY IS PREDICTED.	-	Neutral												
	<b>Journey Ambience</b>	The grade-separated junction will reduce traveller frustration for a large number of drivers. Travellers using the grade-separated junction will enjoy an improved view and traveller stress would be reduced by the revised A1/Racedcourse Road junction.	-	Large benefit												
<b>SAFETY</b>	<b>Accidents</b>	<b>Reduced accidents:</b> The number of personal injury accidents will reduce as will the number of casualties.	PIA's and casualties savings over 60 years: <table border="1" style="margin-left: 20px;"> <tr> <td colspan="2">PIA's and casualties savings over 60 years:</td> </tr> <tr> <td colspan="2" style="text-align: center;">Central Growth</td> </tr> <tr> <td style="text-align: center;">PIA's</td> <td style="text-align: center;">392.7</td> </tr> <tr> <td style="text-align: center;">Slight</td> <td style="text-align: center;">510.7</td> </tr> <tr> <td style="text-align: center;">Serious</td> <td style="text-align: center;">36.2</td> </tr> <tr> <td style="text-align: center;">Fatal</td> <td style="text-align: center;">4.2</td> </tr> </table>	PIA's and casualties savings over 60 years:		Central Growth		PIA's	392.7	Slight	510.7	Serious	36.2	Fatal	4.2	PVB £14.63m
PIA's and casualties savings over 60 years:																
Central Growth																
PIA's	392.7															
Slight	510.7															
Serious	36.2															
Fatal	4.2															
	<b>Security</b>	Pedestrians, riders & cyclists diverted onto longer routes possibly unlit but with good intervisibility. Very few movements - assumed less than 100 per day.		Slight Adverse												
<b>ECONOMY</b>	<b>Public Accounts</b>	Construction and maintenance (dis)benefits have not been assessed.	Central Govt PVC £5.0m Local Govt PVC £0	PVC £5.0m												
	<b>Business Users &amp; Providers</b>	The scheme will reduce geometric and queuing delays at the Carpenter's Lodge roundabout. Reduced journey times for through traffic on A1 will be achieved	Users PVB £88.24m Providers PVB -£0.057m Other PVB £0.000(CG)	PVB £88.186m												
	<b>Consumer Users</b>	The scheme will reduce geometric and queuing delays at Carpenter's Lodge roundabout. Reduced journey times for through traffic on A1 will be achieved.	PVB £64.747m	PVB £64.747m												
	<b>Reliability</b>	Existing peak delays would be eliminated and reliability improved.		Moderate benefit												
	<b>Wider Economic Impacts</b>	No impact envisaged by this localised scheme		Neutral												
<b>ACCESSIBILITY</b>	<b>Option values</b>	Unlikely to affect transport options available	-	Neutral												
	<b>Severance</b>	Improvement in existing severe severance. Assumed less than 100 peds. per day	-	Slight benefit												
	<b>Access to the Transport System</b>	Unlikely to affect access to the transport system	-	Neutral												
<b>INTEGRATION</b>	<b>Transport Interchange</b>	No effect on level of facilities provided at interchanges	-	Neutral												
	<b>Land-Use Policy</b>	The number of key policies hindered by the proposed improvements is approximately the same as the number of policies facilitated.	-	Neutral												
	<b>Other Government Policies</b>	The scheme will not directly benefit people without access to a car but is consistent with the objectives to improve public health, to invest in transport infrastructure and to improve the competitiveness and productivity of the UK economy.	-	Beneficial												

N. B. The AST appraises the effects of the proposals in the design year, compared with the Do-Minimum situation, except for safety and economy, which is evaluated over a 30 year period.

# Appendix C – Scheme Evaluation Summary Tables (ESTs)

**Table C.1 – Evaluation Summary Table (EST): Blyth Junction**

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
Environment	Noise	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than or within the tolerances assumed by POPE.	-	Generally as expected, but better than expected on the A1 southbound exit-slip road, the A614 and the B6045
	Local Air Quality	Traffic flows are greater than predicted on the A1 south of the junction, with the percentage difference between the mean forecasts and the observed flows exceeding the +10% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT.	-	Generally as or better than expected, but likely worse than expected on the A1 south of the junction
	Greenhouse Gases		166tonnes Carbon	Adverse As expected
	Landscape/ Townscape	The current levels of plant growth and establishment indicate that the visual screening, landscape integration, and visual amenity functions of the plant stock at all junctions do not appear to be developing as well as would be expected at FYA, and may not fulfil their objectives by the design year. The landscape and visual impact of the roundabout and associated lighting is likely to remain more visible (i.e. worse) than expected within the surrounding landscape in the long term. Replanting at the southern roundabout following the collision with serious spillage on first opening appears not to have been undertaken, and the approach to Blyth from the southern roundabout would act as an attractive gateway feature and be more favourable than the existing situation and the northern roundabout would be better integrated into the surrounding environment on the approach from the A614 Bawtry Road if the planting on the roundabouts (as indicated on the As-Built drawings) was present.	-	Landscape: Worse than expected Townscape: As expected
	Heritage of Historic Resources	All aspects of proposed mitigation have been addressed as reported at OYA, and there were no unresolved issues at OYA. In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected.	-	Archaeology: Better than expected Built Heritage: As expected
	Biodiversity	The variable, and in some locations poor, establishment of the new tree and shrub planting is such that the full ecological potential of these habitats have likely not been realised in the short term.	-	Slightly worse than expected in the short term
	Water	Drainage facilities noted during the FYA site visit appeared to be generally clear of vegetation, maintained, and able to function as would be expected, although localised parts of the drainage system require maintenance to ensure that drainage efficiency is maximised; vegetative treatment systems (rushes) appeared to have generally established well where planted.	-	Generally as expected, but requires maintenance
	Physical Fitness	Safer, more pleasant crossings over the A1 have been provided, and it is considered that there is likely to have been the expected reduction of traffic encountered by NMUs. Silt and debris is partially obscuring the tactile paving at the junction of Whitewater lane with the southern roundabout.	-	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
	Journey Ambience	Traveller Care/ Views: No issues were outstanding from the OYA evaluation, and no further issues were identified during the FYA site visit. Traveller Stress: The A1 through traffic is segregated from other traffic and congestion has been reduced (route uncertainty/ frustration); the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts (fear of potential accidents).	-	Traveller Care/ Views: As expected Traveller Stress: Generally as expected
Safety	Accidents	Grade separation of the junction has reduced the number of collisions, even taking into consideration the national trend.	Forecast annual saving: 2.1 Observed annual saving: 3.7	Better than expected
	Security	Less queuing at the junctions has slightly reduced the risk of crime.	-	As expected
Economy	Transport Economic Efficiency	Journey times have improved but less than predicted on the A1.	PVB for whole A1: £397m.	Worse than expected across all junctions. (Individual junction evaluation not possible).
	Reliability	Journey time variability has decreased for A1 traffic and there are also likely to be reduced delays for traffic on the others roads at the junctions either crossing the A1 or accessing the A1.	-	Not appraised Evaluation: Moderate beneficial
	Wider Economic Impacts	The impacts of the scheme are localised, and it was not planned for the improvements to facilitate the opening up of land for development opportunities.	-	n/a
Accessibility	Option values	There has been no change in option values resulting from the scheme.	-	n/a
	Severance	Improvements for residents living north of the junction wishing to travel to Blyth village, although the numbers affected are low.	-	Moderate beneficial, as expected
	Access to the Transport System	The scheme has had no impact on public transport provision.	-	Neutral, as expected
Integration	Transport Interchange	The scheme has not had an impact on the provision of transport interchange facilities.	-	Neutral, as expected
	Land-use Policy		-	Beneficial, as expected
	Other Government Policies	The scheme is supported by local and regional polices and has provided economic benefits.	-	Neutral as expected

**Table C.2 – Evaluation Summary Table (EST): Apleyhead Junction**

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
Environment	Noise	Traffic flows are greater than predicted on the B6420, with the percentage difference between the mean forecasts and the observed flows exceeding the +25% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT.	-	Generally as expected, but better than expected on the A1 southbound exit-slip road and the A614, and worse than expected on the B6420
	Local Air Quality	Traffic flows are greater than predicted on the B6420, with the percentage difference between the mean forecasts and the observed flows exceeding the +10% tolerance assumed by POPE with the overall number of vehicles exceeding the predicted figures by over 1,000 AADT.	-	Generally as expected, but better than expected on the A1 southbound exit-slip road and the A614, and worse than expected on the B6420
	Greenhouse Gases	Increase due to extra traffic on A1	increase of 221 tonnes of carbon FYA	Worse than expected
	Landscape	The current levels of plant growth and establishment indicate that the visual screening, landscape integration, and visual amenity functions of the plant stock at all junctions do not appear to be developing as well as would be expected at FYA, and may not fulfil their objectives by the design year. None of the swathes of wild daffodils in grasslands indicated on the As-Built drawings were observed during the FYA site visit, and the areas appeared to be managed in such a way that would actively exclude daffodils from surviving at these locations.	-	Worse than expected
	Heritage of Historic Resources	All aspects of proposed mitigation have been addressed as reported at OYA, and there were no unresolved issues at OYA. In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected. The plant stock does not appear to be developing as well as would be expected at FYA, and this may have resulted in localised slight adverse effects on the landscape settings of the heritage resources that are worse than those reported at OYA, at least in the short term	-	Archaeology: Better than expected Built Heritage: Slightly worse than expected
	Biodiversity	The variable, and in some locations poor, establishment of the new tree and shrub planting is such that the full ecological potential of these habitats have likely not been realised in the short term. The replacement of the badger foraging habitat lost to the proposals by off-site planting has not been implemented as per the ecological mitigation proposals stated in the ES. The presence of healthy and established reed beds at the southern balancing pond, and areas of relatively tall vegetation within the northern balancing pond indicate it likely that remedial measures to implement reedbeds have been undertaken	-	Slightly worse than expected in the short term
	Water	Several of the swale/ balancing pond inlets/ outlets are either partially or fully blocked and as such, it is considered likely that more than routine maintenance is required to ensure that the drainage system as a whole can perform in line with expectations	-	Worse than expected
	Physical Fitness	Safer, more pleasant crossings over the A1 have been provided, and it is considered that there is likely to have been the expected reduction of traffic encountered by NMUs. The western corral does not appear to have been subject to equestrian use for a period of time, and the bridleway along the redundant carriageway (adjacent to the northbound exit-slip road) has a tarmac, rather than gravel, surface. The NMU directional sign is not upstanding at the western corral, and silt build up is partially obscuring the tactile (blister) paving and pavement signs indicating traffic direction at the eastern roundabout.	-	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
Journey Ambience	Traveller Care/ Views: No issues were outstanding from the OYA evaluation, and no further issues were identified during the FYA site visit.	-	Traveller Care/ Views: As expected	
	Traveller Stress: The A1 through traffic is segregated from other traffic and congestion has been reduced (route uncertainty/ frustration); the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts (fear of potential accidents).	-	Traveller Stress: Generally as expected	
Safety	Accidents	Grade separation of the junction has reduced the number of collisions, even taking into consideration the national trend.	Forecast annual saving: 4.8 Observed annual saving: 4.7	As expected
	Security	Less queuing at the junctions has slightly reduced the risk of crime.	-	As expected
Economy	Transport Economic Efficiency	Journey times have improved but less than predicted on the A1.	PVB for whole A1: £397m.	Worse than expected across all junctions. (Individual junction evaluation not possible).
	Reliability	Journey time variability has decreased for A1 traffic and there are also likely to be reduced delays for traffic on the others roads at the junctions either crossing the A1 or accessing the A1.	-	Moderate beneficial, as expected
	Wider Economic Impacts	The impacts of the scheme are localised, and it was not planned for the improvements to facilitate the opening up of land for development opportunities.	-	n/a
Accessibility	Option values	There has been no change in option values resulting from the scheme.	-	n/a
	Severance	The junction has provided a safer crossing of the A1 and caused a large reduction in traffic encountered by non-motorised users. However, the number of people affected is small.	-	Moderate beneficial, as expected
	Access to the Transport System	The scheme has had no impact on public transport provision.	-	Neutral, as expected
Integration	Transport Interchange	The scheme has not had an impact on the provision of transport interchange facilities.	-	Neutral, as expected
	Land-use Policy		-	Beneficial, as expected
	Other Government Policies	The scheme is supported by local and regional polices and has provided economic benefits.	-	Neutral as expected

**Table C.1 – Evaluation Summary Table (EST): Markham Moor Junction**

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
Environment	Noise	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than or within the tolerances assumed by POPE.	-	Generally as expected, but better than expected on the A1 southbound exit-slip road
	Local Air Quality	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than, or within, the tolerances assumed by POPE.	-	Generally as expected, but better than expected on the A1 southbound exit-slip road and the A638
	Greenhouse Gases	Increased carbon emissions due to more traffic and higher speeds on the A1.	Increase of 161 tonnes of carbon at FYA	Worse than expected
	Landscape	The current levels of plant growth and establishment indicate that the visual screening, landscape integration, and visual amenity functions of the plant stock at all junctions do not appear to be developing as well as would be expected at FYA, and may not fulfil their objectives by the design year. None of the swathes of wild daffodils in grasslands indicated on the As-Built drawings were observed during the FYA site visit, and the areas appeared to be managed in such a way that would actively exclude daffodils from surviving at these locations.	-	Worse than expected
	Heritage of Historic Resources	All aspects of proposed mitigation have been addressed as reported at OYA, and there were no unresolved issues at OYA. In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected. The plant stock does not appear to be developing as well as would be expected at FYA, and this may have resulted in localised slight adverse effects on the landscape settings of the heritage resources that are worse than those reported at OYA, at least in the short term	-	Archaeology: Better than expected Built Heritage: Slightly worse than expected
	Biodiversity	The variable, and in some locations poor, establishment of the new tree and shrub planting is such that the full ecological potential of these habitats have likely not been realised in the short term. It would appear unlikely that maintenance at the receptor site for the translocated Pyramid Orchids is being carried out in accordance with the HEMP. No obvious areas of wildflower grassland were observed throughout the Markham Moor site visit and although it remains unconfirmed, it would appear unlikely that the remedial works to replace the amenity grassland with wildflower grassland have been undertaken	-	Slightly worse than expected in the short term
	Water	Drainage facilities noted during the FYA site visit appeared to be generally clear of vegetation, maintained, and able to function as would be expected, although localised parts of the drainage system require maintenance to ensure that drainage efficiency is maximised; vegetative treatment systems (rushes) appeared to have generally established well where planted. The perimeter fence of the balancing pond adjacent to the access road/ car park of the China Moon restaurant has been damaged (breached).	-	Generally as expected, but requires maintenance
	Physical Fitness	Safer, more pleasant crossings over the A1 have been provided, and it is considered that there is likely to have been the expected reduction of traffic encountered by NMUs. Silt and debris is partially obscuring the tactile paving at the eastern roundabout adjacent to the northbound entry-slip road, and an NMU directional sign is not upstanding at the same location	-	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
Safety	Journey Ambience	Traveller Care/ Views: No issues were outstanding from the OYA evaluation, and no further issues were identified during the FYA site visit. Traveller Stress: The A1 through traffic is segregated from other traffic and congestion has been reduced (route uncertainty/ frustration); the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts (fear of potential accidents).	-	Traveller Care/ Views: As expected Traveller Stress: Generally as expected
	Accidents	Grade separation of the junction has reduced the number of collisions, even taking into consideration the national trend.	Forecast annual saving: 5.3 Observed annual saving: 7.0	Better than expected
Economy	Security	Less queuing at the junctions has slightly reduced the risk of crime.	-	As expected
	Transport Economic Efficiency	Journey times have improved but less than predicted on the A1.	PVB for whole A1: £397m.	Worse than expected across all junctions. (Individual junction evaluation not possible).
	Reliability	Journey time variability has decreased for A1 traffic and there are also likely to be reduced delays for traffic on the others roads at the junctions either crossing the A1 or accessing the A1.	-	Moderate Beneficial, as expected
Accessibility	Wider Economic Impacts	The impacts of the scheme are localised, and it was not planned for the improvements to facilitate the opening up of land for development opportunities.	-	n/a
	Option values	There has been no change in option values resulting from the scheme.	-	n/a
	Severance	The junction has provided a safer crossing of the A1 and caused a large reduction in traffic encountered by non-motorised users. However, the number of people affected is small.	-	Moderate beneficial, as expected
Integration	Access to the Transport System	The scheme has had no impact on public transport provision.	-	Neutral, as expected
	Transport Interchange	The scheme has not had an impact on the provision of transport interchange facilities.	-	Neutral, as expected
	Land-use Policy	The scheme is supported by local and regional policies and has provided economic benefits. Businesses adjacent to the junction, largely serving travellers remain in business	-	Beneficial, as expected
	Other Government Policies		-	Beneficial, as expected

**Table C.2 – Evaluation Summary Table (EST): Gonerby Moor Junction**

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
Environment	Noise	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than or within the tolerances assumed by POPE	-	Better than expected at the A1 south of the junction (no other data available)
	Local Air Quality	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than, or within, the tolerances assumed by POPE.	-	Better than expected at the A1 south of the junction (no other data available)
	Greenhouse Gases	Reduction in journey lengths on the A1 is minor counterbalance by increased traffic	Decrease of 28 tonnes of carbon FYA	Worse than expected
	Landscape	The current levels of plant growth and establishment indicate that the visual screening, landscape integration, and visual amenity functions of the plant stock at all junctions do not appear to be developing as well as would be expected at FYA, and may not fulfil their objectives by the design year. None of the swathes of wild daffodils in grasslands indicated on the As-Built drawings were observed during the FYA site visit, and the areas appeared to be managed in such a way that would actively exclude daffodils from surviving at these locations.	-	Worse than expected
	Heritage of Historic Resources	All aspects of proposed mitigation have been addressed as reported at OYA, and there were no unresolved issues at OYA. In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected.	-	Archaeology: Better than expected Built Heritage: As expected
	Biodiversity	The variable, and in some locations poor, establishment of the new tree and shrub planting is such that the full ecological potential of these habitats have likely not been realised in the short term. Although unable to be confirmed, it would appear possible that remedial works have been undertaken to replace amenity grassland with wildflower grassland to the south of the western approach to the western roundabout.	-	Slightly worse than expected in the short term
	Water	Drainage facilities noted during the FYA site visit appeared to be generally clear of vegetation, maintained, and able to function as would be expected, although localised parts of the drainage system require maintenance to ensure that drainage efficiency is maximised; vegetative treatment systems (rushes) appeared to have generally established well where planted.	-	Generally as expected, but requires maintenance
	Physical Fitness	Safer, more pleasant crossings over the A1 have been provided, and it is considered that there is likely to have been the expected reduction of traffic encountered by NMUs.	-	As expected
	Journey Ambience	Traveller Care/ Views: No issues were outstanding from the OYA evaluation, and no further issues were identified during the FYA site visit. Traveller Stress: The A1 through traffic is segregated from other traffic and congestion has been reduced (route uncertainty/ frustration); the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts, and the net increase in annual collisions is reflected by local concerns (fear of potential accidents).	-	Traveller Care/ Views: As expected Traveller Stress: Generally as expected, although beneficial effects regarding fear of accidents are unlikely to have been realised
Safety	Accidents	Taking into consideration the national trend of reduced collisions, there is a net increase in the number of collisions at this junction.	Forecast annual saving: 2.5 Observed annual saving: -2.3	Worse than expected
	Security	Less queuing at the junctions has slightly reduced the risk of crime. Pedestrians have been diverted onto longer routes.	-	As expected
Economy	Transport Economic Efficiency	Journey times have improved but less than predicted on the A1.	PVB for whole A1: £397m.	Worse than expected across all junctions. (Individual junction evaluation not possible).
	Reliability	Journey time variability has decreased for A1 traffic and there are also likely to be reduced delays for traffic on the others roads at the junctions either crossing the A1 or accessing the A1.	-	Moderate benefit, as expected
	Wider Economic Impacts	The impacts of the scheme are localised, and it was not planned for the improvements to facilitate the opening up of land for development opportunities.	-	Neutral, as expected
Accessibility	Option values	There has been no change in option values resulting from the scheme.	-	Neutral, as expected
	Severance	The junction has provided a safer crossing of the A1 and caused a large reduction in traffic encountered by non-motorised users. However, the number of people affected is small.	-	Slight benefit, as expected
	Access to the Transport System	The scheme has had no impact on public transport provision.	-	Neutral, as expected
Integration	Transport Interchange	The scheme has not had an impact on the provision of transport interchange facilities.	-	Neutral, as expected
	Land-use Policy		-	Neutral, as expected
	Other Government Policies	The scheme has contributed to the achievement of national, regional and local policy objectives.	-	Neutral, as expected

**Table C.1 – Evaluation Summary Table (EST): Colsterworth Junction**

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
Environment	Noise	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than or within the tolerances assumed by POPE	-	Generally better than expected, but as expected on the A1 north of the junction and on the B6043 (west) at Colsterworth south
	Local Air Quality	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than, or within, the tolerances assumed by POPE.	-	Generally better than expected, but as expected on the B6043 (west) at Colsterworth south
	Greenhouse Gases	Negligible change in carbon emissions.	Increase of 20 tonnes of carbon in opening year.	As expected
	Landscape	Although the omission from the scheme of lighting of the overbridges has benefitted the local landscape character and visual amenity, this is offset by the variable establishment of the plant stock in general and particularly by the slow development of the new hedgerows at Colsterworth south. In an improvement to the situation at OYA, the planting omitted from along the A1 northbound carriageway has now been implemented, and wildflower species are now beginning to colonise Colsterworth Bank at the northern junction.	-	As expected
	Heritage of Historic Resources	All aspects of proposed mitigation have been addressed as reported at OYA, and there were no unresolved issues at OYA. In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected.	-	Archaeology: Better than expected Built Heritage: As expected
	Biodiversity	The variable, and in some locations poor, establishment of the new tree and shrub planting is such that the full ecological potential of these habitats have likely not been realised in the short term. In an improvement on the situation at the time of the OYA evaluation, wildflower species are now starting to colonise the exposed limestone banks at the northern junction (Colsterworth Bank), and Lincolnshire Wildlife Trust signs designate the area to be a Roadside Nature Reserve and note it to be an important wildlife site	-	Slightly worse than expected in the short term
	Water	Drainage facilities noted during the FYA site visit appeared to be generally clear of vegetation, maintained, and able to function as would be expected, although localised parts of the drainage system require maintenance to ensure that drainage efficiency is maximised; vegetative treatment systems (rushes) appeared to have generally established well where planted.	-	Generally as expected, but requires maintenance
	Physical Fitness	Safer, more pleasant crossings over the A1 have been provided, and it is considered that there is likely to have been the expected reduction of traffic encountered by NMUs. Silt and debris is partially obscuring the tactile paving at the roundabout to the northeast of the overbridge (Colsterworth south)	-	Generally as expected, although maintenance is required to ensure clarity of the NMU signage
	Journey Ambience	Traveller Care/ Views: No issues were outstanding from the OYA evaluation, and no further issues were identified during the FYA site visit. Traveller Stress: Although the A1 through traffic is segregated from other traffic and congestion has been reduced, the extent of damage at both eastern and western roundabouts suggests that HGV drivers are having difficulty in negotiating these roundabouts (route uncertainty/ frustration); the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts, and the net increase in annual collisions is reflected by local concerns (fear of potential accidents).	-	Traveller Care/ Views: As expected Traveller Stress: Generally as expected, although beneficial effects regarding fear of accidents are unlikely to have been realised
Safety	Accidents	Taking into consideration the national trend of reduced collisions, there is a net increase in the number of collisions at this junction.	Forecast annual saving: 1.7 Observed annual saving: -3.1	Worse than expected
	Security	Less queuing at the junctions has slightly reduced the risk of crime. Pedestrians have been diverted onto longer routes.	-	As expected
Economy	Transport Economic Efficiency	Journey times have improved but less than predicted on the A1.	PVB for whole A1: £397m.	Worse than expected across all junctions. (Individual junction evaluation not possible).
	Reliability	Journey time variability has decreased for A1 traffic and there are also likely to be reduced delays for traffic on the others roads at the junctions either crossing the A1 or accessing the A1.	-	Moderate benefit, as expected
	Wider Economic Impacts	The impacts of the scheme are localised, and it was not planned for the improvements to facilitate the opening up of land for development opportunities.	-	Neutral, as expected
Accessibility	Option values	There has been no change in option values resulting from the scheme.	-	Neutral, as expected
	Severance	The junction has provided a safer crossing of the A1 and caused a large reduction in traffic encountered by non-motorised users. However, the number of people affected is small.	-	Slight benefit, as expected
	Access to the Transport System	The scheme has had no impact on public transport provision.	-	Neutral, as expected
Integration	Transport Interchange	The scheme has not had an impact on the provision of transport interchange facilities.	-	Neutral, as expected
	Land-use Policy	The scheme is supported by local and regional policies and has provided economic benefits and is thus beneficial to policies to improve competitiveness and productivity of the UK economy.	-	Neutral, as expected
	Other Government Policies	.	-	Beneficial, as expected

**Table C.2 – Evaluation Summary Table (EST): Carpenters Lodge Junction**

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
Environment	Noise	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than or within the tolerances assumed by POPE	-	Generally better than expected, but as expected on the A1 north of the junction.
	Local Air Quality	The percentage difference between the mean forecasts and the observed traffic flows at FYA are predominantly less than, or within, the tolerances assumed by POPE.	-	Generally better than expected, but as expected on the A1 north of the junction
	Greenhouse Gases	Increase in carbon emissions due to extra traffic	Increase of 104 tonnes of carbon FYA	Worse than expected
	Landscape/ Townscape	Although Landscape character and visual amenity have benefitted as a consequence of providing lighting along the B1081 and not at the overbridge, this is offset by the slow development of the plant stock on the southern embankments of the overbridge and by the failure of a section of the translocated hedgerow	-	Landscape: As expected Townscape: As expected
	Heritage of Historic Resources	All aspects of proposed mitigation have been addressed as reported at OYA, and there were no unresolved issues at OYA. In the absence of any significant finds, the impacts of the schemes on the buried archaeological resource are considered to be better than expected. The plant stock does not appear to be developing as well as would be expected at FYA, and this may have resulted in localised slight adverse effects on the landscape settings of the heritage resources that are worse than those reported at OYA, at least in the short term	-	Archaeology: Better than expected Built Heritage: Slightly worse than expected
	Biodiversity	A significant section of the translocated hedgerow has failed, and the variable, and in some locations poor, establishment of the new tree and shrub planting is such that the full ecological potential of latter habitats have likely not been realised in the short term. Wildflower grasslands were observed during the FYA site visit round the junction with Racecourse Road and directly south of the overbridge adjacent to the northbound carriageway as expected.	-	Slightly worse than expected in the short term
	Water	Drainage facilities noted during the FYA site visit appeared to be clear of vegetation, maintained, and able to function as would be expected	-	As expected
	Physical Fitness	Safer, more pleasant crossings over the A1 have been provided, and it is considered that there is likely to have been the expected reduction of traffic encountered by NMUs. The damage that has occurred to the pedestrian parapet of the overbridge requires repair	-	Generally as expected, although the damaged pedestrian parapet on the overbridge constitutes a serious hazard to NMUs and the northbound carriageway below.
	Journey Ambience	Traveller Care/ Views: No issues were outstanding from the OYA evaluation, and no further issues were identified during the FYA site visit. Traveller Stress: The A1 through traffic is segregated from other traffic and congestion has been reduced (route uncertainty/ frustration); the degree of fear experienced during an extreme braking event may be slightly greater than expected on the approaches to roundabouts, and there has been a net increase in annual collisions (fear of potential accidents).	-	Traveller Care/ Views: As expected Traveller Stress: Generally as expected, although beneficial effects regarding fear of accidents are unlikely to have been realised
Safety	Accidents	Taking into consideration the national trend of reduced collisions, there is a net increase in the number of collisions at this junction.	Forecast annual saving: 4.9 Observed annual saving: -1.2	Worse than expected
	Security	Less queuing at the junctions has slightly reduced the risk of crime. Pedestrians have been diverted onto longer routes.	-	As expected
Economy	Transport Economic Efficiency	Journey times have improved but less than predicted on the A1.	PVB for whole A1: £397m.	Worse than expected across all junctions. (Individual junction evaluation not possible).
	Reliability	Journey time variability has decreased for A1 traffic and there are also likely to be reduced delays for traffic on the others roads at the junctions either crossing the A1 or accessing the A1.	-	As expected
	Wider Economic Impacts	The impacts of the scheme are localised, and the improvements have not facilitated the opening up of land for development opportunities.	-	As expected
Accessibility	Option values	There has been no change in option values resulting from the scheme.	-	As expected
	Severance	The junction has provided a safer crossing of the A1 and caused a large reduction in traffic encountered by non-motorised users. However, the number of users affected is small.	-	As expected
	Access to the Transport System	The scheme has had no impact on public transport provision.	-	As expected
Integration	Transport Interchange	The scheme has not had an impact on the provision of transport interchange facilities.	-	Neutral, as expected
	Land-use Policy		-	Neutral, as expected
	Other Government Policies	The scheme has contributed to the achievement of national, regional and local policy objectives.	-	Beneficial, as expected

# Appendix D – Locations of Collisions

Figure D.1 – Collisions around Blyth junction

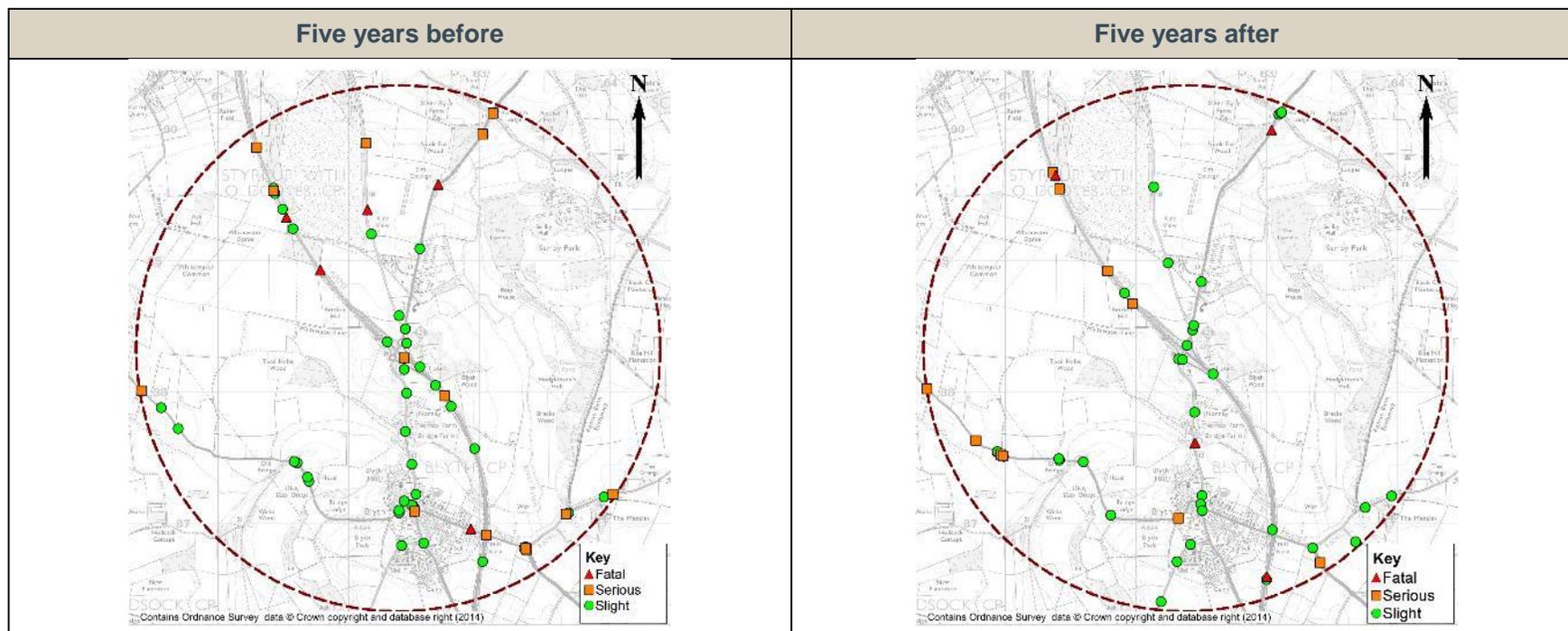


Figure D.2 – Collisions around Apleyhead

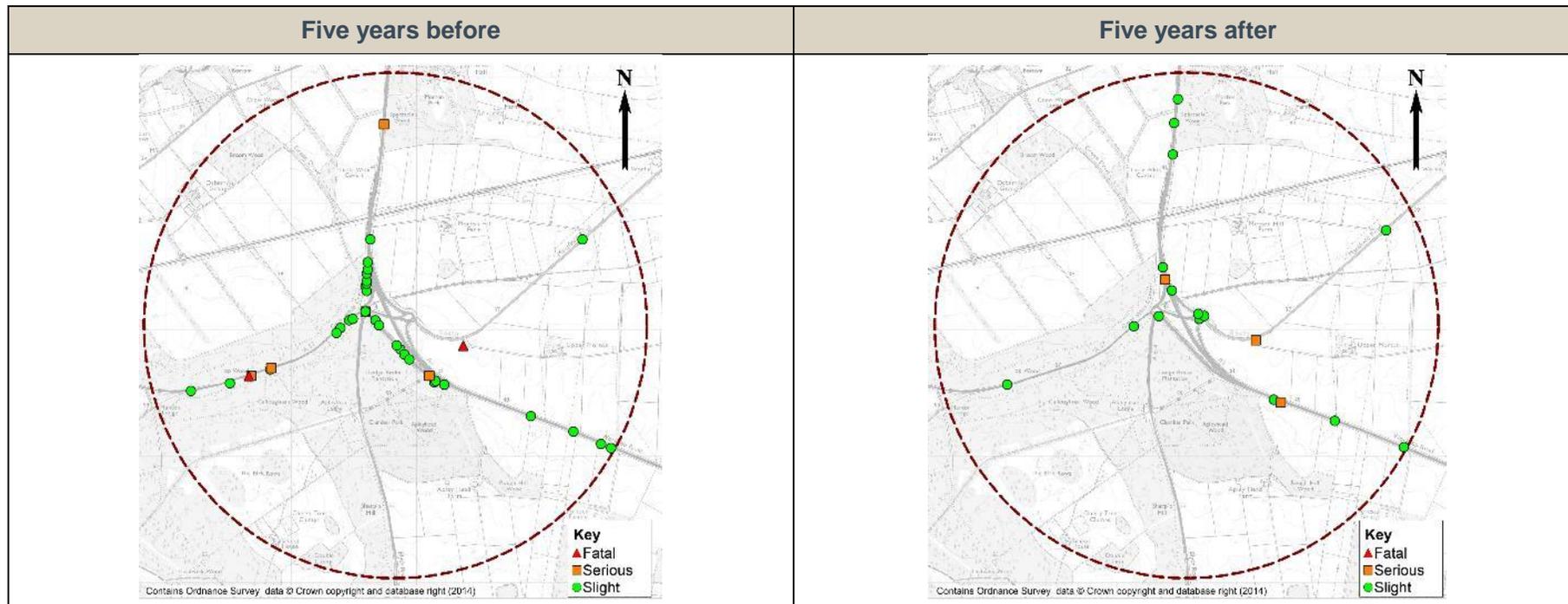


Figure D.3 – Collisions around Markham Moor

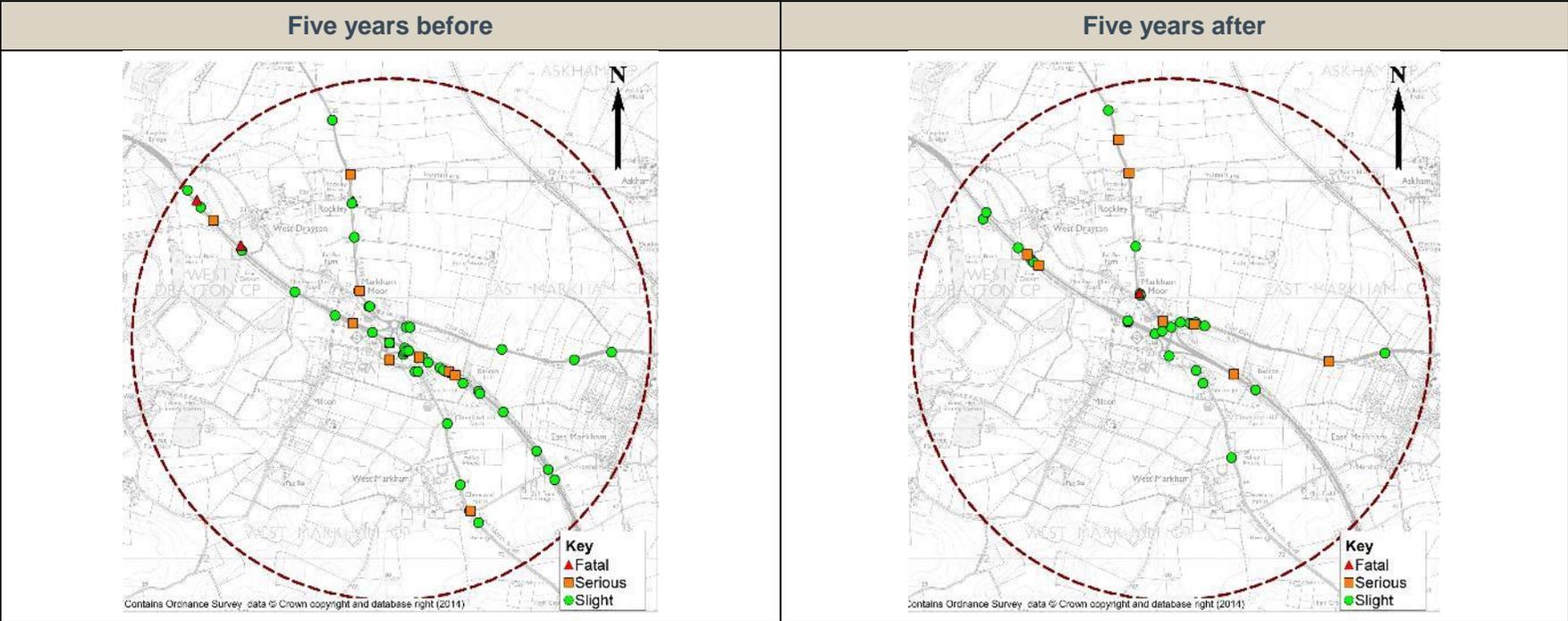


Figure D.4 – Collisions around Gonerby Moor

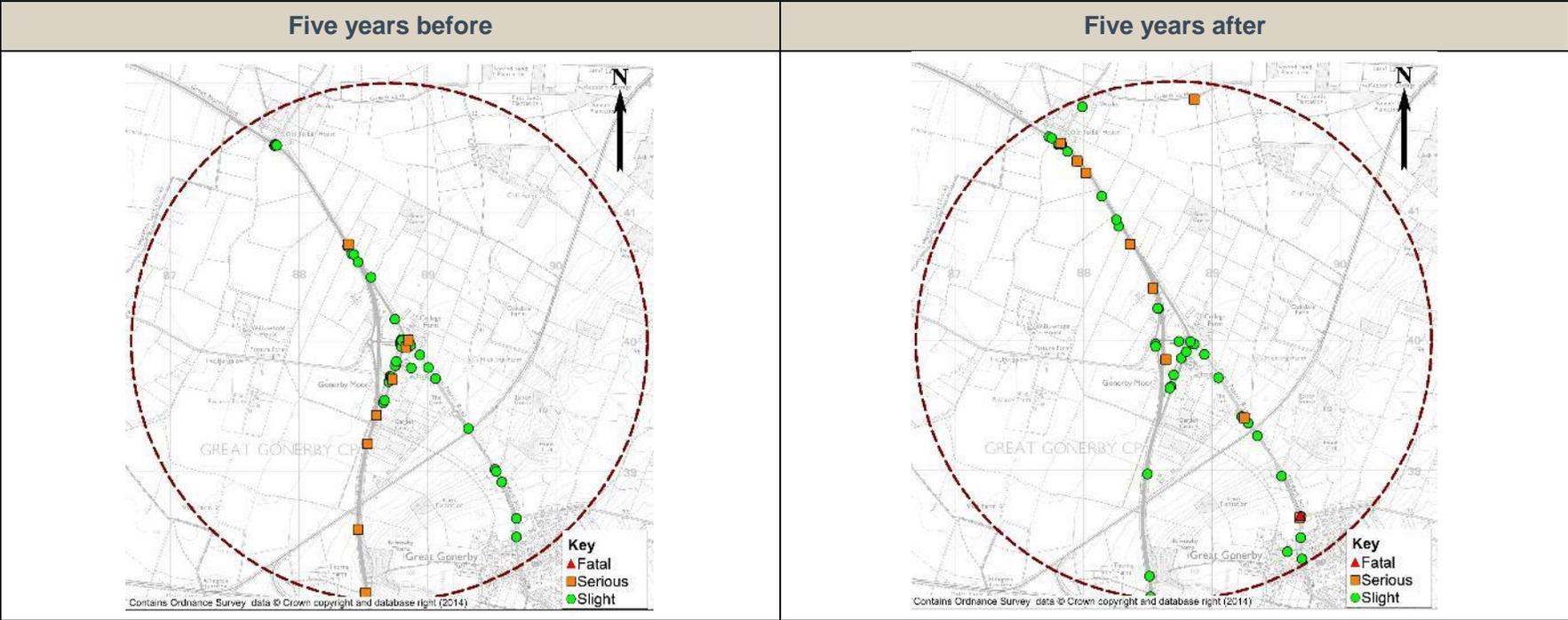


Figure D.5 – Collisions around Colsterworth

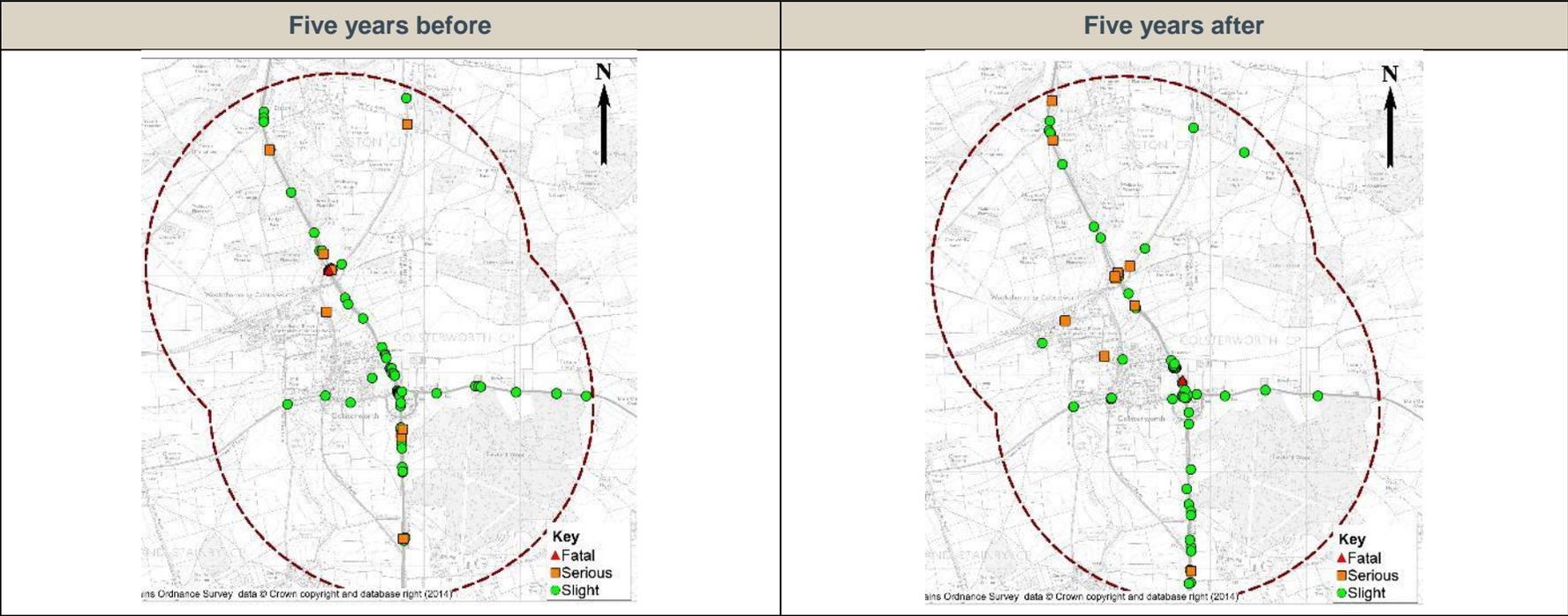
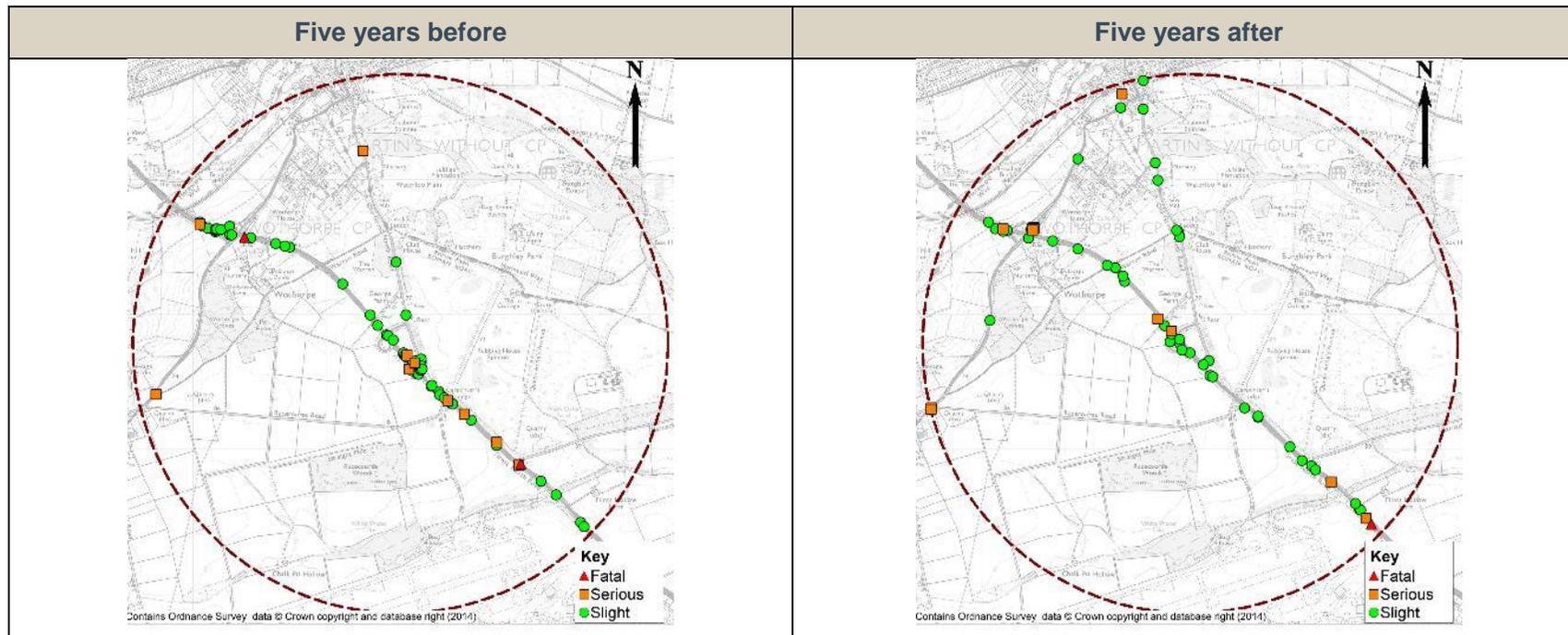


Figure D.6 – Collisions around Carpenters Lodge



# Appendix E – Data Requested for Section 5: Environment

**Table E.1 – Information requested & received to evaluate the Environment objective.**

Environment Specific Requirements	OYA Response	FYA Response
Environment Statement (ES) or Stage 3 Scheme Assessment Report (SAR) or Environmental Assessment Report (EAR) including Environmental Masterplan (EMP) drawings.	A1 Peterborough to Blyth Improvements ES Volumes 1, 2 & 3 received for all GSJs: <ul style="list-style-type: none"> <li>• Apleyhead/ Carpenters Lodge (Aug '04);</li> <li>• Blyth/ Colsterworth (Dec '04);</li> <li>• Gonerby Moor (Feb '05); and</li> <li>• Markham Moor (Jun '05).</li> </ul>	As noted at OYA.
AST	Received for all GSJs: <ul style="list-style-type: none"> <li>• Blyth/ Apleyhead (Dec '04);</li> <li>• Markham Moor (Jun '05);</li> <li>• Carpenters Lodge (Jul '05);</li> <li>• Gonerby Moor (Sep '05); and</li> <li>• Colsterworth (Jan '06).</li> </ul>	As noted at OYA.
Any amendments / updates, additional surveys or reports since the ES / SAR / EAR.	None noted.	No additional information received at FYA.
Any changes to the scheme since the ES / SAR / EAR e.g. to lighting and signs, retention of material on site in earthworks in the form of landscape bunds or other, or to proposed mitigation measures.	Blyth: Less landscape planting than expected at the time of the ES;  Apleyhead/ Markham Moor: Some landscape and biodiversity changes to the scheme since the ES; and  Gonerby Moor/ Colsterworth/ Carpenters Lodge: No significant changes to the scheme since the ES.	As noted at OYA.
As built drawings for landscape/ biodiversity/ environmental mitigation measures/ drainage/ fencing/ earthworks etc.	Electronic versions of As Built Drawings for landscape, ecological mitigation measures, drainage, fencing, earthworks etc received for all GSJs.	As noted at OYA.
Construction Environment Management Plan (CEMP), Landscape and Ecology Aftercare Plan (LEAP), Landscape Management Plan (LMP) or Handover Environmental Management Plan (HEMP).	CEMP's received for all GSJs (Jan '09).  Draft versions of HEMPs received for all GSJs.	As noted at OYA.  Final versions of HEMPs also received for all GSJs
Health and Safety File – Environment sections (to include all environment As-Built reports).	Health and Safety files received for all GSJs: <ul style="list-style-type: none"> <li>• Apleyhead (May '09);</li> <li>• Markham Moor/ Gonerby Moor/ Carpenters Lodge (Jun '10);</li> <li>• Blyth (Nov '10);</li> <li>• Colsterworth North/ Colsterworth South (Dec '10).</li> </ul>	As noted at OYA.
Relevant Contact Names for consultation.	Sourced by POPE team.	As noted at OYA.
Archaeological Reports (popular and academic).	No significant finds and no archaeological reports produced for any GSJ.	As noted at OYA.

<b>Environment Specific Requirements</b>	<b>OYA Response</b>	<b>FYA Response</b>
The Road Surface Influence (RSI) value of any low noise surface installed.	The RSI value of the low noise surface installed for all GSJs was provided in the document ' <i>HAPAS Roads and Bridges Agreement Certificate No 01/H052, Masterpave thin surfacing system for highways, March 2005</i> '	As noted at OYA.
The insulation performance properties of any noise barriers installed (The BS EN 1794-2 result provided by the noise barrier manufacturer).	The Designers confirmed no noise barriers had been installed for any GSJ.	As noted at OYA.
List of properties eligible for noise insulation.	The Designers confirmed that no properties were eligible for noise insulation for any GSJ.	As noted at OYA.
Employers Requirements Works Information - Environment sections.	A1 Peterborough to Blyth Junction Grade Separated Junctions, Volume 2, Works Information, was provided for all GSJs (Feb '03).	As noted at OYA.
Reports for any pre/ post opening survey and monitoring work e.g. for noise, biodiversity, water quality).	The Designers confirmed that no post opening surveys or monitoring had been carried out for any GSJ.	No additional information received at FYA.
Animal mortality data.	Provided by the MAC's for all GJS's.	Provided by the MAC's for all GJS's.
Pre or Post opening Non-motorised User (NMU) Audits or Vulnerable User Surveys.	The Designers confirmed that no post opening Non-Motorised User Surveys had been carried out by the Designers with respect to any GSJ.	No additional information received at FYA.
Information may be available regarding environmental enhancements to streetscape/ townscape for bypassed settlements	No environmental enhancements were carried out to streetscape/ townscape for any settlement bypassed by the GSJs.	As noted at OYA.
Scheme Newsletters/ publicity material/ Award information for the scheme.	No publicity material was provided for any GSJ.	No additional information received at FYA.

## Appendix F – Photographic Record of Scheme

*Supplied in separate file*

# Appendix G – Responses to Consultation

**Table G.1 – BLYTH: Summary of Environmental Consultation Responses**

<b>BLYTH</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Natural England</b>	Biodiversity & Landscape	Landscape – increased local visual impact for low number of residents.  Biodiversity – satisfied that overall impact relatively low	Natural England is satisfied that there has not been any adverse impact upon internationally/ nationally designated sites or protected landscapes.  Natural England note that a European protected species licence was sought at the Colsterworth junction and that badger and water vole licences were sought across the other junctions. Natural England has no further comment to make on ecological mitigation.  Natural England is satisfied, owing to the requirements of Natural England licences where sought and granted, that impacts upon legally protected species have been mitigated.  Natural England is not aware of any unforeseen impacts of the scheme.
<b>English Heritage</b>	Heritage	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.	Historic England (HE) <sup>10</sup> said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.
<b>Environment Agency</b>	Water	There had been a major incident at Blyth junction days after it opened, involving a Road Traffic Accident (RTA) with a chemical spill and fire.	Responded that the EA were not aware of impacts on groundwater quality or levels. This would indicate that the impacts are as expected or better.
<b>Nottinghamshire County Council</b>	General	Landscape and biodiversity – impacts generally as expected. PRow – better than expected with safe links not previously available.	Did not respond to the invitation to provide feedback.
<b>Bassetlaw District Council</b>	General	Did not consider there had been any detrimental impact on heritage assets.	Did not respond to the invitation to provide feedback.
<b>Blyth Parish Council</b>	General	The A1 noise is now louder and more continuous and there have been many requests to have sound insulation barriers erected from south of the bridge across the A634 (Blyth - Retford road) to north of the bridge.  Considered landscaping planting and earthworks at the	The council commented that: <ul style="list-style-type: none"> <li>• Connectivity between the two halves of the village (laying either side of the A1) has vastly improved;</li> <li>• Blyth has experienced far more traffic through the village because it is easier</li> </ul>

<sup>10</sup> Following the changes to English Heritage's structure that moved the protection of the National Heritage Collection into the voluntary sector in April 2015, the body that remained was rebranded as Historic England. The Consultation request sent to English Heritage in March 2015 was answered by Historic England in April 2015.

<b>BLYTH</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
		<p>roundabouts 'a disaster', biodiversity to be adequate and water mitigation measures initially inadequate but subsequently upgraded after the RTA.</p>	<p>for traffic (mainly coming from Bawtry) to come through Blyth.</p> <ul style="list-style-type: none"> <li>• It is problematic that two slip roads enter and exit northbound and southbound through Blyth;*</li> <li>• Most villagers are not able to have their windows open at night due to the increase in noise. A query was raised as to whether a noise survey could be conducted and whether resurfacing with a noise reducing Tarmac could be considered; and</li> <li>• The landscape at the roundabout is much neglected and does not create a favourable impression for people entering Blyth from the A1 – <i>“the litter finding a home on that part of the roundabout is appalling”</i>.</li> </ul> <p>*No further details were provided.</p>
<b>River Idle and Ryton Internal Drainage Board</b>	Water	<p>There did not appear to be any change to the Whitewater Drain as a result of the scheme. The Board had not identified or been advised of any issues arising from the works and therefore the assumption was that the mitigation works appear to have worked.</p>	<p>Did not respond to the invitation to provide feedback.</p>

**Table G.2 – APLEYHEAD: Summary of Environmental Consultation Responses**

<b>APLEYHEAD</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Natural England</b>	Biodiversity & Landscape	Landscape – increased local visual impact for low number of residents  Biodiversity – satisfied that overall impact relatively low	Natural England is satisfied that there has not been any adverse impact upon internationally/ nationally designated sites or protected landscapes.  Natural England note that a European protected species licence was sought at the Colsterworth junction and that badger and water vole licences were sought across the other junctions. Natural England has no further comment to make on ecological mitigation.  Natural England is satisfied, owing to the requirements of Natural England licences where sought and granted, that impacts upon legally protected species have been mitigated.  Natural England is not aware of any unforeseen impacts of the scheme.
<b>English Heritage</b>	Heritage	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.
<b>Environment Agency</b>	Water	The EA was not aware of any flooding or pollution incidents at Apleyhead.	Responded that the EA were not aware of impacts on groundwater quality or levels. This would indicate that the impacts are as expected or better.
<b>Nottinghamshire County Council</b>	General	Landscape and biodiversity – impacts generally as expected.  PRoW – better than expected with safe links not previously available. Disappointed with a horse stile with a gate which obstructed free flow of non-motorised users.	Did not respond to the invitation to provide feedback.
<b>Bassetlaw District Council</b>	General	Did not consider there had been any detrimental impact on heritage assets.	Did not respond to the invitation to provide feedback.
<b>Babworth Parish Council</b>	General	Traffic noise was lower than previously.  Were positive about the landscaping.  Provision for NMUs was satisfactory.	Responded as follows:  Air Quality: There is much more traffic on the B6420 so the local air quality will be worse;  Greenhouse Gases: Slight decrease due to less queuing;  Landscape: Hedges, bushes and trees are growing slowly. No wildflower areas have been planted;

<b>APLEYHEAD</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
			<p>Biodiversity: Some (unspecified) mitigation measures in the south west corner have not been provided;</p> <p>Cultural Heritage: No archaeological finds;</p> <p>Water: Drainage appears to be as intended;</p> <p>Physical Fitness: Safer crossing of the A1 has been used by walkers and cycles, but no horses have been seen; and</p> <p>Journey Ambiance: Driver stress on the A1 has improved due to much reduced queuing. The increased use of the B6420 has led to frequent queues at Babworth where the B6420 joins the A620.</p>
<b>Elkesley Parish Council</b>	General	<p>The landscaping was good.</p> <p>Wondered why fencing and gates had been provided because there were few horse riders.</p>	Did not respond to the invitation to provide feedback.

**Table G.3 – MARKHAM MOOR: Summary of Environmental Consultation Responses**

<b>MARKHAM MOOR</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Natural England</b>	Biodiversity & Landscape	Landscape – increased local visual impact for low number of residents.  Biodiversity – satisfied that overall impact relatively low.	Natural England is satisfied that there has not been any adverse impact upon internationally/ nationally designated sites or protected landscapes.  Natural England note that a European protected species licence was sought at the Colsterworth junction and that badger and water vole licences were sought across the other junctions. Natural England has no further comment to make on ecological mitigation.  Natural England is satisfied, owing to the requirements of Natural England licences where sought and granted, that impacts upon legally protected species have been mitigated.  Natural England is not aware of any unforeseen impacts of the scheme.
<b>English Heritage</b>	Heritage	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.	HE said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.
<b>Environment Agency</b>	Water	No response received.	Responded that the EA were not aware of impacts on groundwater quality or levels. This would indicate that the impacts are as expected or better.  Also responded that there was no evidence that work at Markham Moor has had an impact on the river Maun in the vicinity of the works.
<b>Nottinghamshire County Council</b>	General	Landscape – impacts generally as expected except for translocation of orchids and SINC semi-improved grassland both worse than expected.  PROW – better than expected with safe links not previously available.	Did not respond to the invitation to provide feedback.
<b>Tuxford Town Council</b>	General	Presumes free flowing traffic will have improved noise and air quality. Landscape as expected. For safety reasons recommended more lighting.	Did not respond to the invitation to provide feedback.
<b>Bassetlaw District Council</b>	General	No detrimental impact on heritage assets.	Did not respond to the invitation to provide feedback.
<b>Markham Clinton Parish Council</b>	General	Considers noise has increased due to higher speeds. Planting should be adequate once mature. As expected, lighting visible from the overbridge.  Suggested additional length of footpath to cater for HGV drivers.	Did not respond to the invitation to provide feedback.

**Table G.4 – GONERBY MOOR: Summary of Environmental Consultation Responses**

<b>GONERBY MOOR</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Natural England</b>	Biodiversity & Landscape	Landscape – increased local visual impact for low number of residents. Biodiversity – satisfied that overall impact relatively low.	Natural England is satisfied that there has not been any adverse impact upon internationally/ nationally designated sites or protected landscapes.  Natural England note that a European protected species licence was sought at the Colsterworth junction and that badger and water vole licences were sought across the other junctions. Natural England has no further comment to make on ecological mitigation.  Natural England is satisfied, owing to the requirements of Natural England licences where sought and granted, that impacts upon legally protected species have been mitigated.  Natural England is not aware of any unforeseen impacts of the scheme.
<b>English Heritage</b>	Heritage	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.	HE said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.
<b>Environment Agency</b>	Water	No comments received.	Had no comments to make.
<b>Lincolnshire County Council</b>	General	Landscape – Impacts generally as expected. The nearby motocross track and equestrian centre have become more visible.  Heritage - Impacts generally as expected.  Not aware of any issues relating to rights of way.	Did not respond to the invitation to provide feedback.
<b>South Kesteven District Council</b>	General	Commented that it not undertaken any air quality monitoring so was unable to provide feedback.	Did not respond to the invitation to provide feedback.

<b>GONERBY MOOR</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Great Gonerby Parish Council</b>	General	<p>Landscape impacts were generally as expected except for the areas enclosed by the rerouted and former A1, particularly the area once occupied by the site compound which was an awful eyesore compounded by the fact that it was visible from the new elevated roundabout.</p> <p>The existing roundabout (B1174/A1 slip road) is in need of some easily maintained landscaping.</p> <p>The impact of the lighting was considered worse than expected and the lights were often not working.</p> <p>Biodiversity impacts were as expected.</p> <p>There was a lack of maintenance of ditches.</p> <p>Provision for NMUs was better than expected.</p>	<p>Responded that that the impact of the Gonerby Moor junction was as expected, and considered the “<i>upgrade</i>” of the A1 to be a success.</p> <p>Although there were (unspecified) issues with the length of the slip road going north from Great Gonerby, council considered the length of the slip road crossing to Marston to be “<i>very dangerous</i>” and that it would have been far safer to use the old road as a way of accessing Marston from Great Gonerby as originally planned.</p>
<b>Allington Parish Council</b>	General	<p>Landscape and biodiversity impacts were generally as expected.</p> <p>Visibility exiting from the new slip road onto the A1 both northbound and southbound is poor.</p> <p>There is an increase in traffic cutting through Allington from the A1 to the A52.</p> <p>Some of the lorries that cut though the village to access the A52 find they cannot get underneath the railway bridge at Sedgebrook village.</p>	<p>Did not respond to the invitation to provide feedback.</p>
<b>Upper Witham Internal Drainage Board</b>	Water	<p>No issues to report but would have liked to have been provided with maintenance regimes for balancing ponds and contact details.</p>	<p>Responded that the board were not aware of any issues as a result of the junction improvements, and that maintenance appears to have been carried out on the drainage system.</p> <p>Noted that it is essential that the regular inspections and maintenance are carried out to ensure that the drainage system works to the design standard.</p>

**Table G.5 – COLSTERWORTH: Summary of Environmental Consultation Responses**

<b>COLSTERWORTH</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Natural England</b>	Biodiversity & Landscape	Landscape – increased local visual impact for low number of residents.  Biodiversity – satisfied that overall impact relatively low.	Natural England is satisfied that there has not been any adverse impact upon internationally/nationally designated sites or protected landscapes.  Natural England note that a European protected species licence was sought at the Colsterworth junction and that badger and water vole licences were sought across the other junctions. Natural England has no further comment to make on ecological mitigation.  Natural England is satisfied, owing to the requirements of Natural England licences where sought and granted, that impacts upon legally protected species have been mitigated.  Natural England is not aware of any unforeseen impacts of the scheme.
<b>English Heritage</b>	Heritage	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.	HE said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.
<b>Environment Agency</b>	Water	No comments received.	Had no comments to make.
<b>Lincolnshire County Council</b>	General	Landscape – Impacts generally as expected. Views now exist down to the Truck Stop areas.  Heritage - Impacts generally as expected.  LCC was not aware of any issues in respect of the Rights of Way.	Did not respond to the invitation to provide feedback.
<b>South Kesteven District Council</b>	General	Commented that it had not undertaken any air quality monitoring so was unable to provide feedback.	Did not respond to the invitation to provide feedback.

<b>COLSTERWORTH</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Colsterworth Parish Council</b>	General	Provided photographs showing the poor state of verges.	<p><u>Noise:</u> Dwellings adjacent to the A1 have reported an increase in noise levels. The perception is that traffic using the A1 has significantly increased in the five years. In particular HGV traffic. Mondays and Fridays were deemed the busiest pre- scheme, now it seems that every day is the same. We would be interested in seeing traffic statistics pre and post scheme.</p> <p><u>Landscape and visual impact:</u> Hedging schemes are taking longer to mature than expected;</p> <p><u>Water quality and drainage:</u> Some flooding still occurs on land north of B676 junction;</p> <p><u>Physical fitness:</u> Sadly the pedestrian/cycle path B676/A151 has not been continued to Twyford Wood (400 metres). This should have been in the original specification and would have been hugely beneficial for the public to safely access this recreational feature. The parish council is seeking funding; and</p> <p><u>Journey ambience:</u></p> <ul style="list-style-type: none"> <li>A. The B676 slip road A1 north has a very short run in combined with an exit road off the A1 to the garage. Very difficult to join the A1 at peak times.</li> <li>B. The B6403 slip road A1 north is also very short and again, it can be difficult to join the A1. We would like to see accident statistics pre and post scheme.</li> <li>C. The A1 gaps need to be closed. Increased traffic flows make it very dangerous to cross the A1. There seem to be continuous accidents at the crossing points between Colsterworth and Grantham.</li> <li>D. Increased usage of the A1 following the removal of the roundabouts (particularly by HGVs) requires consideration of making the A1 three lanes.</li> </ul> <p><u>Additional Comments:</u></p> <ul style="list-style-type: none"> <li>A. Roundabouts to the east and west side of A1 (B676 &amp; A151) are not fit for purpose. The roundabouts are continually being driven over/ damaged by HGV traffic (photos provided).</li> </ul>

**Table G.6 – CARPENTERS LODGE: Summary of Environmental Consultation Responses**

<b>CARPENTERS LODGE</b>			
<b>Consultee</b>	<b>Field of Interest</b>	<b>Comments at OYA</b>	<b>Comments at FYA</b>
<b>Natural England</b>	Biodiversity & Landscape	Landscape – increased local visual impact for low number of residents.  Biodiversity – satisfied that overall impact relatively low.	Natural England is satisfied that there has not been any adverse impact upon internationally/ nationally designated sites or protected landscapes.  Natural England note that a European protected species licence was sought at the Colsterworth junction and that badger and water vole licences were sought across the other junctions. Natural England has no further comment to make on ecological mitigation.  Natural England is satisfied, owing to the requirements of Natural England licences where sought and granted, that impacts upon legally protected species have been mitigated.  Natural England is not aware of any unforeseen impacts of the scheme.
<b>English Heritage</b>	Heritage	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.	EH said that it does not monitor the implementation of road schemes and therefore was not able to provide a response.
<b>Environment Agency</b>	Water	No balancing pond or water storage ditches provided.	Had no comments to make.
<b>Peterborough City Council</b>	General	Landscape and heritage – impacts generally as expected.  PRoW – equestrians not provided for.	Did not respond to the invitation to provide feedback.
<b>South Kesteven District Council</b>	General	Commented that it has not undertaken any air quality monitoring so was unable to provide feedback.	Did not respond to the invitation to provide feedback.
<b>Easton on the Hill Parish Council</b>	General	No change had been noted for noise emissions or air quality.  Landscaping looks very new and rather bleak.  The run-on and run-off roads from the A1 are too short.	Did not respond to the invitation to provide feedback.

# Appendix H – Animal Mortality Data

## Blyth

Table H.1 – Blyth Animal Mortality Data, 2009-2014

Blyth Animal Mortality	2009	2010 (OYA)	2011	2012	2013	2014 (FYA)
Deer			1			2
Dog		1				1
Fox					1	
Cat			1			

## Apleyhead

Table H.2 – Apleyhead Animal Mortality Data, 2009-2014

Apleyhead Animal Mortality	2009	2010 (OYA)	2011	2012	2013	2014 (FYA)
Deer						2
Dog						1
Swan		1				

## Markham Moor

Table H.3 – Markham Moor Animal Mortality Data, 2009-2014

Markham Moor Animal Mortality	2009	2010 (OYA)	2011	2012	2013	2014 (FYA)
Deer			1			1
Badger					1	
Fox			1			
Cat	1		1			

## Gonerby Moor

Table H.4 – Gonerby Moor Animal Mortality Data, 2009-2014

Gonerby Moor Animal Mortality	2009	2010 (OYA)	2011	2012	2013	2014 (FYA)
Badger		1	1	2		
Cat				1		
Unspecified						1

## Colsterworth

Table H.5 – Colsterworth Animal Mortality Data, 2009-2014

Colsterworth Animal Mortality	2009	2010 (OYA)	2011	2012	2013	2014 (FYA)
Cat			1			1
Dog				1	1	
Badger				1		
Deer			1			

## Carpenters Lodge

The data received (2009-2014) did not contain any records of animal mortality at Carpenters Lodge.

# Appendix I – Traffic forecasts and observed FYA Annual Average Daily Traffic (AADT) flows

## Blyth

Table I.1 – Blyth: Comparison of Do Something forecasts with FYA AADTs

Location	Do Something/ With scheme 2015			
Blyth	Forecast	Observed	Diff	% Diff
A1 N of the junction	50,300	51,300	1,000	2%
A1 S of the junction	40,400	46,600	6,200	15%
A1 NB exit-slip	2,800	2,800	0	0%
A1 SB exit-slip	8,100	6,400	-1,700	-21%
Overbridge	14,700	13,200	-1,500	-10%
A614	14,700	8,600	-6,100	-41%
B6045	10,000	4,300	-5,700	-57%

## Apleyhead

Table I.2 – Apleyhead: Comparison of Do Something forecasts with FYA AADTs

Location	Do Something/ With scheme 2015			
Apleyhead	Forecast	Observed	Diff	% Diff
A1 N of the junction	49,900	46,600	-3,300	-7%
A1 S of the junction	46,000	47,400	1,400	3%
A1 NB exit-slip	5,700	5,800	100	2%
A1 SB exit-slip	7,900	5,400	-2,500	-32%
Overbridge	13,800	14,300	500	4%
A57	14,900	14,200	-700	-5%
A614	14,700	10,600	-4,100	-28%
B6420	1,300	4,100	2,800	215%

**Markham Moor****Table I.3 – Markham Moor: Comparison of Do Something forecasts with FYA AADTs**

<b>Location</b>	<b>Do Something/ With scheme 2015</b>			
<b>Markham Moor</b>	<b>Forecast</b>	<b>Observed</b>	<b>Diff</b>	<b>% Diff</b>
<b>A1 N of the junction</b>	49,200	N/A		
<b>A1 S of the junction</b>	41,100	39,800	-1,300	-3%
<b>A1 NB exit-slip</b>	2,500	2,300	-200	-8%
<b>A1 SB exit-slip</b>	6,800	5,100	-1,700	-25%
<b>Overbridge</b>	10,000	9,800	-200	-2%
<b>A57</b>	10,300	9,500	-800	-8%
<b>A638</b>	8,300	7,200	-1,100	-13%
<b>B6420</b>	5,000	4,100	-900	-18%
<b>Main St</b>	2,500	3,000	500	20%

**Gonerby Moor****Table I.4 – Gonerby Moor: Comparison of Do Something forecasts with FYA AADTs**

<b>Location</b>	<b>Do Something/ With scheme 2015</b>			
<b>Gonerby Moor</b>	<b>Forecast</b>	<b>Observed</b>	<b>Diff</b>	<b>% Diff</b>
<b>A1 N of the junction</b>	65,000	N/A		
<b>A1 S of the junction</b>	57,500	41,000	-16,500	-29%
<b>A1 NB exit-slip</b>	4,100	N/A		
<b>B1174</b>	19,800	N/A		
<b>Gonerby Lane</b>	2,400	N/A		

**Colsterworth****Table I.5 – Colsterworth: Comparison of Do Something forecasts with FYA AADTs**

<b>Location</b>	<b>Do Something/ With scheme 2015</b>			
<b>Colsterworth (North)</b>	<b>Forecast</b>	<b>Observed</b>	<b>Diff</b>	<b>% Diff</b>
A1 N of the junction	57,000	47,400	-9,600	-17%
A1 S of the junction	58,000	44,200	-13,800	-24%
B6403 / A1 NB exit-slip	3,700	N/A		
B6403 / A1 SB exit-slip	3,600	N/A		
North Junction Overbridge	3,400	N/A		
<b>Colsterworth (South)</b>	<b>Forecast</b>	<b>Observed</b>	<b>Diff</b>	<b>% Diff</b>
B6043 (west)	1,600	2,400	800	50%
B6043 (east)	6,000	N/A		
B676 / A1 NB exit-slip	7,300	4,300	-3,000	-41%
A151 / A1 SB exit-slip	7,200	4,400	-2,800	-39%
South Junction Overbridge	8,600	4,700	-3,900	-45%
A151	12,800	5,500	-7,300	-57%
B676	5,400	3,100	-2,300	-43%

**Carpenters Lodge****Table I.6 – Carpenters Lodge: Comparison of Do Something forecasts with FYA AADTs**

<b>Location</b>	<b>Do Something/ With scheme 2015</b>			
<b>Carpenters Lodge</b>	<b>Forecast</b>	<b>Observed</b>	<b>Diff</b>	<b>% Diff</b>
A1 N of the junction	46,200	48,500	2,300	5%
A1 S of the junction	57,100	N/A		
Racecourse Road	200	N/A		
Overbridge	5,400	4,000	-1,400	-26%
B1081 (S of Overbridge)	6,500	4,100	-2,400	-37%
B1081 (N of Overbridge)	10,100	7,100	-3,000	-30%

## Appendix J – AST/ ES Summaries

Table J.1 – BLYTH: AST/ ES Summaries

Sub-Objective (BLYTH)	AST	ES
<b>Noise</b>	The AST stated that noise increases of 1 to 2 dB could be expected at the most exposed facades of the properties to the south of the proposed scheme. A slight reduction in noise levels was assessed at the most exposed façade of Mandalay. Two properties to be demolished were not included in the ' <i>with scheme</i> ' assessment.	The ES stated that the realignment of the roads and the predicted increase in HGVs on the A1 would result in an increase in noise levels of up to 2dB for residential properties over the do-minimum scenario, and that this increase would be perceptible to residents.
<b>Local Air Quality</b>	The AST stated that five properties were within the range of effects from the proposed scheme and there would be a general improvement in air quality.	The ES stated that there would be slight adverse air quality effects associated with the scheme, although this would only affect one property, ' <i>Mandalay</i> ', to the north east of the scheme.
<b>Greenhouse Gases</b>	Net impact 191 tonnes carbon	Net impact 256 tonnes carbon
<b>Landscape/ Townscape</b>	<p>The AST stated that designated areas and landscapes of high quality would be avoided and that the character and appearance of the local area was already influenced by the existing A1 and adjacent development. Mitigation measures would provide opportunities for screening the existing and proposed A1 and extending the adjacent attractive woodland character. The overall impact was assessed as Slight Beneficial.</p> <p>The AST stated that Townscape was not considered to be an issue, there would be no direct impact on Blyth village and the junction location was within a largely rural landscape. The overall impact was assessed as Neutral.</p>	<p>The ES stated that the proposed scheme was largely contained within the footprint of the existing junction and as such, would have limited effect on the local and wider landscape character.</p> <p>The ES also noted that while there would be some loss of roadside vegetation, few visual receptors would be impacted and the deepening of the A1 cutting would reduce the visual impact of the road. The ES considered that the realignment and lighting of the junction improvements and access roads would, in the long term, be comparable to existing conditions.</p> <p>Overall, the ES concluded that the junction improvements, largely through the design and implementation of the mitigation measures, would extend the overall character of the area and reduce the wider landscape and visual impacts of the A1 corridor and would as such, have a slight beneficial impact.</p>
<b>Biodiversity</b>	The AST stated the loss of species poor (but ecologically valuable) hedgerows and a small area of semi-improved neutral grassland would be replaced through habitat creation. There were no predicted impacts on Blyth Wood ancient woodland or the heathland inventory site. Habitats created within landscape areas would reflect the base poor vegetation that is characteristic of the area. The impact overall was assessed as Neutral.	<p>The ES stated that although there were several sites of local nature conservation value in the area, none would be directly affected by the proposals.</p> <p>The ES concluded that while there would be minor losses of locally important habitats, the proposals were mostly located over the existing junction and as such, the overall impact of the scheme would be minor adverse.</p>

<b>Cultural Heritage &amp; Archaeology</b>	The AST stated that there would be no impact on known archaeology and a possible impact on yet unknown buried archaeology (crop-mark features). The impact overall was assessed as Slight Adverse.	The ES stated that there were no known archaeological remains within the study area and that as the scheme was largely within the footprint of the existing junction, there was low potential for disturbing unknown remains. The ES also stated that there was the potential to find remains at the site of the proposed balancing pond, but noted that this was subject to investigation at the time of writing.  The ES concluded that would be no impact on the built heritage of the local area, and that the overall the effect of the scheme on the cultural heritage resource was considered to be neutral.
<b>Water Quality &amp; Drainage</b>	The AST stated there would be no significant effect on water quality from road drainage or accidental spillage, and no discharge to groundwater. The overall impacts were assessed to be Neutral.	The ES stated that the junction was located over a Source Protection Zone <sup>11</sup> III catchment area that was classified as a major aquifer, with a SPZ II some 5km away. The ES further stated that (prior to construction) there were no pollution containment measures provided as part of the junction and that the run-off from the scheme was predicted to fall within permitted Environmental Quality Standard (EQS) concentrations.  The ES also stated that as the A1 would be in deep cutting, the drainage of the road would be piped through a bored tunnel to a balancing pond adjacent to the A614 to the north, and that this arrangement would provide an element of spillage contaminant and water attenuation for the scheme.  The ES concluded that as proposals included pollution control measures and there would be no discharge to ground water, the overall effect of the scheme on water quality would be neutral.
<b>Physical Fitness</b>	The AST stated that the proposed junction with dedicated crossing space would provide a safer more pleasant crossing of the A1. The grade separation would cause a large reduction in traffic encountered by non-motorised users. The new junction would promote physical exercise although the number of people who would benefit was likely to be small. An overall assessment score was not provided on the AST.	The ES noted a number of residential properties in close proximity to the junction, and two centres of population, Blyth and Blyth North, on either side of the junction. The ES also noted that (prior to construction) the A1 acted as a barrier to the movement of pedestrians, equestrians and cyclists between these villages, and that the crossing was particularly dangerous.  The ES concluded that the construction of the grade separated junction would incorporate facilities for these Non- Motorised Users (NMUs), and considered this impact to be substantially beneficial.
<b>Journey Ambience</b>	The AST stated that the journey would be safer and more pleasant and travellers, including public transport users, would experience less delay	The ES stated that the segregation of A1 through traffic from other traffic would reduce stress for a large number of vehicle travellers, and that further benefits for vehicle travellers would result from the reduction of congestion and improved safety.

<sup>11</sup> Groundwater provides a third of our drinking water, and the Environment Agency ensures that water is safe to drink by defining Source Protection Zones (SPZ). These zones help to monitor the risk of contamination from any activities that might cause pollution in the area.

	and frustration. The overall impact was assessed as Substantial Beneficial.	
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Table J.1 – APLEYHEAD: AST/ ES Summaries

Sub-Objective (APLEYHEAD)	AST	ES
<b>Noise</b>	The AST stated that only one property within 300m of the scheme was identified and there would be up to 5 dB reductions in traffic noise at the northern and eastern facades of the property. The estimated population annoyed by noise would be reduced by 0.3 for the do something scenario.	Despite a predicted increase in traffic volumes, the realignment of the A1 combined with the installation of a low noise road surface was stated by the ES as resulting in a 4.1 dB improvement in noise levels at Apleyhead Wood, the single property sufficiently close to the junction to be affected by the scheme.
<b>Local Air Quality</b>	The AST stated there would be improvement in air quality at the single property within range of the effect of the proposed scheme.	Despite a predicted increase in traffic volumes, the realignment of the A1 combined with the predicted reduction in congestion and improvements to vehicle technology were stated by the ES as resulting in improvements in air quality at Apleyhead Wood, the single property sufficiently close to the junction to be affected by the scheme.
<b>Greenhouse Gases</b>	Net impact -55 tonnes carbon	Net impact -57 tonnes carbon
<b>Landscape/ Townscape</b>	<p>The AST stated that the proposed scheme would avoid designated areas and landscapes of high quality, although new landform in an otherwise flat and open landscape would provide an incongruous element. Elevated lighting would be difficult to mitigate and 'urbanises' a rural landscape, although this was already influenced by the existing A1 corridor. Mitigation measures would provide opportunities for screening the existing and proposed A1 and extending the attractive woodland character. The overall impact was assessed as Slight Beneficial.</p> <p>The AST noted that the Townscape sub-objective was not applicable to this junction improvement.</p>	<p>The ES stated that although the landscape around the junction was not designated as being of great value, it was attractive being predominantly rural with areas of woodland and farmland.</p> <p>The ES considered that as there were few properties or PRoW in the area, the visual impact of the scheme would be limited.</p> <p>Overall, the ES concluded that with the implementation of good mitigation, the scheme would have a neutral impact when compared with the existing situation.</p>
<b>Biodiversity</b>	The AST stated that the habitats affected by the proposed scheme were of value in a local context and that appropriate mitigation, including habitat creation works would adequately mitigate any loss or temporary disturbance. Impacts on protected species (badger and potentially great crested newt) were not predicted to be significant and could be mitigated. The overall impact was assessed as slight adverse.	The ES stated that there were a number of features of ecological value in the area; the green lane with mature oak trees on either side, hedges of native conservation importance by the (original) A1, ponds with smooth (and potentially great crested) newts in the woodland to the west, and a badger colony in Morton Hill Farm to the east. It was also stated by the ES that the junction was located in an area of arable farmland with fields divided by species-poor clipped hedges, and that the overall the footprint of the scheme was ecologically poor.

		The ES concluded that as the scheme incorporated a number of measures to improve the ecological value of the area (such as areas of acid grassland and new wetlands), the overall impact of the scheme would be neutral.
<b>Cultural Heritage &amp; Archaeology</b>	The AST stated that buried archaeological remains, identified through crop-marks visible on aerial photographs, were likely to be impacted upon by the scheme proposals and were likely to consist of ditches which might be associated with evidence of settlement remains. Therefore based on the information available the proposed scheme would 'damage locally significant heritage features for which adequate mitigation could be specified.' However, further investigation was being undertaken which, it was stated, might confirm the presence or absence of further features. The AST noted that this could affect the overall impact which, at the time, was assessed as slight adverse.	<p>The principal cultural heritage value of the junction area was stated by the ES as relating to the potential for a Roman brickwork field system, revealed by a series of crop-marks. The new junction was stated as affecting the western margins of this system, resulting in the loss of a part of it. A single listed building was noted by the ES as "<i>some way distant from the Junction</i>", and the effect of the scheme on this heritage resource was considered negligible.</p> <p>Although the ES noted that there would be an effect on the historic landscape character of the area, it was noted that the Grade 1 Historic Park and Garden of Clumber Park House would not be affected by the scheme.</p>
<b>Water Quality &amp; Drainage</b>	The AST stated the scheme passes close to a Source Protection Zone II but there would be no significant effect on groundwater quality from road drainage or accidental spillage, and no discharge to surface watercourses. The impacts were assessed to be Neutral.	<p>The ES stated that the junction lay over a Zone III Source Protection Zone and was in very close proximity to a Zone II SPZ. It also stated that there were no pollution control measures in place at the Junction (before the scheme), noting that the potential for adverse effects on the ground water in the event of pollution incident.</p> <p>The ES concluded that as the design of the junction included pollution containment measures and treatment facilities, there would be an overall benefit to water quality with the scheme.</p>
<b>Physical Fitness</b>	The AST stated that the proposed junction would provide a safer more pleasant crossing of the A1. The grade separation would cause a large reduction in traffic encountered by non-motorised users however the number of people who would benefit was likely to be small and the overall impact was considered to be Neutral.	<p>The ES considered that as there were few centres of population in the vicinity of the junction, the scheme would have little effect on community issues. However, the ES did note that (prior to construction) the A1 acted as a barrier to the movement of pedestrians, equestrians and cyclists, and considered the road dangerous for these NMUs.</p> <p>The ES concluded that the impact of providing facilities for NMUs on a grade separated crossing to be substantially beneficial.</p>
<b>Journey Ambience</b>	The AST stated that in the long term all travellers would benefit from improved views. The segregation of A1 through-traffic from other traffic and the closure of a central reservation gap would reduce stress for a large number of travellers. The overall impact was assessed as Large Beneficial.	<p>The ES stated that in the long term, all vehicle travellers would benefit from improved views, and that the segregation of A1 through-traffic from other traffic with the closure of a central reservation gap would reduce stress for a large number of vehicle travellers.</p> <p>The ES considered that further benefits for vehicle travellers would result from the reduction of congestion and improved safety.</p>

**Table J.1 – MARKHAM MOOR: AST/ ES Summaries**

<b>Sub-Objective (MARKHAM MOOR)</b>	<b>AST</b>	<b>ES</b>
<b>Noise</b>	The AST stated that there would be noise reductions at Walnut View (up to 10 dB), Sibthorpe Kennels (up to 5 dB), Rosalie and adjacent property (up to 5 dB). There would be no noise increases at any properties. The estimated population annoyed by noise would be reduced by 2.4 for the do something scenario.	The ES stated there would be perceptible noise increases of 1-2 dB at 16 properties with the scheme by 2022, and perceptible to slight decreases of 1-4 dB at 8 properties and 9 dB at 1 property with the scheme. If the scheme were not built, the ES stated that 30 properties would be expected to experience perceptible noise increases of 1-3 dB.
<b>Local Air Quality</b>	The AST stated there would be a slight improvement at 8 properties; the remaining would be largely unaffected. There would be a general improvement in air quality.	The ES stated that there were a number of residential properties in close proximity to the Markham Moor junction. The local air quality assessment was stated to indicate that all pollutant concentrations would be well below the Air Quality Scheme (AQS) objectives both with and without the scheme, and that PM <sub>10</sub> objectives for 2010 would be achieved at all properties.  The ES concluded that there would be very minor changes in concentrations of nitrogen dioxide (NO <sub>2</sub> ) and PM <sub>10</sub> at local properties
<b>Greenhouse Gases</b>	Net impact -55 tonnes carbon	Net impact 2-125 tonnes carbon
<b>Landscape/ Townscape</b>	The AST stated that the junction improvements would be confined to an area already influenced by large scale commercial developments and lighting. Land take would be largely confined within the area of the existing roundabout with associated vegetation loss and a slight increase in wider landscape character impacts, particularly to the north and south. There would be adverse changes in views to the residential properties to the southeast and northwest largely due to the elevated bridge and associated lighting. Full cut-off lighting would be provided to mitigate the impacts. The adjacent commercial developments and proposed landscape mitigation measures would screen many of the wider impacts although the elevated structures, including lighting would be difficult to mitigate fully. The overall impact was assessed as Slight Adverse.  The AST noted that the Townscape sub-objective was not applicable to this junction improvement.	The ES stated that the junction was located in a mainly rural area, but was surrounded by development that in combination with lighting, would have a significant visual and landscape effect.  The ES concluded that while the new junction would result in the loss of some landscape elements and increased visual impact, the proposed mitigation would ensure that the overall impact of the scheme would be slight adverse.
<b>Biodiversity</b>	The AST stated that the loss of the Site of Interest for Nature Conservation (SINC) and other orchid populations within the proposed scheme would be mitigated by their translocation in combination with	The ES stated that the improvements to the Markham Moor junction would result in the loss of the Site of Importance for Nature Conservation (SINC) located between the north and southbound carriageways of the A1 south of the existing junction. The ES also

	improvement of the declining orchid populations of Cliffgate SINC which was expected to offset some of the adverse effects. The overall impact was assessed as Slight Adverse.	stated that there would be minor damage to habitats that potentially supported reptiles and water voles, as well as other minor habitat losses.  With mitigation, the ES expected the overall effect of the scheme to be moderate to slight adverse.
<b>Cultural Heritage &amp; Archaeology</b>	The AST stated that there would be a visual impact on 3 nationally important Listed Buildings and 2 buildings of local historic interest, all of which were less than 500 metres from the embanked overbridge. There were no known sites of archaeological interest within the scheme footprint. Crop-marks had been identified within 500 metres of the scheme which suggested the potential for as yet unknown remains located in the area. However due to the limited new land take there was a low potential for anything to be found. The impact overall was assessed as Slight Adverse.	The ES stated that the new junction would be built largely over the footprint of the existing junction, and that there were no known archaeological remains affected by the scheme and that there was a low potential for disturbing unknown remains.  As the proposals were expected to adversely affect the setting of a number of Listed Buildings near the junction, the ES concluded that the overall effect of the scheme would be moderate adverse.
<b>Water Quality &amp; Drainage</b>	The AST stated there would be no significant effect on river water quality from road drainage or from accidental spillage. There would be no discharge to groundwater. The impacts were assessed to be Neutral.	The ES stated that there were no attenuation or pollutant containment devices at the existing junction (prior to the scheme). Although the scheme was predicted to result in an increase in run-off, the provision of a surface water storage pond was not predicted to increase the risk of flooding. The risk of spillage resulting in a serious pollution incident was expected to be reduced, and the predicted concentrations of dissolved copper and zinc in surface water discharge were forecast to be lower than the levels specified for local river quality.  Overall, the ES concluded that the scheme would have a neutral effect on water quality.
<b>Physical Fitness</b>	The AST stated that the scheme would speed up A1 traffic thereby disadvantaging users of the at-grade bridle crossing approximately 1km northwest of the junction. Lower traffic volumes and dedicated crossing space at the junction would reduce the severance effect of the A1 for non-motorised users (NMUs). The existing and latent demand for crossing the A1 was considered to be low. An overall assessment score was not provided.	The ES stated that the dedicated facilities for NMUs wishing to cross the A1 (before the scheme) were poor, and that as a consequence of this and the location of community and recreational facilities within the vicinity, there was little cross-A1 NMU traffic.  As the proposed junction included facilities for pedestrians and cyclists to enable a safe crossing of the A1, the ES concluded that the impact of the scheme would be slight beneficial.
<b>Journey Ambience</b>	The AST stated that once constructed the new junction layout would reduce traffic congestion and segregate local traffic from A1 traffic. These changes would reduce the fear of accidents and frustration felt by a large number of travellers. The overall impact was assessed as Large Beneficial.	The ES stated that the new junction would be safer and less stressful for vehicle travellers. It was also stated that the view from the road would be improved, and that traveller care would be maintained such that the overall impact of the scheme would be beneficial.

**Table J.1 – GONERBY MOOR: AST/ ES Summaries**

Sub-Objective	AST	ES
<b>Noise</b>	The AST stated that there would be no change in traffic flow on the A1. There were very few inhabited buildings around the existing road and no perceivable change in noise was expected. The road would be moved further away from all but one property. The estimated net population annoyed by noise would be increased by 0.4 for the do something scenario	The ES noted that there was one residential property within 300m of the junction, and went on to state that the realignment of the roads would result in a decrease in noise levels of up to 6dB on the property over the do-minimum scenario despite a predicted increase in HGVs on the A1.  Overall, the ES concluded that the impact of the scheme would be slight beneficial
<b>Local Air Quality</b>	The AST stated there was one property within the range of effects of the proposed scheme and that there would be an improvement in air quality for this property.	The ES noted that there was one residential property within 300m of the junction, and went on to state that the realignment of the roads would result in slight beneficial effects for the property over the do-minimum scenario despite a predicted increase in HGVs on the A1.  Overall, the ES concluded that the scheme would provide slight beneficial air quality effects.
<b>Greenhouse Gases</b>	Net impact -382 tonnes carbon	Net impact -188 tonnes carbon
<b>Landscape/ Townscape</b>	The AST stated that there would be a loss of characteristic landscape features and that an increase in road structures including the bridge and lighting would increase the perception of the road corridor on the wider landscape character and increase views from receptors. The overall impact was assessed as Slight Adverse.  For townscape the AST stated that given the rural nature of the area, Townscape was not considered to be an issue.	The landscape around the junction was stated by the ES to be predominantly rural, but noted a service area and retail park immediately to the south east of the junction and an Area of Great Landscape Value to the south of the junction. The ES also stated that as there were few properties or public right of ways in the area, the visual impact of the scheme would be limited.  With the implementation of good mitigation, the ES considered that the scheme would have a slight adverse impact when compared with the existing situation.
<b>Biodiversity</b>	The AST stated that the proposed scheme was not in an especially sensitive area, although there was potential for minor impacts on birds and water voles. The overall impact was assessed as Neutral.	The ES stated that the junction was located in an area of arable farmland with fields divided by clipped hedges. It was noted that while there were a number of features of ecological value in the area which included hedges (both dividing fields and alongside the existing A1), ponds that could support a population of amphibians, and ditches hosting water voles, the overall the footprint of the scheme was ecologically poor.  The ES outlined a number of measures to improve the value of the scheme (such as replacement hedgerows and new wetlands), and therefore concluded that the overall effect of the scheme would be neutral.

<b>Cultural Heritage &amp; Archaeology</b>	The AST stated that the scheme would be damaging to potential locally significant heritage assets, resulting in loss of features such that their integrity was compromised, but not destroyed, and adequate mitigation would be specified. The overall impact was assessed as Slight Adverse.	The principal cultural heritage value of the junction area was stated by the ES to relate to the potential for a Roman settlement and field system revealed by a series of crop-marks.  The ES concluded that there would be no impact on the built heritage of the local area and as such, considered the overall the effect of the scheme on the cultural heritage resource to be slight adverse.
<b>Water Quality &amp; Drainage</b>	The AST stated that no amenity features would be affected. Any increase in surface water run-off would be stored so that there was no increase in the rate of discharge to Foston Beck and there would be no effect on Foston Beck floodplain. The overall impacts were assessed to be Neutral.	The ES stated that (before the scheme) run-off from the existing A1 at Gonerby Moor discharged into the Foston Beck and Toll Bar Drain, and further stated that there were no pollution containment measures provided as part of the junction, and that the run-off from the scheme was predicted to fall within permitted Environmental Quality Standard (EQS) concentrations.  Mitigation was stated in the ES as comprising the installation of pollution interceptors, silt traps and balancing ponds, and that as there was no predicted discharge to ground water the overall effect of the scheme on water quality would be slight beneficial.
<b>Physical Fitness</b>	The AST stated that the scheme would create safer crossings of the A1 however few pedestrians, equestrians or cyclists were likely to benefit. The overall impact was assessed to be Slight Beneficial.	The ES stated that although centres of population were located someway distant from the junction, the retail park adjacent to the existing junction did attract large numbers of users. The ES also stated that (before the scheme) the A1 acted as a barrier to the movement of the few pedestrians, equestrians and cyclists using the roads and paths around the junction, noting the crossing for Footpath 2 being particularly dangerous.  The ES concluded that construction of the new grade separated junction would incorporate facilities for NMUs, this would provide a substantial benefit for this user group.
<b>Journey Ambience</b>	The AST stated that generally there would be improved conditions for a large number of travellers, including safer journeys with fewer delays and an improved view. The overall impact was assessed as Large Beneficial.	The ES stated that construction of the new grade separated junction would have a substantial benefit for vehicle travellers in terms of reduced congestion and improved safety.

**Table J.1 – COLSTERWORTH: AST/ ES Summaries**

Sub-Objective	AST	ES
<b>Noise</b>	The AST stated that there would generally be a slight decrease in noise for properties in the north of Colsterworth and the A151 and a slight increase for properties in the south of Colsterworth and one property on the A151.	The ES stated that 234 properties were expected to experience a perceptible noise increase of 1-3 decibels by 2022, and that this was slightly less than the number of properties that were expected to experience similar noise increases if the scheme were not built.
<b>Local Air Quality</b>	The AST stated there would be an overall slight deterioration in air quality due to the link road (over the A1 at the B6403).	The ES stated that there were no residential properties in close proximity to the Colsterworth North junction, and that the scheme was expected to meet Air Quality Strategy objectives for all pollutants except PM <sub>10</sub> 's, which would be exceeded at three properties near the southern junction either with or without the junction improvements.
<b>Greenhouse Gases</b>	Net impact -49 tonnes carbon	Net impact -27 tonnes carbon
<b>Landscape/ Townscape</b>	<p>The AST stated that the proposals would impact on landscape character, both directly through land take and indirectly through the greater perception of the road network on the wider landscape character, which has been designated as an Area of Great Landscape Value (AGLV). A few scattered properties to the north and residential properties to the south of Colsterworth and within the industrial area to the south east would experience a change in view. Mitigation measures over time would limit the impacts. The overall impact was assessed as Slight Adverse.</p> <p>The AST noted that the townscape sub-objective was not applicable to this junction improvement.</p>	<p>The ES stated that the junctions were located in an attractive, mainly rural area which was designated as an area of Great Landscape Value. The existing southern junction was stated as being surrounded by development and this, in combination with lighting, had significant visual and landscape effects.</p> <p>While the ES stated that the new junctions would result in the loss of some landscape elements and an increased visual impact, it was concluded that with the proposed mitigation, the overall impact of the scheme would be slight adverse.</p>
<b>Biodiversity</b>	The AST stated that there would be a slight adverse impact on a non-statutory designated road verge at the northern end of the proposed improvement. The overall impact was assessed as Slight Adverse.	<p>The ES stated that the improvements to the Colsterworth North junction would result in damage to two locally important habitats which support Biodiversity Action Plan (BAP) priority and county endangered species. At Colsterworth South, the ES stated that there would be loss of low quality habitat of local nature conservation value.</p> <p>With mitigation, the ES concluded that effect of the proposals on biodiversity would be negligible to slight adverse.</p>

<p><b>Cultural Heritage &amp; Archaeology</b></p>	<p>The AST stated that no known Ancient monuments or listed structures would be affected, although there would be potential for the scheme to impact on remains to the south of the A1/ A151 junction. The overall impact was assessed as slight adverse.</p>	<p>The ES stated that although the southern junction was located on the line of a Roman road (Ermine Street), the cultural heritage value of the area around the junctions was deemed to be low.</p> <p>Despite the ES prediction of direct effects on two elements of cultural heritage, a milestone on the A151 (listed building), and the railway bridge at Colsterworth North, the overall impact of the scheme on the cultural heritage resource of the area was concluded by the ES to be slight adverse.</p>
<p><b>Water Quality &amp; Drainage</b></p>	<p>The AST stated the headwaters of the River Witham and local field ditches would receive additional water from the scheme, but no special problems were envisaged. The overall impacts were assessed to be Neutral.</p>	<p>The ES stated that there were no attenuation or pollutant containment devices at the existing (pre-scheme) junctions and that although the scheme would result in an increase in run-off, the provision of a surface water storage pond at Colsterworth South would ensure that there would be no increase in flood risk.</p> <p>The ES also considered that the risk of spillage resulting in a serious pollution incident would be reduced, and that the predicted concentrations of dissolved copper and zinc in the surface water discharge would be lower than the levels specified for local river quality.</p> <p>Overall, the ES concluded that the scheme would have a neutral effect on water quality.</p>
<p><b>Physical Fitness</b></p>	<p>The AST stated that small numbers of pedestrians, riders and cyclists crossing at the roundabout would have a safer route via the Loop Road Bridge. The new bridge at the B6403 would also provide a safer crossing. No material change in the level of physical activity was predicted and the overall impact was assessed as Neutral.</p>	<p>The ES stated that (before the scheme) there were no dedicated facilities for NMUs wishing to cross the A1, although at Colsterworth North the dismantled railway bridge was noted to provide an informal crossing point. As a consequence of this, and the location of community and recreational facilities, the ES stated that there was little cross-A1 NMU traffic.</p> <p>The ES concluded that as the proposed junctions included facilities to enable pedestrians, equestrians and cyclists to safely cross the A1, the overall impact of the scheme would be slight beneficial.</p>
<p><b>Journey Ambience</b></p>	<p>The AST stated that the grade-separated junctions would enable a large number of travellers to make better progress along the route they were travelling on thereby reducing traveller frustration. Fear of accident would be significantly reduced at the A1/ B6043 junction as a grade separated junction would replace the existing junction with its difficult turning manoeuvres. The overall impact was assessed as Large Beneficial.</p>	<p>The ES stated that the new junctions would be safer and less stressful for vehicle travellers, the view from the road would be improved, and that traveller care would be maintained such that the overall impact of the scheme would be beneficial.</p>

**Table J.1 – CARPENTERS LODGE: AST/ ES Summaries**

Sub-Objective	AST	ES
<b>Noise</b>	The AST stated that there were two properties within 300m of the scheme and that there would be up to 1 dB noise reduction at George Farm, and no change in noise levels at Carpenters Lodge due to scheme. The estimated population annoyed by noise would not change for the do something scenario.	Despite a predicted increase in HGVs on the A1 by 2022 design year, the ES stated that construction of the junction would result in a decrease in noise levels of around 1dB for two residential properties over the do-minimum scenario.
<b>Local Air Quality</b>	The AST stated there were two properties close to the scheme and there would be a slight deterioration for nitrogen dioxide (NO <sub>2</sub> ) at one receptor.	The ES stated that the scheme would provide very slight air quality effects, and that these effects would only affect two properties.
<b>Greenhouse Gases</b>	Net impact 14 tonnes carbon	Net impact -27 tonnes carbon
<b>Landscape/ Townscape</b>	<p>The AST stated that the proposals would impact on the wider landscape character of the 'Area of Best Landscape Value' which included the setting of the adjacent designated Burghley Park. Two properties would experience a change in view. The overall impact was assessed as Slight Adverse.</p> <p>The AST stated 'No Townscape'. The overall impact was assessed as neutral.</p>	<p>The ES stated that the landscape around the junction was predominantly rural, with the historic Burghley Park immediately to the east of the junction and the town of Stamford to the northeast of the junction.</p> <p>The ES describe the landscape as an attractive and valued area that was recognised by the numerous landscape and historic designations covering the area and that due to few properties or PRow in the area, the visual impact of the scheme would be limited.</p> <p>With the implementation of good mitigation, the ES considered that the scheme would have a slight adverse impact when compared with the existing situation.</p>
<b>Biodiversity</b>	The AST stated that there would be minor adverse impacts on hedges and potentially on badgers and that these could be mitigated. The overall impact was assessed as Neutral.	<p>The ES stated that the junction was located between an area of arable farmland with fields divided by clipped hedges, and the parkland of Burghley Park. A number of features of ecological value in the area were noted, including an 'important' hedge alongside the existing B1081, badger setts and trees that support bats, but the overall footprint of the scheme was stated as being ecologically poor.</p> <p>The ES outlined mitigation measures designed to improve the ecological value of the scheme (such as replacement hedgerows and hedgerow translocation), and concluded that the overall effect of the scheme on biodiversity would be negligible.</p>
<b>Cultural Heritage &amp; Archaeology</b>	The AST stated that allowing for the successful implementation of several programmes of mitigation works it was likely that the scheme proposals could restore or enhance the sense of place of the heritage	The principal cultural heritage value of the junction area was stated by the ES as comprising Burghley Park, a listed building known as 'The Grandstand', a hedgerow by the B1081, and a milestone of unknown date.

	resource through good design and mitigation. Overall the scheme would result in a Slight Beneficial effect.	The ES concluded that there would be no impact on the built heritage of the local area, and that overall the effect of the scheme on the cultural heritage resource was considered to be neutral.
<b>Water Quality &amp; Drainage</b>	The AST stated there was a high quality watercourse and sensitive aquifer in close proximity to the scheme. The overall impacts were assessed to be Neutral.	<p>The ES stated that run-off from the existing (pre-scheme) A1 at Carpenters Lodge discharged into the ground via open ditches alongside the carriageway, and that there no pollution containment measures were provided.</p> <p>The ES predicted that run off from the scheme would fall within permitted EQS concentrations, and stated that attenuation ditches would be provided as part of the scheme to prevent flooding.</p> <p>Overall, the ES stated that there would be no discharge of run-off to ground water, and the effect of the scheme on water quality would be neutral.</p>
<b>Physical Fitness</b>	The AST stated that no change in the level of physical activity was predicted and the overall effect of the scheme was considered to be Neutral.	<p>The ES noted that centres of population were located “<i>someway distant</i>” from the junction, and that the A1 acted as a barrier to the movement of pedestrians, equestrians and cyclists using the roads and paths around the junction, with the crossing for the footpath alongside the A1 was noted as being particularly dangerous.</p> <p>The ES concluded that construction of the new grade separated junction incorporating NMU facilities would be beneficial for this user group.</p>
<b>Journey Ambience</b>	The AST stated that the grade-separated junction would reduce traveller frustration for a large number of drivers. Travellers using the grade-separated junction would enjoy an improved view and traveller stress would be reduced by the revised A1/Racecourse Road junction. The overall impact was assessed as Large Beneficial.	The ES stated that construction of the new grade separated junction incorporating NMU facilities would be beneficial for vehicle travellers in terms of improved safety, and that congestion would be reduced.

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## Appendix L – Glossary of Terms

Term	Definition
AADT	<b>Annual Average Daily Traffic.</b> Average of 24 hour flows, seven days a week, for all days within the year.
AAWT	<b>Annual Average Weekday Traffic.</b> As AADT but for five days, (Monday to Friday) only.
Accessibility	Accessibility can be defined as 'ease of reaching'. The accessibility objective is concerned with increasing the ability with which people in different locations, and with differing availability of transport, can reach different types of facility.
AM	denoting the morning peak period
ARCADY	<b>Assessment of Roundabout Capacity and Delay</b> roundabout modelling software
AST	<b>Appraisal Summary Table.</b> This records the impacts of the scheme according to the Government's five key objects for transport, as defined in DfT guidance contained on its Transport Analysis Guidance web pages, WebTAG
ATC	<b>Automatic Traffic Count,</b> a machine which measures traffic flow.
AWT	<b>Average Weekday Traffic.</b> Average of Monday to Friday 24 hour flows.
BCR	<b>Benefit to Cost Ratio</b>
COBA	<b>COst Benefit Analysis</b> – a computer program which compares the costs of providing road schemes with the benefits derived by road users (in terms of time, vehicle operating costs and accidents), and expresses the results in terms of a monetary valuation. The COBA model uses the fixed trip matrix.
DfT	<b>Department for Transport</b>
Discounting	Discounting is a technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report.
DSR	<b>Detailed Scheme Review.</b> An update of the air quality data in the ES, undertaken by Atkins in May 2004.
EST	<b>Evaluation Summary Table.</b> In POPE studies, this is a summary of the evaluations of the TAG objectives using a similar format to the forecasts in the AST.
HEMP	<b>Handover Environmental Management Plan</b>
HFS	<b>High Friction Surface</b>
HGV	<b>Heavy Goods Vehicle.</b>
Highways England	The new government company responsible for operating, maintaining and improving the strategic road network in England. Formerly Highways Agency up to March 2015.
IP	<b>Inter Peak,</b> the time between the AM and PM peaks
LCC	<b>Lincolnshire County Council</b>
JTDB	<b>Journey Time Database</b> – For Highways England's core network, this is a database of historical records of journey times consisting of junction to junction time segments for each 15 minute period.

Term	Definition
KSI	Killed or <b>Seriously Injured</b>
MAC	Managing Agent Contractor – organisation normally contracted in five-year terms for undertaking the management of the road network within a Highways England area.
NCC	<b>Nottinghamshire County Council</b>
NTS	Non - Technical Summary
PIC	<b>Personal Injury Collision.</b> A road traffic accident in which at least one person required medical treatment.
PIC/mvkm	PIC/mvkm is the number of <b>PICs</b> per <b>million vehicle kilometres</b> where 'vehicle kilometres' are the number of vehicles using a section of the road multiplied by the length of the road.
PM	Evening peak period
POPE	<b>Post Opening Project Evaluation</b> , before & after monitoring of all major highway schemes in England.
Present Value	Present Value is the value today of an amount of money in the future. In cost-benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.
PVB	<b>Present Value Benefits</b> Value of a stream of Benefits accruing over the appraisal period of a scheme expressed in the value of a Present Value
PVC	<b>Present Value Cost</b> As for PVB but for a stream of costs associated with a project
PRV	<b>Protected Road Verge.</b> County wildlife sites on road verges designated due to special habitat
RRS	<b>Road Restraint System</b>
RSI	<b>Road Surface Influence</b>
Severance	Community severance is the separation of adjacent areas by road or heavy traffic, causing negative impact on non-motorised users, particularly pedestrians.
SINC	<b>Site of Importance for Nature Conservation.</b> A conservation designation awarded by local authorities to an area as being of local conservation interest.
STATS19	A database of injury accident statistics recorded by police officers attending accidents
TRADS	<b>Traffic Flow Data System</b>
Vehicle hours	<b>Vehicle hours</b> refers to the total time spent by all vehicles using a road and is expressed normally as a yearly value. For example, if 10,000 vehicles a day used a route with a 6 minute journey time, then the route's vehicle hours for the year would be 365,000.
VOC	<b>Vehicle Operating Costs</b>
VOT	<b>Value Of Time</b>
vpd	<b>Vehicles Per Day</b>
webTAG	Department for Transport's website for guidance on the conduct of transport studies at <a href="http://www.webtag.org.uk/">http://www.webtag.org.uk/</a>