

Post Opening Project Evaluation

A11 Fiveways to Thetford - One Year After



August 2017

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Executive Summary

Scheme Description

The A11 Fiveways to Thetford scheme was a major Highways England project in the East of England which opened to traffic in December 2014. The purpose of the scheme was to upgrade 9.1 miles of the A11 between Fiveways Roundabout in Suffolk and Thetford in Norfolk to dual carriageway. The A11 provides access to Norwich to the east. Prior to the scheme, this was the only remaining section of single carriageway along the M11/A11 route.

As part of the scheme, the A11 was re-routed to bypass the village of Elveden. A split-level junction was provided here, to connect to the B1106, which provides access to the Center Parcs holiday village. Several accesses onto the previous A11 route were closed off, and overbridges were provided for farming operations. In addition, a pedestrian and cyclist route was provided to pass under the A11 at the site of the war memorial, which is located approximately 2.5km west of Elveden.

This Post Opening Project Evaluation (POPE) report evaluates the impact of the scheme one year after opening.

Scheme Objectives

Objectives (Client Scheme Requirements, 2014)	Objective Achieved?
Complete the upgrade of the A11 to dual two-lane all-purpose standard (D2AP) from the M11 to Norwich	✓
Reduce congestion and provide adequate capacity	✓
Minimise private means of access and side road connections to the trunk road, consistent with making other satisfactory arrangements for the traffic	✓
Reduce the incident rate of accidents that occurs on both the main carriageway and the junctions	✓
Provide a bypass for the village of Elveden	✓
Improve journey time reliability	Likely to be achieved
Minimise the impact the road will have on the surrounding area of The Brecks, an area of outstanding beauty and national importance	Mitigation measures have been implemented such that the impact of the scheme is likely to be broadly as expected at this stage, although confirmation is required

Key Findings

- There have been increases in traffic in the vicinity of the scheme over time. In particular, traffic on the A11 scheme section has increased (by approximately 26%) between the pre- and post-scheme periods.
- There have been reductions in journey times for those travelling along the A11 between Fiveways Roundabout and Thetford in all time periods assessed (particularly in the AM and PM peaks).
- There has been a reduction in the collision rate, with a saving of 15.8 collisions a year on the scheme section.
- The outturn investment costs were slightly lower than forecast at £65.98m.

Summary of Scheme Impacts

Traffic

- There have been general increases in traffic in the area over time, with increases in average weekday traffic for several sites in the vicinity of the scheme between the pre-scheme and post-scheme periods.
- Traffic on the A11 has increased (by approximately 26%) between the pre- and post-scheme periods, suggesting that the scheme has led to an increase in traffic volumes on the A11, through a combination of new traffic and reassigned traffic from other routes.
- There are some differences in the daily flow profile on Mondays and Fridays, which are affected by the holiday village nearby, but generally weekdays follow a typical pattern, with AM and PM peak periods.
- There have been reductions in journey times along the A11 scheme section in all time periods assessed, of between approximately 4 and 10 minutes.
- Journey time reliability has not been able to be assessed, however post opening average journey times in all time periods are consistent, indicating improve journey time reliability.

Safety

- The overall reduction in collision rate in terms of observed PIC/mvkm for key links affected by the scheme is lower than forecast, with a reduction of 0.129 PIC/mvkm (after background collision decline considered).
- Analysis of observed collision data for the whole study area shows a reduction of 22.6 collisions per year, representing a statistically significant beneficial impact on the A11 and surrounding roads.
- Analysis of the observed collision data for the scheme key links which were directly affected by the scheme shows a reduction (when compared to the counterfactual) of 15.8 collisions a year, which is also a statistically significant change.
- Feedback was received from Mildenhall Parish Council highlighting a safety issue at Fiveways Roundabout. However, the safety analysis undertaken in this evaluation shows that collisions at the roundabout have remained relatively in line between the pre-scheme and post-scheme periods, with 17 collisions in the five-year pre-scheme period, and one collision in the one year post-opening period.

Environment

- Based on the information available, the impact on the Noise and Air Quality are considered likely to be as expected in the opening year.
- The outturn evaluation of Greenhouse Gases was not possible, and so the impact has been assumed to be as forecast.
- The inclusion of the underpass at the war memorial on Weather Heath is locally adverse but has not significantly altered the overall large adverse impact of the scheme on Landscape and visual amenity as predicted by the AST/ES at in the opening year.
- Planting proposals appear to have been broadly implemented as anticipated, and any local variations in expected effects are unlikely to have materially changed the predicted Landscape or visual amenity effects of the scheme overall.

- In terms of Townscape, a degree of separation now exists between the bypass and settlement of Elveden as expected. The overall impact on Townscape is slight beneficial.
- In terms of Heritage & Historic Resources, as a consequence of the drainage design modifications the beneficial impact of the scheme on the Landscape setting on the Bowl Barrow/How Hill scheduled monument has likely not been realised to the predicted extents, at this time. It is too early to consider the screening and integration functions of the planting proposals with respect to heritage assets.
- In terms of Biodiversity, the design of the bat wires appears to have been optimised in line with research published since the time of appraisal and may ensure a greater chance of success than that proposed by original design. Bat monitoring information would be required to confirm this. The overall impact of the scheme on Biodiversity is likely to be neutral.
- The reduction in the degree of severance of the Elveden Estate and the Public Rights of Way network (facilitated by the B1112 underpass and the pedestrian and cyclist underpass) and the improved amenity and reduced severance at Elveden is likely to have had the moderate beneficial effects as expected by the forecast. The scheme is likely to have had a large beneficial impact on Journey Quality.

Summary of Scheme Economic Performance

	All prices in £m 2002 market prices, discounted	Forecast	Outturn Reforecast
Costs	Present Value Costs (PVC)	£67.4m	£66.0m
Benefits	Journey time benefits	£1,003.1m	£943.4m
	Construction and future maintenance delay	£47.9m	£47.9m
	Safety Benefits	£111.7m	£92.0m
	Vehicle Operating Costs	£68.4m	£68.4m
	Carbon Benefits	£4.7m	£4.7m
	Present Value Benefits (PVB) subtotal	£1,235.7m	£1,156.6m
	Indirect Tax	-£10.2m	-£10.2m
	Benefit Cost Ratio (BCR) (with Indirect Tax in PVC)	18.2	17.4
	BCR (with Indirect Tax in PVB)¹	15.9	15.2

- Journey time benefits are slightly below that forecast, as whilst journey time savings in the peak periods are higher than forecast, there are lower than expected traffic flows.
- Outturn safety benefits are also lower than forecast, at £92.0m, due to observed collisions savings in the opening year being lower than forecast.
- Outturn investment costs are slightly lower than forecast.
- An outturn BCR of 15.2 is considered very high value for money.

¹ At the time of scheme appraisal, Treasury guidance was to include indirect tax as a cost. However, the most recent guidance on indirect tax impacts is to include these as a benefit, rather than a reduction in cost, therefore two BCRs are presented here.

1. Introduction

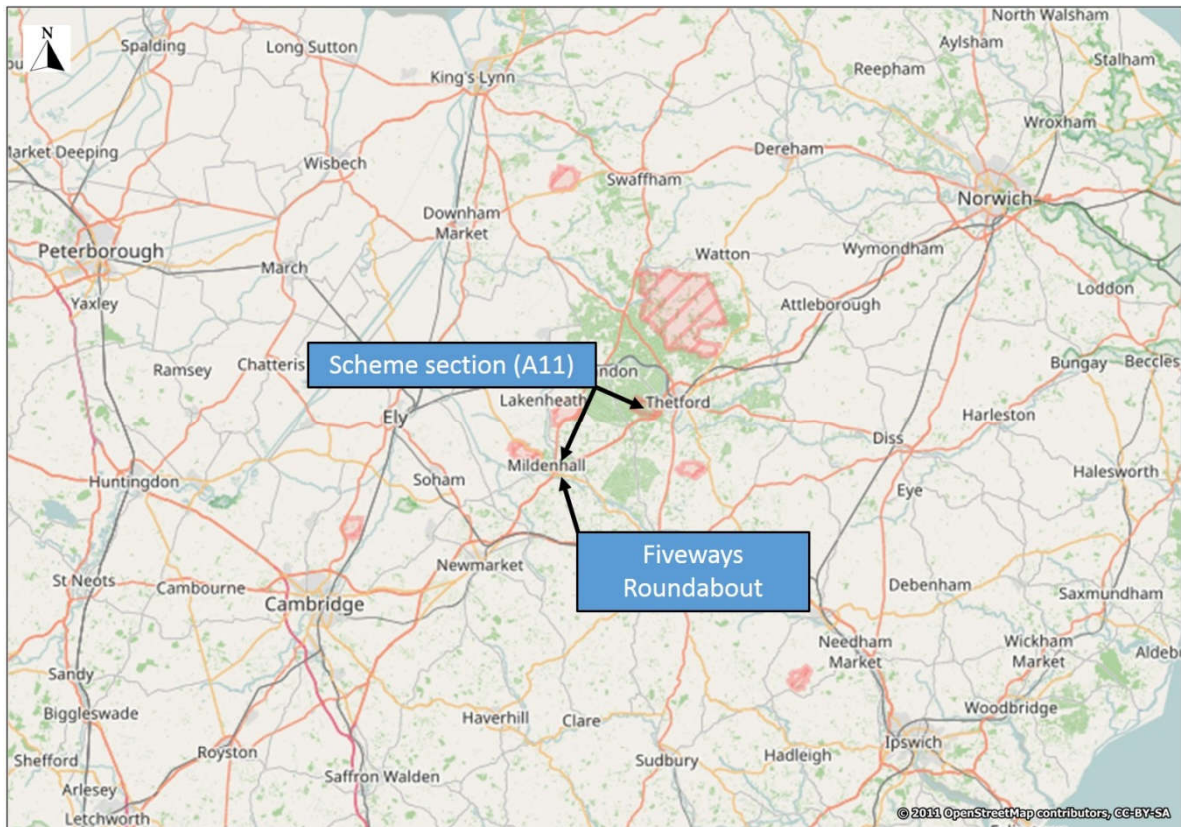
Background

- 1.1. This report is the One Year After (OYA) post-opening study of the A11 Fiveways to Thetford dualling scheme which opened in December 2014. The evaluation has been prepared as part of Highways England's POPE programme and presents initial post-opening findings.

Scheme Context

- 1.2. The A11 provides a strategic link to Norwich in the east of England from Cambridgeshire. The A11 connects to the A14, providing access to Cambridge and to the M11, which provides links to London to the south.
- 1.3. The scheme section of the A11 runs from Fiveways Roundabout at Barton Mills to the roundabout at the southern end of the Thetford Bypass. This section, which is 9.1 miles long (14.8km), was the only single carriageway link remaining on the M11/A11 route before the scheme was implemented and according to the Forecasting and Economic Report (2007) was said to have contributed to:
 - Congestion problems, particularly during holiday periods;
 - Conflict between fast moving trunk road traffic and slow moving agricultural traffic, particularly at crossing points, creating conflicting movements and causing congestion;
 - Overtaking difficulties;
 - Difficulties joining the trunk road from side roads; and
 - Adverse environmental effects through the village of Elveden.
- 1.4. The village of Elveden is located along the scheme section of the A11, and the A11 previously passed through the village before being routed to the north of the village. Furthermore, the Center Parcs holiday village is located near to Elveden off the B1106 which is accessed from the A11.
- 1.5. The scheme section is shown on the map overleaf in Figure 1-1 in the context of the wider area.

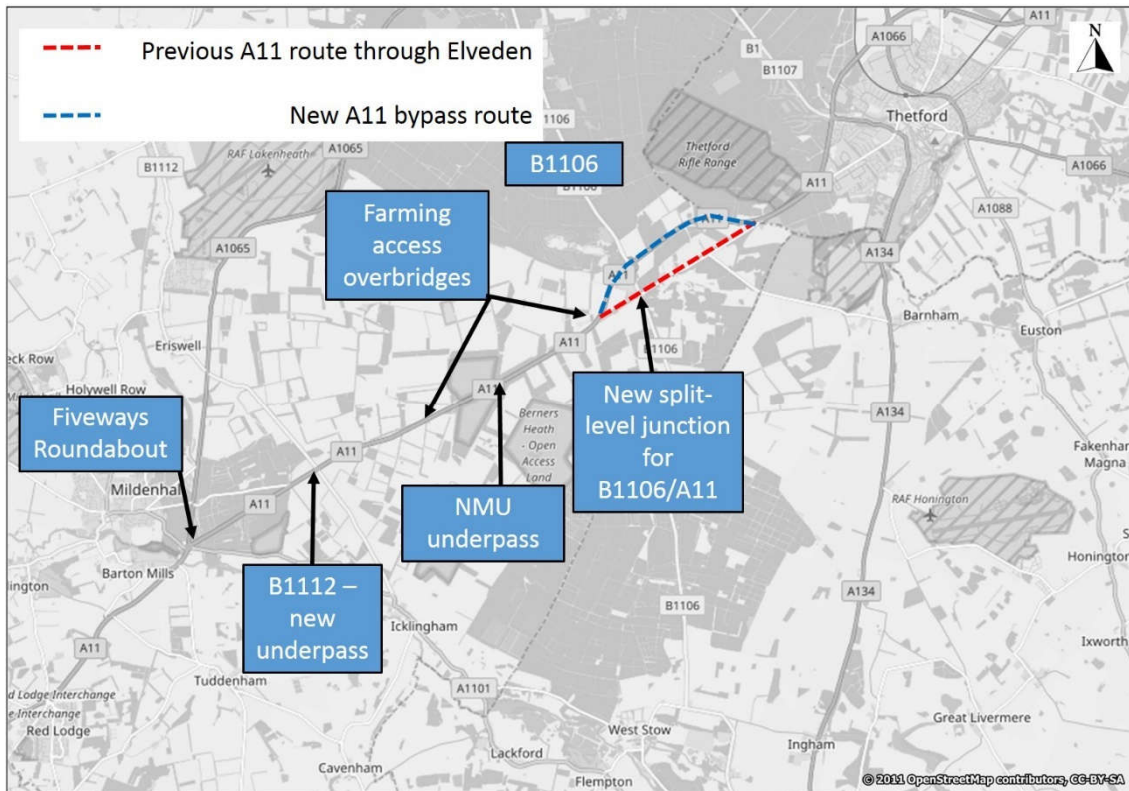
Figure 1-1 Extent of Scheme



Scheme Description

- 1.6. The scheme section was upgraded and widened to dual carriageway with the aim of increasing safety and improving journey times. The work primarily followed the line of the existing A11, except the section at the Elveden Bypass. This involved routing the A11 to the north of the village of Elveden, with a two-level junction providing access to the B1106, which runs north to south and passes over the A11. This intersection was previously known as Elveden Crossroads and was at-grade.
- 1.7. In addition to the new dualled section, the scheme also included:
 - **Improvements to Fiveways Roundabout:** this involved decreasing the size of the central island to provide more capacity and re-lining the circulatory carriageway with the aim of improving safety.
 - **Changes to the B1112:** An underpass was provided to take the B1112 beneath the new A11, with the A11 no longer accessible from this route.
 - **New access arrangements:** With previous minor accesses onto the A11 removed, new access bridges were constructed at Canada Drive and Chalk Hall Farm to assist farming operations and provide access to Elveden Estate.
 - **A NMU underpass:** An unpaved NMU footway was provided underneath the A11 near to the war memorial, to the west of the village of Elveden.
- 1.8. The scheme measures are presented on the map in Figure 1-2. This demonstrates the previous A11 route through Elveden and the current route which bypasses Elveden.

Figure 1-2 Scheme Measures



- 1.9. Full construction of the scheme commenced in January 2013, with the scheme opening in December 2014.
- 1.10. In addition to these works, a new service station with a petrol garage, fast food restaurant and coffee shop was built adjacent to Fiveways Roundabout, with accesses onto the A1101 and A1065. This opened in October 2014, although this development was not part of the scheme. Flows on these roads may therefore be impacted by traffic utilising these services and the impact of this cannot be separated from the overall impact of the dualling scheme. For further context, the layout of Fiveways Roundabout is shown in Figure 1-3. Fiveways Roundabout provides access to the village of Mildenhall.

Figure 1-3 Fiveways Roundabout



Objectives

- 1.11. The specific objectives of the scheme, as stated in the Client Scheme Requirements (last updated June 2014) were to:
- Complete the upgrade of the A11 to dual two-lane all-purpose standard (D2AP) from the M11 to Norwich;
 - Reduce congestion and provide adequate capacity;
 - Minimise private means of access and side road connections to the trunk road consistent with making other satisfactory arrangements for the traffic;
 - Reduce the incident rate of accidents that occurs on both the main carriageway and the junctions;
 - Provide a bypass for the village of Elveden;
 - Improve journey time reliability; and
 - Minimise the impact the road will have on the surrounding area of The Brecks, an area of outstanding beauty and national importance.
- 1.12. The following objectives were also stated in the Client Scheme Requirements but will not be assessed in this POPE report:
- Develop a scheme that is well engineered and economically viable;
 - The scheme shall implement measures to control, to within acceptable levels as determined by project specific hazard analysis, the hazards to workers and transport users during all operations related to the construction of the works; and

- The scheme shall be designed to control the hazards to road users and maintainers to within acceptable levels, as defined through the project specific hazard analysis.

Scheme History

- 1.13. According to the Statement of Case (Highways Agency, 2009), the A11 was identified in the East of England Plan (2008), as part of the strategic road and rail network, which should be improved due to its economic importance for the region. As the last remaining single carriageway stretch of the A11, the dualling was expected to lead to improved journey time reliability and improve safety, as well as improved economic growth.
- 1.14. The scheme was in the pipeline for a number of years, with Parsons Brinkerhoff appointed in 1999 to consider the preferred route for the scheme. The preferred route was announced in 2001, although at this stage it was also agreed to include improvements to Fiveways Roundabout as part of the scheme. Several changes to the preferred route were incorporated following this, including the provision of the NMU underpass. In 2008, the scheme was given DfT approval to move to the Statutory Procedures and Powers stage and the Client Scheme Requirements were confirmed. In May 2010, following the change in Government and the Public Inquiry, the scheme was halted. In October 2010, an announcement from the Chancellor to fund 14 Highways England schemes to start construction by 2015, including the A11 Fiveways to Thetford scheme, allowed it to continue to progress.
- 1.15. The scheme began full construction on 24th January 2013, with the scheme opening to traffic in December 2014.

Overview of Post Opening Project Evaluation (POPE)

- 1.16. Highways England 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 five Central Government objectives for Transport² (Environment, Safety, Economy, Accessibility and Integration) have been achieved. The AST for this scheme is presented in Appendix A.
- 1.17. POPE studies are carried out for all Major Schemes to evaluate the strengths and weaknesses in the techniques used for appraising schemes. This is so that improvements can be made in the future. For POPE, this is achieved by comparing information collected before and after the opening of the scheme to traffic, against predictions made during the planning process. The outturn impacts of a scheme are summarised in an Evaluation Summary Table (EST) which summarises the extent to which the objectives of a scheme have been achieved. The EST for this scheme is presented in Appendix A.
- 1.18. POPE of Major Schemes goes beyond monitoring progress against objectives set beforehand. Instead, it provides the opportunity to study which aspects of the intervention and appraisal tools used to evaluate it are performing better or worse than expected, and how they can be made more effective. More specifically, the objectives of POPE evaluation reports are to:
- Provide a quantitative and qualitative analysis of scheme impacts consistent with national transport appraisal guidance (WebTAG) and scheme specific objectives.
 - Identify discrepancies between forecast and outturn impacts.
 - Explain differences between forecast and outturn impacts.

² As of August 2011, this approach has been revised. However, POPE is concerned with evaluation against the appraisal and as such follows the objectives used at that time.

- Identify key issues relating to appraisal methods that will assist the Highways England in ongoing improvement of appraisal approaches and tools used for Major Schemes.
- 1.19. Note that a separate interim report for this scheme was provided in February 2017, as requested by Highways England in advance of the full POPE report to understand more about the impact of the dualling on traffic flows around Fiveways Roundabout specifically. Fiveways Roundabout is at the southern end of the dualling scheme, and was subject to minor alterations as part of the scheme. It is understood that there have been concerns raised by residents in Mildenhall about delays accessing the roundabout. As such, the report focused on traffic flows at this location, whereas this full POPE report will include analysis of the full scheme impacts across all sub-objectives appraised.

Contents of this Report

- 1.20. The remainder of this report is structured as follows:
- **Section 2 – Traffic Analysis:** This section considers the impact the scheme has had on traffic volumes and journey times on the A11 and surrounding roads;
 - **Section 3 – Safety:** This section compares the pre- and post-scheme collision numbers and looks at collision rates;
 - **Section 4 – Economy:** This section compares the monetary value of any changes in journey times and collisions and compares these benefits with the cost.
 - **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 the scheme impacts on accessibility for pedestrians and cyclists and considers the impact of the scheme on local land use and Government Policies; and
 - **Section 7 – Conclusions:** This section summarises the main findings of this study against the key objectives.
- 1.21. There are also several appendices, as follows:
- **Appendix A** – AST and EST
 - **Appendix B** – Turning Count Analysis
 - **Appendix C** – Journey Time Analysis
 - **Appendix D** – Environment: Information Required for Environmental Evaluation and Photographic Record of Scheme
 - **Appendix E** – Glossary
 - **Appendix F** – List of Tables and Figures Presented in this Report

2. Traffic Analysis

Introduction

- 2.1. This section examines traffic data from several sources to provide a before and one year after opening comparison of traffic flows and journey times on the scheme section and other roads in the vicinity of the scheme. The purpose of this evaluation is to understand whether any changes in traffic flows and journey times may be attributable to the scheme.
- 2.2. This section includes the following:
- A description of national, regional and local background changes in traffic to provide a context against which observed changes in actual traffic can be considered;
 - A summary of the traffic data sources used;
 - A detailed comparison of before and one year after traffic flows on key routes in the study area likely to be affected by the scheme;
 - An evaluation of key differences between the forecasts and outturn impacts of the scheme in terms of traffic flows to identify whether traffic flow changes are as expected;
 - A summary of the journey time data sources used;
 - A comparison of pre- and post-scheme journey times and journey time reliability on key routes, including on the scheme section; and
 - An evaluation of differences between the forecast and observed journey times on the scheme section.

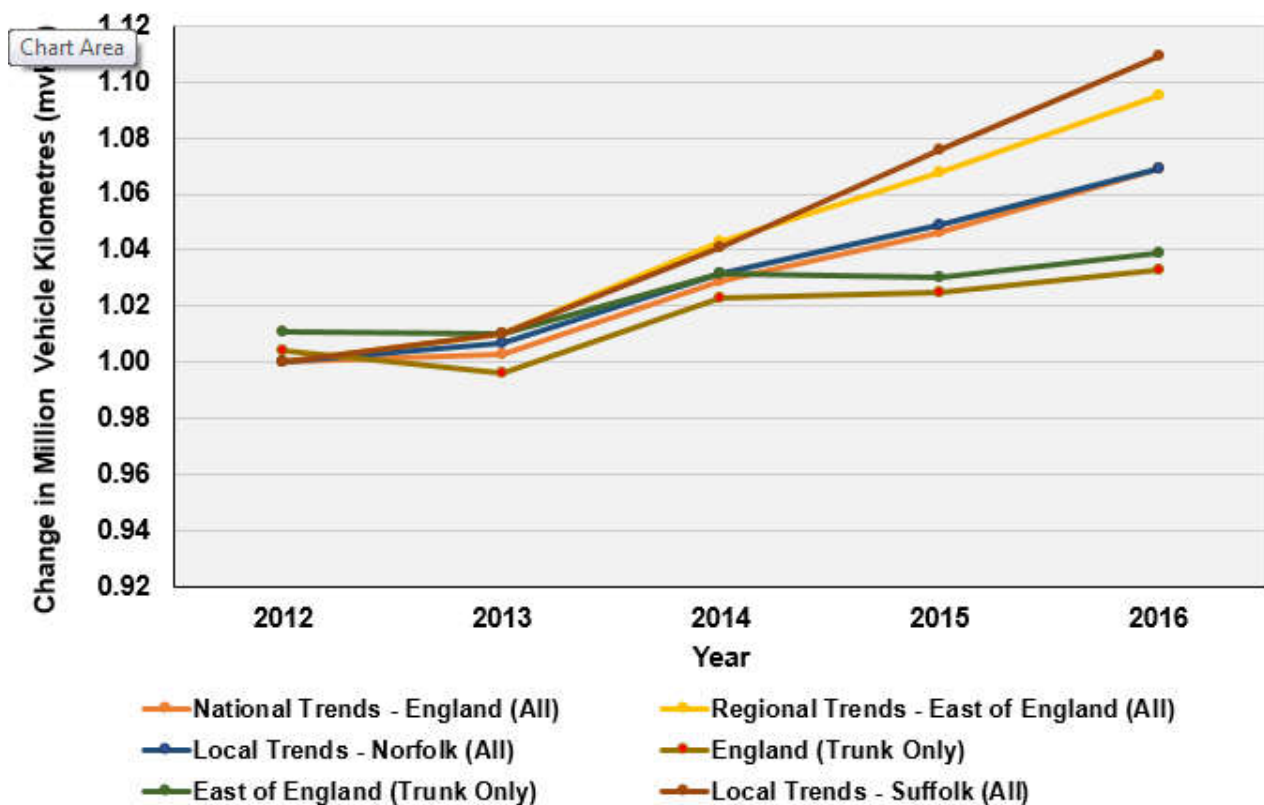
Background Changes in Traffic

- 2.3. Over time, traffic flows change without a change to the road network, and this can depend on other outside factors such as the economic climate, residential and non-residential developments and wider growth. This POPE study has taken a considered approach in order to assess changes in the vicinity of the scheme, within the context of national, regional and locally observed background changes in traffic.

National, Regional and Local Trends

- 2.4. The Department for Transport (DfT) produces observed annual statistics for traffic flows by local authority and road type. Data between 2012 (before construction began) and 2016 (the latest available) is shown in million vehicle kilometres (mvkm) for Norfolk and Suffolk, the East of England and England in Figure 2-1. Changes in mvkm travelled on trunk roads in England and the East of England are also shown. Note that data for Norfolk as well as Suffolk has been included as the scheme lies partly in each county.

Figure 2-1 National, Regional and Local Trends (mvkm Travelled)



2.5. The main points to note from Figure 2-1 are as follows:

- Overall from 2012 to 2016, there has been an increase in mvkm travelled nationally, regionally and locally on all roads.
- There has been an increase of approximately 7% on all roads in Norfolk and 11% in Suffolk between 2012 and 2016, and similarly there has been an increase of approximately 7% on all roads in the East of England as a whole.
- Considering trunk roads only, there has been a smaller increase of approximately 3% in the East of England and an increase of 2% for England as a whole.

Long-Term Traffic Trends

2.6. In order to establish the degree of changes that can be attributed to the scheme, changes in traffic flows on the A11 have been considered. An evaluation would normally consider yearly flows, comparing pre- and post-scheme traffic volumes, on the scheme section. However, due to limited data availability on the A11 on the scheme section, flows for a traffic count site further along the A11 in Thetford have been compared in 2012 (immediately pre-scheme) and 2015 (immediately post-scheme). Although not specifically on the scheme section, the data can provide an indication of the changes in traffic volumes. The changes between the pre- and post-scheme period for average weekday traffic (AWT) are presented in Table 2-1.

Table 2-1 Change in AWT

Site: A11, Thetford	AWT (Two-Way)	Change
January 2012 – December 2012 (Pre-Scheme)	31,200	-
January 2015 – December 2015 (Post-Scheme)	38,300	23%

- 2.7. The data shows that flows on the A11 have increased more than local, regional and national trends. Although this data was only available up to 2015, and the A11 post-scheme period which has been considered is in 2016, traffic flows on the A11 appear to be higher than in the wider area in 2015, and so it can be assumed that 2016 trends are similar. An increase in traffic is to be expected with the conversion of a single carriageway to a dual carriageway due to the extra capacity, as was the case with this scheme.
- 2.8. The monthly changes in traffic volumes by direction for the site are shown in Figure 2-2, with the construction start and end dates illustrated.

Figure 2-2 Monthly Changes in Traffic, A11



- 2.9. The data shows that the northbound and southbound daily flows for the A11 follow very similar patterns, with some indication of seasonality evident. The lowest traffic volumes have been observed in December and January, with higher flows seen in summer months, due to the addition of holiday traffic.
- 2.10. It is also evident that traffic has increased since the introduction of the scheme. Prior to the scheme opening, traffic volumes were relatively similar year to year. Following the opening of the scheme in December 2014, traffic volumes have increased, peaking at approximately 21,000. This suggests that the scheme has had an impact on traffic using the A11 almost immediately.

Conclusions on Background Growth

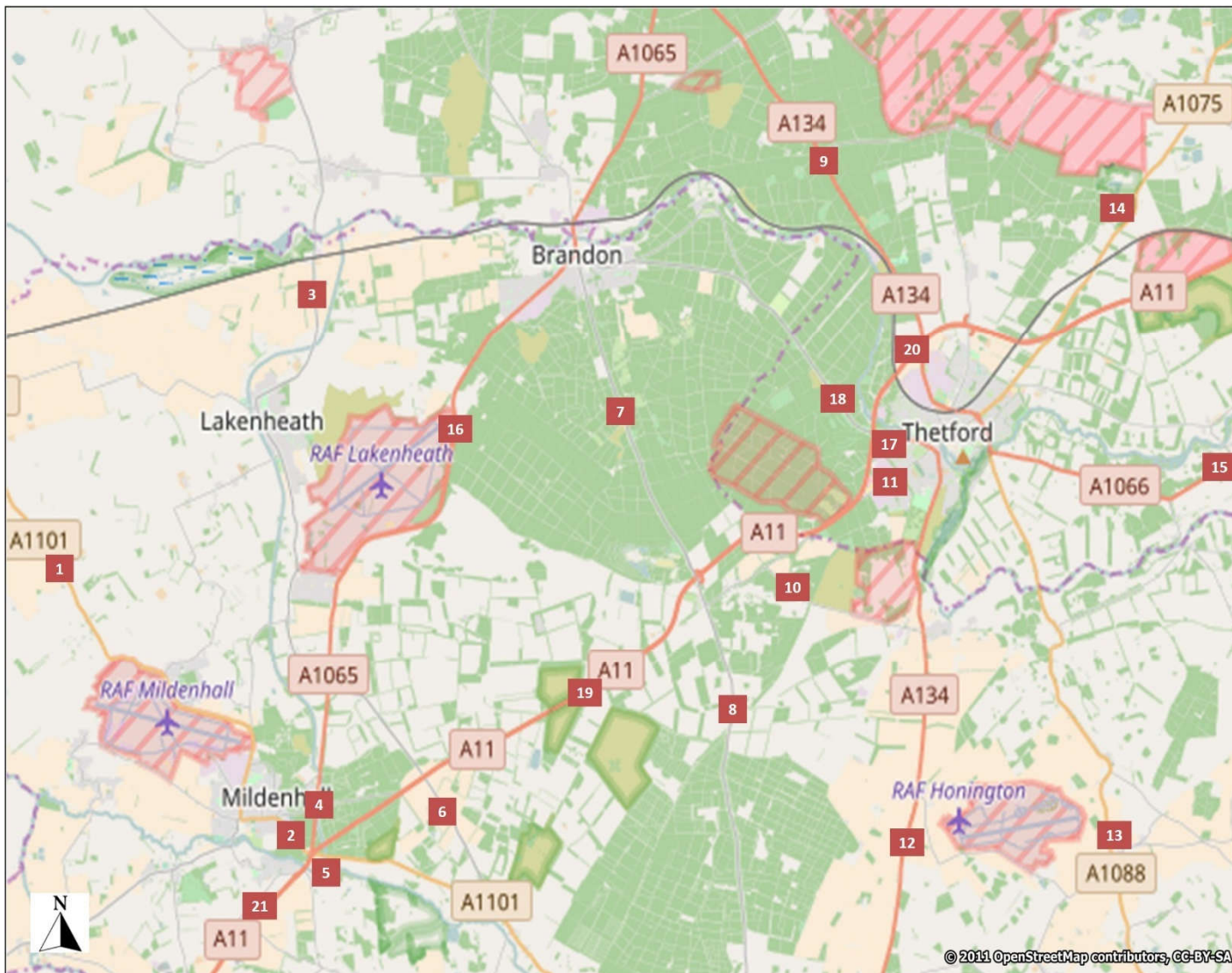
- 2.11. The analysis of background traffic changes show national, regional and local trends on all roads between 2012 and 2015 have increased, but traffic flows on the A11 have increased more than this between the pre- and post-scheme periods (by approximately 23%). It should be noted traffic flows presented in this report have not been adjusted to reflect background changes, and so it is important to keep in mind that some element of any increases could be due to the background traffic growth. No factors have been applied as later in this chapter flows are compared to forecasts, which are only available for hour periods, and there is no reliable way to factor hourly flows by background growth and any attempt would introduce error.

Traffic Volume Analysis

Data Sources

- 2.12. This section of the evaluation uses several data sources to consider the pre- and post-scheme flows on key routes and in the vicinity of the scheme. This is to understand whether any changes in traffic flows are likely to be attributable to the scheme. Data has been collected from before construction of the scheme (January 2013) and after construction had finished (December 2014) for neutral periods. The data has been obtained from Highways England's online database of long term traffic counts (WebTRIS) where possible, although it is noted that there was no flow data available on the A11 scheme section until March 2017 due to issues with the traffic counting device. Furthermore, there is limited pre-scheme data available on the A11 in the northbound direction, and as such, pre-scheme data for this site has been calculated by factoring counts from other sites further north and south on the A11. In addition to permanent count data obtained from the TRADS and WebTRIS databases, this section has been supplemented with alternative data sources, as follows:
- Count data obtained from Suffolk County Council for routes in the vicinity of the scheme (both pre- and post-scheme);
 - A turning count provided in a Transport Assessment compiled to assess the potential impacts of the new service station at Fiveways Roundabout (pre-scheme); and
 - Temporary traffic count data provided by Highways England, specifically located around Fiveways Roundabout (post-scheme).
- 2.13. The approximate locations of the traffic count sites are shown in Figure 2-3.

Figure 2-3 Traffic Count Sites

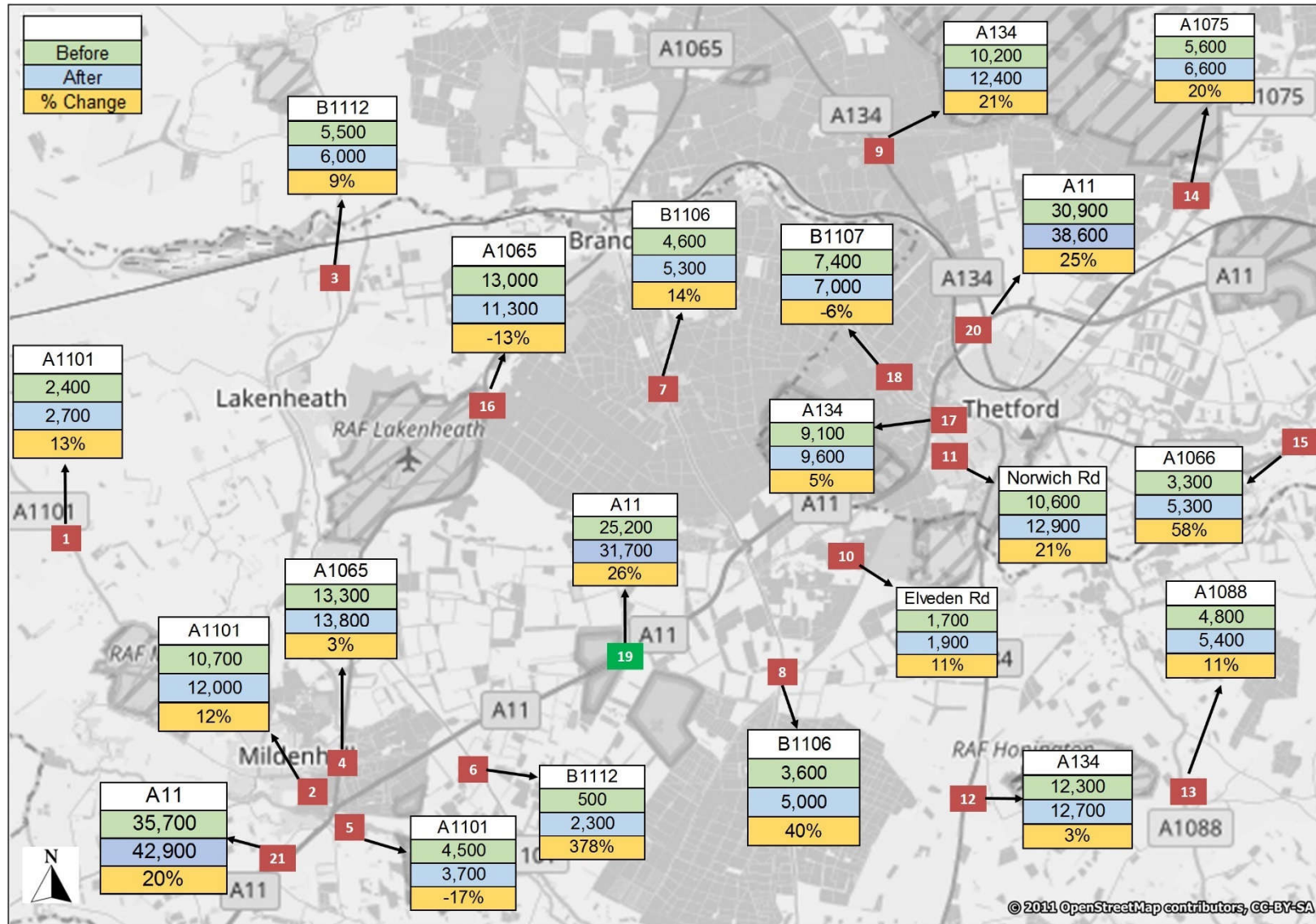


Count Site	Description
1	A1101 north-west of Fiveways Roundabout
2	A1101 West, near Fiveways Roundabout
3	B1112 near Lakenheath
4	A1065 near Fiveways Roundabout
5	A1101 East, near Fiveways Roundabout
6	B1112 between Mildenhall Road and A11
7	B1106 north of A11
8	B1106 south of A11
9	A134 between Lynford and Thetford
10	Elveden Road between Elveden and Barnham
11	Norwich Road, west of Thetford
12	A134 south of Thetford
13	A1088 south of Thetford
14	A1075 north-east of Thetford
15	A1066 east of Thetford
16	A1065 Brandon Road, north of Fiveways Roundabout
17	A134 east of A11
18	B1107 between Brandon and Thetford
19	A11 between Fiveways Roundabout and Thetford
20	A11 Thetford Bypass
21	A11 Red Lodge

Observed Flows

- 2.14. Pre-scheme (2012) and post-scheme (2016, reflecting the data available) two-way average weekday traffic (AWT) flows have been compared to understand how traffic has changed since the introduction of the scheme. Note that the flows have been rounded to the nearest 100 and should be regarded as an indication of traffic flows only. The change in flows between the pre- and post-scheme periods has been presented as a percentage. Note that percentages are based on the exact numbers rather than the rounded figures. This information is shown on the map in Figure 2-4.

Figure 2-4 Changes in AWT (Two-Way)



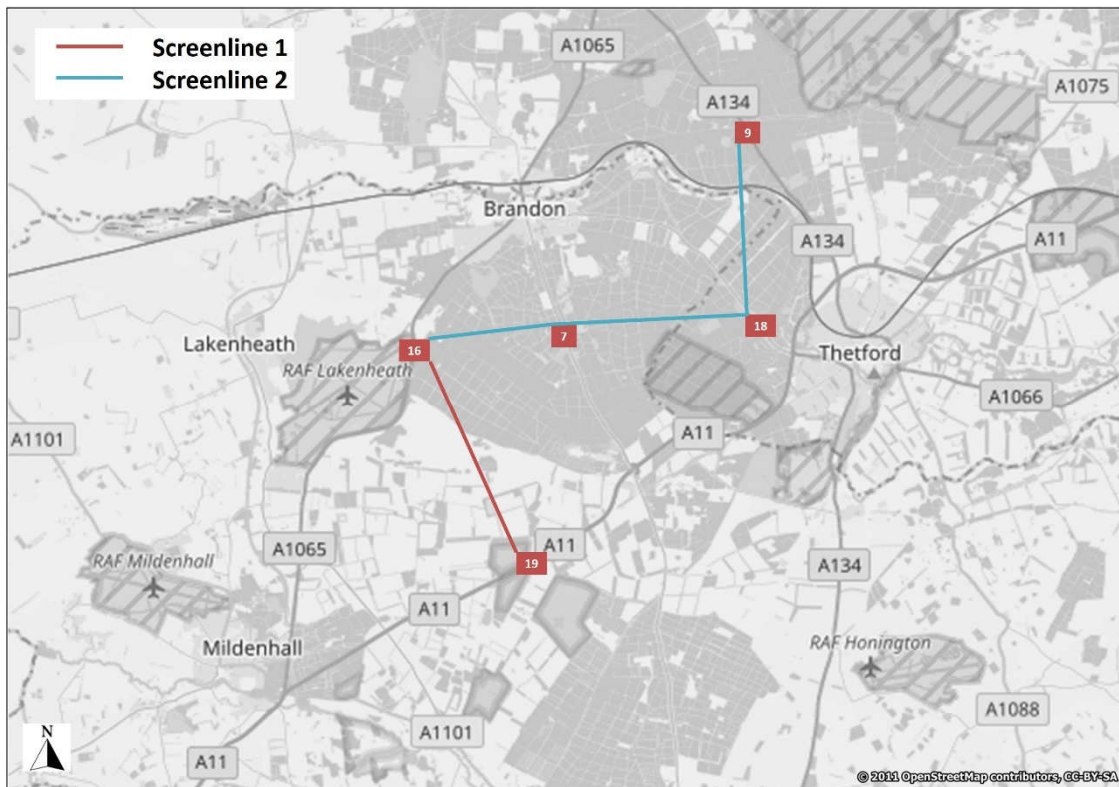
2.15. The key points to note from Figure 2-4 are as follows:

- Two-way traffic flows have increased on most links, with some smaller increases of 3% which are likely to be attributable to background traffic growth.
- The highest proportional increase is at Site 6, which is on the B1112. Pre-scheme, there were relatively few vehicles travelling through this section, whereas post-scheme this has increased by over 350%. This is likely to be due to vehicles re-routing along the B1112, rather than routing via the A1101 and A1065 and passing through Fiveways Roundabout, following the provision of an underpass for the A11 as part of the scheme, making this route more attractive. Prior to the scheme and the underpass, there was a staggered crossroads arrangement in place which could have been a less attractive option for drivers.
- Traffic flows on the A11 between Fiveways Roundabout and Thetford (the scheme section, Site 19) have increased between the pre- and post-scheme periods, by approximately 26%. Despite the increase in background traffic growth, in part this increase is likely to be due to the scheme making the A11 a more attractive route. However, due to traffic data availability issues, this is based on a relatively small data selection, and so the five year after opening evaluation should consider longer term post-scheme flows on this section.
- There have been some increases in traffic near to Fiveways Roundabout, with flows at Site 2, the A1101 West (Bury Road) experiencing a 12% increase in traffic flows. However, flows have only increased by 3% on the A1165 (Site 4), although a count site further north (Site 16) along this route suggests there has been a decrease of 13%. The change of 3% may not be indicative of a change as a result of the scheme, as traffic counts are only accurate to +/-10%. Therefore, it is more likely that the reduction in traffic observed further north on the A1065 is due to the scheme. It is possible that traffic is routing along the A11 to travel to Brandon and other areas to the north of the scheme, as it is likely to now offer a quicker route. This is because the dualling of the A11 will have increased the speed of the route and there is now a split-level junction at Elveden Crossroads offering improved access to the B1106. Indeed, online journey planners suggest that taking this route is a quicker route than using the A1065 to Brandon.
- Furthermore, there has been an increase in traffic flows at Site 7 and Site 8, implying that more drivers are routing along the A11 and using the split-level junction at Elveden than previously used Elveden Crossroads.

Screenline Analysis

- 2.16. To further understand the traffic volume changes and to investigate whether there has been any re-routing as a result of the scheme, two screenline analyses have been undertaken using the screenlines identified in Figure 2-5. These try to account for a wider change in traffic and are based on the changes shown in Figure 2-4. Traffic crossing screenlines represents vehicle movements across a wider corridor and can therefore better represent traffic flow changes than by studying individual roads in isolation.
- 2.17. The first strategic screenline selected for this study is the east to west routes from the A1065 to the A11, and the second considers movements to Brandon, to the north of the A11.

Figure 2-5 Screenline Analysis



2.18. The screenline analyses use data from the data sources previously discussed and provide an indication of whether traffic has been redistributed following the implementation of the scheme. The traffic flows for the screenline analyses are presented in Table 2-2.

Table 2-2 Screenline Analysis

	Description of Site	Two Way Traffic Flow (AWT)			
		Before (2012)	OYA (2016)	Difference	Percentage Difference
Screenline 1	Site 16 (A1065)	13,000	11,300	-1,700	-13%
	Site 19 (A11, scheme section)	25,200	31,700	6,600	26%
	Screenline Total	38,200	43,000	4,900	13%
Screenline 2	Site 16 (A1065)	13,000	11,300	-1,700	-13%
	Site 7 (B1106)	4,600	5,300	700	14%
	Site 18 (B1107)	7,400	7,000	-400	-6%
	Site 9 (A134)	10,200	12,400	2,200	21%
	Screenline Total	35,200	35,900	700	2%

Change may not total difference due to rounding.

2.19. The screenline analysis shows that traffic volumes have increased on the A11 and decreased on the A1065, which is an indication that traffic reassignment has occurred onto the A11. The

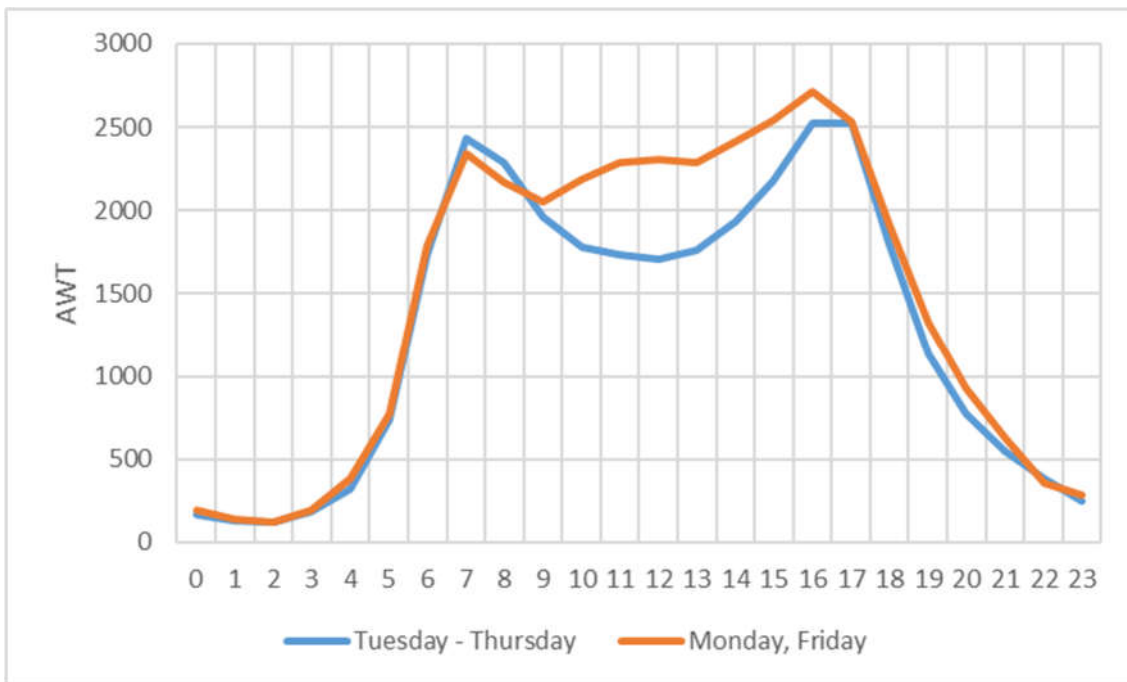
A11 could offer drivers a more attractive route to Brandon using the new split-level junction onto the B1106.

- 2.20. Furthermore, the screenline analyses shows that the decrease in traffic at Site 16 (on the A1065) has been countered by an increase of 14% at Site 7 (on the B1106). This supports the theory that traffic now uses the A11 scheme section to reach Brandon and areas further north, rather than the A1065. Similarly, there has been an increase in traffic at Site 9 (on the A134), suggesting that drivers now use the A11 up to Thetford to access areas to the north of Brandon, rather than travelling northbound along the A1065 from Fiveways Roundabout.

Daily Flow Profiles

- 2.21. Due to the location of the Center Parcs holiday village along the B1106, which is accessed via the scheme section of the A11, it is important to consider whether the trips to and from the holiday village impact on the A11. As such, the daily flow profile of the A11 has been considered and is presented in Figure 2-6. The average flows are presented for Tuesday – Thursday and for Monday and Friday separately. This is because the changeover days at the holiday village are Monday and Friday, and so these have been isolated in order to understand whether they have any impact on the daily flow profile. Note that the data has been obtained from the count site along the A11 for the month of March 2017.

Figure 2-6 Post Opening Daily Flow Profiles (Two-Way)



- 2.22. The graph shows that Tuesdays to Thursdays experience a daily flow profile which is typical for UK roads: a low overnight flow increasing to a high AM peak, with flows decreasing slightly during the day before increasing again to a PM peak. However, the Monday and Friday daily profiles differ. The AM peak is still experienced, but traffic flows remain high throughout the day between around 09:00 and 16:00. This indicates that Center Parcs changeover days (where holidaymakers leave the village at approximately 10:00 and are permitted to enter at approximately 14:00) have an impact on the flow profile in the vicinity of the scheme. Therefore, journey time analysis undertaken later in this chapter will consider a separate inter-peak period to account for the impact of Center Parcs.

Heavy Goods Vehicle Traffic

- 2.23. Table 2-3 presents the changes in Heavy Goods Vehicle (HGV) proportions as total flow and percentage of total flow on the scheme section of the A11. For the purposes of this report, the classification of an HGV is a vehicle over 6.6 metres in length. Note that there is no HGV data in the northbound direction pre-scheme and that 2017 has been used for post-scheme data due to limited data availability.

Table 2-3 Weekday HGVs

	Direction	March 2012	March 2017	Change in proportion
		AWT and HGVs as Percentage of Total Flow	AWT and HGVs as Percentage of Total Flow	
A11 (scheme section)	Northbound	-	2,900 (18%)	-
	Southbound	2,200 (17%)	2,300 (14%)	-3%

Change may not total difference due to rounding.

2.24. The table shows that in the southbound direction, there is no real change in the number of HGVs, as there has only been a change of 3%. In terms of percentage of HGVs as part of total traffic, post opening appears to represent a lower proportion, indicating that growth in non-HGV traffic has increased more than HGVs. However, there is limited data available on the scheme section, and this should be taken as a guide only. When considering changes for a count site further south of Fiveways Roundabout, there has not been a change in the percentage of HGVs.

Turning Count Analysis

2.25. Although not the main focus of the A11 Fiveways to Thetford scheme, some changes were made to Fiveways Roundabout, with an interim technical note on the operation of this roundabout requested by Highways England in February 2017, as previously mentioned. This was requested due to concerns over the residents of Mildenhall accessing the roundabout.

2.26. A turning count analysis using pre- and post-scheme turning counts (not commissioned by POPE) has therefore been undertaken. This provides a useful insight into movements at the junction. The full turning count analysis is presented in Appendix B. The main points to note from the analysis are as follows:

- During the AM peak, there are increases in vehicle flows on the A11 North of Fiveways and A11 South of the junction. The largest increase is experienced on the A11 North where a 64% increase was observed.
- There have been reductions in the level of traffic travelling from the A1101 East towards the A11 South, and in the opposite direction from the A11 South towards the A1101 East. It is possible that this route was used as an alternative route to avoid queuing on the A11 North pre-scheme to reach locations south of Thetford. Post-scheme, drivers appear to be travelling along the A11 North.

Forecast Traffic Flows

2.27. This section provides a comparison of the observed traffic flows following the scheme opening at key sites in the area with those forecast in the appraisal. To do so, it is necessary to understand the appraisal approach and key assumptions underpinning the appraisal, as this may assist in understanding any potential differences between the forecast and observed impacts.

Appraisal Traffic Modelling and Forecasting

2.28. An updated SATURN traffic model report was produced by Jacobs in 2010 to model the proposed A11 Fiveways to Thetford improvements. The model report presents the impact of the scheme in the 'Do Something 1' scenario (DS1). This scenario includes the introduction of the A11 Fiveways to Thetford scheme without the signalisation of Fiveways Roundabout. To provide a consistent post-scheme comparison, the model output flows have been interpolated to 2016 using the available forecast data. The forecasts were provided for the following periods:

- AM peak (08:00 – 09:00);
- Off-peak (average of 07:00 – 08:00, 09:00 – 17:00 and 18:00 – 19:00); and
- PM peak (17:00 – 18:00).

Forecast vs. Observed Traffic Flows

- 2.29. Forecasts for the Do Nothing (DN) scenario – without the scheme – were available (rather than Do Minimum, which may have involved some changes, such as signalisation of Fiveways Roundabout) and have been used in this forecasting section, along with the Do Something - with the scheme – forecasts. Forecast traffic flows for the hours specified above have been compared with observed flows during the same periods for the key sections in the vicinity of the scheme. These are presented in Table 2-4. Note that observed flows are based on data from the relevant traffic count sites used earlier in this section.
- 2.30. Note that the impact of the service station which was constructed between the A1101 West (Bury Road) and A1065 was not explicitly included in the forecasting.

Table 2-4 Observed vs. Forecast Hourly Traffic Flows

Time Period	Location	Direction	Forecast			Observed			Forecast-Observed Pre Difference	Forecast - Observed Post Difference
			DN (2012)	DS (2016)	Difference	Pre (2012)	Post (2016)	Difference		
AM Peak	A1065 near Fiveways Roundabout	NB	520	520	0 (0%)	320	320	0 (0%)	-200 (-38%)	-200 (39%)
		SB	590	540	-50 (-8%)	570	390	-180 (-32%)	-30 (-5%)	-150 (-27%)
	A11 North of Fiveways Roundabout	NB	850	1,090	240 (28%)	-	1,120	-	-	30 (3%)
		SB	1,020	1,650	630 (62%)	970	1,350	380 (39%)	-50 (-5%)	-300 (-18%)
	A1101 Mildenhall Road	EB	280	170	-110 (-39%)	160	140	-20 (-13%)	-120 (-43%)	-40 (-21%)
		WB	440	260	-180 (-41%)	240	190	-50 (-21%)	-200 (-45%)	-70 (-27%)
	A1065 North of B1112	NB	490	470	-20 (-4%)	280	260	-20 (-7%)	-210 (-44%)	-210 (-45%)
		SB	540	500	-40 (-7%)	430	320	-110 (-26%)	-110 (-21%)	-170 (-35%)
Off-Peak	A1065 near Fiveways Roundabout	NB	340	300	-40 (-12%)	410	380	-30 (-7%)	70 (16%)	80 (27%)
		SB	550	510	-40 (-7%)	410	360	-50 (-12%)	-140 (-34%)	-150 (-29%)
	A11 North of Fiveways Roundabout	NB	940	1,170	230 (24%)	-	1,070	-	-	-110 (-9%)
		SB	870	1,150	280 (32%)	840	1,050	210 (25%)	-40 (-4%)	-110 (-9%)
	A1101 Mildenhall Road	EB	250	210	-40 (-16%)	150	120	-30 (-20%)	-110 (-74%)	-120 (-51%)
		WB	240	200	-40 (16%)	150	130	-20 (-13%)	-90 (-64%)	-80 (-39%)
	A1065 North of B1112	NB	360	330	-30 (-8%)	430	370	-60 (-14%)	70 (15%)	50 (15%)
		SB	510	490	-20 (-4%)	420	390	-30 (-7%)	-90 (-22%)	-100 (-21%)
PM Peak	A1065 near Fiveways Roundabout	NB	430	410	-20 (-5%)	580	510	-70 (-12%)	140 (25%)	100 (24%)
		SB	530	450	-80 (-15%)	610	420	-190 (-31%)	70 (12%)	-30 (-7%)
	A11 North of Fiveways Roundabout	NB	1,270	1,640	370 (29%)	-	1,750	-	-	110 (6%)
		SB	920	1,160	240 (26%)	860	1,010	150 (17%)	-60 (-6%)	-150 (-13%)
	A1101 Mildenhall Road	EB	210	80	-130 (-62%)	230	150	-80 (-35%)	20 (9%)	80 (104%)
		WB	290	310	20 (7%)	230	180	-50 (-22%)	-60 (-28%)	-130 (-42%)
	A1065 North of B1112	NB	520	420	-100 (-19%)	590	460	-130 (-22%)	70 (11%)	40 (9%)
		SB	600	580	-20 (-3%)	410	400	-10 (-2%)	-190 (-48%)	-181 (-31%)

Change may not total difference due to rounding.

- 2.31. The key points on the traffic forecast accuracy to note from Table 2-4 are as follows:
- The observed 2016 traffic flows are below forecast in the AM peak, with observed traffic flows being inconsistently higher and lower than forecast in the off-peak and PM peak periods. However, data availability issues may have impacted this analysis, and longer-term traffic counts should be used to compare the scenarios at the five years after opening stage.
 - The DS forecasting assumes that the dominant movement in the AM peak is southbound on the A11, while in the PM peak this is reversed and the dominant flow is in the northbound direction. This is mirrored in the observed data, with traffic flows following this tidal pattern.
 - The observed 2016 A11 northbound traffic flows are among the closest to forecast, with the observed northbound AM peak flow being just 3% above forecast.
 - Generally, where an increase or decrease in traffic flows was forecast between the DN and DS scenarios, this pattern was followed in the observed pre- and post-scheme flows, with the exception of in the westbound direction on the A1101 Mildenhall Road.
 - There appears to be a large percentage difference between traffic observed in 2016 on the A1101 Mildenhall Road eastbound and that forecast. However, these are relatively small numbers of traffic.
 - Generally, the DN forecast flows were higher than the 2012 observed flows.
- 2.32. In summary, the observed flows are considered to be generally lower than forecast in the area. However, there are discrepancies among the results, with some time periods showing observed flows much higher or lower than others. This could be due in part to the fact that the junction is slightly different to that which was modelled in the forecasting report, as there is the addition of the service station which provides a route between the A1101 (Bury Road) and the A1065.

Journey Times

- 2.33. This section of the report considers the impact of the scheme on journey times along the length of the scheme. The analysis compares the journey time differences on the A11 between Fiveways and Thetford pre-scheme with those along the new route including the Elveden Bypass post-scheme. Journey times are then compared to forecast journey time savings on this route. Journey times have also been analysed for a further two routes on approach to Fiveways Roundabout, as part of the interim POPE report. These are the A1065 and A1101 West (Bury Road) approaches to the roundabout.

Data Sources

- 2.34. Satellite navigation³ data for the two routes on the approach to Fiveways Roundabout has been used to compare pre- and post-scheme journey times. This data was not available for the A11 scheme section, and so journey times for this section have been obtained from Trafficmaster data.
- 2.35. Journey times for a month from mid-September to mid-October 2012 (pre-scheme) have been compared to the same period in 2016 (post-scheme). This was selected as a neutral period during which no other construction took place. Furthermore, additional work has been carried out at Fiveways Roundabout following the opening of the scheme, including implementing signs, adjustment of the lining on the approach to the junction and resurfacing works. In addition, the area between the A1101 West (Bury Road) and the A1065 was developed into a service station. The post-opening period used here is after these works were all completed.

³ Motorists who use satellite navigation devices have the option to voluntarily allow anonymous data about their journeys to be collected and use to provide a range of services, including the analysis of historic journey times along specific routes.

- 2.36. Journey times have been collected for the following time periods:
- AM peak (Monday – Friday, 08:00 – 09:00);
 - PM peak (Monday – Friday, 17:00 – 18:00);
 - Off-peak (Monday – Friday, 07:00 – 08:00, 09:00 – 17:00 and 18:00 – 19:00, A11 route only for forecast comparison);
 - Inter-peak (Tuesday – Thursday, 09:00 – 17:00); and
 - Center Parcs inter-peak (Monday and Friday only, 09:00 – 17:00).
- 2.37. Note that the separate daytime period on Mondays and Fridays allows the impact of Center Parcs on journey times to be isolated. Analysis of the daily traffic profiles showed that there are higher volumes of traffic on a Monday and Friday during the day, which are the changeover days at Center Parcs. Therefore, the peak has been split to understand whether these influxes of traffic have an impact.
- 2.38. However, in order to ensure robust comparison with forecast impacts, the off-peak period has also been considered for the A11 route. This is a ten-hour period which includes an hour either side of the inter-peak period.
- 2.39. In terms of journey time routes analysed, due to the interest in local routes around Mildenhall for the interim POPE report, journey times were obtained for those travelling south along the A1065 towards Fiveways Roundabout and exiting at the A11 South arm, as well as for those travelling from the A1101 West towards Fiveways Roundabout, also exiting on the A11 South arm. Analysis of traffic profiles using the available information suggested that these were important movements at the junction from these locations. The third journey time route was the A11 scheme section, between Fiveways Roundabout and Thetford, in each direction. Note that pre-scheme, the journey time route routes through Elveden on the previous A11 route, and the post-scheme route reflects the current A11 arrangement bypassing Elveden. The routes used for this journey time analysis are shown on the following maps.

Figure 2-7 Journey Time Route – A1065 Through Fiveways Roundabout

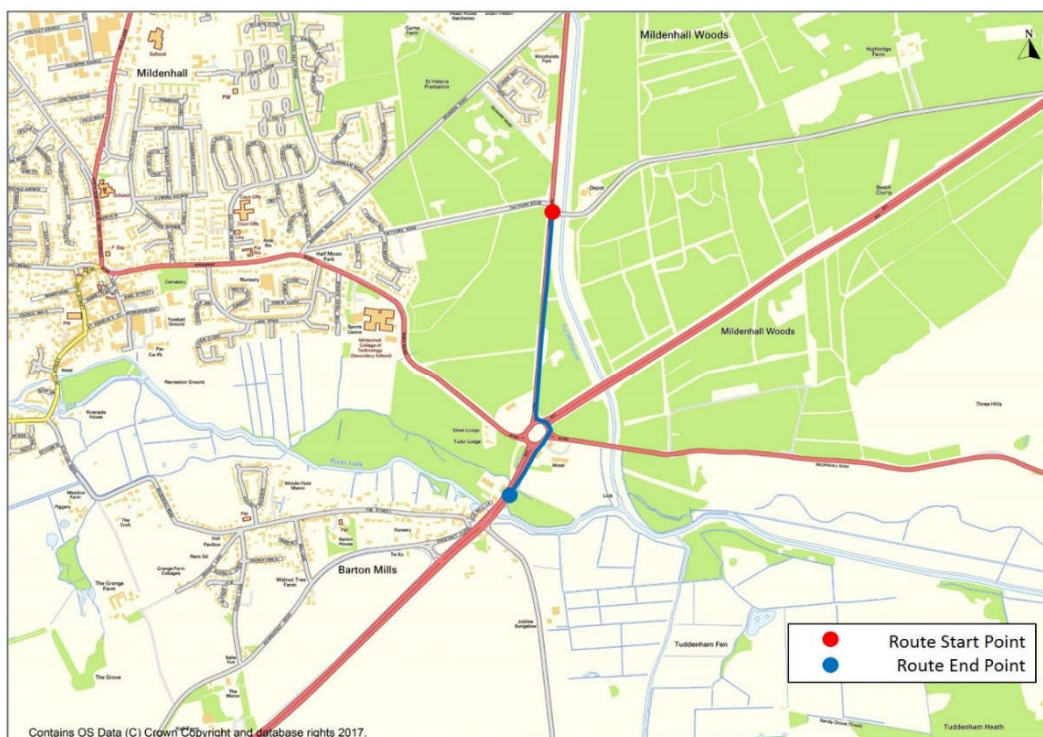


Figure 2-8 Journey Time Route – A1101 West Through Fiveways Roundabout

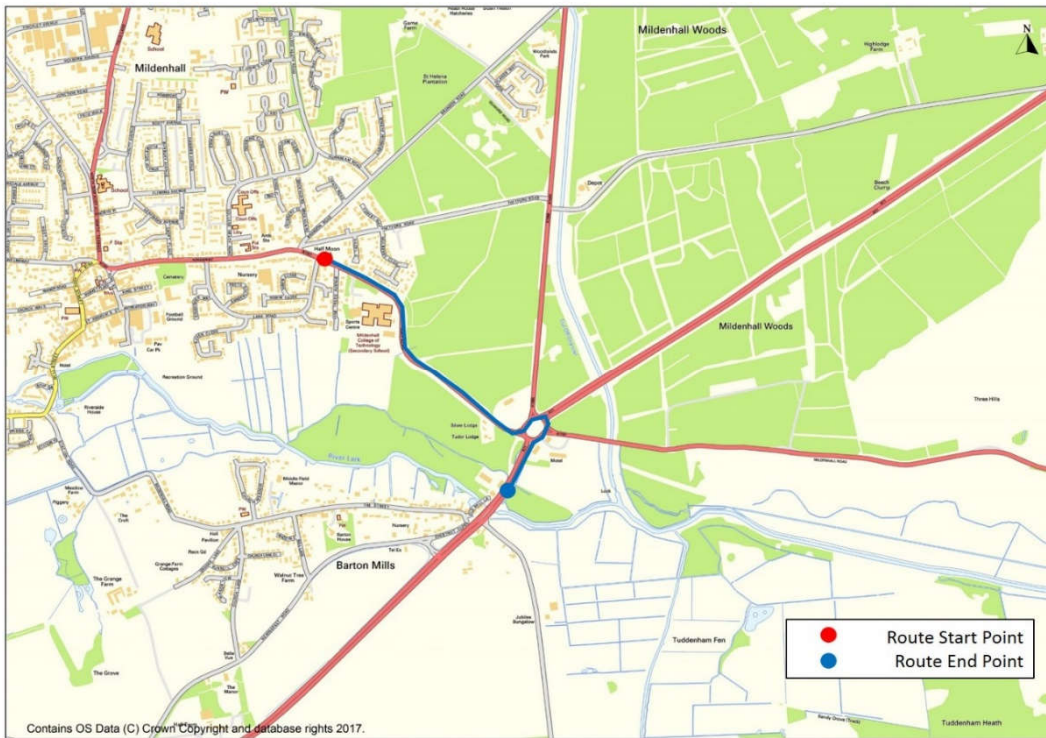
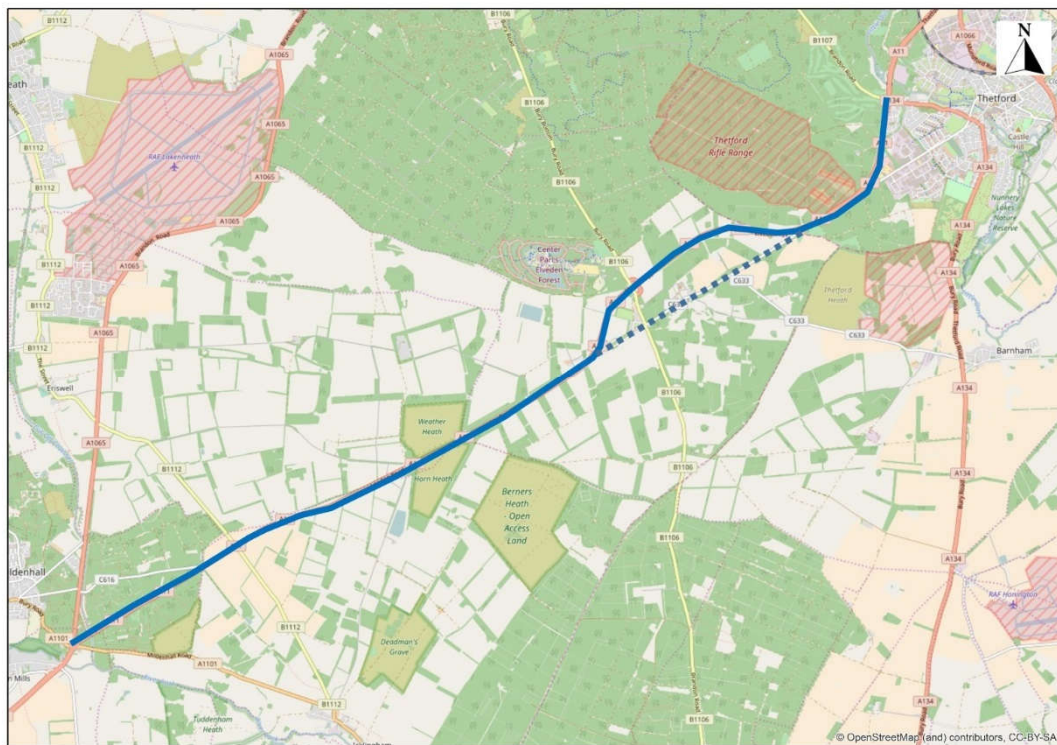


Figure 2-9 Journey Time Route – A11



Observed Journey Times

- 2.40. Observed journey times along the A11 between Fiveways and Thetford have been extracted from Trafficmaster. This records the average vehicle journey time for sections of the UK road network. The analysis has been used to understand journey times at the pre-scheme and this one year after opening post-scheme analysis stage.
- 2.41. Table 2-5 presents the savings between pre- and post-scheme journey times along the length of the scheme, for the northbound and southbound carriageways across the five key time periods.

Table 2-5 Observed Journey Times (mm:ss)

Direction	Time Period	Observed Pre-Scheme	Observed Post-Scheme	Change*	% Change
Northbound	AM Peak	14:18	09:28	- 04:50	- 34%
	PM Peak	17:47	09:22	- 08:25	- 47%
	Off-Peak	15:48	09:30	-06:18	-40%
	Inter-Peak	13:54	09:14	- 04:41	- 34%
	Center Parcs Inter-Peak	19:49	09:39	- 10:10	- 51%
Southbound	AM Peak	17:52	10:42	- 07:10	- 40%
	PM Peak	14:02	09:53	- 04:08	- 30%
	Off-Peak	15:09	10:08	-05:01	-33%
	Inter-Peak	13:55	10:00	- 03:55	- 28%
	Center Parcs Inter-Peak	16:45	10:35	- 06:09	- 37%

Change may not total difference due to rounding.

- 2.42. The key points to note from Table 2-5 are:
- There have been reductions in journey times in all time periods and in each direction. This is despite an increase in traffic on the A11 and can be attributed to the dualling, due to the higher speeds and removal of conflicting movements on the scheme section, as well as the Elveden bypass removing the need for vehicles stopping in the village at the crossroads.
 - In the northbound direction, the longest journey time was in the Center Parcs inter-peak, at over 19.5 minutes. This also had the largest journey time decrease in this direction, with journey times reducing by approximately half.
 - In the southbound direction, the largest decrease in journey times was observed in the AM peak, by over 7 minutes. The AM peak experienced the highest journey time pre-scheme in the southbound direction therefore was likely to experience the largest benefit.
 - In the northbound direction for the five key time periods analysed, pre-scheme journey times varied by almost 6 minutes. Post-scheme, journey times across the periods are more consistent, with a variation of just 25 seconds. This suggests that journeys along this route in the northbound direction are substantially more predictable as a result of the scheme.
 - In the southbound direction, journey times varied across the key time periods by almost 4 minutes, whereas post-scheme variability reduced to 49 seconds, showing that journeys along this route are also substantially more predictable since the scheme opened.
- 2.43. The journey time results for the two routes at Fiveways Roundabout are presented in Appendix C. The main points to note from this analysis are as follows:
- Journey time increases are experienced throughout almost all of the time periods for the A1101 and A1065 routes.

- The worst affected time period appears to be the PM peak for both routes, which coincides with the period where there has been the largest increase in flow on the A11 (northbound) suggesting that the A11 flow is dominant, perhaps limiting access for the A1065 and A1101.
- Times of lower flow on the A11 (for example, overnight and inter-peak) have seen less of an impact on these routes, indicating that the level of flow on the A11 is a key element affecting the A1101 West (Bury Road) and A1065.

Forecast vs. Observed Journey Times

- 2.44. The latest forecasting report (Report on Traffic Modelling Volume 1, 2010) does not provide details of the forecast impact of the scheme on journey times. However, there is some indication of journey time savings provided in the Statement of Case (2009) for the A11 scheme section. Therefore, this can be used to compare to the observed savings. It should be noted that the comparisons are for different years and the forecasts are not based on the latest modelling work undertaken, and therefore should be taken as a guide only. Note that there are no forecasts provided for the overnight or weekend periods.
- 2.45. In order to consider how the journey time savings for this scheme compare to forecasts, the forecasts for 2013 have been compared to the observed journey time savings along the A11 route. This is presented in Table 2-6.

Table 2-6 Forecast Vs. Observed Journey Times (mm:ss)

Time Period	Direction	Forecast Saving	Observed Saving	Difference
AM Peak	Northbound	05:46	04:50	-00:56 (16%)
	Southbound	07:16	07:10	-00:06 (-1%)
Off Peak	Northbound	05:23	06:18	00:55 (17%)
	Southbound	05:54	05:01	-00:53 (-15%)
PM Peak	Northbound	13:14	08:25	-04:49 (-36%)
	Southbound	05:52	04:08	-01:44 (-30%)

2.46. The results show that while there have been journey time savings in all time periods and in each direction, the savings are generally slightly lower than those forecast, except in the northbound direction during the off-peak period, where the observed saving is greater than forecast. However, there are still substantial savings during the other time periods, with the nearest saving to forecast being in the AM peak in the southbound direction (a saving of 7 minutes and 10 seconds). The greatest discrepancy between forecast and observed savings is during the PM peak. It is difficult to state why this is the case, as the DN forecast journey time information was not available to make further comparisons. However, it is likely that the appraisal overestimated the level of delay in the PM peak.

Reliability

2.47. A POPE report would normally consider reliability, preferably by considering the percentile speeds before and after the scheme construction. However, due to the type of data available for this evaluation for the A11 journey time route, this method was not possible. The AST did not provide reliability or route stress statistics, and without the appropriate speed percentile or annual traffic information on the scheme section, it is not possible to undertake a reliability analysis. However, reliability graphs were produced for the two Fiveways Roundabout routes for the interim report, and are presented in Appendix C.

Traffic Analysis - Key Points

- There have been general increases in traffic in the area over time, supported by increases in AWT for several sites in the vicinity of the scheme between the pre-scheme and post-scheme periods. For example, there has been an increase in traffic of 26% on the A11 scheme section. The data therefore suggests that the scheme has led to an increase in traffic volumes on the A11. However, this is in part based on factored data from sites to the north and south of the scheme section, due to data availability issues, and so this figure should be used as a guide only.
- There are some differences in the daily flow profile on the A11 observed on Mondays and Fridays, which are affected by the holiday village nearby giving high levels of inter-peak traffic compared with other weekdays.
- Observed 2016 traffic flows are inconsistently higher and lower than forecast during the off-peak and PM peak periods. Generally, forecast flows for the scheme not being in place were higher than the 2012 pre-scheme observed flows.
- There have been reductions in journey times along the A11 scheme section in all time periods assessed. While these savings are not as great as those forecast, they are substantial, with savings of between approximately 4 and 10 minutes.

3. Safety

Introduction

- 3.1. This section considers the impact of the scheme in terms of the level of success in addressing the objective of reducing collisions.
- 3.2. The Appraisal Summary Table (AST) (2012) for the scheme stated that ‘existing road is sub-standard single carriageway with limited opportunities for overtaking & conflict with slow moving & oncoming vehicles. The scheme provides a higher standard road with lower accident rates which translates into a reduction in accidents over the life of the scheme’.
- 3.3. An objective of the scheme (Client Scheme Requirements, 2014) is to ‘Reduce the incident rate of accidents that occurs on both the main carriageway and the junctions’.
- 3.4. In order to assess the impact of the scheme on collisions⁴, this section of the report analyses changes in Personal Injury Collisions (PICs) occurring in the five-year pre-construction period, and the one year post-opening period. Evaluation of the scheme’s impact on personal security has been undertaken through the use of observations made during a site visit.

Sources

Forecasts

- 3.5. Forecasts of the impact of the scheme on safety have been obtained from the AST, and information in the Report on Traffic Modelling (May 2010) which was based on results from the COBA (Cost Benefit Analysis) model. The COBA model input and output files have not been available for this evaluation. The forecast impact on safety is expressed in terms of numbers of PICs 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 of changes in collisions is evaluated in Chapter 4.

Observed Data

- 3.6. Collision data for this study was obtained from the Department for Transport (DfT).
- 3.7. The original appraisal was based on historic data for the period July 2000 to August 2005 inclusive. This report compares the five years prior to the start of construction, with one year of post opening data. The following time periods are covered:
 - Pre-scheme – 1 January 2008 – 31 December 2012 (5 years)
 - Construction – 1 January 2013 – 31 December 2014 (2 years)
 - Post-scheme – 1 January 2015 – 31 December 2015 (1 year)
- 3.8. It should be noted that at this stage, not all the collision data has yet been validated by the Department for Transport (DfT). The requirement for up to date and site specific information necessitated the use of unvalidated data sourced from the local authority. Thus, the data is judged to be sufficiently robust for use in this study, but it may be subject to change. However, it is not anticipated that this would be significant in terms of the analysis of collision numbers presented in this report.
- 3.9. The collision data is based on the records of PICs (i.e. collisions that may involve injuries to one or more persons) recorded in the STATS19 data collected by the police when attending

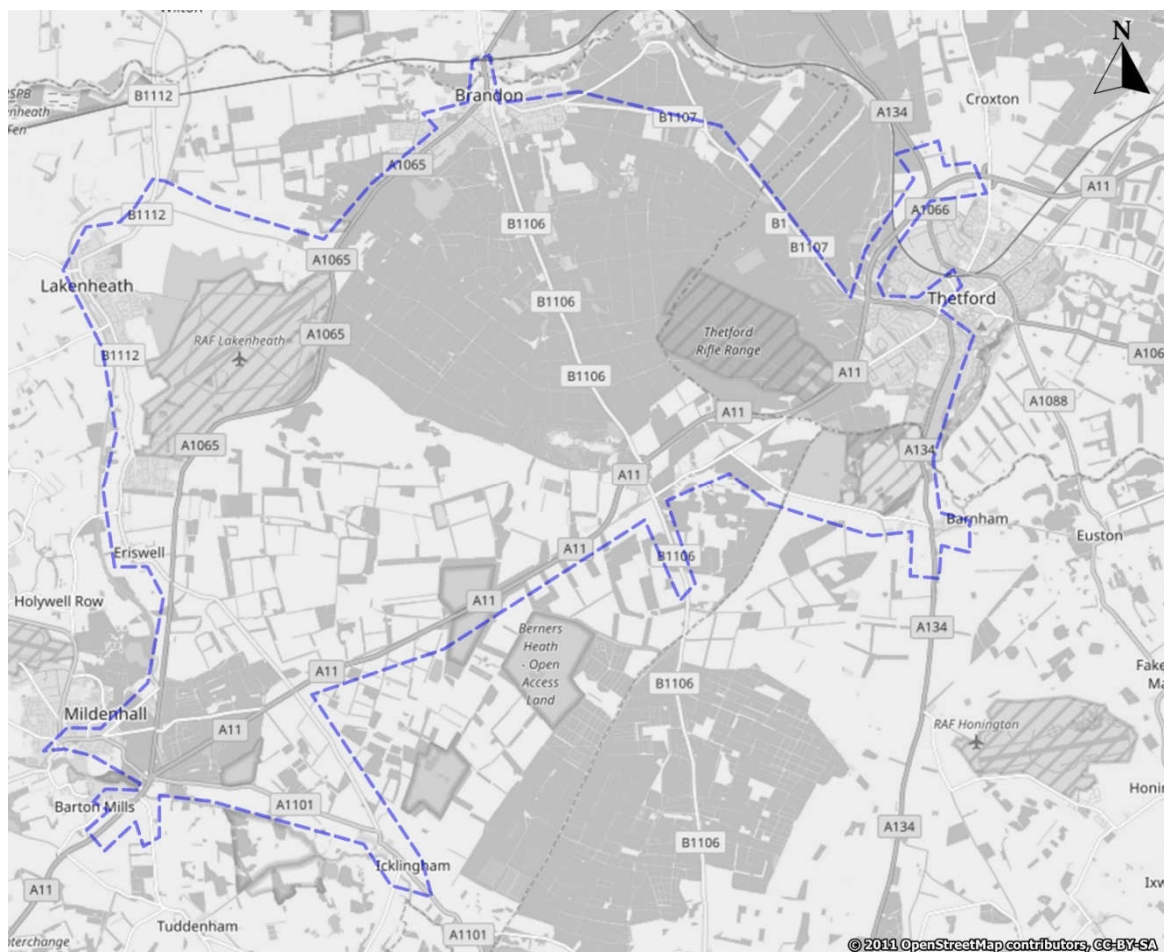
⁴ Collisions used in place of ‘accidents’ in this report, but relate to the same data.

collisions. Collisions that do not result in injury are not included in this dataset and are therefore not considered in this evaluation.

Collision Numbers

- 3.10. This section analyses the observed changes in PICs following the implementation of the scheme. This section includes an investigation into the changes in the number of collisions and associated casualties as well as whether there has been any change in the relative severity of recorded collisions.
- 3.11. Two areas are considered as part of this analysis. A wider area is first looked at, and then further detail is provided regarding the impacts on the key links of the scheme section only.
- 3.12. As earlier noted, the COBA model input and output files have not been made available for this evaluation. However, the Forecasting and Economic Report – Update using 2006 model (December 2007), while superseded, states that the COBA network coverage is the same as that within the SATURN model. For a comparable analysis, a similar area to the SATURN area has been taken forward within this evaluation for the wider area of analysis, based on the mapping of SATURN networks included in the appendices of the Report on Traffic Modelling (2010).
- 3.13. The extent of this analysis area is shown in Figure 3-1. It covers the main routes in the immediate and wider vicinity of the scheme where changes in traffic were anticipated, and hence changes in collisions may occur.

Figure 3-1 Extent of Wider Area of Analysis



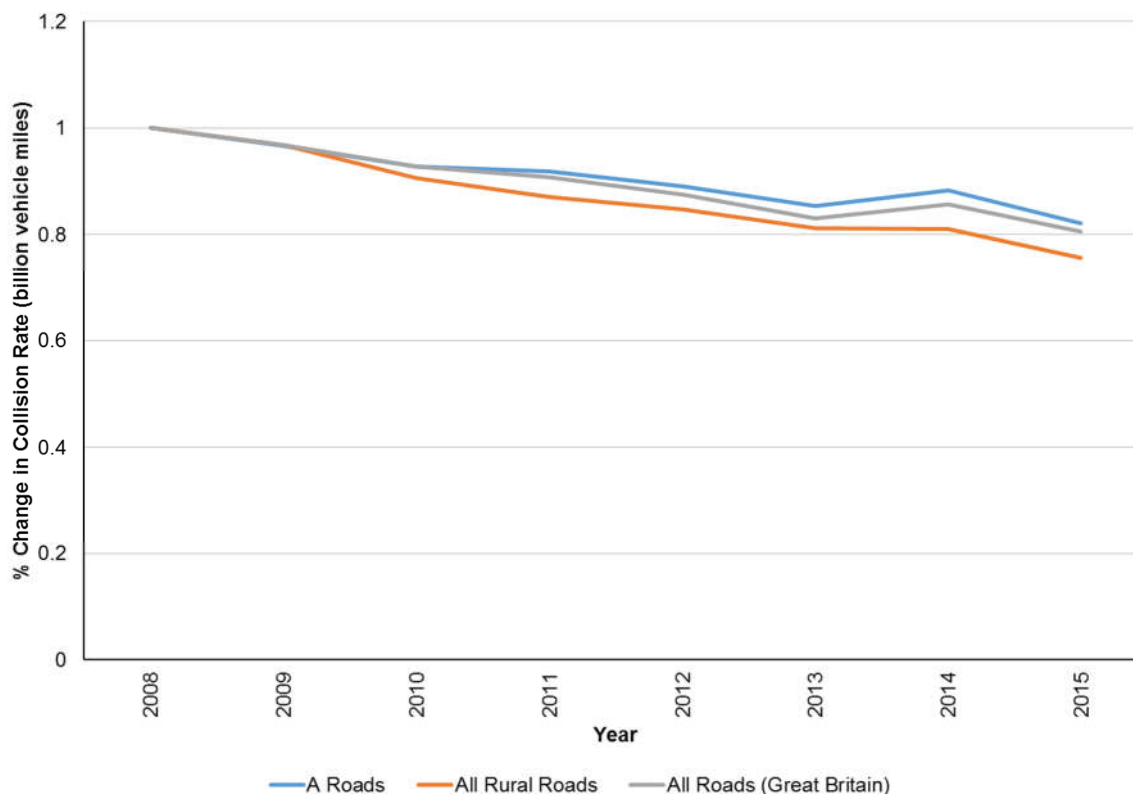
- 3.14. An analysis of collision records for the scheme's key links has also been undertaken to investigate the impact of the scheme on collisions on the directly improved A11 Fiveways to Thetford scheme. This area is the A11 from the Fiveways junction to the Thetford junction.

The Fiveways junction is included as this had some changes as part of the scheme, while the Thetford junction is excluded.

Background Changes in Collision Reduction

- 3.15. It is widely recognised that, for over a decade, there has been a year-on-year reduction in the number of PICs on the roads, even against a trend of increasing traffic volumes during much of that period. The reasons for the reduction are considered to be wide-ranging and include improved safety measures in vehicles and reduced numbers of younger drivers. Consideration of this background trend is needed when considering the changes in collision numbers in the scheme area in the before and after periods. If the scheme had not been built, collision numbers in the area are still likely to have been influenced by wider trends and therefore reduced.
- 3.16. The numbers of collisions in this area in the years before and after the scheme was built are compared. Although the net change is primarily associated with the scheme, this background reduction is considered. The best way to do this is to assume that, if the scheme had not been built, the number of collisions on the roads in the study area here would have dropped at the same rate as they did nationally during the same time period⁵. This gives what is known as a counterfactual scenario. A comparison can then be made between this data for the counterfactual 'without scheme' scenario on a like-for-like basis and the observed post-opening data which is the 'with scheme' scenario.
- 3.17. The difference between the numbers of collisions in these two scenarios can then be attributed to the scheme rather than the wider national trends. This result will inform the calculation of monetised safety benefits achieved by the scheme as discussed in the Economy chapter of this report.
- 3.18. The comparison needed is between the one year after period (2015) and the pre-construction period (2008 to 2012). Figure 3-2 illustrates the changes in collision numbers by road type between 2008 and 2015.

Figure 3-2 Trends in PICs Over Time



⁵ National trend data sourced from DfT table RAS10002

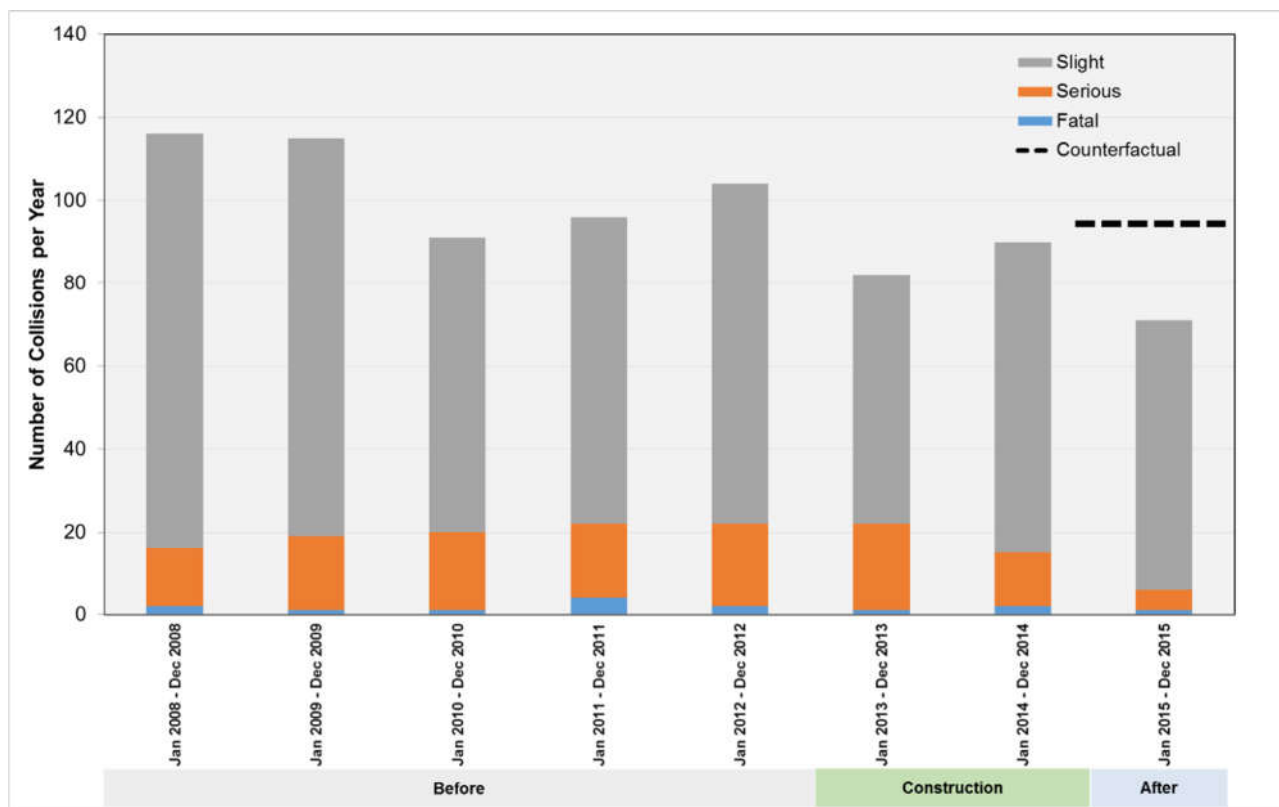
Wider Area: Evaluation of Collision Numbers and Severity

3.19. The evaluation of the before and after collision numbers by year for the scheme modelled area (as shown in Figure 3-1) and the counterfactual number of collisions which could have been expected in the opening year had the scheme not been built, is shown in Table 3-1 and Figure 3-3. The severity of a collision is defined by the most serious injury incurred.

Table 3-1 Number of Collisions by Severity over the Wider Area

Time Period	Date		Number of Collisions				Annual Average			
	From	To	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	All
Pre-scheme	Jan-08	Dec-08	2	14	100	116	2.0	17.8	84.6	104.4
	Jan-09	Dec-09	1	18	96	115				
	Jan-10	Dec-10	1	18	71	91				
	Jan-11	Dec-11	4	18	74	96				
	Jan-12	Dec-12	2	20	82	104				
Application of Counterfactual 0.90										93.6
Construction Period	Jan-13	Dec-13	1	21	60	82	1.5	17.0	67.5	86.0
	Jan-14	Dec-14	2	13	75	90				
Post-scheme	Jan-15	Dec-15	1	5	65	71	1.0	5.0	65.0	71.0
Annual Collision Saving										22.6

Figure 3-3 Number of Collisions by Severity in the Wider Area



3.20. From Table 3-1 and Figure 3-3, it can be seen that:

- The 'without scheme' counterfactual (accounting for the background reduction in collisions over time) is calculated as 93.6 collisions per year. Compared to the post-opening period collision rate, this represents an annual collision saving of 22.6 (24%) collisions a year, suggesting the scheme has had a clear beneficial impact on the frequency of collisions

along the A11 corridor and surrounding roads. As discussed later, this is statistically significant.

- The annual average number of serious and fatal collisions in the study area has reduced by 70%.

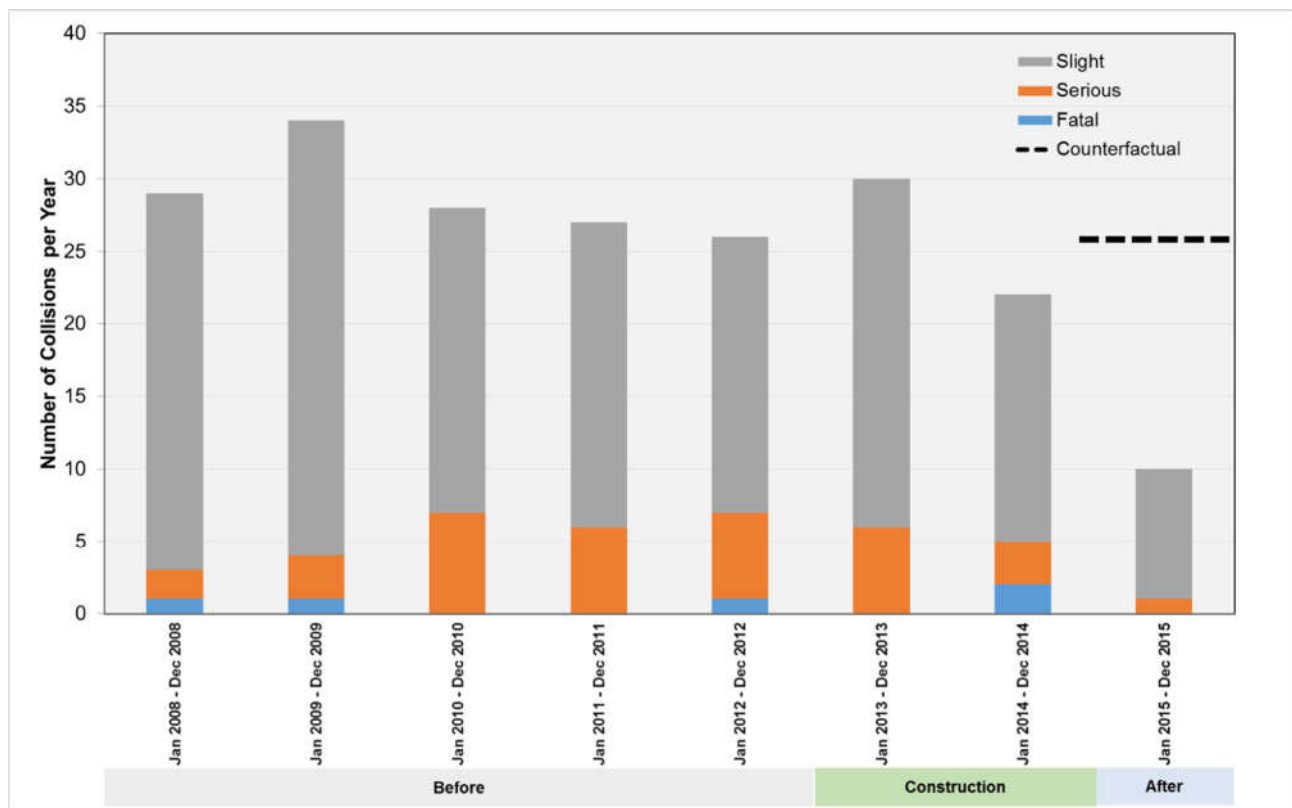
A11 Fiveways to Thetford Key Links Section: Evaluation of Collision Numbers and Severity

3.21. An analysis of the before and after collision numbers by year for the scheme key links is shown in Table 3-2 and Figure 3-4.

Table 3-2 Number of Collisions by Severity on the Scheme Key Links

Time Period	Date		Number of Collisions				Annual Average			
	From	To	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	All
Pre-scheme	Jan-08	Dec-08	1	2	26	29	0.6	4.8	23.4	28.8
	Jan-09	Dec-09	1	3	30	34				
	Jan-10	Dec-10	0	7	21	28				
	Jan-11	Dec-11	0	6	21	27				
	Jan-12	Dec-12	1	6	19	28				
Application of Counterfactual 0.90										25.8
Construction Period	Jan-13	Dec-13	0	6	24	30	1.0	4.5	20.5	26.0
	Jan-14	Dec-14	2	3	17	22				
Post-scheme	Jan-15	Dec-15	0	1	9	10	0.0	1.0	9.0	10.0
Annual Collision Saving										15.8

Figure 3-4 Number of Collisions by Severity on the Scheme Key Links



3.22. Table 3-2 and Figure 3-4 show that:

- The 'without scheme' counterfactual (accounting for the background reduction in collisions over time) is calculated as 25.8 collisions per year. Compared with the post-opening collision level of 10.0 per year, this represents an annual saving of 15.8 collisions (61%).
- The percentage reduction in collisions is higher than the wider area (61% compared to 24%). These results suggest that the scheme has had a direct beneficial impact on the frequency of collisions along the scheme extent more than in the wider area.
- While there was an annual average of 0.6 fatal collisions per annum pre-scheme, none were recorded in the first year after scheme opening. The annual average of serious collisions has reduced by 79% post-opening (when not taking background reduction into account).

Evaluation of Collision Severity Index

3.23. The collision severity index is the ratio of the number of collisions classed as serious or fatal compared to the total number of collisions. A summary of the before and after opening collision severity indices for the A11 scheme section and the wider area is shown in Table 3-3.

Table 3-3 Collision and Casualty Severity Index

Period	Wider Area	Key Links
	Average Collision Severity Index	Average Collision Severity Index
Pre-scheme	19%	19%
Construction	22%	21%
Post-opening	8%	10%

3.24. Table 3-3 shows that there has been a substantial reduction in collision severity between pre-scheme and post-scheme, for both the wider area analysed and the scheme key links.

Statistical Significance of Outturn Collision Impacts

- 3.25. In order to determine whether the changes in collision numbers observed between pre-scheme and post-scheme are statistically significant, Chi Square tests have been undertaken. This test uses the before (counterfactual) and after numbers of collisions to establish whether the changes are significant or are likely to have occurred by chance.
- 3.26. The changes within both the wider area analysed as well as the scheme key links are statistically significant. For the wider area, the test showed that we can be 95% confident that the reduction in the number of collisions within the wider area covered is not due to chance. When analysing the scheme key links in isolation, the test showed that we can be 99% confident that the collision number change is not due to chance.

Contributory Factors

- 3.27. Information on the contributory factors of collisions was included as part of the DfT safety data. Along the scheme extent pre-scheme, the most frequently recurring contributory factors were:
- Driver failed to look properly
 - Driver following too close
 - Driver failed to judge other person's path or speed
 - Sudden braking
- 3.28. This is in line with the AST (2012), which reported pre-scheme safety issues of limited opportunities for overtaking and conflict with slow moving and oncoming vehicles. While analysis for this evaluation includes one year of post-opening data only, there has been a reduction in these contributory factors in the collisions in the post-scheme period.

- 3.29. At Fiveways Roundabout pre-scheme, the most frequently occurring contributory factors to collisions were drivers' failures to judge another person's path or speed and drivers' failures to look properly. Post-scheme, the rate of collisions due to the latter contributory factor slightly increased, while there were no collisions relating to the drivers' failure to judge another person's path or speed.
- 3.30. Due to the limited post-scheme data available at this one year after stage, contributory factors should be considered in more detail at the five year after evaluation stage.

Locations of Collisions

- 3.31. For the A11 corridor and local area, the locations of collisions in Table 3-2 have been examined. While there is limited data available at this one year after opening stage, the key initial findings are:
- The number of collisions on the A11 mainline section of the scheme extent between Fiveways and Thetford has substantially reduced.
 - At the Fiveways junction (including the circulatory and 10m of joining roads), collisions remained relatively in line between pre-scheme and post-scheme periods, with 17 collisions in the five-year pre-scheme period, as compared to 5 in the one year post-opening period. At Fiveways Roundabout, there was one collision in the five-year pre-scheme period which had a serious severity level, while the rest were slight collisions. In the post-scheme period, all collisions at the roundabout were of slight severity. This will be re-evaluated at the FYA stage, but at this point it appears as though there has not been a large change in collisions at this junction. It is noted that there have been some changes to lining and signing at this junction in March 2016.

Consultation Feedback

- 3.32. Mildenhall Parish Council provided feedback relating to safety concerns at Fiveways Roundabout post opening including:
- Fast moving traffic through the roundabout on the A11 'high speed traffic flowing south in the outside lane meets slow moving right turn traffic. Similarly, northbound A11 traffic meets traffic turning across its path into Barton Mills'.
- 3.33. As detailed above, at this early stage there is no indication of a worsening in safety at this junction based on the information available to POPE, although it is noted that the most comment contributory factor in collisions at the junction post opening is failure to look properly.

Forecast vs. Observed Change in Collisions

- 3.34. The AST (2012) and the Report of Traffic Modelling (March 2010) included a 60-year forecast collision number saving of 1,119, including savings on links and at junctions. This was based on a central growth forecast which was considered to be the most likely growth scenario at the time of the report.
- 3.35. However, the appraisal documents made available for this POPE evaluation do not include forecast collision savings for the opening year, and the COBA input and output files are not available for this evaluation. Therefore, it has not been possible to compare forecast collision savings with outturn collision savings for the opening year.

Collision Rates

- 3.36. The number of collisions along a length of road used together with the AADT for the same section can be used to calculate a collision rate, known as PIC/mvkm. This allows comparisons to be made which take into account traffic growth.
- 3.37. Table 3-4 shows the collision rate calculated for A11 Fiveways to Thetford key links pre- and post-scheme.

- 3.38. There was no opening year forecast available. However, for context, between the average of the five-year pre-scheme safety analysis undertaken and 2015 (the post-scheme analysis period) on A roads in Britain, there was a 9% reduction in collisions.

Table 3-4 Observed Collision Rates (PIC/mvkm) for Scheme Key Links

	Observed
Before opening observed PIC/mvkm	0.229
Without scheme PIC/mvkm (Counterfactual for same period as post-opening data)	0.189
Post-scheme opening observed PIC/mvkm	0.060
Net change PIC/mvkm	0.129
Percentage saving	68%

- 3.39. Table 3-4 shows that there has been observed saving of 0.129 PIC/mvkm, representing a large percentage saving of 68%. This change is statistically significant, and we can be 99% confident that the change in collision rate is not a result of chance alone, and therefore that the scheme has had a direct impact on collision rates.

Fatalities and Weighted Injuries

- 3.40. The collision rate discussed above and shown in Table 3-4 does not take into account the severity of collisions. To analyse this, we now present the Fatalities and Weighted Injuries (FWI) metric which is a combined measure of casualties based on the numbers of fatal, serious and slight casualties, as presented through Table 3-5. It should be noted that this is based on three years of pre-scheme data, and it does not include counterfactual adjustment.
- 3.41. To take into account the change in traffic on the A11 and for comparison with other schemes, we also present the FWI rate per billion vehicle kilometres (bvkm). It should be noted that these figures do not account for changes in the background reduction in casualties.

Table 3-5 FWI on the Scheme Key Links

Period	FWI/collision	FWI/year	FWI/bvkm
Pre-scheme	0.064	1.74	13.8
One Year After scheme opening	0.025	0.25	1.5

- 3.42. Table 3-5 shows that as measured by the FWI/PIC metric, the seriousness of collisions has substantially reduced post-opening despite the increase in traffic on the A11.

Security

- 3.43. The aim of this sub-objective is to consider both the changes in Security and the likely number of users affected by the changes. For highway schemes, Security includes the perception of risk from damage to or theft from vehicles, personal injury or theft of property from individuals or from vehicles. Security issues may arise from the following:
- On the road itself (e.g. being attacked whilst broken down).
 - In service areas/car parks/lay-bys (e.g. vehicle damage while parked at a service station, attacked whilst walking to a parked car).
 - At junctions (e.g. smash and grab incidents while queuing at traffic lights).
- 3.44. The primary indicators for roads include surveillance, landscaping, lighting and visibility, emergency call facilities and pedestrian and cycling facilities.

Forecast

- 3.45. The scheme appraisal stated that a 'neutral' impact was expected for Security, with the AST noting that those aspects relating to Security would not be changed by the scheme.

Evaluation

- 3.46. The new route of the A11 to the north of Elveden means that traffic no longer travels through the village and is therefore no longer required to pass through or stop at traffic signals, which is beneficial for Security. Lighting is not provided along the route, as was also the case pre-scheme. One lay-by in each direction has been provided along the A11 at the site of the war memorial, and feature emergency telephones. These were in place prior to the scheme, as well as additional lay-bys at various points along the A11. The post-scheme lay-bys are visible from the road, as per the pre-scheme situation.
- 3.47. Overall, it is considered that the scheme has had a neutral impact on Security, in line with what was forecast.

Safety - Key Points

Collisions

- The overall reduction in collision rate in terms of observed PIC/mvkm for key links affected by the scheme is lower than forecast, with a reduction of 0.129 PIC/mvkm (after background collision decline considered). The observed saving can be directly attributed to the scheme following the calculation of a counterfactual pre-scheme collision rate which considers the background decline in collisions.
- Analysis of observed collision data for the whole study area shows a reduction (when compared to the counterfactual) of 22.6 collisions per year, representing a statistically significant beneficial impact on the A11 and surrounding roads.
- Analysis of the observed collision data for the scheme key links which were directly affected by the scheme shows a reduction (when compared to the counterfactual) of 15.8 collisions a year, which is also a statistically significant change.
- There has been a substantial reduction in collision severity since scheme opening, for both the wider area analysed and the scheme key links.

Forecast versus observed collisions

- An opening year collision saving forecast has not been obtained for this evaluation, and therefore it has not been possible to compare the opening year outturn safety benefit with the forecast.

Security

- Lay-by facilities with emergency telephones have been provided on the A11, although these existed prior to the scheme. Traffic is no longer required to pass through the traffic signals at Elveden Crossroads. The lighting situation is the same post-scheme as pre-scheme. Therefore, the overall outturn assessment of the impact of the scheme on Security has been scored as neutral.

4. Economy

Introduction

- 4.1. This chapter evaluates how the scheme is performing against the economy objective which consists of the following sub objectives:
- Achieve good value for money in relation to impact on public accounts.
 - Improve Transport Economic Efficiency (TEE) for business users, transport providers and consumer users.
 - Improve journey time reliability.
 - Provide beneficial wider economic impacts.
- 4.2. The study area for the scheme assessment consisted of the A11 between Barton Mills and Thetford, as well as sections of the B1106 and A1065. The full appraisal area is assumed to be as per the SATURN area, as stated in the Forecasting and Economic Report – Update using 2006 model (December 2007). This area is shown in Figure 3-1.
- 4.3. TUBA (Transport User Benefits Appraisal) was used to forecast the economic benefits of the scheme. As TUBA is unable to directly analyse collision benefits or user delays, a COBA model was used to appraise the safety benefits of the schemes and added manually to the analysis. The benefits were appraised for a 60-year period in line with guidance.
- 4.4. This section provides a comparison between outturn costs and benefits and the economic impacts forecast. Consideration has also been given to the scheme's wider economic impact. Outturn journey times and safety economic impacts are based on the observed results presented in previous sections of this report, and re-forecast to a 60-year period.

Sources

- 4.5. The economic forecasts of the scheme's economic impacts have been taken from the TUBA Update Technical Note for the A11 Fiveways to Thetford Improvement dated March 2012. This report was an update of the economic assessment in the A11 Fiveways to Thetford Improvement, Forecasting and Economics Report – Update using 2006 model (December 2007). The key changes are as follows:
- Revised forecast scheme costs.
 - TUBA version 1.8 used rather than 1.7.
 - Update opening date of the scheme to 2015 instead of 2013.
- 4.6. The AST (2012) and the Report on Traffic Modelling (2010), containing the latest available forecasts, were used for the economic evaluation comparison. No COBA model was made available for use in this evaluation.
- 4.7. The outturn spend profile for this scheme was obtained from the Highways England Regional Finance Manager in July 2017. All costs presented in this report are in 2002 prices and values in line with those in the Economic Assessment Report (EAR), unless otherwise stated.
- 4.8. Table 4-1 outlines the evaluation approach undertaken in this report. A 'yes' indicates that a certain element has been considered in this evaluation. A 'no' indicates that the forecast impact has been used in place of a full evaluation at this stage.

Table 4-1 Economic Benefits of Scheme (2002 prices and values)

Benefits in £m 2002 market prices, discounted	Forecast £m (EAR)	Evaluate?	Evaluation Approach/Comments
Journey Time (TEE business and consumer users)	£1,003.06m	Yes	Outturn journey time impacts on opening year can be calculated from observed data.
Vehicle Operating Costs (VOC)	£68.36m	Yes	Net change in fuel consumption in operating year would usually be monetised to calculate a proxy outturn reforecast value of VOC. In this instance, VOC has been assumed to be as forecast.
Delay during construction and future maintenance	£47.88m	No	Not within the remit of POPE to evaluate. Included in PVB calculations and forecast cost assumed at outturn.
Safety benefits	£111.66m	Yes	Based on observed reduction in collision numbers, if this is statistically significant.
Carbon benefits	£4.72m	Yes	Ratio between forecast and outturn opening year carbon impact would normally be used to calculate 60-year re-forecast. In this instance, carbon benefits have been assumed to be as forecast.
Indirect Tax impact	£10.19m	Yes	Usually, outturn change in fuel consumption in the opening year is calculated and the ratio used against forecast change to reforecast 60-year benefit. In this instance, Indirect Tax has been assumed to be as forecast.
Total PVB	£1,225.49m		

Journey Time Benefits

- 4.9. The change in annual vehicle hours for the A11 key link has been used to derive economic benefits, as this key link form the key elements of the economic benefits for the whole scheme.
- 4.10. The vehicle hour savings for those travelling along the A11 improved scheme section (between Barton Mills and Thetford) have been calculated. Savings have been considered for the weekday peak periods and off-peak period. The observed vehicle hour savings have been calculated using traffic counts and journey time savings, discussed earlier in this report. Note that due to the lack of traffic data on the A11 northbound during the pre-scheme period, a proxy has been created using the southbound flows available.
- 4.11. Additional traffic in the corridor, which is the traffic attracted by the improved A11, was attributed with half the benefits, using the economic principle of rule-of-half, in line with the WebTAG guidance.

Table 4-2 Annual Observed Vehicle Hour Savings Between Pre- and Post-Scheme Periods

Route	Annual Vehicle Hour Saving (hours)
A11 Total Saving	706,976

Monetised Journey Time Benefits

4.12. The methodology detailed below (profile approach) was applied to obtain a POPE re-forecast for the 60-year journey time benefits as shown in Table 4-3 and Table 4-4.

- The total forecast vehicle hours saved in the year post-opening on the A11 was calculated using forecast flows and journey times from the traffic forecasting report.
- The observed vehicle hours saved over the scheme section was calculated using observed traffic flows and observed journey times from the opening year.
- The ratio between the forecast opening year vehicle saving and observed opening year vehicle saving along the scheme section was applied to the forecast opening year monetised benefit from the TUBA appraisal.
- The profile method has been used to factor the observed opening year benefits to the full 60-year appraisal period, splitting into the first year and the following 59. This method applies the absolute difference between the forecast and observed benefits in the first year post-opening to the TUBA benefits profile for the remaining years of the appraisal period. It considers the difference between the observed and modelled benefits as an absolute difference rather than proportionally.

Table 4-3 Comparison of Predicted and Observed Vehicle Hours

Annual Vehicle Hour Saving (hours)	
Re-forecast impact on scheme key links	833,719
Observed (OYA)	706,976
% difference	-15%

4.13. Table 4-3 shows the observed saving in vehicle hours for the A11 between Fiveways and Thetford is 15% lower than forecast. This is as a result of lower than forecast journey time savings.

4.14. The full TUBA assessment for the study area shows that the forecast time saving benefits for the scheme were £1,003.06m. This represents the most recent forecast available to POPE. Applying the profile approach detailed above, an outturn value of £943.4m is achieved, as shown in Table 4-4.

Table 4-4 Time Benefits Comparison

Annual Vehicle Hour Saving (hours)		Predicted Benefit over 60 Years	
Key Link Re-forecast	833,719	TUBA forecast (60 years)	£1,003.1m
Observed	706,976	Outturn (first year)	£12.7m
		Outturn re-forecast (subsequent 59 years)	£930.7m
		Outturn (total 60 years)	£943.4m

Safety Benefits

Forecast Safety Benefits

- 4.15. The AST (2012) and the Report on Traffic Modelling (March 2010) for the scheme included a 60-year monetary safety benefit of £112m (2002 prices, discounted to 2002), including construction and maintenance costs. This represents a 60-year forecast collision number saving of 1,119 including savings on links and at junctions. This was based on a central growth forecast which was considered to be the most likely growth scenario at the time of the report.

Evaluation of Safety Benefits

- 4.16. The COBA model has not been obtained for this study. The preferred POPE methodology for the outturn economic value of safety benefits requires an opening year collision saving, which it has not been possible to obtain for this evaluation. Therefore, a proxy has been calculated. While the Forecasting and Economic Report: Update using 2006 model (2007), has been superseded, it included an annual breakdown of collision savings across the 60-year benefit period. To calculate the proxy opening year saving, the annual breakdown from the Forecasting and Economic Report has been applied to the forecast 60-year collision saving included in the final AST.
- 4.17. The POPE methodology for the evaluation of the outturn of the economic value of safety benefits is based on the comparison of observed and forecast collision changes at the POPE evaluation stage (in this case one year after opening, and using the pre-scheme counterfactual scenario to take background decline in collisions into account). This is then combined with the assumption that the observed safety impact at this stage can be taken as indicative of that over the whole 60-year appraisal period.
- 4.18. Monetisation of safety savings is calculated by:
- Calculating the net difference between the forecast opening year saving and the opening year observed collision savings.
 - Monetising the net difference using the PAR method which values collisions by road type and enables capitalisation of this figure over 60 years based on expected traffic growth, in line with PAR 6.2 guidance.
 - Calculating the 60-year outturn benefits for the whole area by combining the monetary forecast from COBA (for the whole study area) with the assessment of the outturn accuracy of the net difference in numbers of collisions.
- 4.19. Table 4-5 presents the predicted collisions savings for the wider area compared to the outturn savings in the wider area of safety analysis (see Figure 3-1 for geographical area used).

Table 4-5 Predicted and Outturn Collision Saving and Monetary Benefit

Benefits	Forecast Wider Area		Outturn (Wider Analysis Area)	
	(a)	1,119	(c)	22.6
60-year collision saving (PVB)	(a)	1,119		
Opening year collision saving	(b)	28.7	(c)	22.6
Difference from forecast			(d) = (c) – (b)	-6.0
Collision value in opening year in 2002 prices			(e)	£85,810
60-year benefits of difference in opening year collisions (in 2002 prices, discounted)			(f) = (d) x (e) x factors	-£15.30m
60-year monetary (PVB)	(g)	£105.32m	(f) + (g)	£90.02m

4.20. The monetary benefits of the collision savings are £90.02m, 15% lower than expected.

Construction and Maintenance Delay

4.21. A QUADRO assessment was undertaken to analyse the potential construction and maintenance impact of the scheme. This assessment evaluates the dis-benefits to traffic due to the construction of the scheme, as well as the benefits of the new maintenance arrangements of the scheme. The dis-benefits result from roadworks causing delays to traffic, leading to increased travel times and vehicle operating costs.

4.22. The net difference between these gave a benefit to the value of £47.88m.

4.23. The impacts of construction periods and future maintenance are not re-evaluated in POPE. It is assumed that the forecast is still valid and thus is included in the PVB unchanged.

Indirect Tax and Vehicle Operating Costs

4.24. Indirect Tax revenue is the expected change in the Indirect Tax revenue to the Government over the appraisal period due to changes in the transport sector as a result of the scheme over the appraisal period. For the highways schemes, such as that in this study, the tax impact is primarily derived from the monetisation of the changes in fuel consumption over the 60-year period. A scheme may result in changes in fuel consumption due to:

- Changes in speed resulting in greater or lesser fuel efficiency for the same trips;
- Changes in distance travelled; and
- Increased road use through induced traffic or the reduction of trip suppression.

4.25. Note that historically, the scheme cost would represent the wider costs to public accounts and thus the impact of the scheme on Indirect Tax was considered within these wider costs. The current guidance⁶ (AMCB, Analysis of Monetised Costs and Benefits) considers the costs of a scheme only in terms of the 'broad transport budget' i.e. costs and revenues which directly affect the public budget available for transport and therefore the Indirect Tax impact is covered within the benefits. Both are compared as part of this evaluation.

⁶ TAG UNIT A1.1 Cost-Benefit Analysis, October 2013

- 4.26. Forecasting of the impact of the scheme on Indirect Tax was done within the TUBA modelling (which was updated with TUBA version 1.8) and was based on the whole study area. This showed that the scheme was expected to reduce tax revenue over the 60-year appraisal period.
- 4.27. Vehicle Operating Costs (VOC) is the cost to users of the use of the road system by private cars and lorries. It includes both fuel and non-fuel elements. The fuel part of VOC and Indirect Tax impacts are both directly linked to changes in fuel consumption, which can be affected by factors such as changes in speed. They are both linked to the same magnitude of impacts, but for road users, they are on opposite sides of the benefit balance. If there is increased fuel consumption, VOC will increase as drivers pay more for fuel (i.e. a dis-benefit to the driver), but this would result in increased Indirect Tax being collected by the Treasury (i.e. a benefit to the Treasury).
- 4.28. However, for this scheme, the TUBA Update Technical Note presents the VOC benefits disaggregated by user type, and shows that it is business users, especially freight who receive positive VOC benefits, while car users have a VOC dis-benefit; this reflects the impacts of the differing speeds and fuel efficiency of goods vehicles compared with light vehicles. The TUBA model forecast for this scheme has both VOC and Indirect Tax as positive benefits which means that the POPE methodology for evaluating Indirect Tax and VOC as based on estimated net change in fuel consumption in the opening year is not suitable. Additional data on goods vehicles speeds would be required. Therefore, Indirect Tax and VOC outturn benefits are assumed to be as forecast.

Table 4-6 Indirect Tax Revenue Impact and VOC as a Present Value

Costs in 2002 market prices, discounted	Forecast	Outturn
Impact on Indirect Tax revenue raised	£10.19m	£10.19m
VOC	£68.36m	£68.36m

Carbon Impact

- 4.29. Monetised carbon benefits were forecast to be £4.72m. Based on the detail provided for VOC (as explained in that sub-section), it is likely that the fuel impacts were differing between business freight and all other users. Without the detail of the scope of the carbon assessment, outturn carbon benefits cannot be evaluated on a like-for-like basis. As such, the evaluation will assume the appraised value for the estimated outturn BCR calculations.

Scheme Costs

- 4.30. This section compares the forecast costs of the scheme as of the start of the construction period with the actual spend at the time of this study.
- 4.31. Costs of the scheme are also considered for the full appraisal period of 60 years so they can be compared with the benefits over the same period. The full costs examined are made up of the following:
- Investment costs: before and during construction
 - Net impact on future maintenance costs; over the 60 years after opening
- 4.32. Investment costs are considered in terms of a common price base of 2002 for comparison with forecast costs. For comparison with the benefits, overall costs are expressed in terms of present value (PVC).

Investment Costs

- 4.33. The investment cost is the cost to Highways England of the following:

- Costs of construction
- Land and property costs
- Preparation and supervision costs
- Allowance for risk and optimism bias

4.34. The last pre-construction forecast of the investment costs was in March 2012.

4.35. For the purpose of this evaluation, we have determined a forecast scheme cost (based on latest forecast cost prior to start of works) for Highways England Major Projects of £83.91m.

4.36. The outturn spend profile for this scheme has been obtained for the purpose of this study and covers the period from 2002 to 2019. For the purpose of comparison between forecast and actual, and 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.

4.37. Comparison between the forecast and outturn is presented in Table 4-7.

Table 4-7 – Scheme Investment Costs (£m)

Forecast Cost		Outturn Cost		% Difference
Cost in 2002 prices, undiscounted	£83.9m	Cost in £million 2002 prices, undiscounted	£80.2m	4%

4.38. The key point to note as shown in the table is that the outturn cost was accurate when compared to forecasts, being 4% below that forecast.

Summary of Present Value Costs (PVC)

4.39. 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.

4.40. Following current Treasury Green Book guidance, calculation of the present value entails the conversion to market prices, then discounting by year. This uses a rate of 3.5% for the first 30 years and 3% thereafter.

4.41. The full PVC is made up of the following costs converted to present value:

- Investment costs, as above
- Indirect tax revenues during the lifetime of the scheme

1.1 Table 4-8 shows the investment costs in 2002 costs, expressed in market prices, discounted. The outturn costs are presented likewise.

Table 4-8 –Present Value Cost (£m)

Present Value (costs in 2002 market prices, discounted)	Forecast	Outturn
Investment Costs	£67.97m	£66.53m
Operating Costs	-£550,000	-£550,000
Total PVC	£67.42m	£65.98m

Benefit Cost Ratio

- 4.42. The Benefit Cost Ratio (BCR) is used as an indicator of the overall value for money of the scheme. It is the comparison of the benefits (PVB) and costs (PVC) expressed in terms of present value.
- 4.43. Projects with a BCR greater than 1 have greater benefits than costs; hence they have positive net benefits. The higher the ratio, the greater the benefits relative to the costs. It is to be noted that the BCR is insensitive to the magnitude of net benefits and therefore may favour projects with small costs and benefits over those with higher net benefits.
- 4.44. Table 4-9 compares the predicted and outturn costs and benefits as detailed in the above sub-sections.

Table 4-9 – 60-Year BCR Evaluation

		Forecast	Outturn Reforecast
Costs	PVC	£67.4m	£66.0m
Benefits	Journey time benefits	£1,003.1m	£943.4m
	Construction and future maintenance delay	£47.9m	£47.9m
	Safety Benefits	£111.7m	£92.0m
	Vehicle Operating Costs	£68.4m	£68.4m
	Carbon benefits	£4.7m	£4.7m
	PVB subtotal	£1,235.7m	£1,156.6m
	Indirect Tax	-£10.2m	-£10.2m
	BCR (with Indirect Tax in PVC)	18.2	17.4
	BCR (with Indirect Tax in PVB)⁷	15.9	15.2

- 4.45. It can be seen from Table 4-9 that the outturn BCR is slightly lower than forecast and that this is mainly due to lower than expected journey time benefits. A BCR of 15.2 is considered very high value for money according to the DfT criteria.

⁷ At the time of scheme appraisal, Treasury guidance was to include indirect tax as a cost. However, the most recent guidance on indirect tax impacts is to include these as a benefit, rather than a reduction in cost, therefore two BCRs are presented here.

- 4.46. It should be noted that the BCR ignores non-monetised impacts. In the Transport Business Case guidance, the impacts on wider objectives must be assessed but are not monetised. The evaluations of the wider economic impacts, environmental, accessibility and integration objectives are covered in the following sections of the report.

Wider Economic Impacts

- 4.47. It is inherently difficult to isolate wider economic impacts which could be attributed to the scheme. However, it is important to understand the socio-economic context in which the scheme opened and how the upgrading of the A11 route between Fiveways and Thetford may have assisted local and regional socio-economic aspirations.
- 4.48. The AST forecast that the scheme would have a **moderate beneficial** impact on the wider economy, stating that the scheme promotes the investment in the north-east of the region. Furthermore, the time saved by business users would have a positive impact on productivity in the region. The Road to Success, a magazine produced by Eastern Daily Press with Norfolk County Council, and the A11 Wider Economic Impacts Study (2008), produced by Atkins to assess the wider economic benefits generated by the scheme, stated that there would be the following benefits:
- Improved productivity: £101m
 - Wider economic benefits, such as unlocked land for development: £136m
 - Time savings for businesses: £356m
 - Time savings for commuters and leisure travellers: £202m
- 4.49. However, the appraisal did not calculate the quantitative impacts of the scheme on wider impacts, and this evaluation does not seek to assess the quantitative evidence for the impact on wider impacts and instead provides a qualitative overview of the likely impact on this objective.
- 4.50. The A11 Wider Economic Impacts Study (2008) stated that overall, the scheme would assist Norfolk by linking the two key regional engines of growth in Norwich and Cambridge, and would help to promote increased business efficiency, enterprise, innovation and skills in an area which was lagging behind other areas in the East of England. Furthermore, tackling the remaining bottleneck on the corridor would provide confidence to businesses in Norwich and attract investors. In turn, this would create opportunities for delivering new housing and employment sites in the city.
- 4.51. It is likely that the scheme has had a positive impact on the wider region due to the improved connection to Norwich. The analysis presented in this evaluation has shown that journey times have reduced and safety has improved along the scheme section. Therefore, journey times between Cambridge and Norwich will have been positively impacted. The dualling has created an attractive corridor for not only investors but for individuals accessing employment along the A11 corridor.
- 4.52. The A11 Wider Economic Impacts Study (2008) also stated that the scheme, which completed the dualling from the M11 to Norwich, would consolidate the role of the A11 as the primary access route to Norfolk, with a wider catchment using the route. This POPE has demonstrated that traffic has been attracted onto the A11 route, suggesting that this is likely to have occurred.
- 4.53. More locally to the scheme, the A11 Wider Economics Impacts Study (2008) stated that without the scheme, future growth of Thetford would be limited due to the delays becoming worse. Prior to the implementation of the scheme, 6,000 new homes were planned for Thetford in the 20 years to 2021. As this is substantial growth for a relatively small town, the upgrade of the road network is likely to have assisted in securing this development, which may otherwise not have materialised due to the likely worsening of delays without the scheme.
- 4.54. The scheme, due to its improved journey times, is likely to have boosted confidence for businesses already in Thetford but also for potential investors, which in turn provides future

opportunities for growth. This is supported by the 'The Road to Success' magazine⁸, in which Caroline Williams, chief executive of Norfolk Chamber of Commerce, says, "The dualled A11 will allow Norfolk businesses to maximise their potential. It will attract new businesses along this strategic growth corridor and will allow existing businesses to expand, thereby contributing towards economic growth and more jobs for our region". One example of developers being attracted to the area is the Kingsfleet development, to be located to the north of Thetford alongside the A11, which is planned to provide 5,000 homes, employment land and associated community facilities. The website for the development cites Thetford as being an ideal location due to the dualling of the A11 providing links to Cambridge and Norwich⁹. Planning permission was granted in December 2015, following the completion of the scheme.

- 4.55. In summary, one of the key objectives of the scheme was to complete the upgrade of the A11 to dual carriageway from the M11 to Norwich. Analysis presented in this report has demonstrated that the scheme has improved journey times and safety for vehicles using the scheme section. This is beneficial to both freight and business users and in turn is likely to have improved productivity, as a result of the journey time savings. Furthermore, the TUBA forecast that business users would receive the most benefits as a result of the scheme. The improvements to the route as a result of the scheme have opened up opportunities for development locally as well as creating a more attractive link to Norwich, supported by the growth in traffic on the route.
- 4.56. Analysis of quantitative evidence of wider economic impacts is not undertaken as part of POPE, although the results of this POPE study indicate that there are likely to be benefits for economic growth as a result of the scheme. Furthermore, development which may have slowed without the scheme is more likely to now continue, as confidence improves for developers and investors. Therefore, at the OYA stage of analysis, it is likely that the scheme will have a **moderate beneficial** future impact on this sub-objective.

⁸ Published 12th December 2014, Eastern Daily Press in association with Norfolk County Council

⁹ <http://www.kingsfleet-thetford.co.uk/>

Economy - Key Points

Present Value Benefits

- The outturn journey time benefits of £943.4m are lower than expected, due to the journey time savings being less than forecast.
- Outturn safety benefits were calculated to be £92.0m, compared to a forecast of £105.3m, due to the collision savings being lower than expected.
- The outturn PVB subtotal (before Indirect Tax) was £1,156.6m, compared to a forecast of £1,235.7m. The lower than expected outturn benefits are a result of lower than forecast journey time and safety benefits.
- Vehicle operating costs were forecast to be a benefit, although this was mainly predicted for goods vehicles and therefore could not be evaluated.

Costs

- The outturn investment cost of £80.2m (2002 prices, undiscounted) was 4% lower than forecast.

Benefit Cost Ratio

- Taking Indirect Tax as a benefit, the scheme achieves a BCR of 15.2 which shows the scheme has delivered very high value for money.

Wider Economic Impacts

- The scheme is likely to have contributed positively towards wider economic impacts and has provided an attractive link between Cambridge and Norwich. As well as potentially attracting growth to Norwich by completing the dualling between the M11 and Norwich, local areas such as Thetford are likely to benefit from the scheme.

5. Environment

Introduction

- 5.1. This section considers the environmental impacts of the scheme by evaluating a range of sub-objectives.

Background

- 5.2. In 1998, the Government published the Transport White Paper *A New Deal for Transport: Better for Everyone*, which set out plans for a transport system that was safe, efficient, clean and fair. The Roads Review, *A New Deal for Trunk Roads in England*, reported on the Government's roads programme against criteria of accessibility, safety, economy, environment, and integration; the A11 Fiveways to Thetford Improvement was included in this Review as a scheme that was to be progressed without delay.
- 5.3. The programme for the Fiveways to Thetford Improvement was published for public consultation in February 2001, and a total of 1,215 responses were received from members of the public, statutory bodies and other organisations. The responses received indicated a high level of support for the scheme, with the majority believing that the improvement was necessary and that the proposed route was acceptable. However, concern was expressed that the proposals did not include improvements to Fiveways Roundabout. A Preferred Route Announcement was made in November 2001, and the scheme was developed further to include improvements to Fiveways Roundabout.
- 5.4. The development phase of the scheme was between April 2011 and June 2012, with advanced works starting on 7th June 2012 and with main construction activities commencing 7th January 2013; completion was achieved in December 2014.

Scheme Overview

- 5.5. The scheme was designed to improve journey time reliability and road safety on the A11, and comprised the dualling of a 14.8 km section of the A11 trunk road between Fiveways Roundabout in Barton Mills, Suffolk, and the Thetford Southern Bypass roundabout in Norfolk. The dualling was to generally follow the existing road alignment, except for a new bypass around the village of Elveden.
- 5.6. As a part of the advanced works, the remaining Elveden Estates track network received upgrades due to changes of traffic routes that would occur following completion of the new bypass and dualling.

Assessment

- 5.7. An Environmental Impact Assessment (EIA) for the scheme was undertaken and reported in an Environmental Statement (ES), which noted that the environmental objective of the scheme was to:
- Minimise the impact of the improved road on the surrounding Breckland – a designated area of Important Landscape Quality and a Special Landscape Area.
- 5.8. For each of the environmental sub-objectives considered by the published ES, the evaluation in this chapter assesses the environmental impacts predicted in the scheme's Appraisal Summary Table (AST) and the published ES against those observed one year after opening.
- 5.9. In the context of the AST and published ES forecasts and using evidence collected one year after (OYA) opening, this chapter presents:
- A record of any significant changes to the scheme that have taken place since publication of the ES;
 - An evaluation of the effectiveness of the mitigation measures implemented as part of the scheme; and

- A summary of key impacts against the ten environmental WebTAG sub-objectives.

Data Collection

- 5.10. The following documents/data have been used in the compilation of this environmental chapter of the OYA report:
- Environmental Statement, Volumes 1-3 incl., with Non-Technical Summary (September 2008);
 - Addendum to the Environmental Statement, Volumes 1-3 incl., (September 2009);
 - Appraisal Summary Table Report (September 2012);
 - Bat Mitigation Strategy (January 2013);
 - Draft Construction Environmental Management Plan (January 2013);
 - Health and Safety File, Interim Version for Handover (December 2014); and
 - Interim Handover Environmental Management Plan (September 2015).
- 5.11. A list of the background information specifically requested and received to help with the compilation of this report is included in Appendix D. It should be noted that the *As-Built* drawings were unavailable for evaluation by this study, so the availability of this information should be checked and confirmed at the Five Years After (FYA) stage.

Design Development

- 5.12. Following publication of the ES in 2008, consultation with stakeholders and interested parties led to the development of a proposed Non-Motorised User (NMU) underpass at the war memorial (at Weather Heath) for incorporation into the scheme between the B1112 underpass and the B1106 junction. The consultation process also highlighted areas of the ES which would benefit from the incorporation of updated information. An addendum to the ES was subsequently produced in 2009 which detailed the consultation undertaken since publication of the ES, and explained the changes made to each published ES Chapter as a consequence of this iterative process.
- 5.13. Following approval for the scheme and during the development of the detailed design, a number of minor modifications were made to the scheme; these were subsequently assessed through a series of Environmental Assessment Reports (EARs) to compare the effects with those identified within the ES and subsequently amended within the ES Addendum. Although the individual EARs were unavailable for evaluation by POPE, the interim Handover Environmental Management Plan (HEMP) stated that the modifications (evaluated in the relevant sub-objectives, below), comprised:
- Between chainages 800-2,000 the alignment was moved to the north to reflect the existing alignment of the A11 – the EAR concluded that for the majority of environmental aspects the change would be beneficial, but that the predicted effects would not be modified from the findings of the assessment of the approved scheme;
 - To ensure sufficient headroom clearance between the A11 and the proposed Chalk Hall overbridge (accommodation bridge), it was necessary to modify the vertical alignment to achieve this – the EAR concluded that this change would not modify the predicted effects of the approved scheme;
 - Changes to the vertical alignment for the B1106 junction to ensure sufficient headroom provision along with changes to the slip roads to accommodate essential drainage soakaways were considered necessary – the EAR concluded that these changes would not modify the predicted effects of the approved scheme;

- As part of a value engineering exercise, modifications to the specification of the proposed planting material (i.e. plant stock) were suggested to reduce scheme costs without compromising the ability to mitigate – the EAR concluded that the findings of the assessment of the approved scheme would not be modified as a result;
- Modifications to the slope profile associated with Gibson’s overbridge (accommodation bridge) were proposed to ensure that more land could be handed back to the adjacent landowner – the EAR concluded that this change would not modify the predicted effects of the approved scheme;
- The decision not to translocate turf from the existing verge between chainages 6,050 and 6,875 was agreed at a meeting with Natural England, as the turf was considered to be of insufficient quality to justify its re-use – the EAR concluded that this change would not modify the predicted effects of the approved scheme;
- The proposed modification to the drainage design arose from the decision of the Environment Agency to change the extent of the designation of the groundwater Special Protection Zone (SPZ) 1. This required a secondary containment area to be proposed as part of the design. The changes included lined and unlined grass channels, kerb drains and oil baffles, and pre-earthwork drains. The EAR concluded that the findings of the assessment of the approved scheme would not be modified as a result; and
- Minor modifications to the Landscape strategy, to reflect the minor changes to the design arising during the construction phase, included the relocation of proposed planting, modifications to the planting mixes to woodland edge planting, and clarification on the detailed layout to avoid buried services.

5.14. In the ES and subsequent addendum, six bat wires (to allow bats to be able to cross the road safely in order to minimise disruption to their foraging and commuting patterns) were proposed, with additional crossing points at the River Lark cut-off channel, the NMU underpass, and at the B1106 overbridge. Reports following subsequent surveys (2011) resulted in slight changes to the design and location of the bat wires:

- The location and orientation of the bat wires were amended to more accurately reflect the species involved, existing flightpaths, existing and perceived changes in behaviour due to the scheme, land availability, and safety considerations; and
- The design of the bat wires was altered to reflect evidence suggesting that a U- or V-shaped bat wire design (rather than a wire strung with balls to aid echolocation) was more effective.

Site Visit

5.15. As part of the OYA evaluation, a site visit was undertaken in late May 2016. The visit included the taking of photographs to provide a photographic record of the scheme, and this included the taking of photographs to provide comparison views with selected ES photomontages – these are shown in Appendix D. Where appropriate, photographs have also been included within this environment section.

Consultation

5.16. Statutory environmental organisations, stakeholders, District/Borough/County councils, and relevant organisations were contacted as part of the OYA evaluation regarding their views on the impacts they perceive the scheme has had on the environment and are shown in Table 5-1 below.

Table 5-1 Summary of Environmental Consultation Responses

Organisation	Field of Interest	Comments at OYA
Natural England	Biodiversity & Landscape	Did not respond to the invitation to provide feedback.
Historic England	Heritage	Commented on the impact of the scheme on Bowl Barrow/How Hill, and on mitigation measures generally.
Environment Agency	Water	Did not respond to the invitation to provide feedback.
Suffolk County Council	General	Did not respond to the invitation to provide feedback.
Norfolk County Council	General	Did not respond to the invitation to provide feedback.
Forest Heath District Council	General	Did not respond to the invitation to provide feedback.
Breckland Council	General	Did not respond to the invitation to provide feedback.
Elveden Estates	General	Did not respond to the invitation to provide feedback.
Suffolk Local Access Forum	General	Did not respond to the invitation to provide feedback.
Ramblers Association	General	Did not respond to the invitation to provide feedback.
British Horse Society	General	Did not respond to the invitation to provide feedback.
Mildenhall Parish Council	General	Identified five specific issues associated with traffic safety at Fiveways Roundabout.
Thetford Town Council	General	Did not respond to the invitation to provide feedback.

Animal Mortality

- 5.17. The Network Managing Agent (NMA) has also been consulted with regard to animal mortality figures but at the time of writing, no data has been provided for analysis; it is therefore suggested that the NMA be re-contacted at the FYA stage.

Traffic Forecast Evaluation

- 5.18. 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 POPE and an assumption is made that the level of traffic and the level of traffic Noise and Local Air Quality are related.
- 5.19. Table 5-2 below shows the accuracy of the traffic modelling before and after construction for the scheme. The traffic forecasts presented in the traffic chapter of this report correspond to this data, and the Environmental evaluations are consistent with this.

Table 5-2 Traffic Flow (Hourly) on the A11, North of Fiveways Roundabout

Location	Peak	Without Scheme 2012			With Scheme 2016		
		DM F'cast	Obsv'd	Diff (%)	DS F'cast	Obsv'd	Diff (%)
Northbound	AM	850	-	-	1,090	1,120	30 (3%)
Southbound	Peak	1,020	970	-50 (-5%)	1,650	1,350	-300 (-18%)
Northbound	Off	940	-	-	1,170	1,070	-110 (-9%)
Southbound	Peak	870	840	-40 (-4%)	1,150	1,050	-110 (-9%)
Northbound	PM	1,270	-	-	1,640	1,750	110 (6%)
Southbound	Peak	920	860	-60 (-6%)	1,160	1,010	-150 (-13%)

Change may not total difference due to rounding.

5.20. In order to provide a context for the following review and evaluation of environmental topics, the key points regarding the accuracy of the traffic forecasts and the changes in traffic following the opening of the scheme (as shown in the Traffic Analysis section) are summarised as follows:

- The observed flows are generally lower than forecast. However, there are discrepancies among the results, with some time periods showing observed flows much higher or lower than others. This could be due in part to the fact that the junction is slightly different to that which was modelled in the forecasting report.
- AWT traffic flows on the A11 between Fiveways Roundabout and Thetford have increased between the pre- and post-scheme periods, by approximately 26%, as shown in the Traffic Analysis section. Despite the increase in background traffic growth, in part this increase is likely to be due to the scheme making the A11 a more attractive route. However, due to traffic data availability issues, this is based on a relatively small data selection, and so the FYA evaluation should consider longer term post-scheme flows on this section.

5.21. Analysis of HGV levels uses vehicle classification by length, in which an HGV is classed as a vehicle over 6.6m in length. Results by flow and percentage of total flow are shown in Table 5-3 below.

Table 5-3 Weekday HGV Flows on the A11 North of Fiveways Roundabout

	Direction	March 2012	March 2017	Change in proportion
		AWT and HGVs as Percentage of Total Flow	AWT and HGVs as Percentage of Total Flow	
A11 (scheme section)	Northbound	-	2,900 (18%)	-
	Southbound	2,200 (17%)	2,300 (14%)	-3%

5.22. It can be seen from Table 5-3 that that in the southbound direction, the percentage of HGVs has decreased by 3%. As discussed in the traffic section of this report, however, there is limited data available on the scheme section, and so this should be taken as a guide only. When considering changes for a count site further south of Fiveways Roundabout, there has not been a change in the percentage of HGVs overall.

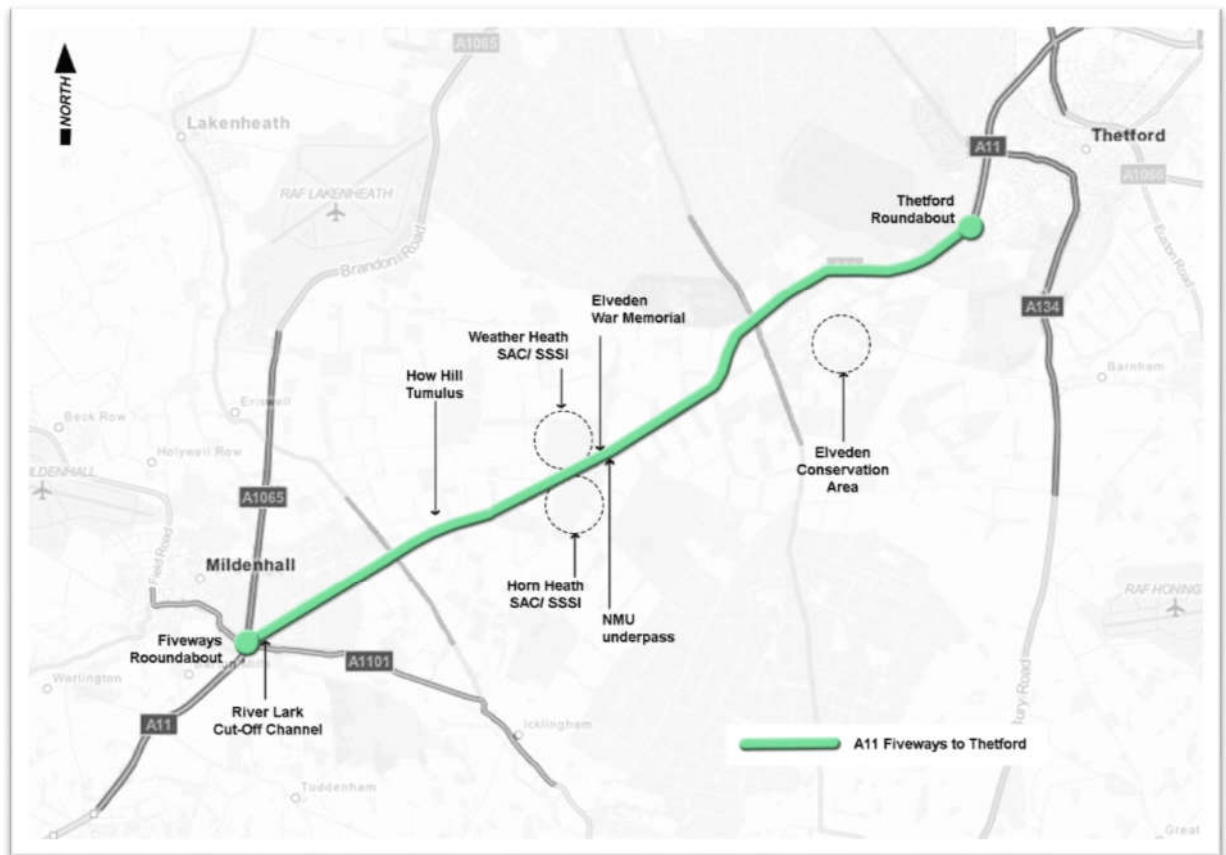
5.23. Although POPE methodology would also normally take speed data into account for evaluating the effects of the scheme on Noise, Local Air Quality and Greenhouse Gases, technical limitations of the traffic counting at sites throughout the scheme precluded any comparisons between speed data to be made.

One Year After Environmental Assessment

5.24. Included in this section is a brief summary of statements from the AST and ES evaluations which have been included to provide the context for the OYA evaluation.

5.25. The key environmental features that are discussed in this chapter are shown in Figure 5-1.

Figure 5-1 Key Environmental Features (not to scale)



Noise

Forecast

Appraisal Summary Table

- 5.26. The AST stated that while properties near the existing A11 in Elveden would experience an overall significant decrease in Noise due to the significant reduction in traffic passing through the village as a result of the scheme, the façades of the 7 properties facing the new A11 route towards the north of Elveden would experience a Noise increase greater than 5dB.
- 5.27. Properties along the sections of the existing route where there was to be no significant realignment were expected to experience decreases in Noise, as any increase in Noise due to the increase in line speed were more than compensated for by the reduction in Noise due to the thin surfacing. Properties shielded by environmental screens were expected to experience significant decreases in Noise.
- 5.28. Overall, the AST concluded that there would be 3 less people annoyed by the scheme in the 15th year after opening. With the scheme in place, the AST predicted that 14 properties would experience an increase in Noise levels of more than 3dB in 2028 (when compared to the baseline Do Minimum (DM) scenario in 2013), and that 18 properties would experience a reduction in Noise levels of more than 3dB in 2028 (also when compared to the baseline DM scenario in 2013).
- 5.29. No overall qualitative assessment (i.e. the degree of adverse or beneficial impacts) of the effect of the scheme on the Noise climate was given.

Environmental Statement

- 5.30. The ES stated that construction phase Noise levels were not expected to exceed the short or long-term limits for more than 30 days at any receptor, and that with or without the scheme, there would be an overall decrease in the numbers of people bothered by both traffic Noise and vibration:
- With the scheme in the Opening Year, the majority of nearby properties would experience decreases in exposure to traffic, with a small proportion experiencing minor increases.
 - Without the scheme in the 15th Year after opening, all properties would have experienced decreases in traffic Noise levels of between 1 & 3 dB compared to the Opening Year (2014) DM scenario. This assessment assumed that quiet surfacing technology would increasingly be used on surfacing replacement schemes.
 - With the scheme in the 15th Year after opening, most properties would have experienced decreases in traffic Noise levels of greater than 1 dB compared to the Opening Year DM scenario. Approximately 15 properties near the new route around Elveden would experience an increase of between 1-10 dB, depending on their proximity to the scheme, compared to the Opening Year DM scenario.
- 5.31. The ES also noted that no properties were expected to be eligible for compensation under the Noise Insulation Regulations.

Addendum to the Environmental Statement

- 5.32. The ES addendum stated that further Noise studies had shown that overall, a greater number of receptors were expected to experience Noise benefits with the scheme when compared to the DM scenario in both the short term (2013) and long term (2028). This was stated as largely being due to the number of receptors located in Elveden predicted to experience Noise benefits as a result of the considerable reduction in traffic on the existing A11 in this area.
- 5.33. The ES addendum also considered that no properties would be likely to be eligible for Noise insulation as a consequence of the scheme.

Consultation

- 5.34. No responses to consultation requests were received for this sub-objective.

Evaluation

- 5.35. POPE is unaware of any properties that are eligible for Noise insulation as a consequence of the scheme.
- 5.36. In terms of the significant decreases in Noise at properties shielded by environmental screens expected by the AST, while the site visit confirmed that the red brick environmental screen wall, Gate Lodge, had been implemented as expected by the ES scheme design (illustrated in Figure 5-2), the acoustic properties of the wall was not able to be confirmed by POPE.
- 5.37. While the ES Noise assessment assumed that quiet surfacing technology would increasingly be used on replacement schemes and that by the 15th year after opening (2029) all carriageways would have been replaced with a modern proprietary thin surfacing material, POPE is unable to confirm whether such low-Noise surfacing has been implemented as part of the scheme.
- 5.38. An assumption is made by POPE methodology that Noise levels will be as expected if observed traffic flows are within 25% more or 20% less than predicted; as can be seen by the comparison of both the predicted and observed traffic flows in Table 5-2 above, the data indicates that the observed AWT traffic flows are between 3% more and 18% less than forecast during the AM, PM, and inter-peak periods.
- 5.39. As noted in the Traffic Analysis chapter, based on observed data at a count site further south of Fiveways Roundabout, there has not been a change in the percentage of HGVs on the A11.

- 5.40. Although POPE methodology would also normally take speed data into account for evaluating the effects of the scheme on Noise, technical limitations of the traffic counting at sites throughout the scheme precluded any comparisons between speed data to be made.
- 5.41. The available information suggests that the effects of the scheme on the Noise climate are likely to be **as expected**. However, the relatively small data selection means that further data is required to confirm, and so consideration should be given to re-evaluation of the Noise sub-objective at the FYA stage when a larger traffic dataset may be available.

Table 5-4 Evaluation Summary: Noise

Sub-Objective	AST	OYA
Noise	Population annoyed without scheme in 15 th year: 36. Population annoyed with scheme in 15 th year: 33. Net change: 3 less people annoyed.	Likely to be as expected, but further data is required to confirm.

Local Air Quality

Forecast

Appraisal Summary Table

- 5.42. The AST stated that the scheme would have an overall beneficial impact on Local Air Quality, primarily due to realignment of the A11 around Elveden. The AST also noted that there were no Air Quality Management Areas (AQMAs) within the study area, and that no new AQMAs were expected to be declared as a result of the proposals. Concentrations (of presumably nitrogen dioxide (NO₂) and particulates (PM₁₀), although this was not explicitly stated in the AST) were stated as being within the objectives of all future scenarios.
- 5.43. In terms of Local Air Quality, changes in NO₂ and PM₁₀ at 28 properties were predicted to experience improvement, 34 properties were predicted to experience deterioration, and no properties were predicted to experience no change.
- 5.44. No overall qualitative assessment (i.e. the degree of the expected beneficial impact) of the effect of the scheme on Local Air Quality was given.

Environmental Statement

- 5.45. The ES stated that an Air Quality assessment of the scheme had been undertaken in accordance with best practice guidance (primarily the DMRB) and legislation. The assessment included consideration of:
- **Construction:** The potential for soiling of vegetation and nuisance dust was stated as high during the construction period, but as this risk would be managed by the use of appropriate mitigation measures and through rigorous enforcement of the Construction Environmental Management Plan (CEMP), no significant residual effects were considered likely.
 - **Local Assessment:** Concentrations of all pollutants were predicted to decrease between the baseline year and Opening Year, regardless of whether the scheme was implemented or not. Due to the realignment of the A11 away from Elveden, traffic-generated pollution was predicted to fall by up to 10 µg/m³ and as a result of this, Elveden was predicted to see an improvement in Air Quality. Outside of Elveden, the maximum increase in pollutant concentrations was predicted to be less than 5% of the relevant standard. No significant adverse impacts on Local Air Quality receptors were expected as a result of the scheme.
 - **Regional Assessment:** The regional assessment indicated an overall decrease in total emissions for all pollutants except carbon dioxide (CO₂) from roads within the study area between the baseline year and the Opening Year whether the scheme went ahead or not. The implementation of the scheme was stated as leading to greater emissions of generic

oxides of nitrogen (NO_x), PM₁₀, and CO₂ than the DM scenario. This was understood to be due to an increase in vehicle kilometres travelled and an increase in vehicle speeds. For carbon monoxide (CO) and hydrocarbons, emissions were predicted to decrease in the Do Something (DS) scenario. This was due to the effects of increasing speed on the A11 resulting in a reduction of emissions of these pollutants, even after the effects of increasing vehicle flows had been considered. The overall impact of the scheme was considered to be slight adverse on regional emissions of pollutants.

- National and International Context: The increase in pollutant emissions was considered to be negligible.
- Protection of Vegetation: The net indirect impact of the scheme was considered to be neutral in terms of Air Quality effects on ecosystems, but the potential for location dependent minor adverse impacts was noted.

Addendum to the Environmental Statement

- 5.46. The ES addendum presented no significant change to the published ES. Calculations in the assessment were repeated to take account of updated traffic predictions and revisions in public information.
- 5.47. The addendum concluded that the scheme would have no significant adverse impact on Local Air Quality, and would reduce the traffic pollution exposure of residents in Elveden; this was considered to be consistent with the published ES.

Consultation

- 5.48. No responses to consultation requests were received for this sub-objective.

Evaluation

- 5.49. An assumption is made by POPE methodology that Local Air Quality will be as expected if observed traffic flows do not vary by more than +/- 1,000 AWT than predicted; as can be seen by the comparison of both the predicted and observed traffic flows in Table 5-2, above, the data indicates that the observed post-opening traffic flows are between 3% (30 AWT) more and 18% (300 AWT) less than forecast during the AM, PM, and inter-peak periods.
- 5.50. Although the percentage tolerances assumed by POPE have been exceeded on the southbound carriageway during both the AM and PM peak periods, the absolute number of vehicles differs from that which was forecast by a maximum of 300 vehicles per hour and as this maximum is less than 1,000 vehicles, the percentage differences between the predicted and observed flows are considered unlikely to be significant.
- 5.51. As noted in the Traffic Analysis chapter, when considering changes for a count site further south of Fiveways Roundabout, there has not been a change in the percentage of HGVs on the A11.
- 5.52. Although POPE methodology would also normally take speed data into account for evaluating the effects of the scheme on Local Air Quality, technical limitations of the traffic counting at sites throughout the scheme precluded any comparisons between speed data to be made.
- 5.53. The available information suggests that the effects of the scheme on Local Air Quality are likely to be **as expected**. However, the relatively small data selection means that further data is required to confirm, and so consideration should be given to re-evaluation of the Air Quality sub-objective at the FYA stage when a larger traffic dataset may be available.

Table 5-5 Evaluation Summary: Air Quality

Sub-Objective	AST	OYA
Air Quality	<p><u>NO₂</u> Overall Assessment Score: -49.36. Properties with improvement: 128; Deterioration: 34; No change: zero.</p> <p><u>PM₁₀</u> Overall Assessment Score: -14. Properties with improvement: 128; Deterioration: 34; No change: zero.</p>	Likely to be as expected, but further data is required to confirm.

Greenhouse Gases

- 5.54. The ES (Vol 2) states that ‘the comparison of ‘Do-Minimum’ and ‘Do-Something’ emissions shows that the effect of the scheme is to increase total emissions, with the increase in carbon for the opening year forecast to be an additional 2,069 tonnes.
- 5.55. However, the latest carbon forecast was undertaken using TUBA, with the TUBA Update Technical Note (2012) forecasting a reduction in carbon of 178 tonnes in the opening year. As this is the latest forecast available, the monetised figure for this reduction in carbon has been used in the Economy section of this report.
- 5.56. The scheme is estimated to impact differently on each user class and the data is not available to understand the impact on each user class. Therefore, the impact of the scheme on carbon has not been evaluated.

Landscape

Forecast

Appraisal Summary Table

- 5.57. The AST stated that the Landscape impact of the scheme on the Agriculture, Heathlands & Forest character types would be a large adverse impact in Year 1, but this was expected to reduce to moderate adverse in Year 15 as the mitigation, i.e. planting proposals, matured. In terms of the Landscape impact on the Parklands character type, the scheme was expected to have a large adverse Impact in Year 1, and that this would remain large adverse at Year 15 due to the impacts on the war memorial brought about by the movement of the road closer to the site; the inclusion of the NMU underpass was not expected to increase this impact.
- 5.58. Overall the scheme was expected to have a **large adverse** impact in Year 1, but this was expected to reduce to **moderate adverse** in Year 15.

Environmental Statement

- 5.59. The ES assessed the Landscape and visual effects of the scheme at Year 1 and Year 15, noting that the scheme was located on the Norfolk/Suffolk borders within the area known as The Brecks or Breckland, an area of considerable ecological, archaeological, and Landscape value with a unique character and a strong sense of place.
- 5.60. In terms of the scheme proposals and mitigation strategy, the ES stated that:
- Landscape mitigation would include the creation of structurally diverse woodland edges where the route severed existing forests/ plantations, the creation of linear belts of shrubs and trees to complement the existing pattern of vegetation in the area, the planting of areas of woodland with glades to replace removed forests/ plantations, and the establishment of Deal Rows¹⁰ to form a buffer between the proposed road and adjacent

¹⁰ A local reference to the single rows of Scots pine (*Pinus sylvestris*) trees which exhibit varying degrees of twisting and contortion that are a distinctive feature of the Breckland landscape

sensitive heath areas. The creation of species rich verges would form a unifying element along the route and should assist in helping to mitigate the drainage measures; and

- Smooth flowing contours were proposed for all earthworks with the profiles of embankments, cuttings, and drainage areas, with the crests of mounds being rounded to give a more natural, softer, appearance appropriate to the Breckland Landscape.

5.61. In terms of the assessment of Landscape effects, the ES stated that Landscape effects of the scheme would be **large adverse** in Year 1, and **moderate adverse** in Year 15:

- Direct and irreversible Landscape impacts would result from the loss of significant vegetation and open agricultural land and its substitution with the infrastructure of the new road, including hard surfacing and structures. The existing A11 road and traffic was, however, a significant existing feature in the Landscape, and the adoption of a route that predominantly followed the existing road corridor was expected to reduce the impact of the scheme on the wider Landscape character of the area to some degree.
- The removal of mature vegetation as a result of the scheme represented the loss of both Landscape and ecological resources. There would also be adverse Landscape effects arising from the opening up of a corridor through existing forest areas and the severance/ removal/ truncation of existing shelterbelts and hedgerows.
- All the Landscape character areas were considered vulnerable to degradation due to their generally good condition (quality) and to the fact that they were ranked generally as of high or exceptional value, with each character area forming an important component part of the unique Breckland Landscape. There would be a direct impact on the intensive agriculture and forest Landscape character types as a result of the scheme, that would result initially in significant adverse effects.
- The scheme would have a beneficial effect on the setting of How Hill Tumulus, and the Elveden Conservation Area and associated Listed Buildings. It would have an adverse effect on the setting of the war memorial.
- The establishment of the proposed planting would serve to reinforce the Breckland character and knit the scheme back into the existing Landscape pattern. The primary impacts resulting from the offline sections of the scheme, the cutting in Mildenhall Woods, the increased scale of the road, the introduction of additional highway infrastructure, and major new engineering features would, however, not be possible to fully mitigate.

5.62. In terms of the assessment of visual effects, the ES stated that:

- There were few roads and Public Rights of Way (PRoW) in the vicinity of the existing A11 and the scheme, and the number of significant viewing positions was limited.
- Visual effects from the scheme generally ranged from moderate adverse to moderate beneficial, although there were several notable instances of effects relating to the cottages at Elveden Gap and Gate Lodge and at the war memorial on Weather Heath.
- While the substantial adverse visual effects of the scheme on the cottages at Elveden Gap and Gate Lodge would eventually reduce to moderate adverse, the visual effects on the war memorial on Weather Heath would remain as substantial adverse at Year 15.
- The majority of the visual benefits would occur in Elveden village centre.

Environmental Statement Addendum

5.63. The ES addendum stated that while the additional impacts of the proposed NMU underpass would be locally significant and have an adverse impact on the character of the parkland near to the war memorial due to the removal of several trees, the assessed Landscape and visual impacts in the published ES would not be changed.

Handover Environmental Management Plan

- 5.64. Although at interim status at the time of the OYA evaluation, the Handover Environmental Management Plan (HEMP) set out the establishment activities, maintenance operations and subsequent monitoring that was to be undertaken by the NMA so that after 20 years (i.e. the design year), all planting would have established, all required monitoring would have been delivered and reported, and the objectives of the mitigation measures of the scheme realised.
- 5.65. The interim HEMP also confirmed at the (ES) assessment stage, that numerous commitments were made as to the design and construction of the environmental aspects of the scheme, and that a number of these extended into the post-construction phase and subsequent establishment maintenance period for which establishment reporting was required; those relevant to the Landscape proposals are summarised below:
- Where deer activity was high, 10m wide Deer Visibility Zones would be placed along road verges to provide drivers with greater visibility of approaching deer, and vegetation within these zones to be managed as clear stemmed specimens or to be periodically coppiced.
 - A Forest Edge Management zone of 20m (including the 10m Deer Visibility Zone) would be established either side of the new road where the route passed through areas of coniferous or mixed forest/ plantation. Management requirements within this zone were the creation of a structurally diverse broadleaved edge, with small glades and grassland mosaics adjacent to the forests/ plantations to soften the edges.
 - Natural regeneration would be allowed in localised areas of grassland, heathland and moorland, and woodland. Periodical review would be required to ensure that invasive weed species did not become established.

Consultation

- 5.66. No responses to consultation requests were received for this sub-objective.

Evaluation

Effects of Design Changes

- 5.67. Regarding the additional Landscape and visual impacts of the NMU underpass at the war memorial on Weather Heath not proposed by the Preliminary ES design but implemented as part of the Detailed Design, the changes have been reviewed by a combination of desk studies and a site visit, and it is considered by POPE that there is no reason to consider that the assessment of the changes noted by the ES Addendum are anything other than valid - refer also to Appendix D, ES Figure 5.9.3 (Photo 3.2): *View looking northwest towards the A11 from byway No.7 Icklingham.*
- 5.68. It is therefore considered that despite the locally significant and adverse impact on the character of the parkland near to the war memorial (due to the removal of several trees), the Landscape and visual amenity impact of the scheme has not been significantly altered by this design change from the original AST and ES adverse assessments.
- 5.69. In terms of the minor modifications made to the scheme reported by the interim HEMP as not modifying the predicted Landscape effects of the approved scheme, the changes have been reviewed by a combination of desk studies and a site visit, and it is considered by POPE that there is no reason to consider that the assessment of the changes noted by the interim HEMP are anything other than valid:
- While direct and irreversible Landscape (and visual) impacts have resulted from the introduction of new structures along the new road, the modifications to the preliminary design (specifically the changes in vertical alignment to ensure sufficient headroom clearance between the A11 at both the Chalk Hall overbridge and the B1106 junction, and the modifications to the slope profile associated with Gibson's overbridge to ensure that more land could be handed back to the adjacent landowner) are considered unlikely to have materially affected the predicted adverse Landscape and visual effects of the approved scheme overall.

- Similarly, the minor changes to the slip roads to accommodate essential drainage soakaways at the B1106 junction and the changes to the drainage design are also considered unlikely to have significantly affected the predicted adverse Landscape effects of the approved scheme.
- In terms of the realignment of the road to the north between chainages 800-2,000 to reflect the existing alignment of the A11, the adoption of a route that predominantly follows the pre-existing road corridor (itself a significant feature in the Landscape) is thought likely to have reduced the impact of the scheme on the wider Landscape character of the area to some degree.
- The decision not to translocate turf from the existing verge between chainages 6,050 and 6,875 was discussed and agreed with Natural England.

5.70. However, as the EARs that compared the effects of the modifications with the effects identified by the ES (and subsequently amended within the ES Addendum) were not available for the purposes of this this evaluation, consideration should be given to comparing the predicted effects of the modifications with the situation on the ground at the FYA stage, when a more detailed evaluation may be possible should the individual EARs be available.

Implementation of Mitigation Measures

5.71. In terms of the assessment of Landscape effects, the ES stated that Landscape effects of the scheme would be **large adverse** in Year 1 - the impacts have been reviewed by a combination of desk studies and a site visit, and it is considered by POPE that there is no reason to consider that the following predicted adverse impacts are anything other than as expected:

- Direct and irreversible Landscape impacts have resulted from the loss of significant vegetation and open agricultural land and its substitution with the infrastructure of the new road, including hard surfacing and structures.
- Landscape and ecological resources have been lost due to the removal of mature vegetation, and adverse Landscape effects have arisen from the opening up of the corridor through Mildenhall Forest and the severance/ removal/ truncation of existing shelterbelts and hedgerows.
- There have been direct impacts on the intensive agriculture and forest Landscape character types that have resulted in significant adverse effects on the unique character of the Breckland Landscape.

5.72. Regarding the predicted beneficial effects of the scheme on the Elveden Conservation Area (with associated Listed Buildings) and the Landscape setting of How Hill Tumulus, please refer to the Townscape and Cultural Heritage sub-objectives respectively.

5.73. In terms of the substantial adverse visual impact of the scheme on Gate Lodge, while the site visit confirmed that the red brick environmental screen wall with tile coping to match the property had been implemented as expected by the ES scheme design (and illustrated in Figure 5-2), the height of the wall - stated as 2.5m high in the ES - was not able to be confirmed. In terms of the mitigation planting at this location, it is too early to evaluate the success or otherwise this aspect of mitigation, and it is suggested that this aspect of mitigation could be reconsidered at the FYA stage to see if is on track to reduce the visual impact of the scheme to moderate adverse as expected by the ES.

Figure 5-2 New environmental screen wall with tile coping at Gate Lodge (© Google, 2017)



- 5.74. In terms of the substantial adverse visual impact of the scheme on the cottages at Elveden Gap, the site visit confirmed that the mitigation measures as stated in the ES (comprising an (approximate) 3m high environmental bund with woodland tree and shrub planting between the cottages and the A11 as illustrated by Figure 5-3) had been implemented as expected.
- 5.75. While the mitigation measures are likely to partly screen traffic in ground floor/garden views and the gentle slopes to the rear of the mound are considered to help marry it with the existing landform as expected, the wooded outlook and relationship to the forest for the cottages has been fundamentally and detrimentally altered by the scheme and as such, the impact is as expected by the ES at this OYA stage. Given that it is too early to meaningfully evaluate the success or otherwise of the plant stock, it is suggested that this aspect of mitigation could be reconsidered at FYA to ascertain if it is on track to reduce the visual impact of the scheme on the cottages to moderate adverse by design year (15 years after).

Figure 5-3 Mitigation at Elveden Gap



Comprising an (approximate) 3m high environmental bund with planting (centre and left) between the cottages at Elveden Gap (not shown, left of image) and the A11 (right).

- 5.76. The ES provided details of typical tree and shrub mixes that would be used in Pine Shelterbelts and Linear Belts of Trees and Shrubs (LBTS). All planting was to comprise indigenous species, wherever possible originating from seed of local provenance, and the aims of the planting were stated as:
- Pine Shelterbelts: to re-create typical Breckland belts of Scots Pine; and

- LBTS: to create predominantly pine shelter belts, similar to that along the Eriswell/Icklingham Parish boundary.
- 5.77. Pine Shelterbelt plant material was to consist of container-grown specimen Scots Pine, 900-1,200mm high, staked and at an overall average spacing of 7m centres, set in a slightly staggered row a minimum of 6m back from the highway verge.
- 5.78. Plant material for the LBTS was to consist of forestry transplants and whips planted at a typical spacing of 1.2m centres, with plants set out in groups of 3, 5, or 7 plants of the same species. The percentages and species of trees and shrubs comprising the forestry stock was stated to be:
- Hawthorn: 40%;
 - Oak: 20%; and
 - Scots Pine: 40%.
- 5.79. The ES stated that specimen stock (in the form of container grown Oak and Scots pine) would also be used within the LBTS to provide structural diversity and visual interest immediately upon planting, typically at an average spacing of 8m centres. Specimen stock was to be planted at a ratio of 5 Scots Pine to 1 Oak, and the stock sizes were stated as:
- Oak: 900-1200mm feathered, container grown, staked; and
 - Scots Pine: 900-1200 container grown, staked.
- 5.80. The ES also noted that in some instances, gorse would be planted as an edging to the LBTS, typically at an average spacing of 0.8m centres. Although gorse was not observed during the site visit, it should be noted that this species can potentially dominate planting plots if not managed correctly; it is therefore suggested that the establishment/ management of this species be re-evaluated at FYA.
- 5.81. The interim HEMP noted that minor modifications were made to the Landscape strategy to reflect minor changes to the design arising during the construction phase, such as the relocation of proposed planting, modifications to the planting mixes to woodland edge planting, and clarification on the detailed layout to avoid buried services. The interim HEMP also noted that changes were made to the specification of the proposed plant stock to reduce scheme costs without compromising the ability to mitigate.
- 5.82. While no information regarding the implementation of the planting proposals was provided in the interim HEMP, where planting plots were able to be accessed during the OYA site visit, it was observed that with the exception of gorse (as noted above), the tree and shrub planting/grassland plots comprising the Landscape mitigation measures generally appeared to have been implemented in line with the preliminary ES design, with plant spacing and sizes broadly as indicated.
- 5.83. As far as could be ascertained at OYA, plant species appeared to be broadly as specified and set out as expected; plant shelters generally remain in place and upright throughout planted areas, and mulch mats (rather than the organic mulch as stated in the interim HEMP) appeared to be generally intact throughout the planting plots.
- 5.84. In terms of the planting that was proposed by the preliminary ES design and that which was observed during the site visit, it is considered that any changes to the planting proposals as a result of detailed design (and as outlined in the interim HEMP) are minor and have likely not materially altered the adverse Landscape and visual effects of the scheme from those predicted by the AST and ES.
- 5.85. As expected, the site visit observed that the highway boundary has been appropriately demarcated with concrete posts as per the preliminary ES design (rather than with the more visually intrusive post & rail fences as is usual for highways schemes), and that Deer Visibility Zones, with clear-stemmed specimen trees, have been implemented along with Forest Edge Management zones where the route passes through areas of coniferous or mixed forest/plantation; these aspects of the scheme are illustrated by Figure 5-4.

Figure 5-4 Highway Boundary Demarcation Post and Forest Edge Management Zone



Left: typical concrete highway boundary demarcation post: as observed throughout the scheme, and right: the Forest Edge Management Zone at Mildenhall, showing a crown-lifted (clear stemmed) specimen tree within the Deer Visibility Zone on the horizon just to the right of the A11.

- 5.86. The site visit also observed that the contours of the earthworks have been rounded to blend in with the Breckland Landscape and that woodland edges have been provided where the route severs existing forests/ plantations (Figure 5-5). It should be noted, however, that the structural diversity of the woodland edges is reliant on appropriate long-term management and maintenance as proscribed by the interim HEMP, and so it is suggested that this aspect of the scheme could be re-considered at FYA when the Landscape proposals have had a chance to establish and receive maintenance as originally intended.

Figure 5-5 Earthworks



Left: earthworks around structures exhibit smooth, naturalistic flowing contours as expected, and right: woodland edges have been provided.

Establishment and Condition of Planting Proposals

- 5.87. The interim HEMP stated that the contract Aftercare Period for the scheme was to be 3 years (with effect from Winter 2014), and set out the establishment maintenance requirements of the mitigation proposals; these are summarised and presented in Table 5-6.

Table 5-6 Aftercare Operations as Stated in the Interim HEMP

Operation	Per Year	Timing
Weed control (waterbodies & culverts, areas of hard standing, and works adjacent to environmentally sensitive areas)	-	During the active growing season
Weed control (retained verges and reservations)	-	During periods of active growth
Weed control (targeted species, including noxious weeds)	-	During the active growing season at a frequency appropriate to the targeted species
Weed control (young trees and shrubs in grass plots)	1	Depth of organic mulch to be inspected annually in March
Weed control (hedge bases, to include 300mm either side of hedge base)	-	As required
Grass cutting (verges and visibility splays)	6	During the growing season
Grass cutting (ditches, swales, banks)	-	As per Roadworks Maintenance Manual
Grass cutting (remaining grasslands)	1	Annually
Watering (all planting undertaken under the contract)	-	For a period of 36 months from practical completion at a frequency necessary to ensure establishment and survival
Additional watering (all planting areas and grasslands)	-	As required, according to the prevailing weather conditions
Removal of stakes, guards and ties	-	As required
Maintenance of existing planting (pruning)	-	As required
Maintenance of existing planting (hedgerows)	1	Annually in January/ February
Maintenance of existing planting (arboricultural works)	-	As required

- 5.88. No records of maintenance operations or specific issues arising were documented in the interim HEMP, although it was noted that any records of environmental incidents during the establishment period would be included within the final HEMP (due in Spring 2018).
- 5.89. Although not all of the planting plots were able to be accessed fully during the site visit, it was observed that the establishment and the condition of the plant stock was generally as would be expected at OYA; the condition of the plant stock and the level of vegetation within the plots are illustrated by Figure 5-6, below, and are generally illustrative of the conditions observed by the site visit throughout the planting plots.
- 5.90. Although the level of vegetative growth in some plots suggests that cutting operations may not yet have been undertaken this growing season, the height of the vegetation generally suggests that maintenance operations have at least been adhered to during the last growing season.
- 5.91. The OYA site visit also observed that a number of the plots had been very recently maintained (Figure 5-6) and given the timing of both the site visit (mid-May) and the aftercare maintenance items as outlined in the interim HEMP, it is considered that although unconfirmed, maintenance operations (in terms of vegetation cutting at least) are likely to be a work in progress at the time of writing.

Figure 5-6 Vegetation Cover



Upper Left and Right: typical vegetation cover within the representation sample of planting plots that were accessed during the site visit, lower centre: a very recently maintained planting plot.

- 5.92. Although relatively few plant failures were observed during the OYA site visit, one notable exception was the new pine shelterbelt adjacent to the southbound carriageway east of Mildenhall Woods, where a significant proportion of the specimen plant stock had failed; this is illustrated by Figure 5-7. No mulch mats or organic mulch were observed by the site visit and although the reasons for the failures are unclear, one potential contributing factor (other than other possible unknown factors such as poor soil, bad handling of plant stock, exposure etc.) could be the effects of resource competition from the under-planted sward, the vigour and density of which could be considered to be inhibiting the natural growth patterns of the plant stock at this location.

Figure 5-7 Plant Failures



Left: the density of the under-planted sward may be contributing to the number of plant failures notable within the immature pine shelterbelt along the southbound carriageway to the east of Mildenhall Woods (right).

- 5.93. In terms of weed control, the OYA site visit found the road corridor generally to be free of noxious weeds, although instances of ragwort infestation were noted (as illustrated by Figure 5-8).

Figure 5-8 Ragwort Infestation of the Grass Verge



- 5.94. The scale of the majority of ragwort colonies and sporadic nature of individual plants is considered to indicate that although this particular weed is broadly under control at the time of writing, ongoing management and maintenance in accordance with the interim HEMP will be required to exclude the larger infestations from grassland areas. However, it should also be noted that localised occurrences similar to those observed during the site visit are likely to remain evident throughout the scheme in locations where ragwort can be found on adjacent land outside the highway boundary.
- 5.95. Although it is considered too early for any meaningful assessment of the environmental functions of the planting proposals to be made at this OYA stage, it is suggested that a more accurate assessment of the planting proposals should be possible at FYA.

Long term Landscape Management

- 5.96. The contract aftercare period for the scheme was stated by the interim HEMP to be 3 years, after which the NMA was to take on the continuing aftercare of the works, and the planting would be incorporated into the routine cyclical management regime associated with the wider soft estate.
- 5.97. In terms of the planting proposals, it was stated in the interim HEMP that the longer-term objectives of Landscape management were to:
- Maintain established low maintenance uniform amenity grass verges to tie in with existing amenity grassland types and open grass channels;
 - Maintain established species rich grassland beyond highway verge, to provide enhancement to local Biodiversity, and promote local wildlife interest within the (former) HA boundary;
 - Establish well-structured woodland which would substantially screen the development site, link with existing shrub and tree planting, and encourage wildlife interest;
 - Establish a dense shrub layer with scattered trees throughout to form a substantial low level screen;
 - Maintain an established woodland edge and dense scrub as part of the planting framework;
 - Replicate the distinctive Deal Row Landscape features typical of the area; and

- Maintain re-established former field boundaries within the context of the existing hedgerow structure.
- 5.98. The interim HEMP also outlined the necessary activities required to establish and manage the Landscape proposals in order to fulfil these objectives.
- 5.99. In terms of environmental barriers, the interim HEMP stated that repairs to the temporary visual screen (fencing) at Horn Heath/ Weather Heath were to be undertaken as necessary, although the requirement for ongoing repairs was to be determined by review and consultation with Natural England, and subject to the establishment of the associated pine screening belt at this location; it was observed that the barriers were in a good state of repair at the time of the site visit, but it is suggested that this aspect of the scheme be reconsidered at the FYA stage.
- 5.100. In light of the interim HEMP acknowledgement of the objectives of the detailed Landscape design and the subsequent maintenance thereof, it is considered that the establishment and maintenance of the Landscape proposals (including the maintenance of the environmental barriers at Horn Heath/Weather Heath) should be considered further at FYA when the final version of the HEMP should be available (Spring 2018).
- 5.101. Additionally, while it is accepted that it is not possible to fully mitigate the impacts resulting from the offline sections of the scheme, the cutting in Mildenhall Woods, the increased scale of the road, the introduction of additional highway infrastructure, and major new engineering features, in terms of the ES statement that (when established) the proposed planting would serve to reinforce the Breckland character and knit the scheme back into the existing Landscape pattern it is too early at OYA for any evaluation of the plant stock to be meaningful - a more accurate assessment of the success or otherwise of planting proposals should be possible at the FYA stage.

Summary

- 5.102. Although there have been additional adverse Landscape and visual impacts resulting from the inclusion of the NMU underpass at the war memorial on Weather Heath that were not considered by the preliminary ES design, it is deemed that this design change has not significantly altered the overall large adverse impact of the scheme on Landscape and visual amenity as predicted by the AST/ES at Year 1; as such, the impacts at OYA are likely to be as expected at this stage.
- 5.103. Similarly, Landscape mitigation measures in the form of planting proposals appear to have been broadly implemented as anticipated and any local variations in expected effects are judged not to have materially changed the predicted Landscape or visual amenity effects of the scheme overall.
- 5.104. In terms of effective establishment and maintenance of the plant stock, it is too early for any evaluation to be meaningful at OYA and a more meaningful assessment of the environmental functions of the planting proposals (including the establishment/ management of gorse) should be possible at the FYA stage.
- 5.105. Although the majority of the plant stock appears to be establishing as would be expected at this OYA stage, it is suggested that remedial action in accordance with the interim HEMP should be undertaken to ensure that the environmental objectives of the new pine shelterbelt adjacent to the southbound carriageway east of Mildenhall Woods are realised by design year.
- 5.106. It is therefore considered that the Landscape and visual amenity effects of the scheme are broadly **as expected** at this stage.

Table 5-7 Evaluation Summary: Landscape

Sub-Objective	AST	OYA
Landscape	Large adverse in Year 1, reducing to moderate adverse by Year 15.	Broadly as expected.

Townscape

Forecast

Appraisal Summary Table

- 5.107. The AST stated that the inclusion of the bypass and movement of the road away from the village (of Elveden) would have a moderate beneficial impact on the Estate Village character area in Year 1, and that this impact was expected to remain as moderate beneficial in year 15; the Center Parcs Holiday Village character area was expected to receive a neutral impact that was expected to remain neutral in Year 15.
- 5.108. Overall, the AST concluded that the Townscape impact of the scheme would be **slight beneficial**.

Environmental Statement

- 5.109. No Townscape specific assessment was undertaken by the ES, although the Land Use chapter of the ES assessed the extent to which the scheme would impact on Elveden village, including access and local businesses.
- 5.110. The Land Use chapter stated that (prior to construction) the A11 passed through the village of Elveden giving rise to all of the adverse impacts associated with a busy trunk road passing through a small settlement, noting that the volume of traffic using this section of road would have increased in recent years, partly as a result of the Center Parcs development to the north of the village.
- 5.111. Overall, the Land Use chapter considered that the impact of the scheme on the settlement of Elveden to be beneficial as:
- Access to the Elveden café and shop would improve as it would be immediately adjacent to the new junction with the B1106 just to the south of the Center Parcs holiday park; and
 - Although the Post Office and village shop would no longer get passing trade, existing village facilities would not be adversely affected by the new road.

Addendum to the Environmental Statement

- 5.112. Townscape was not specifically considered by the ES Addendum, and the Land Use chapter of the same addendum assessed the impacts of the additional Non-Motorised User (NMU) underpass at the war memorial only - no additional assessment regarding the impact of the scheme on Elveden village was undertaken.

Consultation

- 5.113. No responses to consultation requests were received for this sub-objective.

Evaluation

- 5.114. The site visit observed that as expected, the road has moved away from the village of Elveden, bypassing the village to the north to allow easier access between the two distinct settlement areas of the village and introducing a degree of separation between the bypass and settlement; the new junction with the B1106 just to the south of the Center Parcs holiday park was observed to provide access onto the new A11 from the village, and to the Elveden café and shop from the new A11.

Figure 5-9 Degree of Separation between the Bypass and Elveden (© Google, 2017)



Illustrating the degree of separation between the bypass and the settlement of Elveden. The left-hand image is from the B1106/A11 northbound entry/exit slip road junction looking south-east towards the main settlement (behind the tree belts), and the right-hand image shows the view looking north along the B1106 towards the overbridge crossing the A11 from the outskirts of the settlement.

- 5.115. No information has been available for POPE to evaluate the impact of the scheme in terms of changes to passing trade on the Post Office or the village shop – it is suggested that this aspect of the scheme could be considered at the FYA stage.
- 5.116. Based on the site visit and given the likelihood that that the A11 is now a more attractive route and therefore likely to remove traffic from the settlement of Elveden (as outlined in the traffic forecast evaluation section in this chapter), it is therefore considered unlikely that the Townscape impact of the scheme is anything other than beneficial.
- 5.117. No further evaluation has been undertaken, as no changes from the AST regarding Townscape were identified during the site visit.
- 5.118. It is therefore concluded that the effects of the scheme on Townscape are **Slight Beneficial**, as expected.

Table 5-8 Evaluation Summary: Townscape

Sub-Objective	AST	OYA
Townscape	Slight Beneficial	As Expected

Cultural Heritage

Forecast

Appraisal Summary Table

- 5.119. The AST stated that the scheme was expected to have a moderate adverse impact on two heritage assets; the Landscape setting of the war memorial (noted as being of moderate importance and expected to be impacted by the inclusion of the NMU underpass with the historic parish boundary being severed by the underpass), and the Romano-British farmstead (immediately west of the B1106 junction) was expected to be directly impacted by topsoil stripping. 31 sites in total were expected to receive slight adverse impacts.
- 5.120. Moderate beneficial impacts were predicted by the AST for the How Hill tumulus (Scheduled Monument), and a very large beneficial impact to the Elveden Conservation Area as a result of moving the road away from these heritage assets was also expected.
- 5.121. Overall, the AST assessed the impact of the scheme on the heritage resource as **slight adverse**.

Environmental Statement

- 5.122. The ES assessed both Historic Landscape Character and Built Heritage features, and stated that through the implementation of a comprehensive programme of mitigation, while the residual impact of the scheme on both known sites and potential unknown archaeological remains would result in the physical loss of the identified resource, this would be balanced against an increase in knowledge and understanding of the archaeology and historic Landscape of the area that would result in a neutral effect overall.

Addendum to the Environmental Statement

- 5.123. The ES addendum stated that the proposed NMU underpass on Weather Heath would be positioned close to the war memorial, and would have a slight adverse impact on its setting. However, this was not considered to affect the overall assessment of impact for Cultural Heritage as noted in the ES.

Consultation

- 5.124. In its response to consultation, Historic England commented that:
- Adequate evaluation was undertaken prior to construction in order to reduce or avoid the expected impacts on the heritage resource;
 - There were impacts upon non-designated archaeology that were subject to assessment and excavation during construction. Although the impacts were anticipated and effectively managed through the normal development control processes, the results have not yet been published; and
 - Historic England is not aware of any impacts upon the setting of any listed buildings.
- 5.125. An additional comment made by Historic England concerned the impact of the scheme on the setting of How Hill tumulus (also known as Bowl Barrow), a Scheduled Monument of national importance (List Entry Number: 1017795) located east of Heronfield Belt and immediately adjacent to the northbound carriageway of the A11, approximately 3.5km north-east of Fiveways Roundabout:
- *'The impact upon the designated barrow is in our view worse than anticipated. Two issues have emerged:*
 - *The barrow was not initially marked or protected from construction impacts and this had to be rectified during the project on request from Historic England; and*
 - *The impact on the setting of the monument is worse, primarily due to the construction of a drainage scheme, which was placed in the verge adjacent to the monument. This is a large soakaway which would have been better placed elsewhere.'*

Evaluation

- 5.126. Regarding the impact of the NMU underpass on the Landscape setting of the war memorial on Weather Heath not proposed by the Preliminary ES design but implemented as part of the Detailed Design, it is not clear why the AST noted the importance of the Grade II Listed war memorial as being moderately important/valuable, as the Criteria Used to Determine Importance of Receptors in DMRB Volume 11 Section 3 Part 2 indicates that Grade II listed buildings should be considered to be of high importance/value.
- 5.127. For the significance of an impact on a moderately important/valuable resource to be classified as moderate by the Significance of Effects Matrix, the AST would have had to have considered the magnitude (or degree) of change to be major/ moderate, i.e. *complete destruction or a change to the site or feature which would be expected to result in a fundamental or appreciable change in our ability to understand and appreciate the resource and its historical context or setting.*

- 5.128. The ES/ES Addendum categorised the importance/ value of the monument to be high, and for the significance of the impact on a highly important/ valuable resource to be classified as slight adverse by the Significance of Effects Matrix, the magnitude (degree) of change would have to be to be minor/ negligible, i.e. *a negligible or no material change to the site or feature which would be expected to result in a small or no real change in our ability to understand and appreciate the resource and its historical context and setting.*
- 5.129. The impact of the NMU underpass on the Landscape setting of the war memorial has been reviewed by a combination of desk studies and a site visit (see Figure 5-11).
- 5.130.), and it is considered by POPE that there is no reason to consider that the ES Addendum assessment is anything other than valid, as it is considered likely that the removal of several trees would likely only result in a small change in our ability to understand and appreciate the war memorial and its historical context and setting.
- 5.131. It is therefore considered that despite the locally significant slight adverse impact on the Landscape setting of the war memorial (due to the removal of several trees), the overall neutral assessment of impact on Cultural Heritage as noted in the ES has not been significantly altered by the inclusion of this aspect of the scheme.
- 5.132. Regarding the comments received from Historic England generally:
- It is assumed by POPE methodology that all popular and academic archaeological reports relating to the scheme should have been published/submitted to journals and deposited (along with all archaeological finds) by the FYA stage; it is therefore suggested that this could be confirmed at that point in time; and
 - It was a requirement of the CEMP that prior to construction, an external consultant Archaeologist would need to be informed prior to works commencing in any area for which an Archaeological Works Completion Statement (AWCS) had not been produced or where an AWCS detailed the requirement for an archaeological watching brief; it is therefore considered a failing of the scheme that this appears not to have been put in place and that Historic England had to specifically request protection measures at the Bowl Barrow/How Hill scheduled monument (it should be reiterated however, that the consultation response confirmed that the Bowl Barrow/How Hill scheduled monument was eventually marked and protected from construction phase impacts and as such, potential damage avoided).
- 5.133. Concerning the impact of the scheme on the Landscape setting of Bowl Barrow/How Hill scheduled monument being worse than expected due to the proximity of the soakaway, the relationship between the monument and the soakaway is shown below in Figure 5-10. The preliminary drainage design indicated that the nearest soakaway to the monument was to be located approximately 500m to the east (i.e. c.500m to the right of Figure 5-10).

Figure 5-10 Bowl Barrow/How Hill and the Soakaway (© Google, 2017)



Showing the relationship of Bowl Barrow/How Hill (centre left) to the soakaway (lower right) referred to in the consultation response received from Historic England.

- 5.134. Although modifications to the preliminary drainage design arose from the decision of the Environment Agency to change the extent of the designation of the groundwater Special Protection Zone (SPZ) 1, no information has been provided to POPE as to whether it was necessary to extend these SPZ 1 drainage modifications into SPZ 2 (in which Bowl Barrow/How Hill tumulus is located) to facilitate connection with the SPZ 2 drainage facilities.
- 5.135. The site visit observed that soakaway is c.500m closer to the monument than was originally stated in the ES, and has been located directly adjacent to the new northbound carriageway, south of the footprint of the old A11 (which has subsequently been broken out, locally re-graded and seeded). The A11 (and traffic thereon) has been realigned 35-40m to the south and away from the tumulus (as expected).
- 5.136. While it could be considered that the benefits of carriageway re-alignment (i.e. removal of traffic away from the monument) outweigh any adverse effects arising from modifications to the drainage design at this location, it is considered by POPE that the predicted moderate beneficial effects on the Landscape setting of the monument have likely not been realised to the predicted extents due to the proximity of this soakaway to the monument. The overall predicted impact of the scheme on the monument is therefore considered likely to be slightly worse than expected as a result of this design modification, and that this aspect could be re-evaluated at FYA by which time the stones comprising the soakaway would have weathered, and the visual effects of the soakaway may be less prominent.
- 5.137. In terms of the impact of the scheme on the Elveden Conservation Area (encompassing the settlement of Elveden, adjacent and to the north of the previous A11, and additional land to the south of the former A11), the site visit observed that the road now completely bypasses the Conservation Area rather than running through it; the removal of a busy trunk road (and associated adverse impacts) from the Conservation Area is considered unlikely to be anything other than beneficial, and therefore as expected.
- 5.138. In order to mitigate impacts on the area of Romano-British settlement, the ES stated that this should be subject to open area excavation prior to the commencement of development, and that an area equating to the whole working width and length of the development corridor/easement should be investigated. Although areas situated immediately to the east, whilst also producing a small concentration of undated features, were considered likely to relate to activity on the periphery of the main focus of settlement, it was considered that these could be appropriately mitigated through the implementation of an archaeological monitoring and recording (watching brief) action that should be maintained during the course of all topsoil removal works from within the development corridor; POPE is unaware of any reports or findings relating to these actions, and although this aspect of the scheme is consequently unable to be fully evaluated at the time of writing, it should be reconsidered at FYA when further information may be available.
- 5.139. The ES Addendum stated that the construction of the NMU underpass at the war memorial would result in the loss of trees that were a feature of the immediate setting of the (Grade II Listed) structure, and that the earth bank (OA69) forming the parish boundary would also be severed by the proposed scheme on both the east and west side of the A11. The edges of the cutting were stated as to be finished with grass to retain the existing character of vegetation within the immediate vicinity of the war memorial, and the site visit observed that this aspect of mitigation has been undertaken as expected (as can be seen from Figure 5-11).

Figure 5-11 War Memorial



The edges of the cutting of the NMU underpass at the war memorial have been finished with grass to reflect the character of the existing vegetation at this location, as stated in the ES Addendum.

5.140. Regarding mitigation planting, it is considered that although planting has been implemented broadly as expected, it is too early for any evaluation of the plant stock to be meaningful at OYA, and that the screening and integration functions of the planting proposals with respect to heritage assets are likely to be more apparent at the FYA stage.

5.141. In summary:

- Although the damage to the Bowl Barrow/How Hill Scheduled Monument was avoided, it would appear that this was achieved as a result of Historic England specifically requesting appropriate protection measures be implemented during the construction phase;
- As a consequence of the drainage design modifications, the beneficial impact of the scheme on the Landscape setting on the Bowl Barrow/How Hill Scheduled Monument has likely not been realised to the predicted extents, and this aspect of the scheme should be revisited at FYA;
- The removal of a busy trunk road (and associated adverse impacts) from the Conservation Area is considered unlikely to be anything other than beneficial;
- Impacts on the area of Romano-British settlement should be reconsidered at FYA when further information may be available; and
- The final publication and deposition of reports and finds relating to the scheme are outstanding.

5.142. It is considered likely that the effects of the modifications to the scheme’s drainage design on the heritage resource of Bowl Barrow/How Hill scheduled monument are **worse than expected** by both the AST (i.e. Slight Adverse) and the ES/ES Addendum (i.e. neutral) at this OYA stage.

Table 5-9 Evaluation Summary: Heritage and Historic Resources

Sub-Objective	AST	OYA
Heritage and Historic Resources	Slight Adverse	Worse than Expected

Ecology & Nature Conservation

Forecast

Appraisal Summary Table

- 5.143. In terms of species, the AST stated that with mitigation, the scheme was expected to have:
- Neutral impacts on Annex 1 bird species and invertebrates;
 - Slight adverse impacts on bats (resulting from severance) and deer (due to the interruption of deer movement patterns and potential deer mortality);
 - Slight beneficial impacts on reptiles (resulting from the provision of habitat in the new deer visibility zones), and moderate to large beneficial impacts on Great Crested Newts (GCNs) as a result of improvements to the GCN breeding ponds in close proximity to the scheme.
- 5.144. In terms of habitat, the AST stated that with mitigation, the scheme was expected to have:
- A neutral impact on the Breckland Special Area of Conservation (SAC) & Special Protection Area (SPA) habitats and associated Site of Special Scientific Interest (SSSI) units. Neutral impacts on the PRVs (protected road verges), the River Lark cut-off channel (a watercourse), Mildenhall Woods, and Elveden Farm tracks were also predicted.
 - Slight adverse impacts were expected on the habitats in the area of the bypass; and
 - A moderate to large beneficial impact was expected on the Rex Graham Reserve SAC/SSSI as a result of the road moving further away from the site.
- 5.145. Overall, the AST assessed the impact of the scheme on Biodiversity as **neutral**.

Environmental Statement

- 5.146. The ES noted that within 1km of the existing A11 were the Breckland SAC and SPA, and the Rex Graham Reserve SAC, all European designated Natura 2000 sites. Nationally important sites within the study area also included the Breckland Forest SSSI, Breckland Farmland SSSI, and Weather and Horn Heath SSSI's. The regionally important Thetford Park Forest County Wildlife Site (CWS) was also noted as occurring on both sides of the scheme.
- 5.147. Protected species occurring in the study area were stated as including both European and nationally important birds and bats, as well as badgers, GCNs and reptiles. Non-statutory invertebrates, plants, and deer were also stated to be present in the area.
- 5.148. The ES also stated that a comprehensive programme of mitigation had been developed to avoid impacts to ecological features but where potential impacts had been identified, the proposals included habitat creation and enhancement measures, with offsite mitigation measures designed to address the loss of important habitats and species. The majority of the impacts following the implementation of the proposed mitigation were determined to be **neutral** by the ES.
- 5.149. Critically, the ES noted that the scheme would not alter the ecological integrity of the European or nationally important sites or their associated species. Separate studies, noted as having been carried out to inform Appropriate Assessments for the Natura 2000 sites present in the study area, confirmed this assessment, and the ES further noted that Natural England had been closely involved in the development of the proposals, and agreed with the findings of the ecological assessment.

Environmental Statement Addendum

- 5.150. The ES addendum stated that additional ecological surveys undertaken in 2009 revealed that in terms of bats, there was an increase in the significance of impact from slight adverse to moderate adverse (during construction) and from neutral to slight adverse (during operation).

- 5.151. The effects of the scheme on the three European protected sites (Rex Graham Reserve SAC, Breckland SAC and Breckland SPA) was noted by the ES addendum as being discussed with Natural England, the Royal Society for the Protection of Birds (RSPB), the Forestry Commission, and Elveden Estates to ensure that the scheme did not have an impact on their integrity. The management of land identified as a mitigation requirement within these assessments was stated to be covered in a separate Habitat Creation Management Plan (HCMP). The HCMP for Wangford Warren (January 2017) was provided to POPE.

Consultation

- 5.152. No responses to consultation requests were received for this sub-objective.

Evaluation

Species

- 5.153. In terms of construction phase impacts, the interim HEMP confirmed that the following licences had been obtained from Natural England:
- GCN: EPSM2011-3417 (Suffix E); and
 - Badger: WLM/2012/0639.
- 5.154. Regarding the slight changes to the design and location/orientation of the bat wires as a result of design development, the Bat Mitigation Strategy noted that:
- The chainages of the proposed bat wires were never accurately plotted by the ES or ES Addendum and as such, although it would appear that the bat wires had moved since publication of these documents, the accuracy (in terms of location and orientation) of the bat wires had significantly increased and it was this change in accuracy that had resulted in apparent location changes; and
 - The original ES stipulated that bat wires with balls (to aid echolocation) were to be implemented, rather than the U- or V-shape bat wire designs that were installed during the construction phase (as shown in Figure 5-12). The design was altered in light of evidence suggesting that the original design was less effective in terms of mitigation than the U- or V-shaped bat wires.

Figure 5-12 Bat Wire Designs



Evidence suggests that the implemented U- or V-shape bat wire designs are more effective than the original bat wires with balls as stipulated by the ES.

- 5.155. In terms of the operational phase/establishment maintenance period, the interim HEMP also confirmed that within the ES and as part of the mitigation strategy, the following species monitoring exercises were required:

- Bat boxes: To be monitored 3 times annually for a period of 5 years;
 - Bat wires: To be monitored 3 times annually for a period of 5 years, with a further inspection at 10 years;
 - Badgers: Post-construction checks, noted to include 2015 and 2018 monitoring of existing setts, evidence of use of tunnels/underpasses, fencing, & recorded mortalities on road;
 - GCNs: To be surveyed annually to record GCN presence/absence (including population assessments) for the 6-year period 2014 to 2019 inclusive; and
 - Planting: Ongoing monitoring during the establishment phase, to ensure achievement of planting objectives.
- 5.156. The interim HEMP noted that although the GCN survey for 2014 had been undertaken, the findings of the survey (and of the monitoring requirements outlined above) were to be incorporated in the final HEMP, due to be updated after completion of the three-year contract aftercare period (Spring 2018).
- 5.157. POPE is unaware of any other information regarding species or the results of any monitoring required as part of the mitigation strategy, and as such the operational impact of the scheme on species, protected or otherwise, cannot be confirmed at this stage of the POPE process.
- 5.158. In terms of specific mitigation measures implemented as part of the scheme, however, the OYA site visit did observe that mitigation measures included reptile exclusion fencing and underpasses, one-way mammal gates set within mammal exclusion fencing, and mammal ledges located at the River Lark cut-off channel; these mitigation measures are illustrated by Figure 5-13.

Figure 5-13 Species Specific Mitigation Measures



Upper Left: reptile exclusion fencing and underpasses, upper right: one-way mammal gates set within mammal exclusion fencing, and lower centre: mammal ledges at the River Lark cut-off channel.

Habitat

- 5.159. The interim HEMP also confirmed that within the ES and as part of the mitigation strategy, the new GCN habitat was to be managed for a period of 5 years “*as appropriate*”, and considered that this also related to the on-going Landscape management of habitat, i.e. “*appropriate*” management of wildflower meadows, scrub planting etc.
- 5.160. As noted in the Landscape section, above, the OYA site visit found that the planting proposals appear to have been implemented broadly as expected, and any local variations in the effects brought about by changes in vegetation clearance and proposed planting as a result of Detailed Design are unlikely to have materially changed the predicted effects of the scheme on habitat overall. However, it is also considered that it is too early for any meaningful assessment of the planting proposals in terms of habitat to be made at this OYA stage, but that a more accurate assessment should be possible at FYA.
- 5.161. In addition to the species-specific mitigation measures outlined above, the site visit also observed that habitat enhancement measures in the form of insect/ reptile hibernacula (as illustrated by Figure 5-14) had also been undertaken.

Figure 5-14 Habitat Enhancement: in the form of an insect/reptile hibernacula



- 5.162. The results of the monitoring exercises noted in the draft HEMP were unavailable for the purposes of this evaluation, and POPE is unaware of any other information regarding habitat; as such, it is considered that a full evaluation the impact of the scheme on habitat is not possible at this stage of the POPE process, but could be considered further at FYA when the results of the said monitoring exercises are likely to be available.

Animal Mortality

- 5.163. No animal mortality data has been received for evaluation by this study; it is suggested that this aspect could be reconsidered at the FYA stage.

Long-Term Ecological Management

- 5.164. It was stated in the interim HEMP that the longer-term objectives of ecological management were to:
- Maintain the bat fencing around the bat wires whilst the planting established; and
 - Maintain the species specific (badger and GCN) protective fencing to encourage the use of identified crossing points by the targeted species.
- 5.165. In light of the interim HEMP’s acknowledgement of the above and of the requirement for surveys/monitoring associated with bats, badgers and GCNs, it is considered that these aspects should be considered further at FYA when the results of monitoring and surveys should be available for evaluation.

Summary

- 5.166. The impacts of the scheme on species, protected or otherwise, are unlikely to have been significant as mitigation measures outlined in the ES have been implemented as confirmed by the interim HEMP and as observed during the site visit; it is considered that any changes in vegetation clearance and proposed planting brought about by the Detailed Design are unlikely to have materially changed the predicted effects of the scheme on Habitat.
- 5.167. The design of the bat wires appears to have been optimised in line with research published since publication of the ES and ES addendum, and it is suggested that this should ensure a greater chance of success than that proposed by the Preliminary ES design, although this could be confirmed at FYA when the results of monitoring (as specified in the interim HEMP) may be available.
- 5.168. However, in the absence of animal mortality data and post-opening survey/monitoring information, it is not possible to fully evaluate the effects of the scheme on either species or habitat at this stage of the POPE process; these aspects should be considered further at FYA, when the final HEMP (incorporating the findings of the survey/monitoring requirements) and other monitoring reports should be available.
- 5.169. The habitat creation areas should be further progressed by the time of the FYA, and can be considered further.
- 5.170. It is therefore considered that although confirmation is required, the impact of the scheme on Biodiversity is likely to be **as expected** (i.e. neutral) at this stage.

Table 5-10 Evaluation Summary: Biodiversity

Sub-Objective	AST	OYA
Biodiversity	Neutral	Likely to be as expected, although confirmation is required

Road Drainage and the Water Environment

Forecast

Appraisal Summary Table

- 5.171. The AST stated that a water course (the River Lark cut-off channel) and a major aquifer were present within the scheme extents, and that mitigation measures, designed in consultation with the Environment Agency, were expected to reduce any impact to neutral through the incorporation of pollution control measures and sensitive design. Two private water supplies were expected to be affected by the scheme, but the AST stated that mitigation measures would ensure that no property would be left without a viable source of water.
- 5.172. The AST concluded that the scheme would have a **neutral** impact on the Water Environment overall.

Environmental Statement

- 5.173. The ES stated that generally, the proposed dual carriageway would cause a redistribution of the surface water runoff throughout the scheme, and that the following mitigation measures would ensure that the magnitude of the impact of the scheme on the Water Environment would be negligible, and the significance would be neutral:
- Prior to construction, the surface water ran off the single carriageway into the adjacent verges, but after dualling, runoff would be collected and transported to the designated discharge points along the scheme, although some runoff would infiltrate through the grassed channels. It was expected that the net volume of water entering the ground would remain about the same for the majority of the scheme, but would be redistributed. The exception to this would be from the Fiveways Bridge over the River Lark cut-off channel to the top of the hill near Mildenhall Woods, where the existing informal runoff arrangement would change to a positive system and the runoff piped to the River Lark cut-off channel outfall.

- Grass channels were proposed as the collection system throughout the scheme which were to remain unlined, except within groundwater SPZ 1, and allow some infiltration;
- For the length of road adjacent to Weather and Horn Heaths, there was to be no direct runoff to the verges, and the water was to be transported southwards away from the heaths.

5.174. The ES noted that HA216/06, the part of the DMRB providing guidance on the assessment and management of impacts that road projects may have on the Water Environment, requires that the need for and the nature of mitigation measures should be informed by additional risk assessment. The ES stated that it was proposed that that these risk assessments would take place during detailed design, with additional mitigation being incorporated into the drainage proposals if required.

Addendum to the Environmental Statement

5.175. The ES addendum stated that although revisions had been made to the drainage and Water Environment, and geology and soils chapters of the published ES following consultation, in both cases the scheme would have a neutral impact on surface and groundwater features (as stated in the published ES).

Consultation

5.176. No responses to consultation requests were received for this sub-objective.

Evaluation

5.177. The draft Construction Environmental Management Plan (CEMP) identified the prevention of pollution of controlled waters to be a legal requirement of the highest importance, noting that any environmental impacts would be minimised if existing receptors/ treatment facilities were kept in good condition and emptied regularly. Possible sources of pollution were identified as follows:

- Rainwater run-off;
- Spillage or leaks of fuel or chemicals;
- Sewage overflow;
- Wastewater from wheel washes/ cleaning plant;
- Water arising from de-watering excavations; and
- Concrete batching plants.

5.178. The draft CEMP also stated that parts of the access tracks were located above groundwater SPZ 1, and that in order to protect the groundwater, the following mitigation measures would be implemented:

- All fuel bowsers would be double bunded (as a minimum); and
- Fuelling points would be pre-determined by each track location.

5.179. In addition, the draft CEMP noted that the following generic mitigation measures would be implemented to prevent pollution of groundwater and surface water from site runoff:

- Use of drip trays and spill kits to reduce the risk of pollution and provide adequate means for dealing with incidents including means for disposal.

5.180. During the construction phase, nine environmental incidents relating to the spillage and leakage of fuel/chemicals and run-off from the washing of vehicles were recorded by the interim HEMP, along with the remedial action taken as a result of these incidents (including

treatment on the ground by the Emergency Spillage Team, and spillage containment & removal of contaminated material from site for safe disposal).

- 5.181. Although no as-built drainage drawings were available for this evaluation, the interim version for handover of the Health and Safety (H&S) file confirmed that:
- Positive drainage systems have been used throughout, and consist of either pre-cast concrete kerb and gully, combined kerb and drainage units, or slot drains as appropriate;
 - Drainage is primarily to soakaways, and periodic excavation, cleaning and replacement of stone fill material will be required. Although the soakaways are greater than 50m from adjacent private and public water extraction points, reasonable care must be taken to prevent any contamination entering the soakaways and subsequently the aquifer; and
 - Pollution Containment Devices (PCDs) in the form of shut off valves and surface channel flow control gates have been provided in the event of spillage, and there are pollution controls for water runoff treatment areas at the downstream end of each network to mitigate the risk of pollution reaching the watercourses.
- 5.182. All drainage facilities and PCDs noted during the OYA site visit appeared to be generally clear of vegetation/litter/detritus, with no evidence to suggest that the facilities are unable to function other than as expected; an example is provided in Figure 5-15.

Figure 5-15 Pollution Control Devices



Observed to be generally clear of vegetation/litter/detritus at the time of the OYA site visit.

- 5.183. However, the site visit did observe that a number of covers relating to the drainage system and a PCD adjacent to the footpath leading from the southbound lay-by to the NMU underpass at the war memorial were missing; although the missing covers are considered unlikely to materially compromise the scheme's drainage and pollution containment systems, it is considered to constitute a potential hazard for NMUs - consequently, this aspect of the scheme is discussed under the Physical Fitness sub-objective (and illustrated in Figure 5-16) and also in the Safety Evaluation chapter.
- 5.184. No information has been made available to POPE in relation to the two private water supplies expected by the AST to be affected by the scheme.
- 5.185. Although it remains unconfirmed in the absence of any pre-/post-construction phase water quality monitoring information, based on observations made during the site visit and the information provided by the ES, draft CEMP, interim HEMP, and interim H&S file, it is considered that the overall, direct effect of the scheme on water quality and drainage is likely to be **as expected**, although this should be re-considered at FYA when more information may be available.

Table 5-11 Evaluation Summary: Water Environment

Sub-Objective	AST	OYA
Water Environment	Neutral	Unconfirmed, but likely to be as expected

Physical Fitness

Forecast

Appraisal Summary Table

- 5.186. The AST stated that beneficial impacts from the reduction of severance through links to the PRoW network and the inclusion of the NMU underpass were expected, along with an increase in health benefits associated with the inclusion of the bypass and reduced severance for the Elveden Estate. However, the AST also stated that some access routes would be stopped up, and that this aspect of the scheme was expected to have some minor adverse impacts. The AST noted that usage of the PRoW network was low, and assessed the impact of the scheme on NMUs as **neutral** overall.

Environmental Statement

- 5.187. The *Pedestrians, Cyclists, Equestrians, and Community Effects* chapter of the ES considered there to be no long-term changes to journey lengths along existing paths as a result of the scheme.
- 5.188. The main community area that was considered by the ES likely to be affected by the proposed route, was Elveden. Significant benefits were expected as a result of the scheme bypassing the village to the west, including reduced severance and increased amenity.
- 5.189. Apart from Elveden village and the facilities around the Fiveways and Thetford Southern Bypass roundabouts, the area was noted by the ES to be sparsely populated with few community facilities. Severance relating to agricultural and forestry operations was stated as being mitigated through upgrade of the Estate's internal track system, and the provision of two accommodation overbridges. The ES considered that using accommodation overbridges rather than crossing the existing A11 could be considered an improvement in terms of severance for the Elveden Estate.
- 5.190. The ES stated that the scheme would reduce the severance for NMUs on the PRoW network in the area overall, noting that although a number of property accesses would be stopped up, alternative routes to these properties, including the accommodation bridges over the A11, would be provided. Elveden village was expected to experience improved amenity and reduced severance as a result of the scheme.
- 5.191. The overall assessment of the impact of the scheme on NMUs and the community was considered to be **moderate beneficial** by the ES.

Addendum to the Environmental Statement

- 5.192. The ES addendum stated that whilst the NMU underpass near the war memorial on Weather Heath would provide a benefit to pedestrians, cyclists and equestrians by reducing severance, the overall assessment of impact would remain as stated in the published ES as **moderate beneficial**.

Consultation

- 5.193. No responses to consultation requests were received for this sub-objective.

Evaluation

- 5.194. Regarding alternative access for the property accesses stopped up as part of the scheme noted in the ES, the site visit observed that accommodation bridges over the A11 had been provided as expected.
- 5.195. The ES showed that a layby was to be provided on the northbound carriageway directly adjacent to the war memorial, and indicated that a footpath way to be provided to link the layby

to the war memorial, as did the ES Addendum. The ES Addendum also showed a layby on the southbound carriageway, opposite the layby on the northbound carriageway, with a link to the war memorial via the NMU underpass.

- 5.196. Both the ES the ES Addendum showed that showed that access to the south side of the A11 from the existing Icklingham Byway No 7 was to be stopped up, although both documents indicated that the byway would be diverted via the NMU underpass to the war memorial on the north side of the A11, where it was linked to an indicative line of a bridleway that was to be promoted by Suffolk County Council.
- 5.197. The combination of desk studies and the OYA site visit has found no reason to suppose that there have been any significant changes to NMU facilities since publication of the ES Addendum.
- 5.198. No NMU survey has been undertaken specifically for this study and POPE is not aware of any Vulnerable User Studies that have been undertaken for this scheme. Since the POPE site visit in May 2016, a post construction NMU audit for the scheme has been issued (March 2017). Consequently, the actions highlighted by the audit to rectify the issues identified (mainly around vegetation clearance) to improve conditions for NMU's be revisited at the FYA stage as the issues and implementation of the suggested remedial actions raised by this audit have not been verified at by POPE at this stage.
- 5.199. Direct evidence of PRow use by pedestrians and cyclists was observed on several occasions at different locations during the site visit, including at the NMU underpass at the war memorial which is considered to indicate that this significant local landmark is now easily accessible from both laybys by less ambulant visitors. All other sections of the PRow network viewed during the site visit appeared to be capable of performing generally as expected, although it remains unconfirmed at the time of writing whether the bridleway (that was to be promoted by Suffolk County Council) had been implemented.
- 5.200. However, it was observed that a number of covers relating to the drainage system and a PCD adjacent to the footpath leading from the southbound lay-by to the NMU underpass at the war memorial were missing – these are illustrated in Figure 5-16. Given their proximity to the footpath, the diameter and depth of these uncovered shafts is such that they are considered to constitute a potential hazard to NMUs, and corrective action is required.

Figure 5-16 Missing Drainage System Cover



Left: the missing drainage system cover adjacent to the footpath leading from the southbound lay-by to the NMU underpass at the war memorial, and right: the missing covers at the Pollution Containment Device at the same location.

- 5.201. Overall however, it is considered that the reduction in the degree of severance of the Elveden Estate and the PRow network (facilitated by the accommodation bridges and the NMU underpass at the war memorial respectively) and the improved amenity and reduced severance at Elveden is likely to have had the moderate beneficial effects as expected by the ES and the ES Addendum; as such, the effects of the scheme are concluded to be **better than expected** by the AST (i.e. better than neutral), but **as expected** by the ES (i.e. moderate beneficial).

Table 5-12 Evaluation Summary: Physical Activity

Sub-Objective	AST	OYA
Physical Activity	Neutral	Better than expected by the AST, but as expected by the ES & ES Addendum

Journey Quality

5.202. The Journey Quality sub-objective considers traveller care (facilities and information), traveller views (the Landscape through which the traveller passes, the ability to view the Landscape, and features of particular interest) and traveller stress (frustration, fear of potential collisions, and route uncertainty).

Forecast

Appraisal Summary Table

5.203. The AST did not consider traveller views, but stated that the scheme would provide major benefits to over 10,000 vehicle travellers through the provision of additional facilities (traveller care), a reduction in congestion and the fear of collisions (through the incorporation of deer visibility zones and a central reserve) were predicted to reduce traveller stress; overall, a large **beneficial impact** was predicted.

Environmental Statement

5.204. Traveller care was not considered by the ES.

5.205. The ES concluded that the proposals would result in a **slight adverse** impact to traveller views:

- The most significant change in views from the A11 would result from the introduction of the bypass around the village of Elveden. The existing views of Estate village and parkland currently experienced by travellers on the existing A11 would be replaced by intermittent and/or open views of intensive agriculture and forest Landscapes. The Gibson's accommodation overbridge, the Chalk Hall Farm accommodation overbridge, the A11/B1106 junction slip-roads and overbridge which, with their associated earthworks, would all form new, urbanising engineering features that would be prominent in views from the A11 corridor;
- The planting of a new pine hedgerow along the north side of the scheme between Weather and Horn Heaths (for ecological reasons) would ultimately screen the existing attractive open views across Weather Heath. This would reduce the quality of the view north from the road at this point. Likewise, planting in several locations along the scheme would restrict, and in some cases completely close, views from the road corridor; and
- Generally, the overall balance of open, intermittent, and restricted views from the existing A11 would not be altered by the scheme. However, as a result of the addition of new, artificial features to the carriageway, the experience of passing through the Breckland Landscape currently enjoyed by travellers would be negatively affected.

5.206. The ES concluded that the proposals would result in a **significant beneficial** effect on driver stress:

- Baseline conditions indicated moderate levels of driver stress along the A11. The DM scenario would result in an increase in driver stress from moderate to high; a significant adverse impact to vehicle travellers. However, the DS scenario was expected to reduce driver stress levels to below the baseline conditions; resulting in low levels of driver stress along the scheme, providing a significant beneficial effect for vehicle travellers; and

- In addition to predicted reductions in driver stress associated with improvements to traffic volume and speed, the proposals might facilitate further driver stress reductions as a result of improved road design. In addition, the stopping up of existing accesses onto the A11 would reduce the numbers of NMUs and slow-moving agricultural traffic from joining the highway which, it was expected, should help reduce driver frustration and fear of potential collisions. Increased visibility due to the widened and opened verges should also improve safety and reduce drivers' fear of potential collisions, ultimately benefiting vehicle travellers.

Addendum to the Environmental Statement

- 5.207. The ES Addendum stated that no vehicle traveller issues arose from formal consultation following publication of the ES and therefore no further consultation had taken place. Although it also stated that no updates to the published ES had been undertaken, a new lay-by that was not shown on the ES scheme design was proposed by the ES Addendum on the southbound carriageway of the A11, broadly opposite the war memorial; this was to be connected to the new NMU underpass by a footway that was also absent from the ES scheme design.
- 5.208. While the ES Addendum assessed the impacts of the NMU underpass on traveller views and driver stress to remain as stated in the published ES, the impact of the new lay-by (on traveller care) was not considered.

Consultation

- 5.209. Mildenhall Parish Council identified five specific issues associated with traffic at Fiveways Roundabout; although these are not directly related to the dualling of the A11 between the roundabout at Fiveways and that at Thetford, these relate to the safety aspects of the scheme and have been considered within the Safety section of this report.

Evaluation

Traveller Care

- 5.210. No changes regarding traveller care since publication of the ES Addendum were proposed as part of the final design, and none were identified during the OYA site visits. A new service station has been provided at Fiveways Roundabout, although this was not part of the scheme. Consequently, this aspect has not been evaluated further.
- 5.211. As additional Traveller Care facilities (in the form of the new lay-bys on the north and southbound carriageways adjacent to the war memorial) have been provided along with access to existing local facilities (the Elveden café and shop immediately adjacent to the new junction with the B1106 just to the south of the Center Parcs holiday park, and the village Post Office and shop), the impact of the scheme on traveller care is therefore considered to be beneficial and as expected by the AST.
- 5.212. On a safety note however, the site visit noted that one of the first hazard reflector posts at the entrance to the south-bound lay-by at the war memorial had been damaged – this is illustrated in Figure 5-17. Approximately only half of the reflector post's circumference was attached to the base-plate, and the reflector post was noted to be highly unstable. It is considered that the present condition of this reflector constitutes a potential hazard to road users, and corrective action should be given consideration.

Figure 5-17 Hazard Reflector Post



The damaged hazard reflector post at the entrance to the southbound lay-by at the war memorial has only half of the post's circumference attached to the base-plate

- 5.213. The site visit observed a similar safety issue regarding the hazard reflector posts at the Maintenance Access Area (MAA) on the southbound carriageway just to the east of Mildenhall Woods (marker post 14/5); this is illustrated by Figure 5-18. Again, it is considered that the present condition of these reflectors constitutes a potential hazard to the NMA, and corrective action should be given consideration.

Figure 5-18 Hazard Reflector Posts



The damaged hazard reflector posts at the entrance to the southbound MAA to the east of Mildenhall Woods

Traveller Views

- 5.214. While the change from the former, distinctively rural route of the A11 (as based on historic Google Maps imagery) to the new dual carriageway (as observed by the site visit) can be thought of as significant, it is considered by POPE that engineering features along the new road corridor constitute a part of the expected traveller experience and as such, the prominent visual effects of the new accommodation overbridges and slip-roads (and their associated earthworks) on Traveller Views cannot be considered significant in isolation.
- 5.215. As noted in the Landscape sub-objective, above, the Landscape mitigation measures in the form of planting proposals appear to have been broadly implemented as anticipated. It is considered that any local variations in the effects expected are considered unlikely to have materially changed the predicted Landscape or visual amenity effects of the scheme in terms of Traveller Views overall.
- 5.216. Route verges and the new lay-bys at the war memorial were observed to be generally tidy and litter free at the time of the site visit.
- 5.217. Based on the information presented in this evaluation, it is considered that Traveller Views are as expected by the ES, as Gibson's accommodation overbridge, Chalk Hall Farm accommodation overbridge, the A11/B1106 junction slip-roads and overbridge, which with

their associated earthworks, form new, prominent and urbanising engineering features in views from the A11 corridor.

Traveller Stress

- 5.218. The increased capacity brought about by the dualling of the A11 is considered likely to provide more opportunities for the safe overtaking of slower vehicles and a greater likelihood of free flowing traffic and (although this has not been confirmed due to the limitations of the small traffic flow dataset), based on the available evidence, it is considered likely that these factors will have a positive bearing on the degree of driver frustration, and therefore the degree of Traveller Stress, experienced/
- 5.219. Due to traffic data availability issues, this is based on a relatively small data selection, and so the FYA evaluation should consider longer term post-scheme flows on this section.
- 5.220. As observed by the site visit, the creation of Deer Visibility Zones has opened up the verges along the carriageway to provide drivers with greater visibility of approaching deer than existed prior to construction; it is considered that this may have contributed to improved road safety.
- 5.221. The stopping up of existing accesses onto the A11, thus reducing the numbers of NMUs and slow moving agricultural traffic from joining the highway, is also considered likely to have reduced driver frustration, and ultimately had a beneficial impact on driver stress.
- 5.222. At the time of the site visit, the route appeared to be well signed (as illustrated in Figure 5-19) with junctions and routes clearly indicated, and the junctions providing safe access and egress points to and from the A11.

Figure 5-19 Signage: clear, informative signage at the A11/B1106 junction



- 5.223. Although the traffic chapters of this report should be referred to for a full discussion regarding Journey Times and Safety, in summary:
- There have been reductions in journey times along the A11 scheme section in all time periods assessed. While these journey times savings are not as great as those forecast, they are substantial, with savings of between approximately 4 and 10 minutes; this is considered likely to have had a beneficial impact on driver stress in terms of frustration;
 - The removal of several accesses onto the A11 is considered to have had a beneficial impact on driver stress, as there are now alternative routes in place which do not involve crossing the A11. For example, traffic is now routed underneath the A11 on the B1112 and there are now overbridges for farming operations. Furthermore, the dualling of the A11 enables traffic to overtake slower moving agricultural traffic.

Summary

- 5.224. Based on the information presented in this evaluation, it is considered that the effects of the scheme on Journey Quality are likely to be generally as expected in terms of Traveller Views and Traveller Stress.
- 5.225. Although the effects of the scheme on Traveller Care are also likely to be broadly as expected, consideration should be given to correcting the damaged hazard reflector posts at the entrance to the south-bound lay-by at the war memorial and at the MAA on the south-bound carriageway just to the east of Mildenhall Woods.
- 5.226. Table 5-13 and Table 5-14 summarise the evaluation of the schemes impact on Traveller Factors and Journey Quality respectively.

Table 5-13 Evaluation Summary: Traveller Factors

Traveller Factor	AST	OYA
Care	Major Benefits	As Expected
Views	Not considered	As Expected by the ES
Stress	Reduced	As Expected

Table 5-14 Evaluation Summary: Journey Quality

Sub-Objective	AST	OYA
Journey Quality	Large Beneficial	As Expected

Environment - Key Points

Noise and Local Air Quality

- Although further data is required to confirm, traffic forecast data indicates that the observed post-opening AWT traffic flows are between 3% more and 18% less through the scheme. Based on the information available:
 - The impact on the Noise climate is considered likely to be as expected; and
 - The percentage differences between forecast and observed traffic flows in terms of absolute vehicle numbers are considered insignificant, and impacts on Local Air Quality are likely to be as expected.

Greenhouse Gases

- Emissions were forecast to increase with the scheme, as a result of increased speeds and traffic. However, the scheme is estimated to impact differently on each user class and the data is not available to understand the impact on each user class. Therefore, the impact of the scheme on carbon could not be evaluated.

Landscape

- The inclusion of the NMU underpass at the war memorial on Weather Heath is locally adverse but has not significantly altered the overall large adverse impact of the scheme on Landscape and visual amenity as predicted by the AST/ES at Year 1 and as such, the impacts are considered to be as expected.
- Planting proposals appear to have been broadly implemented as anticipated, and any local variations in expected effects are unlikely to have materially changed the predicted Landscape or visual amenity effects of the scheme overall.
- It is considered too early for any evaluation of the establishment and maintenance of plant stock to be meaningful at OYA, although a more meaningful assessment of the environmental functions of the planting proposals should be possible at the FYA stage.
- Although the majority of the plant stock appears to be establishing as would be expected, without remedial action in accordance with the interim HEMP the environmental objectives of the new pine shelterbelt adjacent to the southbound carriageway east of Mildenhall Woods may not be realised by design year.
- The overall effects of the scheme on Landscape are considered to be Large Adverse, as expected at this stage.

Townscape

- A degree of separation now exists between the bypass and settlement of Elveden.
- The overall effects of the scheme on Townscape are considered to be Slight Beneficial, as expected.

Heritage & Historic Resources

- Other than the final publication and deposition of reports and finds relating to the scheme, all other aspects of the proposed mitigation phases appear to have been addressed.

- As a consequence of the drainage design modifications, the beneficial impact of the scheme on the Landscape setting on the Bowl Barrow/How Hill scheduled monument has likely not been realised to the predicted extents, and this aspect of the scheme should be revisited at FYA.
- The screening and integration functions of the planting proposals with respect to heritage assets are likely to be more apparent at the FYA stage.
- The overall effects of the scheme on Heritage and Historic Resources are considered worse than expected (i.e. greater than Slight Adverse).

Biodiversity

- The design of the bat wires appears to have been optimised in line with research published since the ES and ES addendum, and it is suggested that this should ensure a greater chance of success than that proposed by the Preliminary ES design. Bat monitoring information would be required to confirm this.
- In the absence of animal mortality data and post-opening survey/monitoring information, it is not considered possible to fully evaluate the effects of the scheme on either species or habitat at this stage of the POPE process; these aspects should be considered further at FYA, when the final HEMP (incorporating the findings of the survey/ monitoring requirements) and other monitoring reports should be available.
- The overall effects of the scheme on Biodiversity are considered likely to be Neutral, as expected, but further data is required to confirm.

Water Environment

- There is no evidence to suggest that the facilities are functioning in any way other than as expected, but further detail would be required to confirm.
- The overall effects of the scheme on the Water Environment are considered likely to be Neutral, as expected, but further data is required to confirm this.

Physical Activity

- The reduction in the degree of severance of the Elveden Estate and the PRow network (facilitated by the accommodation bridges and the NMU underpass at the war memorial respectively) and the improved amenity and reduced severance at Elveden is likely to have had the moderate beneficial effects as expected by the ES and the ES Addendum; as such, the effects of the scheme are concluded to be better than expected by the AST (i.e. better than neutral), but as expected by the ES (i.e. moderate beneficial).
- Consideration should be given to replacing the missing drainage covers at the PCD adjacent to the footpath leading from the southbound lay-by to the NMU underpass at the war memorial as given their proximity to the footpath, the diameter and depth of these uncovered shafts is such that they are considered to constitute a potential hazard to NMUs.
- The overall effects of the scheme on Physical Fitness are considered to be Neutral, as expected by the ES and ES Addendum, but better than expected by the AST.

Journey Quality

- The effects of the scheme on Journey Quality are likely to be generally as expected in terms of Traveller Views and Traveller Stress.
- Although the effects of the scheme on Traveller Care are also likely to be broadly as expected, consideration should be given to correcting the damaged hazard reflector posts at the entrance to the southbound lay-by at the war memorial and at the MAA on the southbound carriageway just to the east of Mildenhall Woods.
- The overall effects of the scheme on Journey Quality are considered to be Large Beneficial, as expected.

6. Social Impacts Evaluation

Introduction

- 6.1. WebTAG guidance, current at the time of scheme appraisal, described social impacts as those covering the human experience of the transport system, and its impact on the social factors which are not considered as part of the economic or environmental assessment. This includes the following social factors:
- Collisions;
 - Physical Activity;
 - Security;
 - Severance;
 - Journey Quality;
 - Option and Non-Use Values;
 - Accessibility; and
 - Personal Affordability.
- 6.2. Note that Collisions and Security have already been considered in Chapter 3 of this report, and Physical Activity and Journey Quality in Chapter 5. This section therefore considers the remaining social factors, drawing upon the AST produced at PCF Stage 5. Note that it was then transposed into the newer AST format.

Access to Services

- 6.3. The AST stated that the impact on the Access to Services sub-objective would be neutral, as the access to transport facilities remains unchanged, with the nearest railway route being unaffected.
- 6.4. A desktop study has found that access to the east-west railway route which passes through Thetford has been unaffected by the scheme, and so the impact on Access to Services is **neutral**.

Option Values

- 6.5. In terms of Option Values, the AST stated that there would be no change to the transport services available as a result of the scheme.
- 6.6. Although there is a pair of bus stops in Elveden village on the B1106 which provides limited bus services, the location or availability of this has not changed following the introduction of the scheme. The route provides access north-south between Brandon and Bury St Edmunds, and so it is unlikely that the service is affected by the scheme, despite re-routing of the A11 to the north of Elveden. As such, the outturn assessment has scored the impact on Option Values as **neutral**.

Severance

- 6.7. In the AST, the impact on Severance was stated as slight beneficial, with reduced severance in Elveden village due to the re-routing of the A11, resulting in less traffic passing through the village. In addition, the NMU underpass was expected to reduce severance further (see

6.8. Figure 5-11).

6.9. While many vehicle accesses to the A11 were restricted with the scheme, there has been the construction of access bridges to assist farming operations. Furthermore, an unpaved footway connection underneath the A11 connecting to the B1112 has been installed, making this a better crossing for pedestrians and cyclists. While this is beneficial, there are unlikely to be large numbers of NMUs travelling in the vicinity, due to lack of onward route options and the nature of the route being unpaved. Therefore, the outturn evaluation has determined that the impact on Severance is slight beneficial.

Affordability

6.10. The AST stated the impact on Affordability to be moderate beneficial on the 20% most deprived regional income quintile. The Social and Distributional Impacts analysis showed that the scheme would have a positive impact (in terms of vehicle operating costs) on all but the least deprived regional income group.

6.11. The outturn evaluation assumed vehicle operating costs to be as forecast, which was a benefit to users. The impact on Affordability has not been assessed at OYA due to a lack of detailed information.

Social Impacts - Key Points

- In terms of Access to Services, Option Values, Severance and Affordability, the outturn evaluation has reached the same conclusion as noted in the AST. The impact of these is therefore as expected.
- There has been a neutral impact on Access to Services and Option Values.
- Severance has been found to have a slight beneficial impact. This is due to the inclusion of an NMU underpass for Severance. Affordability has not been evaluated at this time.

7. Conclusions

Introduction

7.1. To conclude this evaluation report, this section summarises how the scheme has met the specific objectives outlined in the Introduction chapter of this report.

Performance Against Scheme Objectives

7.2. Table 7-1 presents an evaluation of the scheme's objectives at the OYA stage, using the evidence presented in this POPE study.

Table 7-1 Summary of Success of Scheme Against Objectives

Objective	Has the objective been achieved?	
Complete the upgrade of the A11 to dual two-lane all-purpose standard (D2AP) from the M11 to Norwich	The A11 between the M11 and Norwich is now completely of dual carriageway standard, as the scheme section was the only remaining single carriageway section.	✓
Reduce congestion and provide adequate capacity	The reductions in journey times suggest that the scheme has had a positive impact on congestion, in part due to the increased capacity.	✓
Minimise private means of access and side road connections to the trunk road consistent with making other satisfactory arrangements for the traffic	The scheme has minimised traffic joining the A11 and has stopped traffic crossing the A11. Agricultural traffic has been accounted for through the provision of overbridges.	✓
Reduce the incident rate of accidents that occurs on both the main carriageway and the junctions	The collision rate has decreased following the opening of the scheme. This result has been shown to be statistically significant and can be attributed to the scheme.	✓
Provide a bypass for the village of Elveden	The A11 now routes to the north of the village of Elveden, reducing traffic passing through the village.	✓
Improve journey time reliability	Although it was not possible to evaluate journey time reliability, it is likely that users will see benefits in reliability as a result of the scheme due to the improvements to journey times which are observed to be more consistent post opening in all time periods.	Likely to be achieved
Minimise the impact the road will have on the surrounding area of The Brecks, an area of outstanding beauty and national importance	The results of the environmental assessment were varied, although in general the mitigation measures have been implemented as planned, and therefore the impact of the scheme has generally been mitigated against.	Mitigation measures have been implemented such that the impact of the scheme is likely to be broadly as expected at this stage, although confirmation is required

Appendices

Appendix A. Appraisal Summary Table (AST) and Evaluation Summary Table (EST)

Table A-1 Appraisal Summary Table (AST)

	Impacts	Summary of Key Impacts	Quantitative Measure			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp	
Economy	Business users & transport providers.	Journey time savings accrue to users, due to reduced delays and higher operating speeds on the scheme. Small operating costs dis-benefit (4.1% of business users PVB) owing to longer scheme length. Construction and maintenance savings accrue, due primarily to maintenance travel time savings.	Value of journey time changes (£) Net journey time changes (£)			-	PVB = £869.795m m	-	
			0 – 2 min	2-5 min	>5min				
			Not available as TUBA 1.7 used. Business Users travel time & operating costs PVB = 847.492m Construction & maintenance PVB = £22.303m						
	Reliability impact on Business users	Not assessed as INCA software not applicable at this time.				-	-		
Regeneration	Not assessed.				-	-			
Wider Impacts	The Scheme promotes the dispersal of investment to the north-east of the East Anglian Region. Productivity in the region would be improved through increased time saving by business users and promotion of agglomeration of businesses.	Not Calculated			6-Moderate Beneficial	-			
Environment	Noise	Properties near the existing A11 in Elveden will experience an overall significant Noise decrease due to the significant reduction in traffic passing through the village. The facades of 7 properties which face the new A11 route towards the north of Elveden will see a Noise increase greater than 5dB. Properties along the sections of existing route where there is no significant realignment will experience decreases in Noise. This is because any increases in Noise due to the increase in line speed are more than compensated for by the reduction in Noise due to the thin surfacing. Properties shielded by environmental screens will experience significant decreases.	Estimated Population Annoyed without Scheme in 15th Year: 44 Estimated Population Annoyed with Scheme in 15th Year: 40 Net Noise Annoyance in 15th Year: -4 people With the Scheme in place 14 properties would experience increased Noise levels of more than 3dB in 2028 compared to the baseline Do Minimum situation in 2013. 24 properties would experience reductions in Noise levels of more than 3dB in 2028 compared to the baseline Do Minimum situation in 2013.			SDI analysis shows that none of the population in the most deprived regional income quintile are within the affected area . There are slight adverse impacts upon those within the middle regional income quintile and moderate beneficial and large beneficial impacts respectively for those within the second most deprived and the second least deprived regional income quintiles.	Net Present Value of Noise of proposal = £148k	6 - Moderate Beneficial impact on the 20% - 40% most deprived regional income quintile	
	Local Air Quality	The scheme has as an overall beneficial impact, primarily due to realignment of the A11 around Elveden. There are no AQMAs in the study area and no new AQMAs will need to be declared as a result of the proposal. Concentrations are within the objectives in all future scenarios.	Air quality changes in PM10 and NO2: 128 properties experience improvement 34 properties experience deterioration 0 properties experience no change.			The SDI analysis is not currently available	Overall TAG score PM10 = - 40.63 NO2 = - 184.32	To be confirmed	
	Greenhouse Gases	The scheme results in a net increase in Carbon emissions over the 60 year appraisal period, compared to the Do-Minimum scenario. This is due to increased traffic volumes together with increased km travelled and higher speeds with the scheme.	Change in non-traded carbon over 60y (CO2e)	79651 tonnes	Change in traded carbon over 60y (CO2e)	0	Change in carbon dioxide emissions in the opening year = 0.0056 MtCO2e; Change during 2013-2017 = 0.0267 MtCO2e; Change during 2018-2022 = 0.0256 MtCO2e (Assessed using TAG unit 3.3.5 April 2011)	NPV = - £2.573m	
	Landscape	The scheme would have a Large Adverse impact in year 1 reducing to moderate adverse in year15 on the agriculture, heathlands & forest character types as mitigation in the form of planting matures. The scheme would have a Large Adverse Impact in Year 1 remaining large adverse in Year 15 on the parklands character type due to the impacts on the War Memorial through the movement of the road closer to the site. The inclusion of the NMU Underpass would not increase this impact. Overall the Scheme would have a Large Adverse Impact in Year 1 reducing to Moderate Adverse in Year 15.				2 - Moderate Adverse	-		
	Townscape	The Scheme will have a Moderate beneficial impact on the Estate Village Character Area in Year 1, remaining moderate beneficial in year 15, resulting from the movement of the road away from the village through the inclusion of the bypass. The Holiday Village Character Area would have a neutral impact remaining neutral in year 15. Taken as a whole the Landscape impact would be slight beneficial on the Townscape, as this single beneficial impact would not mitigate for all of the adverse impacts on the remaining Landscape character areas.				5- Slight Beneficial	-		
	Heritage of Historic Resources	The scheme will have a moderate adverse impact on 2 heritage assets. The setting of the war memorial (moderate importance) is impacted by the inclusion of the NMU Underpass with the historic parish boundary being severed by the underpass. There will be direct impacts through topsoil stripping on the Romano British farmstead (Moderate/High importance) immediately west of the B1106 junction. The scheme will have slight adverse impact on 31 sites in total. There will be Moderate beneficial impacts on the How hill tumulus Scheduled Monument, and a very large beneficial impact to the Elveden Conservation area as a result of moving the road away from these sites.				Slight Adverse -3	-		
	Biodiversity	HABITATS The scheme would have neutral impact on Breckland SAC & SPA habitats and associated SSSI units with mitigation. There would also be neutral impacts on the PRVs, cut-off channel, Mildenhall Woods and the Elveden Farm tracks. There would be slight adverse impacts on the habitats in the bypass area.				4 -Neutral	-		

	Impacts	Summary of Key Impacts	Quantitative Measure	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp									
		There would be a moderate to large beneficial impact on the Rex Graham Reserve SAC/SSSI as a result of the road moving further away from the site. SPECIES With mitigation there would be neutral impacts on the Annex 1 Bird Species, and invertebrates. There would be slight adverse impacts on Bats due to severance, and deer due to interruption of deer movement patterns and potential mortality. There would be slight beneficial impacts on reptiles through provision of habitat in the new deer visibility zones, and moderate to large beneficial impacts on GCN through improvements to the breeding ponds close to the Scheme.													
	Water Environment	A water course (the cut-off channel) & the major aquifer are present within the scheme. Mitigation measures designed in consultation with the Environment Agency would reduce any impact to neutral through the incorporation of pollution control measures and sensitive design. Two private water supplies would be affected by the scheme. Mitigation measures would ensure that no property would be left without a viable source of water.	-	4 -Neutral	-										
Social	Commuting and Other users	Journey time savings accrue to users, due to reduced delays and higher operating speeds on the scheme. Small operating costs dis-benefit (1.8% of consumer users PVB) owing to longer scheme length. Construction and maintenance savings accrue, due primarily to maintenance travel time savings.	<table border="1"> <tr> <th colspan="3">Value of journey time changes (£)</th> </tr> <tr> <th colspan="3">Net journey time changes (£)</th> </tr> <tr> <td>0-2 min</td> <td>2-5min</td> <td>>5min</td> </tr> </table> <p>Not available as TUBA 1.7 used. Consumer Users travel time & operating costs PVB = £408.610m Construction & maintenance PVB = £25.578m</p>	Value of journey time changes (£)			Net journey time changes (£)			0-2 min	2-5min	>5min	SDI analysis shows that all income groups within the simulation area experience positive user benefits impacts (time and Vehicle Operating Costs). The greatest share of benefits within the simulation area are experienced by the middle to high regional income quintiles.	PVB = £434.188m	6 - Moderate Beneficial impact on the 20% most deprived regional income quintile.
	Value of journey time changes (£)														
	Net journey time changes (£)														
	0-2 min	2-5min	>5min												
	Reliability impact on Commuting and Other users	Not assessed as INCA software not applicable at this time.	-	-	-	-									
	Physical Activity	There are beneficial impacts from the reduction of severance through links to the PROW network and the inclusion of the NMU underpass, as well as benefits to health associated with the inclusion of the bypass and a reduction in severance for the Elveden Estate. There will be some access routes stopped up however, which will have some minor adverse impacts. There is low usage of the PROW network. Overall the impact would be neutral	-	4 - Neutral	-										
	Journey Quality	The scheme would provide major benefits to >10,000 vehicle travellers through the provision of additional traveller facilities, reduction in driver stress from congestion, and reduced fear of accidents through the incorporation of deer visibility zones and a central reserve. Overall there would be a large beneficial impact.	-	7 -Large Beneficial	-										
	Accidents	Existing road is sub-standard single carriageway with limited opportunities for overtaking & conflict with slow moving & oncoming vehicles. The scheme provides a higher standard road with lower accident rates which translates into a reduction in accidents over the life of the scheme.	Link Accident Savings: 1,011 Casualty Savings: 1,682 Junction Accidents Savings: 108 Casualty Savings:192 Link PVB = £113.891m Junction PVB = £4.158m Const/Maintenance = -£6.363m	-		PVB = £111.686m	N/A.								
	Security	Those aspects relating to Security will be unchanged by the Scheme.	-	4 - Neutral	-	-									
	Access to Services	Access to road going transport facilities remains unchanged. The nearest railway running East/West through Thetford would be unaffected.	-	4 - Neutral	-	-									
Affordability	SDI analysis shows that within the simulation area the scheme will have a positive impact (in terms of Vehicle Operating Costs) upon all but the least deprived regional income group which will experience a slight adverse impact.	-		SDI analysis shows that, in terms of Vehicle Operating Costs, the population within the second least deprived regional income group experience the largest benefits. Those within the two most deprived regional income groups both experience a moderate beneficial impact whilst those within the middle regional income group experience a slight beneficial impact.. The least deprived regional income group experience a slight adverse impact.	-	6 - Moderate Beneficial impact on the 20% most deprived regional income quintile									
Severance	There would be reduced Severance in Elveden Village due to the proposed bypass removing the traffic from the area. There would be reduced Severance to Elveden byways 3 & 4, and the inclusion of the NMU underpass would reduce Severance further through the provision of a dedicated crossing point, and linkages to Icklingham byway 7.	-	5 - Slight Beneficial		-										
Option Values	The Scheme will result in no change to the transport services available	-	-	-	-										
Public Account	Cost to Broad Transport Budget	The scheme will require public capital investment for construction. Small operating costs dis-benefit of £0.55m owing to longer scheme length.	-	-		PVC = £81.485m									
	Indirect Tax Revenues	Tax revenues will be accrued over the life of the scheme	-	-		PVB = £17.885									

Table A-2 Evaluation Summary Table (EST)

	Impacts	Summary of Key Impacts	Quantitative Measure	Qualitative	Monetary	Impact
Economy	Business users & transport providers	Journey time savings have been observed along the A11 scheme section between Fiveways Roundabout and Thetford.	Journey time savings of between 4 minutes and 8 seconds and 8 minutes and 25 seconds. There is an opening year vehicle hour saving of 706,976, equating to £943.4m of benefits over the scheme life.	-	Scheme life benefits: £943.4m	-
	Reliability impact on Business users	N/A	-	-	-	
	Regeneration	N/A	-	-	-	
	Wider Impacts	The scheme has provided improved journey times and safety and provided a more attractive route between Cambridge and Norwich. However, it was not within the scope of POPE to assess the potential quantitative benefits.	-	Moderate beneficial	-	
Environment	Noise	Properties in Elveden would generally experience a decrease in Noise due to the A11 being re-routed, although some properties would now be facing the new route.	Estimated population annoyed without scheme in 15 th year: 36 Estimated population annoyed with scheme in 15 th year: 33 Net change: 3 less people annoyed.	-	-	Likely to be as expected, more further data needed to confirm
	Local Air Quality	The scheme has as an overall beneficial impact, primarily due to realignment of the A11 around Elveden.	NO2 Overall Assessment Score: -49.36. Properties with improvement: 128; Deterioration: 34; No change: zero. PM10 Overall Assessment Score: -14. Properties with improvement: 128; Deterioration: 34; No change: zero.	-	-	Likely to be as expected, more further data needed to confirm
	Greenhouse Gases	An increase in emissions was forecast. The scheme is estimated to impact differently on each user class and the data is not available to understand the impact on each of these. Therefore, evaluation is as forecast.	-	-	-	
	Landscape	There have been additional adverse Landscape and visual impacts resulting from the inclusion of the NMU underpass, this design change has not significantly altered the large adverse impact of the scheme on Landscape as predicted at Year 1. Planting proposals appears to have been broadly implemented as anticipated.	-	As expected	-	
	Townscape	The road has moved away from the village of Elveden, bypassing the village to the north to allow easier access between the two distinct settlement areas of the village and introducing a degree of separation between the bypass and settlement.	-	Slight beneficial, as expected	-	
	Heritage of Historic Resources	Although the damage to the Bowl Barrow/How Hill Scheduled Monument was avoided, it would appear that this was achieved as a result of Historic England specifically requesting appropriate protection measures be implemented during the construction phase. The removal of a busy trunk road (and associated adverse impacts) from the Conservation Area is considered unlikely to be anything other than beneficial.	-	Worse than expected	-	
	Biodiversity	It is considered that a full evaluation the impact of the scheme on habitat is not possible at this stage of the POPE process, but could be considered further at FYA when the results of the said monitoring exercises are likely to be available. In terms of specific mitigation measures implemented as part of the scheme, mitigation measures included reptile exclusion fencing and underpasses, one-way mammal gates set within mammal exclusion fencing, and mammal ledges located at the River Lark cut-off channel.	-	Neutral, as expected, although confirmation is required	-	
	Water Environment	Positive drainage systems have been used throughout, and consist of either pre-cast concrete kerb and gully, combined kerb and drainage units, or slot drains as appropriate. Drainage is primarily to soakaways, and periodic excavation, cleaning and replacement of stone fill material will be required. Although the soakaways are greater than 50m from adjacent private and public water extraction points, reasonable care must be taken to prevent any contamination entering the soakaways and subsequently the aquifer. Pollution Containment Devices (PCDs) in the form of shut off valves and surface channel flow control gates have been provided in the event of spillage, and there are pollution controls for water runoff treatment areas at the downstream end of each network to mitigate the risk of pollution reaching the watercourses.	-	Unconfirmed, but likely to be as expected	-	
Social	Commuting and Other users	Journey time savings have been observed along the A11 scheme section between Fiveways Roundabout and Thetford.	Journey time savings of between 4 minutes and 8 seconds and 8 minutes and 25 seconds. There is a total vehicle hour saving of 706,976, equating to £943.4m of benefits over the scheme life.	-	Scheme life benefits: £943.4m	-
	Reliability impact on Commuting and Other users	N/A	-	-	-	
	Physical Activity	It is considered that the reduction in the degree of severance of the Elveden Estate and the PRoW network (facilitated by the accommodation bridges and the NMU underpass at the war memorial respectively) and the improved amenity and reduced severance at Elveden is likely to have had the moderate beneficial effects as expected by the ES and the ES Addendum.	-	Better than expected	-	

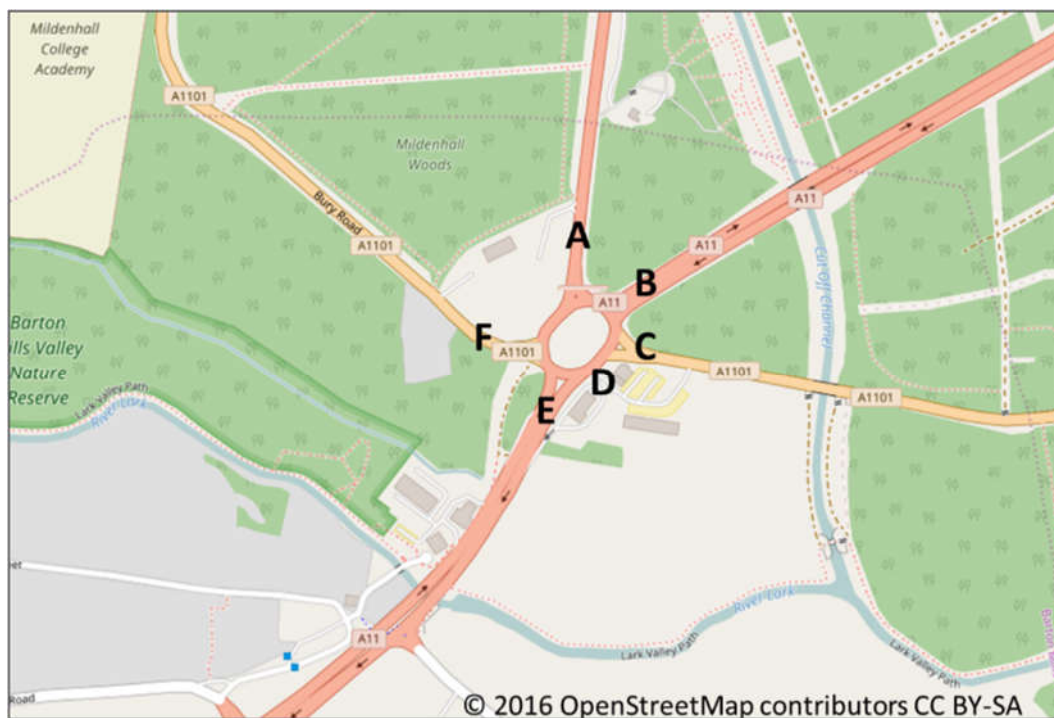
	Impacts	Summary of Key Impacts	Quantitative Measure	Qualitative	Monetary	Impact
	Journey Quality	There would be a reduction in driver stress from congestion, and may have reduced likelihood of collisions through the incorporation of deer visibility zones and a central reserve.	-	Large beneficial, as expected	-	
	Accidents	Collisions have reduced on the scheme section and in the wider area. The observed saving can be directly attributed to the scheme following the calculation of a counterfactual pre-scheme collision rate which considers the background decline in collisions.	Wider area collision saving: 22.6 Key links collision saving: 15.8 60-year monetary benefit: £90.90m	-	Scheme life PVB: £90.90m	-
	Security	Lay-bys are still located near to the war memorial site. There is no longer a need for traffic to stop at traffic signals in Elveden.	-	Neutral	-	-
	Access to Services	Access to transport facilities remains unchanged.	-	Neutral	-	-
	Affordability	Not assessed.	-	-	-	-
	Severance	A new NMU underpass was provided and a dog-leg crossroads replaced by underbridge separating the B1112 from the A11.	-	Slight beneficial	-	-
	Option Values	The scheme will result in no change to the transport services available.	-	-	-	
Public Account	Cost to Broad Transport Budget	The outturn investment costs were slightly lower than forecast at £65.98m.	Scheme investment cost of £65.98m.	-	PVC = £65.98m	
	Indirect Tax Revenues	Assumed as forecast.	-	-	£10.12m	

Appendix B. Turning Count Analysis

This section uses a pre-scheme turning count at Fiveways Roundabout, undertaken in 2007, presented in a Transport Assessment by Parsons Brinckerhoff, and a post-scheme turning count, provided by Suffolk County Council/Highways England, undertaken on a Tuesday in April 2016. This covers a period of nine years so there will be an element of background traffic growth in this time, but here, the figures have been presented as observed as comparison of all vehicles¹¹ travelled in the East, and on A roads in the East, indicate that between 2007 and 2012 traffic flows have either stayed static, or have reduced by up to 2%, and therefore are likely to be similar to the other 2012 pre-scheme flows. Although the roundabout layout has changed between the turning counts, comparing the two counts is useful to provide an indication of any changes in movements at the roundabout.

A plan of the junction identifying the arms is presented in the map below, with the summary provided in the table.

Figure B-1 Fiveways Roundabout Layout



¹¹ DfT Traffic statistics <https://www.gov.uk/government/statistical-data-sets/tra02-traffic-by-road-class-and-region-kms> Table 0203, accessed January 2017

Table B-1 Fiveways Turning Movements 2007 - 2016

Arm	Description
A	A1065
B	A11 North (London Road)
C	A1101 East (Mildenhall Road)
D	Service Station entrance
E	A11 South
F	A1101 West (Bury Road)

The full results of the 2007 and 2016 turning movements and comparison for the Fiveways junction AM and PM peak hours are presented in the following tables.

Table B-2 Fiveways Turning Movements 2007 - 2016 (AM Peak)

2007 AM Peak (08:00-09:00)	TO	A1065	A11 North	A1101 East	Service Station	A11 South	A1101 West	Total
FROM		A	B	C	D	E	F	
A1065	A		2	28	3	376	26	435
A11 North	B	5		7	11	626	189	838
A1101 East	C	16	6		20	155	39	236
Service Station	D							
A11 South	E	181	531	124	16		198	1,050
A1101 West	F	12	160	42	6	375		595
Total		214	699	201	56	1,532	452	3,154
2016 AM Peak (08:00-09:00)	TO	A1065	A11 North	A1101 East	Service Station	A11 South	A1101 West	Total
FROM		A	B	C	D	E	F	
A1065	A		21	22	21	344	2	410
A11 North	B	68	5	24	42	1,060	173	1,372
A1101 East	C	8	6		1	26	136	177
Service Station	D					2	2	4
A11 South	E	271	692	16	10	20	260	1,269
A1101 West	F	12	135	71	3	415	5	641
Total		359	859	133	77	1,867	578	3,873
Comparison AM Peak (08:00-09:00)	TO	A1065	A11 North	A1101 East	Service Station	A11 South	A1101 West	Total
FROM		A	B	C	D	E	F	
A1065	A		19	-6	18	-32	-24	-25
A11 North	B	63	5	17	31	434	-16	534
A1101 East	C	-8			-19	-129	97	-59
Service Station	D					2	2	4
A11 South	E	90	161	-108	-6	20	62	219
A1101 West	F	0	-25	29	-3	40	5	46
Total		145	160	-68	21	335	126	719

Table B-3 Fiveways Turning Movements 2007 - 2016 (PM Peak)

2007 PM Peak (17:00-18:00)	TO	A1065	A11 North	A1101 East	Service Station	A11 South	A1101 West	Total
FROM		A	B	C	D	E	F	
A1065	A		1	52	7	375	23	458
A11 North	B	5		8	9	549	196	767
A1101 East	C	33	9		22	121	38	223
Service Station	D							
A11 South	E	334	699	161	19		234	1,447
A1101 West	F	21	205	46	7	285		564
Total		393	914	267	64	1,330	491	3,459
2016 PM Peak (17:00-18:00)	TO	A1065	A11 North	A1101 East	Service Station	A11 South	A1101 West	Total
FROM		A	B	C	D	E	F	
A1065	A		44	18	19	342	3	426
A11 North	B	43		23	33	716	105	920
A1101 East	C	20	1		5	18	141	185
Service Station	D		1				1	2
A11 South	E	452	1,249	23	11	25	442	2,202
A1101 West	F	3	207	81	10	299	1	601
Total		518	1,502	145	78	1,400	693	4,336
Comparison PM Peak (17:00-18:00)	TO	A1065	A11 North	A1101 East	Service Station	A11 South	A1101 West	Total
FROM		A	B	C	D	E	F	
A1065	A	0	43	-34	12	-33	-20	-32
A11 North	B	38	0	15	24	167	-91	153
A1101 East	C	-13	-8	0	-17	-103	103	-38
Service Station	D	0	1	0	0	0	1	2
A11 South	E	118	550	-138	-8	25	208	755
A1101 West	F	-18	2	35	3	14	1	37
Total		125	588	-122	14	70	202	877

This data shows that during the AM peak, there are increases in vehicle flows on A11 North (Arm B) and A11 South of the junction (Arm E). The largest increase is experienced on the A11 North where a 64% increase is seen, the vast majority of which are travelling to the A11 South. This is to be expected following the scheme to significantly increase capacity on this arm. There are overall increases of over 700 vehicles using the junction in the AM peak in the post-scheme period, equating to a 23% increase compared to 2007.

There have been reductions in the level of traffic travelling from the A1101 East towards the A11 South, and in the opposite direction from the A11 South towards the A1101 East. It is possible that this route was used as an alternative route to avoid queuing on the A11 North pre-scheme to reach locations south of Thetford.

In terms of the PM peak, the data shows that notable increases are experienced on the A11 North arm (Arm B) and the A11 South arm (Arm E) during the PM peak hour. The greatest increase is experienced from the A11 South, with a 52% increase (755 additional movements), with the vast majority of the increase seen between the A11 South and A11 North. Overall there has been an increase of 25% in traffic using this junction between 2007 and 2016.

Again, reductions are seen between the A11 South and A1101 East in both directions. Increases are seen from the A11 in both direction towards the A1065, which may be partly related to the new services.

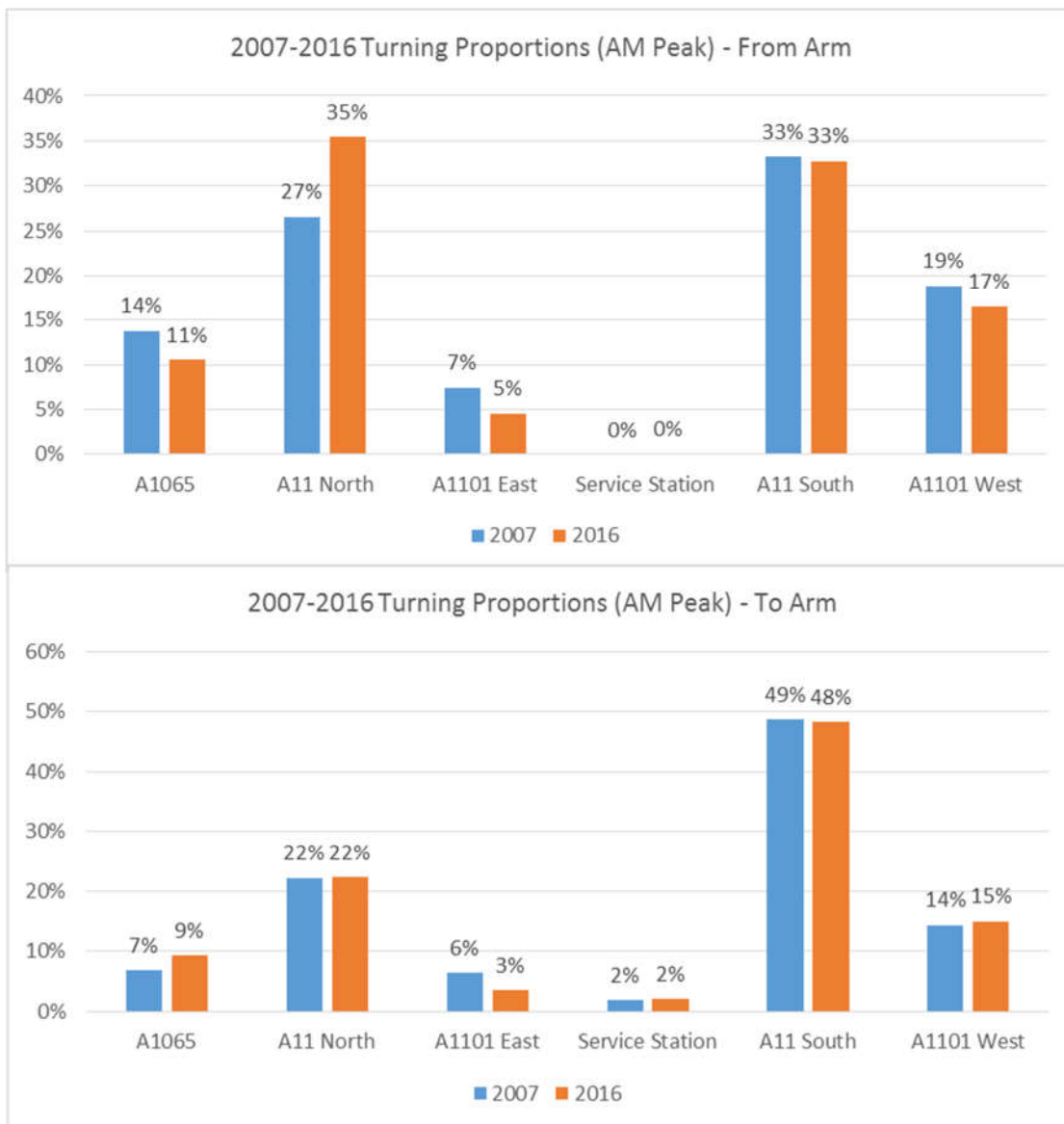
Finally, there is an increase in traffic between the A11 South towards the A1101 West. This may be due to traffic travelling north remaining on the A11 to turn towards Mildenhall at the junction, whereas pre-scheme (with queuing south of the junction for traffic travelling north) traffic accessing Mildenhall may have turned off earlier, and diverted through Barton Mills, but no traffic information is available to verify this.

Turning Proportions

The turning proportions of the Fiveways junction have been compared to see if the changes in vehicle movements (identified in the analysis section above) result in changes to the proportions of the origin/destination of vehicle movements.

The total number of vehicles to and from the arms during the AM peak hour as a percentage as a total junction movements have been presented in the graphs overleaf.

Figure B-2 Fiveways Turning Proportions - 2007/2016 (AM Peak)

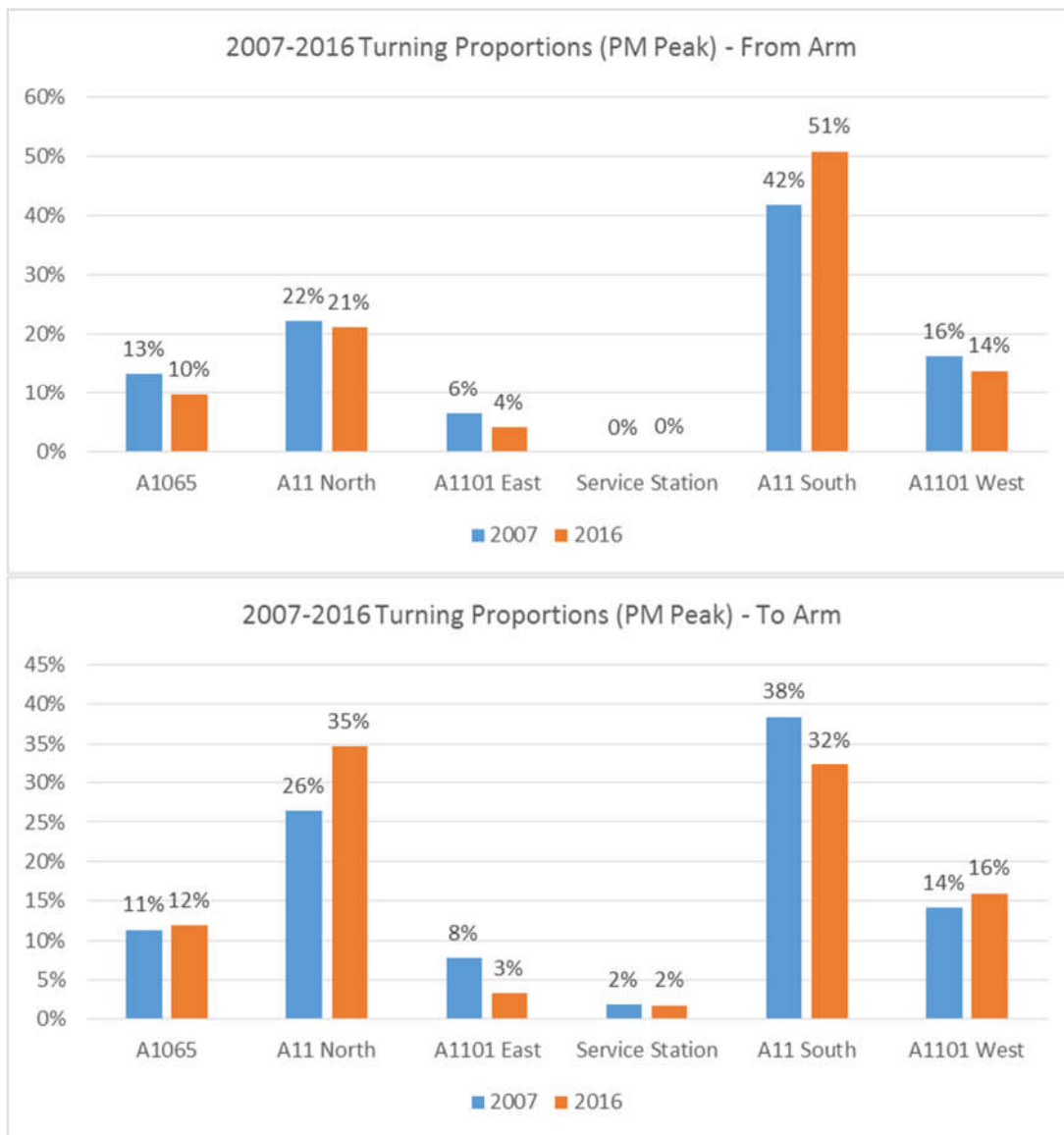


The graphs show that the dominant movements continue to be from and to the A11 arms (Arms B and E). The biggest increase in turning movements (of 8%) is from the A11 North during the AM peak hour.

The proportion of vehicle movements from A1065 decrease slightly (3%), although the proportion of vehicle movements to A1065 experiences a 2% increase. The new services are sign-posted to the A1065 arm, and as such may contribute to this increase. There is a slight decrease in the proportion of vehicles to and from the A1101 East (Mildenhall Road) in the AM peak.

The turning proportions are also presented for the PM peak on the graphs overleaf.

Figure B-3 Fiveways Turning Proportions - 2007/2016 (PM Peak)



The graphs show that during the PM peak, the dominant movements continue to be to and from the A11 arms, A11 North and A11 South (Arms B and E). The graph shows that A11 South experiences the largest increase in the proportion of vehicle movements from the arm (9%), but also experiences a reduction of the proportion to the arm of 6%. The A11 North experiences a slight reduction of the proportion of turning movements from the arm (1%), but has an increase of 9% in the proportion of movements to the arm. This indicates that there has been an increase in flow, and therefore increasing the dominance of the A11 northbound flow in the PM peak.

Again, the A1101 East (Mildenhall Road) experiences a reduction in the proportion of vehicle movements to and from the arm.

Appendix C. Journey Time Analysis

The table below presents the before and after journey time savings along the routes shown in the maps. Note that negative percentages show an increase in journey times.

Table C-1 Journey Time Changes

	Journey Time Changes (Seconds)							
	A1101 – A11 South				A1065 – A11 South			
	Before	After	Change	% Change	Before	After	Change	% Change
AM Peak (Monday – Friday)	156	176	-20	-13%	105	103	2	2%
PM Peak (Monday – Friday)	191	234	-43	-22%	125	224	-99	-79%
Inter-Peak (Tuesday – Thursday)	127	138	-11	-8%	97	99	-2	-2%
Center Parcs Inter-Peak (Monday and Friday)	158	184	-26	-16%	124	138	-14	-11%
Overnight	113	118	-5	-4%	84	74	10	12%
Weekend Day	132	150	-18	-14%	106	116	-10	-9%

The key points to note from the table are as follows:

- Journey time increases are experienced throughout almost all of the time periods for the A1101 and A1065 routes.
- The worst affected time period appears to be the PM peak for both routes, which coincides with the period where there has been the largest increase in flow on the A11 (northbound) suggesting that the A11 flow is dominant, perhaps limiting access for the A1065 and A1101.
- The A1101 is also affected in the AM peak, with an increase of 13% (20 seconds) seen.
- There have been limited changes post opening for those travelling on the A1101 in the inter-peak (Tuesday – Thursday) and overnight periods.
- Small journey time savings can be seen on the A1065 route in the overnight period, with negligible change in the AM peak.
- Times of lower flow on the A11 (for example, overnight and inter-peak) have seen less of an impact on these routes, indicating that the level of flow on the A11 is a key element affecting the A1101 West (Bury Road) and A1065.

The overnight period is indicative of times experienced with little traffic and it can therefore be seen that there was an element of delay seen in most time periods pre-scheme, but that this has worsened post scheme.

The journey time results can also be analysed in terms of speed changes along the route. The following maps show the pre- and post-scheme speeds during the AM peak, inter-peak and PM peak periods.

Figure C-1 A1065 AM Peak



Figure C-2 A1065 Inter-Peak

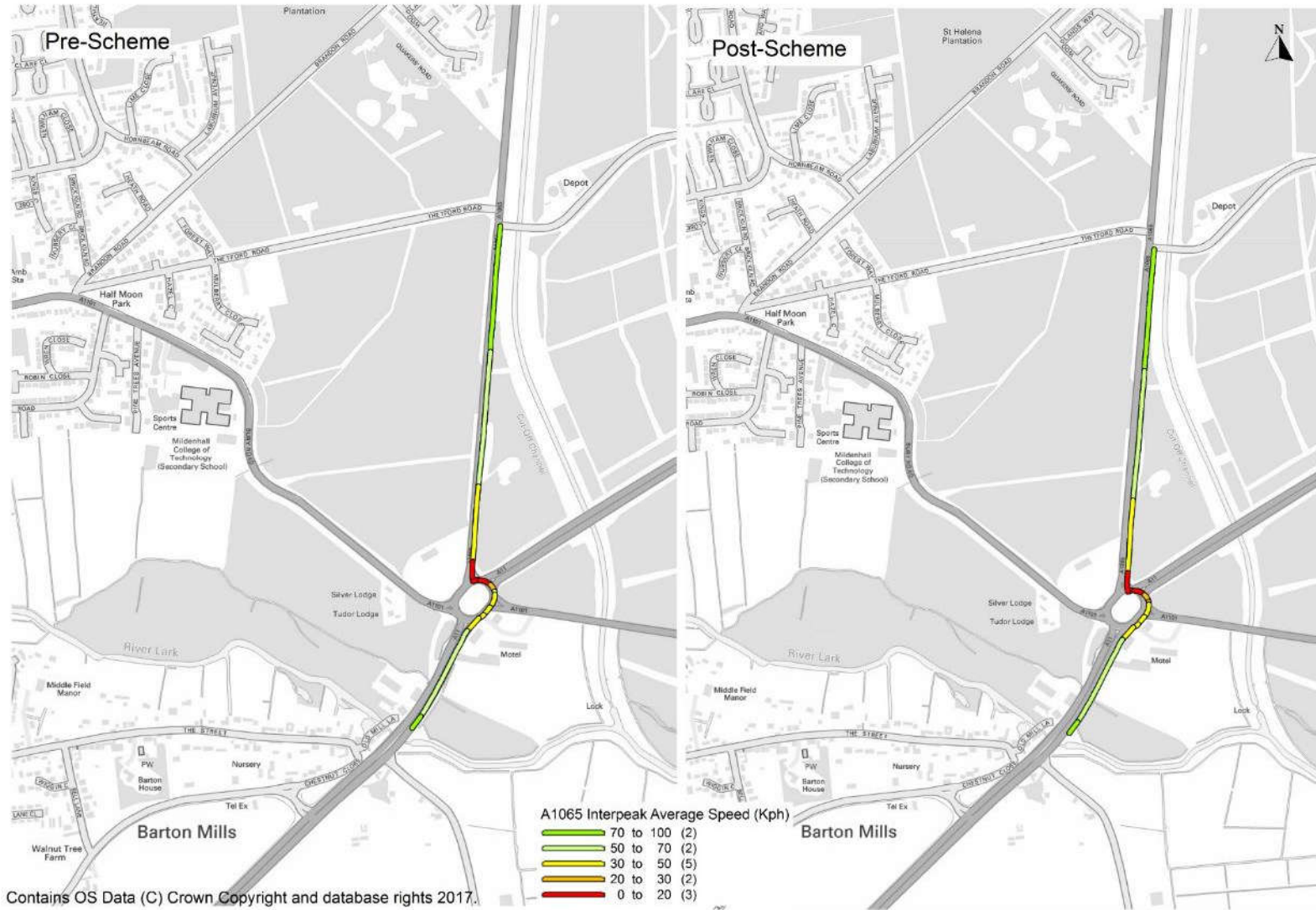


Figure C-3 A1065 PM Peak

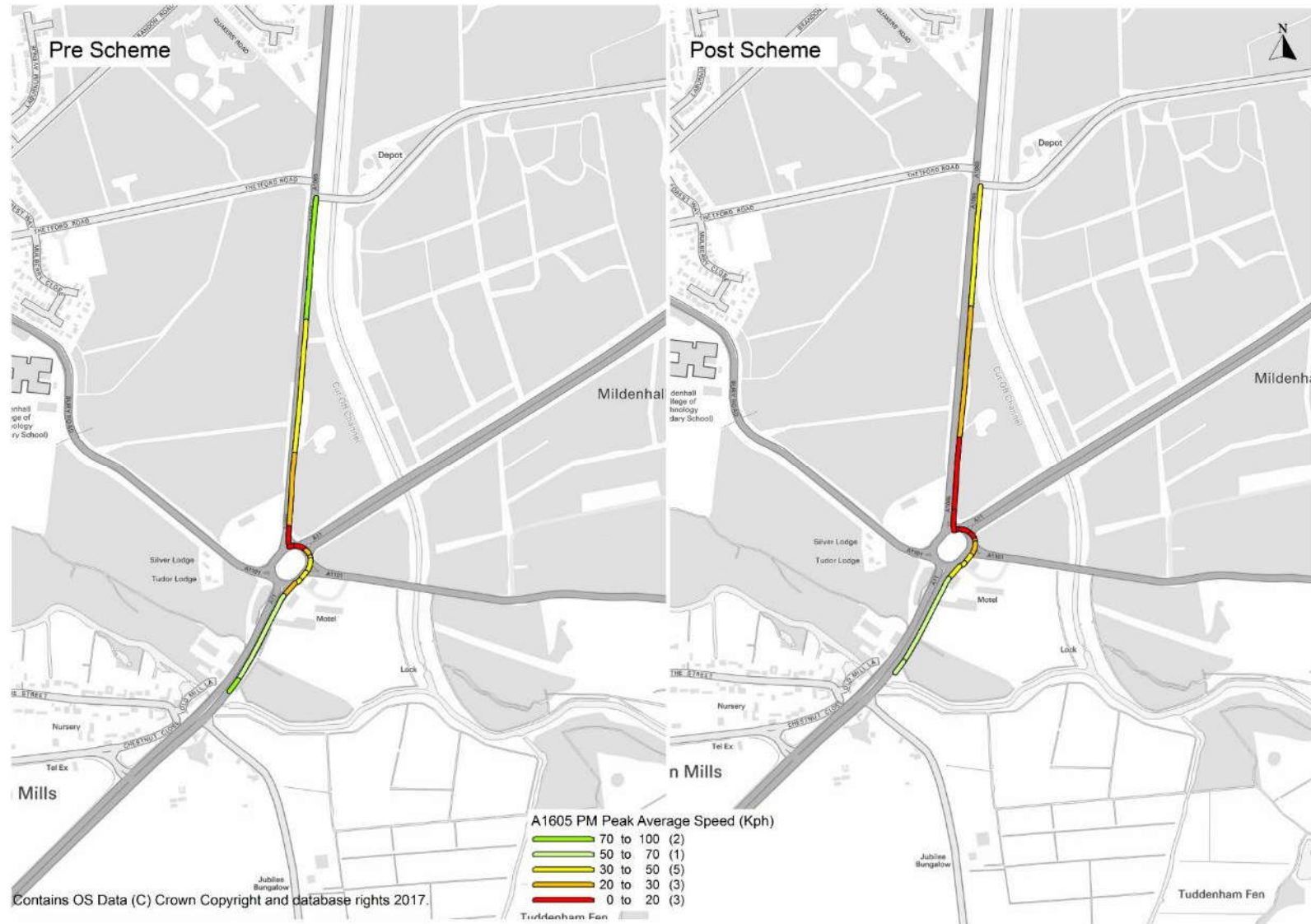


Figure C-4 A1101 AM Peak

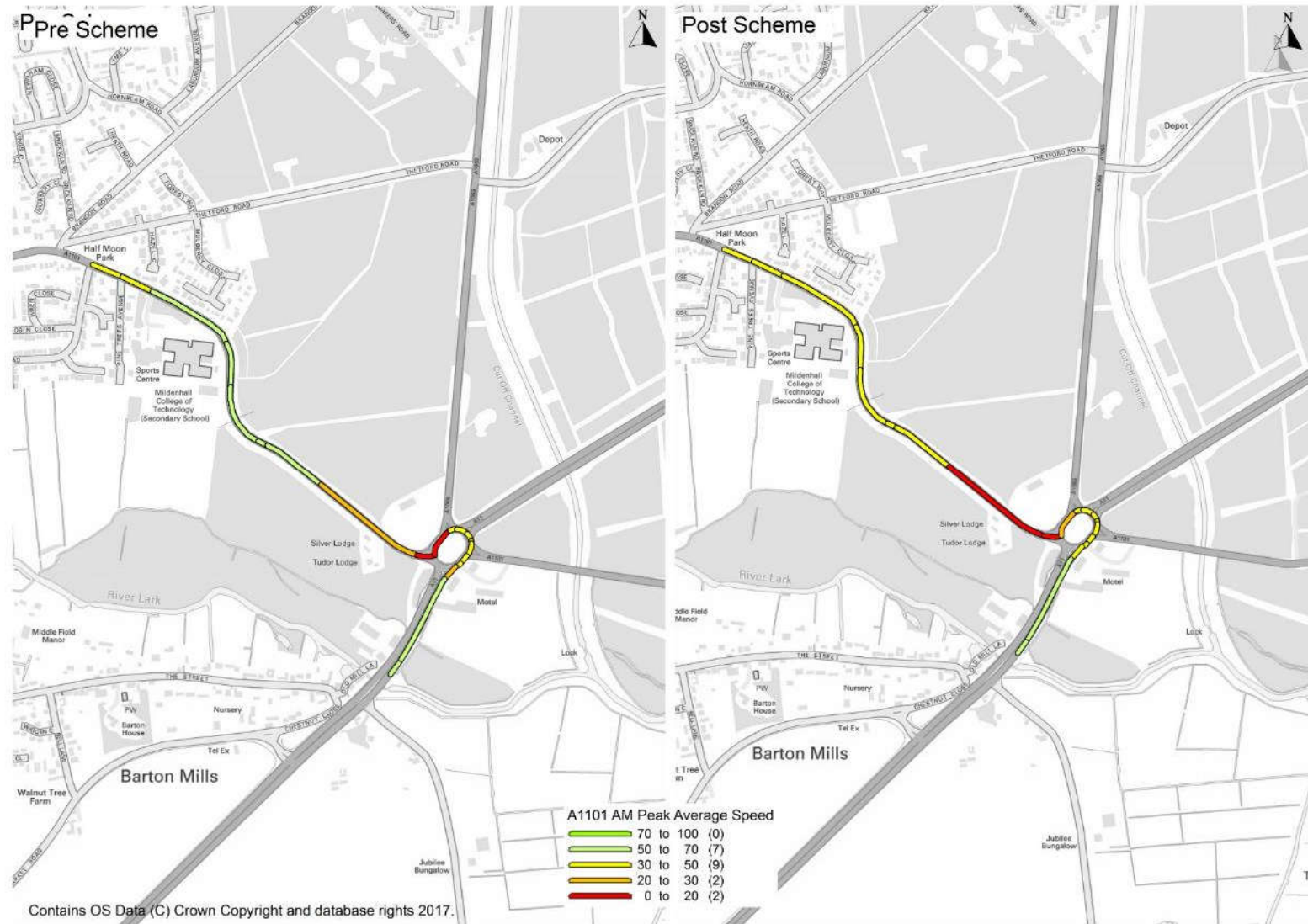


Figure C-5 A1101 Inter-Peak



Post Opening Project Evaluation
 A11 Fiveways to Thetford - One Year After



Figure C-6 A1101 PM Peak

The main points to note from the speed maps above are as follows:

- During the AM peak along the A1065 route, speeds are relatively high on the approach to the junction, up to the point immediately before the roundabout. At this point the speeds are low, as expected, whilst drivers join the roundabout, but don't indicate significant sections of queuing traffic. There is a slight improvement to this in the post-scheme period, with higher speeds experienced further back from the junction.
- There are no substantial changes to speeds approaching the junction on either route during the inter-peak period.
- During the PM peak along the A1065 route, lower speeds are experienced further back along the A1065 on the approach to Fiveways Roundabout during the post-scheme period. This is indicative of queuing on this approach, and is supportive of the longer journey times seen.
- Along the A1011 Bury Road route, during the AM and PM peaks, low speeds are experienced further back along the A1011 Bury Road, again suggesting queuing to join the roundabout.
- In all instances, reasonable speeds are experienced on the circulatory carriageway, with no time periods showing traffic moving in the lowest speed band. This implies that traffic moves relatively well once on the roundabout and that it is the approach to the roundabout that is seeing the changes.

In addition to average journey times, another consideration is the reliability of journey times. Reliability can be an important metric as motorists make decisions on how long to allow for journeys based on their understanding of reliability/predictability, not on the average time it takes to travel. For both the A1065 and A1101 West (Bury Road) routes, journey times have been assessed by considering the 5th, 25th, 75th and 95th percentile journey times across all time periods. Graphs showing the percentiles before and after the scheme was implemented are shown below.

Figure C-7 A1065 Reliability

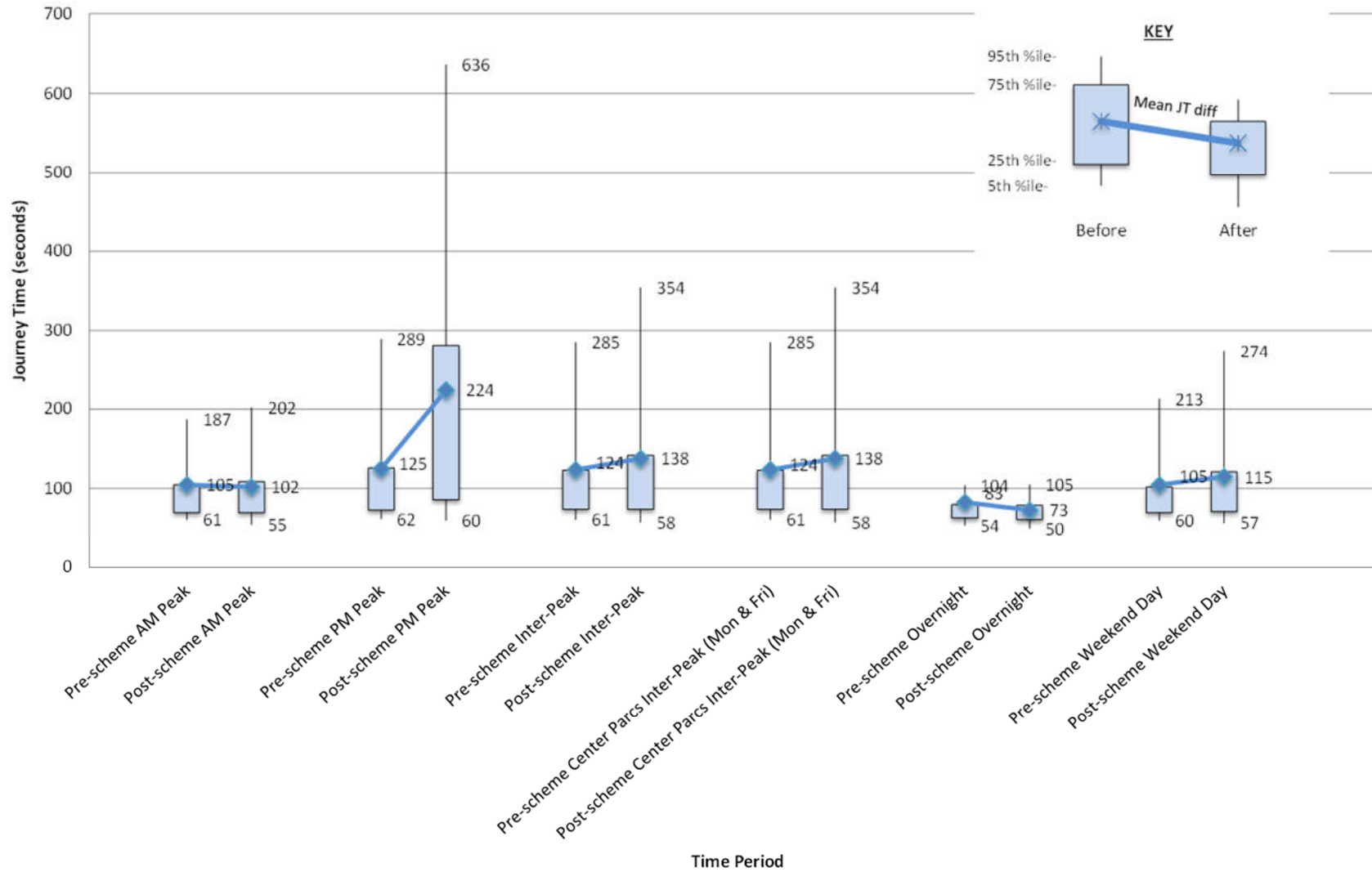
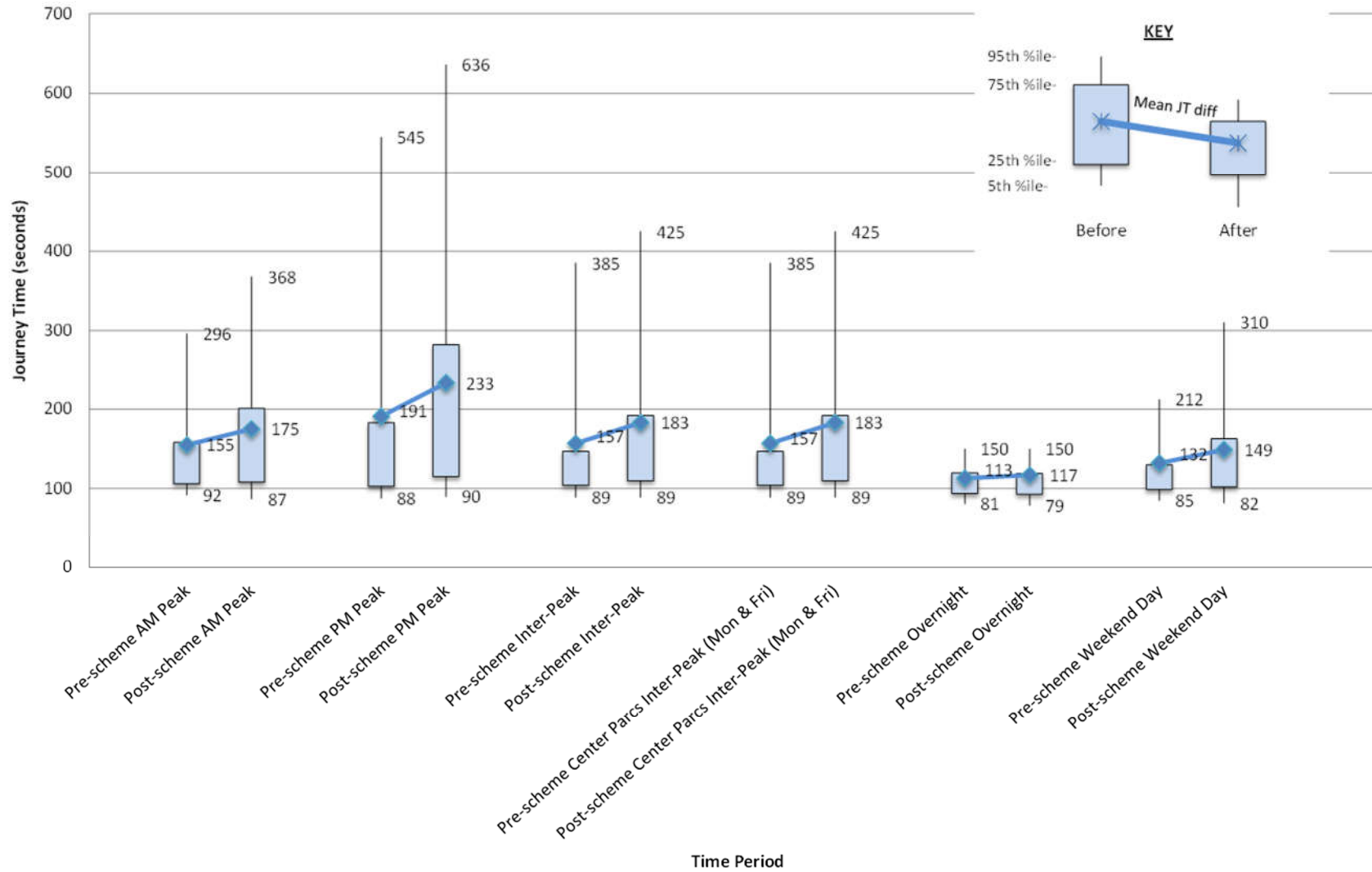


Figure C-8 A1101 Reliability



The key points to note from the reliability graphs are as follows:

- Overall there is a slightly negative impact on reliability across most time periods, with the core 50% of journeys being slightly less reliable than before, with the exception of the overnight and period, which has remained similar between pre- and post-scheme, with some small improvements to reliability.
- In addition, reliability has remained similar from pre- to post-scheme during the AM peak along the A1065 route. This matches what is seen in the speed maps, which show an increase in speeds during the AM peak along this route.
- The largest changes on both routes are in the PM peak period, when the 95th percentile increases in both instances, particularly on the A1065 route. This means that during the peak period, where there may be high traffic volumes, collisions or other incidents, the approaches to the junction are performing worse than before and may be less resilient to such circumstances and some users experience particularly worsened journey times, and reliability.

Appendix D. Environment

D.1. Information Requested for Environmental Evaluation

Table D-1 Information Requested to Evaluate the Environmental Sub-Objectives

Environment Specific Requirements	OYA Response
Environment Statement (ES) or Stage 3 Scheme Assessment Report (SAR) or Environmental Assessment Report (EAR) including Environmental Masterplan (EMP) drawings.	Environmental Statement, Volumes 1-3 incl. (September 2008)
AST.	AST (September 2012)
Any amendments / updates, additional surveys or reports since the ES / SAR / EAR.	Addendum to the Environmental Statement, Volumes 1-3 incl. (September 2009)
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.	Bat Mitigation Strategy (January 2013)
As built drawings for Landscape/ Biodiversity/ environmental mitigation measures/ drainage/ fencing/ earthworks etc.	None provided
Construction Environment Management Plan (CEMP), Landscape and Ecology Aftercare Plan (LEAP), Landscape Management Plan (LMP) or Handover Environmental Management Plan (HEMP). This includes Wangford Warren Habitat Creation and Management Plan.	Draft CEMP (January 2013) Interim HEMP (September 2015) Wangford Warren HCMP.
Health and Safety File – Environment sections (to include all environment As-Built reports).	Interim version for Handover (December 2014)
Relevant Contact Names for consultation.	Sourced by POPE
Archaeological Reports (popular and academic).	None provided
The Road Surface Influence (RSI) value of any low Noise surface installed.	Not provided
The insulation performance properties of any Noise barriers installed (The BS EN 1794-2 result provided by the Noise barrier manufacturer).	Not provided
List of properties eligible for Noise insulation.	None provided
Employers Requirements Works Information - Environment sections.	Not provided
Reports for any pre/ post opening survey and monitoring work e.g. for Noise, Biodiversity, water quality).	None provided
Animal mortality data.	Not provided
Pre- or post- opening Non-Motorised User (NMU) Audits or Vulnerable User Surveys.	Post Opening NMU Audit (March 2017)
Information may be available regarding environmental enhancements to streetscape/Townscape for bypassed settlements	None provided
Scheme Newsletters/ publicity material/ Award information for the scheme.	None provided

D.2. Photographic Record of Scheme

Figure D-1 ES Figure 5.9.2 (Photo 2.1): View looking north towards the A11 from footpath No.2 Icklingham



ES (November 2008)



OYA (May 2016)

Although not apparent from this location, the A11 corridor has been widened to the opposite side of the previously existing highway, and the removal of vegetation along the B1112 has exposed slightly more of the A11 and the traffic to the north of the A11/ B1112 bridge from elsewhere along the footpath (left).

Figure D-2 ES Figure 5.9.2 (Photo 2.2): View looking south-east towards the A11 from the B1112



ES (November 2008)



OYA (May 2016)

As expected by the ES, the widened A11 corridor and traffic are more prominent following construction; the cutting slopes increasingly contain views on approaching the B1112 underpass, but the loss of the mature pine trees and hedgerows flanking B1112 are notable; and the underbridge and cutting slopes comprise new “alien” features in the Landscape, and fundamentally alter the previously open views over arable land from the B1112.

Figure D-3 ES Figure 5.9.3 (Photo 3.2): View looking north-west towards the A11 from byway No.7 Icklingham



ES (November 2008)



OYA (May 2016)

The new NMU underpass can be seen to the right of the war memorial at Weather Heath, and the widened A11 corridor is more prominent in near views as expected. It can be seen that several pine trees have been lost as a result of construction (to the front and to the right of the memorial), and that mitigation proposals in the form of replacement pine tree planting has been undertaken on the embankments leading to the underpass (centre left). Although there have been additional adverse Landscape and visual impacts resulting from the inclusion of the NMU underpass that were not considered by the Preliminary ES design, it is considered that this design change has not significantly altered the overall large adverse impact of the scheme on Landscape and visual amenity as predicted by the AST/ES at Year 1; as such, the impacts at OYA are considered to be as expected at this stage.

Figure D-4 ES Figure 5.9.3 (Photo 3.3): View looking west towards the proposed new line of the A11 from the Elveden village playing field



ES (November 2008)



OYA (May 2016)

As predicted by the ES, the A11 corridor (with high-sided vehicular traffic) is prominent across agricultural land in views to the south-west (between the agricultural building, left, and the sports pavilion, centre), and Chalk Hall accommodation bridge can be seen (to the right of the agricultural building). It is expected that mitigation proposals in the form of a new linear belt of shrubs and trees will, subject to appropriate management and maintenance in the long term, largely screen the A11 corridor from this location by design year. To the west (right of the sports pavilion), the A11 corridor is screened by the existing pine plantations along the boundary of the playing fields.

Figure D-5 ES Figure 5.9.3 (Photo 3.4): View looking south-east along the B1116 towards the proposed A11/B1116 junction



ES (November 2008)



OYA (May 2016)

As expected by the ES, the A11/B1106 grade separated junction and slip roads are visible (behind the trees, centre) from the footpath along the carriageway to the distant right of the picture. The A11 corridor (and high sided vehicle traffic, not shown) is prominent across what was originally agricultural land to the east (left). It is expected that mitigation proposals in the form of new planting will, subject to appropriate management and maintenance in the long term, largely screen the junction from the footpath.

Appendix E. Glossary

Table E-1 Glossary

Terms	Definition
AADT	Annual Average Daily Traffic. Average of 24 hour flows, seven days a week, for all days within a year.
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.
ADT	Average Daily Traffic. Average daily flows across a given period.
AQMA	Air Quality Management Area.
AST	Appraisal Summary Table. 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	Automatic Traffic Count
AWT	Average Weekday Traffic. As ADT but for five days (Monday to Friday) only.
AWCS	Archaeological Works Completion Statement
AWT	Average Weekday Traffic. As ADT but for five days (Monday to Friday) only.
BCR	Benefit Cost Ratio. This is the ratio of benefits to costs when both are expressed in terms of present value i.e. PVB divided by PVC.
Bvkm	Billion Vehicle Kilometres
CEMP	Construction Environmental Management Plan
CO₂	Carbon dioxide
COBA	Cost Benefit Analysis. 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 unless it is being used in Accident-only mode.
Counterfactual	A counterfactual is applied to collision numbers to take account for the general decline in collisions that would have occurred without the scheme.
Chi Square test	A statistical hypothesis test
CWS	Country Wildlife Site
dB	Decibel, measurement of Noise levels.
DfT	Department for Transport
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.
DM	Do Minimum. In scheme modelling, this is the scenario which comprises the existing road network plus improvement schemes that have already been committed.
DMRB	Design Manual for Roads and Bridges
DN	Do Nothing In scheme modelling, this is the scenario which comprises the existing road network.
DS	Do Something. In scheme modelling, this is the scenario detailing the planned scheme plus improvement schemes that have already been committed.
D2AP	Dual two-lane all-purpose standard
EA	Environment Agency
EAR	Environmental Assessment Report or Economic Assessment Report

Terms	Definition
EIA	Environmental Impact Assessment
ES	Environmental Statement
EST	Evaluation Summary Table. In POPE studies, this is a summary of the evaluations of the TAG objectives using a similar format to the forecasts in the AST.
FWI	Fatalities and Weighted Injuries
FYA	Five Years After
GCN	Great crested newt
HCMP	Habitat Creation Management Plan
HEMP	Handover environmental management plan
HGV	Heavy Goods Vehicle
LBTS	Linear Belts of Trees and Shrubs
LEAP	Landscape and Ecology Aftercare Plan
LMP	Landscape Management Plan
MAA	Maintenance Access Area
Mph	Miles per hour
MVKM	Million Vehicle Kilometres
NE	Natural England
NMA	Network Managing Agent
NMU	Non-Motorised User. A generic term covering pedestrians, cyclists and equestrians.
NRTF	National Road Traffic Forecasts. This document defines the latest forecasts produced by the Department of the Environment, Transport and the Regions of the growth in the volume of motor traffic. At the time this scheme was appraised, the most recent one was NRTF97, i.e. dating from 1997.
Outturn	The actual result found in the evaluation at this One Year After stage
OYA	One Year After
PCF	Project Control Framework
PCD	Pollutant Containment Devices
PIC	Personal Injury Collisions
PM₁₀	Particulate matter less than 10 micrometres in size
POPE	Post Opening Project Evaluation. The before and after monitoring of all major highway schemes in England.
Present Value	Present Value. 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.
PRoW	Public Right of Way
PVB	Present Value Benefits. Value of a stream of benefits accruing over the appraisal period of a scheme expressed in the value of a present value.
PVC	Present Value Costs. As for PVB but for a stream of costs associated with a project
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SATURN	Congested Highway Assignment Software
SCC	Suffolk County Council
SDI	Social and Distributional Impacts
Screenlines	Comparisons of traffic flows across routes to determine if re-routing has occurred
SPA	Special Protection Area
SPZ	Special Protection Zone

Terms	Definition
SSSI	Site of Special Scientific Interest
STATS19	A database of injury collision statistics recorded by police officers attending collisions.
TEE	Transport Economic Efficiency
TRADS	Previous Highways England online traffic database (now WebTRIS)
Trunk Roads	Major roads part of the Strategic Road Network
TUBA	Transport User Benefit Appraisal
Ug/m3	Micrograms per cubic metre of air
VOC	Vehicle Operating Costs. The costs that vary with vehicle use, for example fuel, tyres, maintenance costs, vehicle depreciation etc.
WebTAG	DfT's website for guidance on the conduct of transport studies at http://www.webtag.org.uk/
WebTRIS	Database holding information on traffic flows at sites on the strategic network.

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