

# LNMS Evaluation Report

## M20/M26 Street Lighting



**April 2011**

### Notice

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## Glossary of Terms

Term	Abbreviation	Description
Accessibility	-	<b>Accessibility</b> 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.
Area of Outstanding Natural Beauty	<b>AONB</b>	An <b>Area of Outstanding Natural Beauty (AONB)</b> is an area of countryside considered to have significant landscape that has been specially designated by Natural England on behalf of the United Kingdom government.
Automatic Traffic Count	<b>ATC</b>	An automated method of recording the volume (and sometimes classification) of vehicles passing a particular point on a road.
Appraisal Summary Table	<b>AST</b>	This records the impacts of the scheme according to the Government's five key objects for transport, as defined in <b>DfT</b> guidance contained on its <b>Transport Analysis Guidance</b> web pages, <b>WebTAG</b>
Auxiliary Lane	-	An additional lane at the side of the mainline carriageway to provide increased merge or diverge opportunity or additional space for weaving traffic.
Average Weekday Traffic	<b>AWT</b>	The 24hr total traffic flow on an average weekday (Monday – Friday)
Benefit Cost Ratio	<b>BCR</b>	<b>Benefit Cost Ratio</b> is a ratio identifying the relationship between cost and benefits of a proposed project.
Billion Vehicle Kilometres	<b>Bvkm</b>	Traffic that is measured in terms of vehicle kilometres and is sometimes known as the volume of traffic. This is not the same as congestion. For example, traffic levels could increase without increasing congestion if traffic were more evenly spread during the day, with less during peak periods and more at other times.
Capitalisation	-	The process by which benefits for a scheme are factored to give an estimate for the appropriate appraisal period.
Department for Transport	<b>DfT</b>	A Government department whose objective is to oversee the delivery of a reliable, safe and secure transport system that responds efficiently to the needs of individuals and business whilst safeguarding our environment. The <b>Highways Agency</b> is an executive of the <b>DfT</b> .

Term	Abbreviation	Description
Discounting	-	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.
	<b>EAR</b>	Environmental Assessment Report
<b>Evaluation Summary Table</b>	<b>EST</b>	In <b>POPE</b> studies, this is a summary of the evaluations of the <b>TAG</b> objectives using a similar format to the forecasts in the <b>AST</b> .
<b>First Year Rate of Return</b>	<b>FYRR</b>	<b>First Year Rate of Return</b> is the ratio of money gained on an investment relative to the amount of money invested.
<b>Highways Agency</b>	<b>HA</b>	An Executive Agency of the Department for Transport ( <b>DfT</b> ), responsible for operating, maintaining and improving the strategic road network in England.
<b>Killed or Seriously Injured</b>	<b>KSI</b>	A term used to describe the number of people killed or seriously injured as a result of <b>PIAs</b> .
<b>Local Network Management Scheme</b>	<b>LNMS</b>	LNMS are improvement schemes whose total overall estimated cost (including design, land, works, supervision, risk and VAT) is less than £10 million. They are categorised by the Government under Safety, Economy, Accessibility, Integration and Environment.
<b>Managing Agent Contractor</b>	<b>MAC</b>	Responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a Highways Agency area.
<b>New Approach to Appraisal</b>	<b>NATA</b>	Used for transport scheme appraisal since 1998
<b>Non Motorised User</b>	<b>NMU</b>	Includes pedestrians, cyclists, horse riders and disabled people, whose needs must be addressed. An NMU audit considers the specific needs of these road users.
<b>Optimism Bias</b>	-	Is a demonstrated systematic, tendency for project appraisers to be overly optimistic, and in effect, results in an underestimation of scheme costs. The base cost estimate is adjusted to account for optimism bias in order to obtain more accurate cost estimates.
<b>Project Appraisal Report</b>	<b>PAR</b>	A key document summarising the need for a project, plus its costs and benefits (including those that cannot be quantified in monetary terms).
<b>Personal Injury Accident</b>	<b>PIA</b>	A road traffic accident in which at least one person required medical treatment.

Term	Abbreviation	Description
<b>Post Opening Project Evaluation</b>	<b>POPE</b>	The Highways Agency's programme for measuring and monitoring the impacts of schemes implemented on England's strategic road network.
<b>Present Value</b>		<b>Present Value</b> 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.
<b>Present Value Benefits</b>	<b>PVB</b>	<b>Present Value Benefits</b> is the value of a stream of Benefits accruing over the appraisal period of a scheme expressed in the value of a Present Value
<b>Present Value of Costs</b>	<b>PVC</b>	<b>Present Value Cost</b> is as for PVB but for a stream of costs associated with a project
Risk Allowance	-	Risk refers to identifiable future situations that could result in an over spend or under spend occurring. The base cost estimate is adjusted to account for risk in order to obtain more accurate cost estimates.
Severance	-	Community severance is the separation of adjacent areas by road or heavy traffic, causing negative impact on non-motorised users, particularly pedestrians.
-	<b>STATS19</b>	A database of injury accident statistics recorded by police officers attending accidents.
<b>Traffic Database System</b>	<b>TRADS</b>	Traffic count database developed by the Highways Agency, to hold data from the country's traffic monitoring sites.

# 1. Introduction

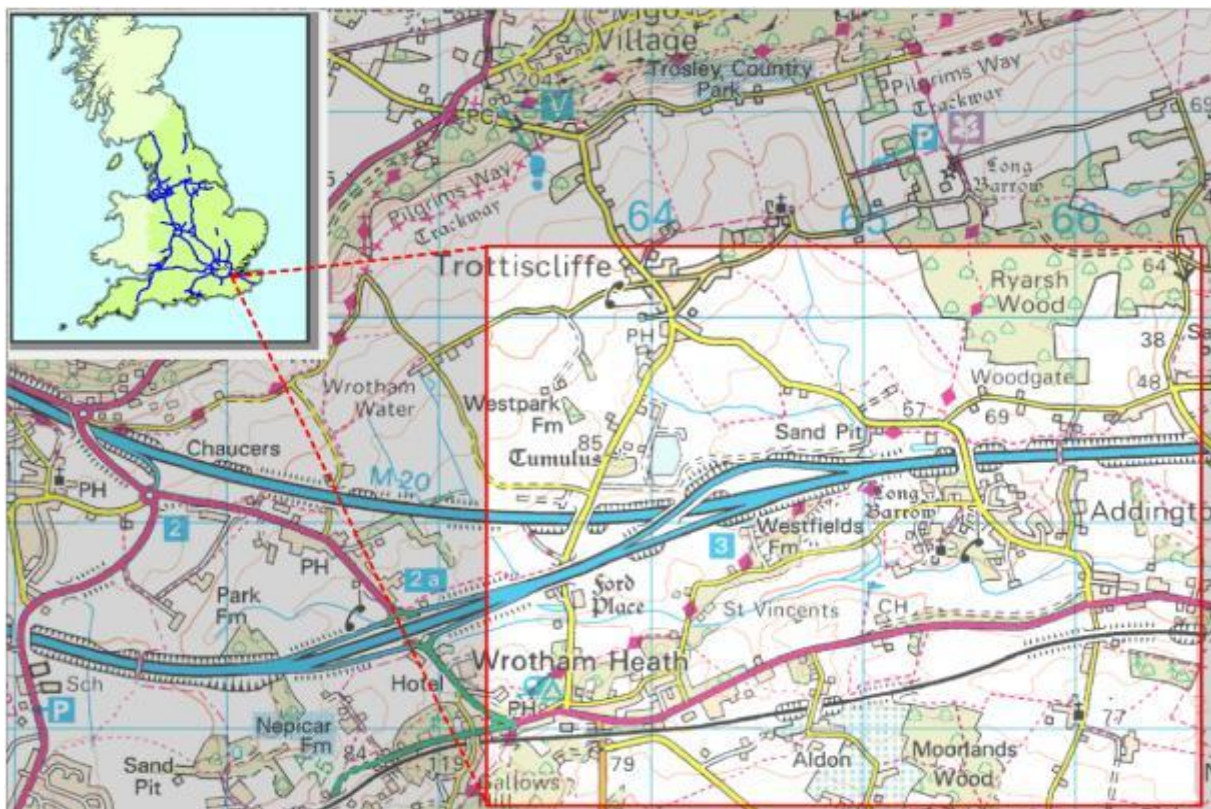
## Background to Scheme

- 1.1 The M20/M26 Street Lighting improvement, which opened in December 2008, is a Highways Agency (HA) Local Network Management Scheme (LNMS). The main objective of the scheme was to improve safety where these two motorways merge. This report presents a Post Opening Project Evaluation (POPE) of the impacts of the scheme.

### Scheme Location

- 1.2 The scheme is located at Junction 3 of the M20 where it meets the M26 near Wrotham in Kent and is presented in **Figure 1.1**. The extent of the street lighting site is approximately 2.1km in length on both carriageways on the M20 and on both entry and exit links on the M26. The site abuts the Kent Downs Area of Outstanding Natural Beauty (AONB).

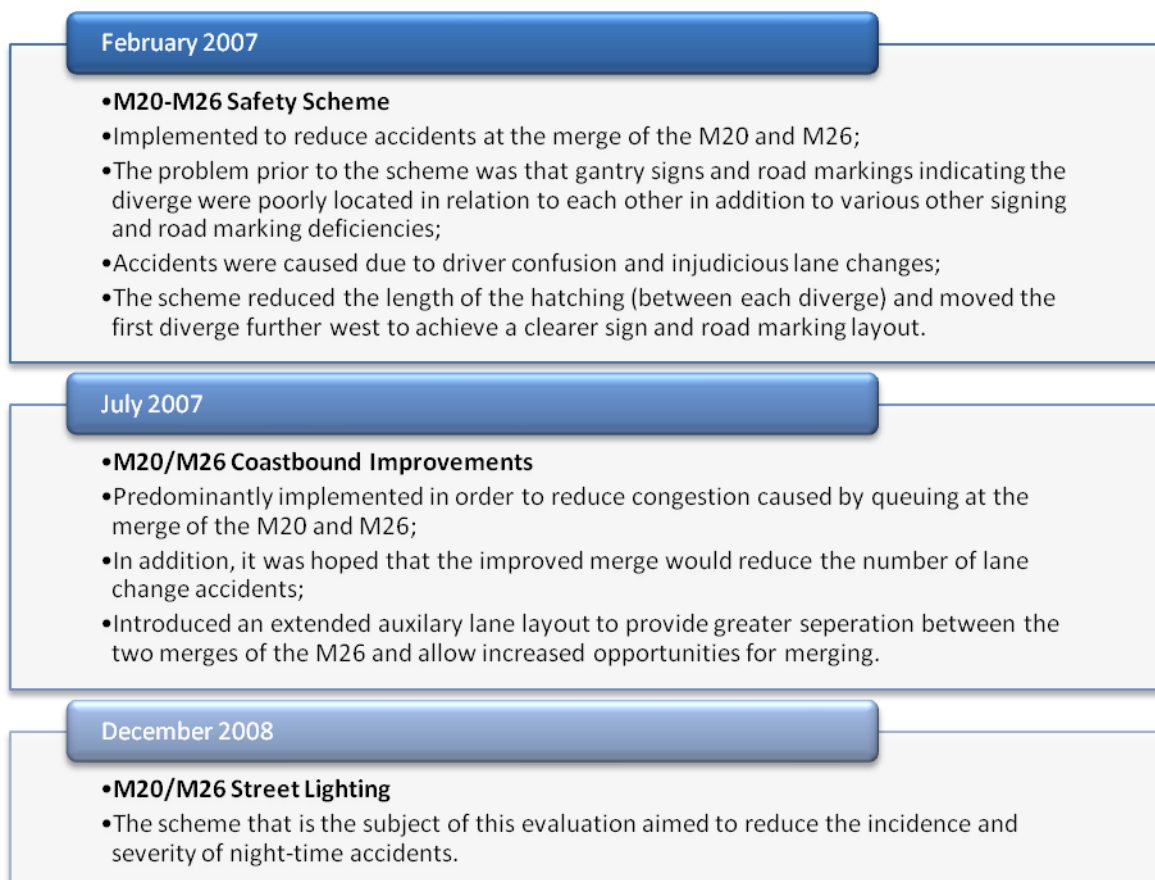
Figure 1.1 – Scheme Location



### History of the Scheme

- 1.3 Two improvement schemes were implemented at this junction during the course of 2007 with the aim of improving lane discipline and reducing accidents. Collectively these schemes are referred to as the “previous schemes” throughout this report. The first scheme opened in February 2007 and was implemented to address accidents due to driver confusion, overrunning of the hatching between each diverge and injudicious lane changes.
- 1.4 The second scheme was predominantly aimed at reducing congestion but it was anticipated that it would also reduce the likelihood of injudicious lane changes and therefore reduce the risk of accidents.
- 1.5 Further details and a timeline of these improvements are presented in **Figure 1.2**:

Figure 1.2 – M20-M26 Improvement History



### Problems Prior to the Scheme

- 1.6 The junction of the M20 and M26 was unlit and had a Personal Injury Accident rate (PIA) and a Killed and Serious Injury accident severity ratio (KSI) higher than the national averages. Ongoing observations and accident data indicated there was a lack of lane discipline resulting in an increased PIA and KSI, and a high proportion of these occurred during night periods.

### Scheme Description

- 1.7 The scheme was to implement a verge mounted lighting solution to reduce the poor safety record associated with this junction.

### Scheme Categorisation

- 1.8 Local Network Management Schemes (LNMS) are categorised according to which of the five assessment objectives of safety, economy, environment, accessibility and integration are primarily addressed by the scheme. As detailed in the Project Appraisal Report (PAR) document, the scheme has been categorised as a **safety scheme**.

### Scheme Objectives

- 1.9 The scheme objectives are as follows:
- Reduce the number of KSI accidents; and
  - Reduce the number of PIAs.

## Purpose of this Report

### Post Opening Project Evaluation (POPE)

- 1.10 As part of an ongoing programme to evaluate the impacts of trunk road schemes, Atkins are commissioned to undertake POPE of Local Network Management Schemes (LNMS) with an implementation cost of between £25k and £10m. The aim of this process is to:
- Quantify the outturn benefits, disbenefits and costs accruing from new schemes and to ascertain which schemes offer the greatest value for money;
  - Develop the pre-scheme appraisal processes (PAR Guidance) and ensure that accurate predictions are made about the possible impacts of highway schemes on safety, economy, environment, accessibility and integration in the future; and
  - Enable the HA to select schemes that offer the greatest value for money and that are the most effective solutions to problems on the trunk road network.

- 1.11 This report specifically sets out the results of the POPE of the M20/M26 Street Lighting scheme as implemented in December 2008. More specifically, this report examines the economic and safety impacts resulting from the improvements, with consideration also given to the main environmental, accessibility and integration impacts.

### POPE Methodology Overview

- 1.12 This evaluation report presents the forecast and outturn impacts of the M20/M26 Street Lighting improvement scheme in accordance with the POPE methodology. POPE is based on an evaluation of the scheme's outturn impacts against the five core New Approach to Appraisal (NATA) objectives as listed below:
- **Economy** – concerned with improving the economic efficiency of transport, for example, journey time savings and reliability;
  - **Safety** – concerned with reducing the loss of life, injuries and damage to property resulting from transport incidents and crime;
  - **Environment** – reducing the direct and indirect impacts of transport facilities on the physical and social environment of both users and non-users;
  - **Accessibility** – concerned with people's ability to reach different locations and facilities by different modes, and the ease with which they can do so; and
  - **Integration** – aims to ensure that all decisions are taken in the context of the Government's integrated transport policy.
- 1.13 Furthermore, this report presents the following:
- A comparison of the 'before' and 'after' traffic volumes at the junction to illustrate how overall traffic conditions have changed following scheme opening;
  - An outline of changes in the number of accidents at the junction following scheme opening;
  - A comparison of predicted and outturn environment, accessibility and integration impacts;
  - A summary of scheme performance from the perspective of key stakeholders engaged in the original scheme development including the HA Project Manager;
  - The PAR assessment which forecast the benefits of the scheme. Where required, values are converted to 2002 prices and discounted to the opening year; and
  - An Evaluation Summary Table (EST) based on the outturn effects of the scheme using a methodology consistent with the PAR assessment undertaken prior to the scheme opening.

### Structure of this Report

- 1.14 Following on from this introduction, this report shall include:
- **Section 2 – Scheme Detail:** Provides details of the scheme including photos illustrating the scheme key features;
  - **Section 3 – Data Collection and Stakeholder Feedback:** Contains an outline of the data which has informed the evaluation and the responses from key stakeholders regarding the scheme;
  - **Section 4 – Traffic Impacts:** Outlines the traffic changes in the study area;
  - **Section 5 – Safety Impacts:** Outlines the safety impacts of the scheme through analysis of personal injury accidents;
  - **Section 6 – Economy:** Summarises the value for money of the scheme by comparing the scheme costs and benefits;
  - **Section 7 – Environment, Accessibility and Integration Issues:** Summarises the scheme impacts on these issues; and
  - **Section 8 – Summary of Conclusions and Recommendations:** Summarises the impact of the scheme based on the data available to evaluate the scheme.
- 1.15 It is intended that the findings from this report shall feed into a wider summary of the outcomes of POPE of LNMS as reported in the annual report.

## 2. Scheme Detail

### Introduction

- 2.1 This section of the report examines the details of the scheme and compares the pre and post opening scheme layout. The aims of this section are to identify and provide further details of the measures implemented.

### Scheme Features

- 2.2 The scheme included the implementation of 144 verge mounted lighting columns (**Figure 2.1** and **2.2**) and the illumination of 4 signs within the scheme extents (approximately 2.1km in length). The lighting columns are unprotected passively safe aluminium columns which are energy absorbing and therefore safer if struck by a vehicle. The columns are 15 metres high and spaced approximately 35 metres apart.

Figure 2.1 – View from Overbridge looking east (Before and after opening)



Before Opening



After Opening

Figure 2.2 – View from Overbridge looking west (Before and after opening)



Before Opening



After Opening

- 2.3 The lamps have been fitted with a full cut-off system (designed to focus the light down onto the motorway) resulting in light spillage being significantly reduced in comparison to traditional

lighting. The lamp columns themselves have been painted dark green to reduce their visual impact during the day (**Figure 2.3**).

**Figure 2.3 – Lamp Columns Painted Green**



## Other options considered

- 2.4 Two other options for the lighting within this scheme were considered during a feasibility study undertaken by the HA Managing Agent Contractor (MAC). Options considered included the use of:
- Central reserve lighting with reduced height columns mounted on a newly constructed central reserve concrete barrier, and
  - Verge mounted lighting columns protected by safety barrier located at the back of the hard shoulder.
- 2.5 Both of these options were rejected in favour of the implemented scheme described previously.

### **Summary – Section 2:**

The scheme appears to have been implemented as per the proposals set out in the Implementation PAR.

## 3. Data Collection and Stakeholder Feedback

### Introduction

3.1 This section of the report sets out the data collection process and sources of data that have been used to support this scheme evaluation. Specifically, this includes:

- Lists of the datasets used to undertake the POPE assessment; and
- A summary of the feedback from the MAC and Project Manager; and any other interested parties regarding the overall effectiveness of the scheme in achieving the intended objectives.

### Datasets used to Support this Evaluation

3.2 The following datasets and information have been used to support this evaluation:

- A site visit of the scheme conducted on 29th November 2010, the aims of which were to ensure that the scheme was implemented as per the PAR;
- A further site visit of the scheme in January 2011 to assess the visual impact of the scheme in the hours of darkness;
- C10 Environmental Assessment Form;
- M20 M26 Lighting Environmental Assessment Report;
- Part 1 Compensation Report;
- Project Appraisal Report v4.1d (PAR) – dated 05/08/2008;
- Accident data for a geographical area shown in **Figure 5.2** (Section 5) from April 2002 to June 2010; and
- Data from permanent Automatic Traffic Count (ATC) sites on the M20 from the Highways Agency (HA) TRADS database.

### Stakeholder Feedback

3.3 A number of stakeholders provided feedback on the scheme at the conception stage. In order to inform this evaluation, in addition to the Highways Agency project manager, feedback was sought from the following stakeholders:

- Managing Agent (Mouchel) Project Manager;
- Kent Downs AONB Unit;
- Natural England;
- Kent County Council;
- Tonbridge and Malling District Council;
- Addington Parish Council; and
- Kent Police.

3.4 Feedback from stakeholders specifically relating to environmental issues has been included in the environment chapter of this report. More general issues/comments are included overleaf:

### Highways Agency Project Manager

- 3.5 The HA project manager was contacted to ascertain his views on the impact of the scheme and any issues encountered. His comments are summarised as follows:

*'This was a safety scheme that was instigated to address the problem of above average night-time accidents. There was strong support for the scheme from local MPs and Environmental risks needed to be mitigated. The scheme was successfully delivered with no particularly adverse environmental backlash. I would therefore consider it successful.'*

*'We engaged directly with the local media, who supported the scheme and were able to highlight the environmental mitigation we built into the design. We also wrote to all residents within a certain radius of the scheme to try and put their minds at rest concerning the perceived light pollution in what is a rural and dark part of Kent.'*

### Managing Agent Contractor Project Manager

- 3.6 The MAC project manager who oversaw the later stages of the detailed design, the procurement and construction of the scheme was contacted to ascertain his views on the impact of the scheme and any issues encountered. His comments are summarised as follows:

*'Generally speaking, I believe the scheme came in on time and to budget. The major challenge was the third party issues (local residents) and ecology surrounding the implementation of street lighting in a location previously unlit. These were mitigated during the detailed design phase and post works.'*

### Addington Parish Council

- 3.7 Addington Parish Council had the following comments on the scheme.

*'We strongly agree safety has been improved, although we feel the scheme had a detrimental impact on the environment as we feel it caused light pollution particularly when viewed from the village towards the North Downs. The junction is better than before in that the well lit scene now avoids sudden changes of direction by lorries who were confused before. We are surprised at the level of light pollution and question the advantage of high mounting heights from the outside of the lane rather than double units in the central reservation which may have meant lower mounting heights for the lanterns.'*

**Summary – Section 3:**

- The Highways Agency Project Manager considered the scheme to be successful and that there was no particular backlash regarding the environmental impact;
- The MAC suggested that the scheme was successfully delivered and that the issues of local opposition and ecology impacts were successfully mitigated during the design phase and post works; and
- Addington Parish Council felt the scheme had improved safety but concerns were expressed as to the level of light pollution.

## 4. Traffic Impacts

### Introduction

- 4.1 This section of the report summarises the analysis that has been undertaken in order to assess the impacts of the scheme on traffic. Data collected before and after the scheme opened is assessed in order to establish changes that have occurred as a result of the scheme. This information on traffic flows has also then been used to inform the economic assessment of the scheme which is presented later in Section 6 of this report.

### Traffic Volumes

#### National Trends

- 4.2 Nationally observed changes in traffic levels are provided in the Transport Statistics Bulletin: Road Traffic & Congestion in Great Britain produced by the Department for Transport (DfT). These statistics provide trends in billion vehicle kilometres (bvkm) by road type and vehicle type, for each quarter. Statistics for motorways for all vehicles since 2006 are provided in **Table 4.1**.

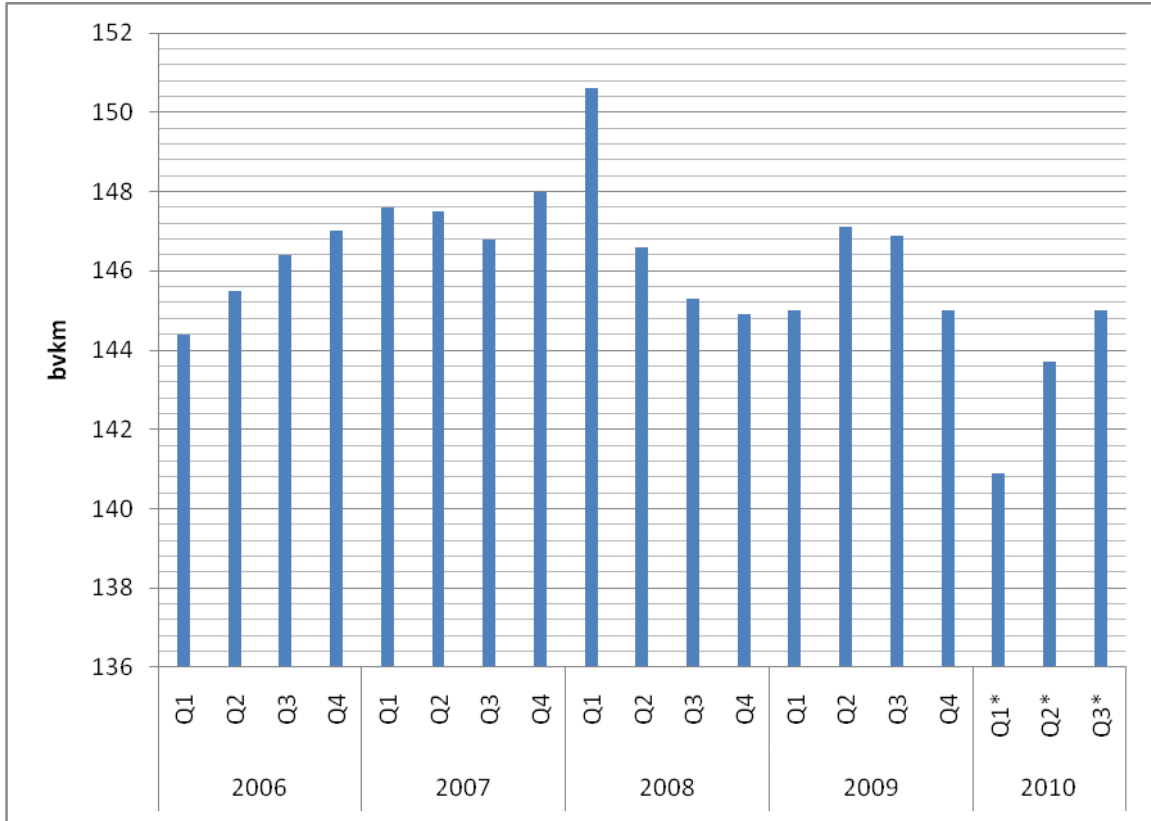
**Table 4.1 – Nationally Observed Trends in Vehicle Kilometres (Motorways)**

Year	Quarter	bvkm
2006	Q1	144.4
	Q2	145.5
	Q3	146.4
	Q4	147.0
2007	Q1	147.6
	Q2	147.5
	Q3	146.8
	Q4	148.0
2008	Q1	150.6
	Q2	146.6
	Q3	145.3
	Q4	144.9
2009	Q1	145.0
	Q2	147.1
	Q3	146.9
	Q4	145.0
2010	Q1 (Provisional)	140.9
	Q2 (Provisional)	143.7
	Q3 (Provisional)	145.0

**Note:** results are based on observed data, 2010 estimates are provisional. Q1 2009 and Q1 2010 figures were affected by heavy snowfall (more so in 2010).

4.3 The statistics for motorways for all vehicles since 2006 as detailed in **Table 4.1** are illustrated graphically in **Figure 4.1**.

**Figure 4.1 – Nationally Observed Trends in Vehicle Kilometres (Motorways)**



\*Provisional Data

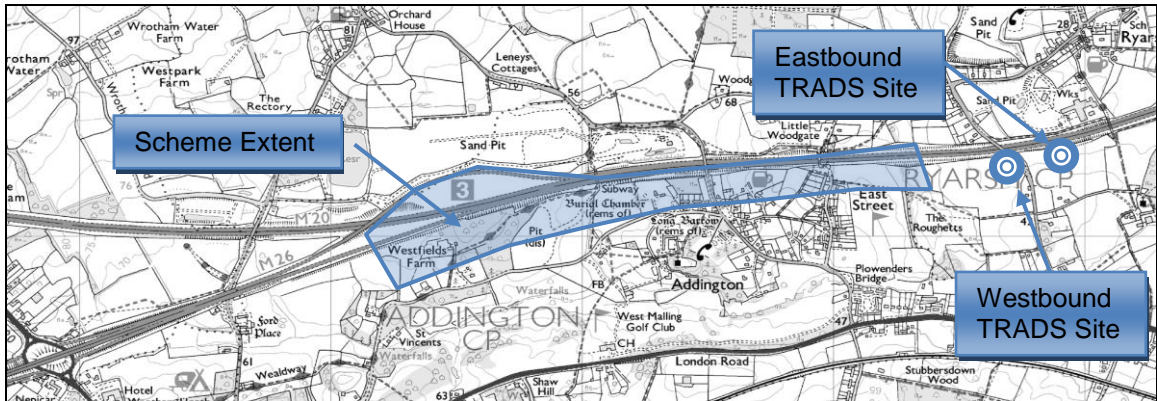
4.4 The national trends shown in **Table 4.1** show that:

- There has been a decline in bvkm on motorways since Quarter 1 of 2008;
- Traffic in the first two quarters of 2010 has been lower than in the four previous years; and
- Provisional data demonstrates a slight downturn in each quarter of 2010 compared to the corresponding quarter in 2009.

### Local Trends

4.5 Long term traffic count data was available from the Highways Agency TRADS database for the M20. **Figure 4.2** shows the locations of the count sites in relation to the scheme. Whilst traffic data was available within the scheme extent this was not long term traffic data and did not include the period before the scheme opened. It is considered that the TRADS sites illustrated in **Figure 4.2** are representative of any change in local traffic volumes in the area.

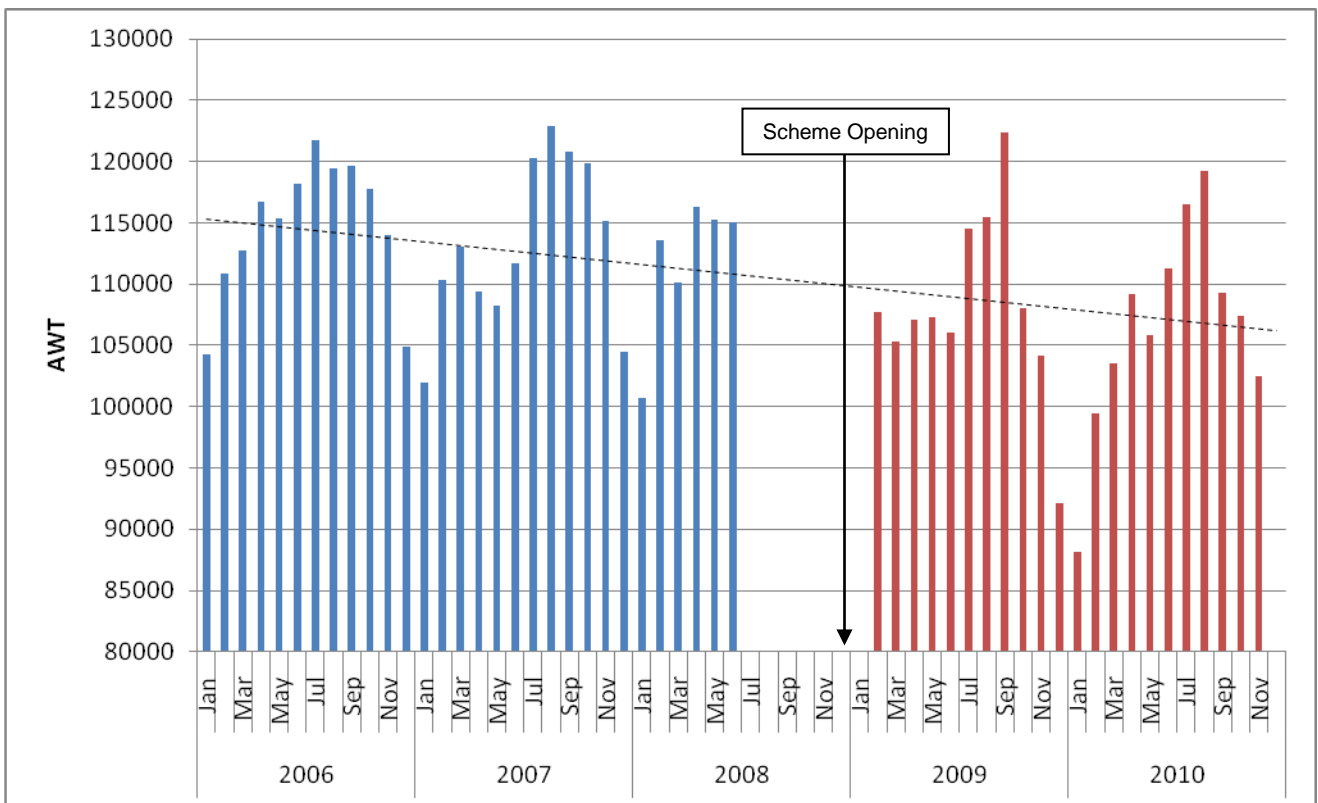
Figure 4.2 – TRADS Count Site Locations



4.6 **Figure 4.3** shows the trend in two-way Average Weekday Traffic (AWT) by month for this section of the M20. Analysis of recent trends in traffic flows in the vicinity of the scheme not only helps to establish the context in which any changes have occurred, but also helps to set the scene in relation to traffic conditions before the scheme was constructed. It should be noted that no traffic data was available at these sites for the latter half of 2008.

- 4.7 From **Figure 4.3**, the following observations can be made regarding trends in traffic on the M20:
- There is seasonal variation with higher flows in the summer months;
  - The M20 carries between 100,000 and 121,000 vehicles on an average weekday; and
  - The M20 has exhibited a slight reduction in traffic since 2006 as demonstrated by the linear trend line. This is likely to be due (in part) to the economic downturn.

Figure 4.3 – Long Term Traffic Trends (AWT) for the M20 near merge of M26



4.8 **Table 4.2** shows the trend in two-way Annual Average Weekday Traffic (AAWT) and Annual Average Daily Traffic (AADT) for the M20 in the vicinity of the scheme.

**Table 4.2 – Change in Two Way AADT and AAWT 2006 to 2010**

Year	AADT	% Change in AADT to 2006	AAWT	% Change in AAWT to 2006
2006	107,281	-	114,643	-
2007	106,399	-1%	113,162	-1%
2008	104,204	-3%	111,836	-2%
2009	102,256	-5%	108,191	-6%
2010	100,364	-6%	106,592	-7%

**Note:** % change in all cases is since 2006. Figures for 2008 are based on 6 months of traffic data only.

4.9 The table shows that:

- Traffic using the M20 in the vicinity of the scheme has reduced by 6-7% between 2006 and 2010; and
- The greatest reduction has been since 2008, widely regarded to be the start of the economic downturn.

**Summary – Section 4:**

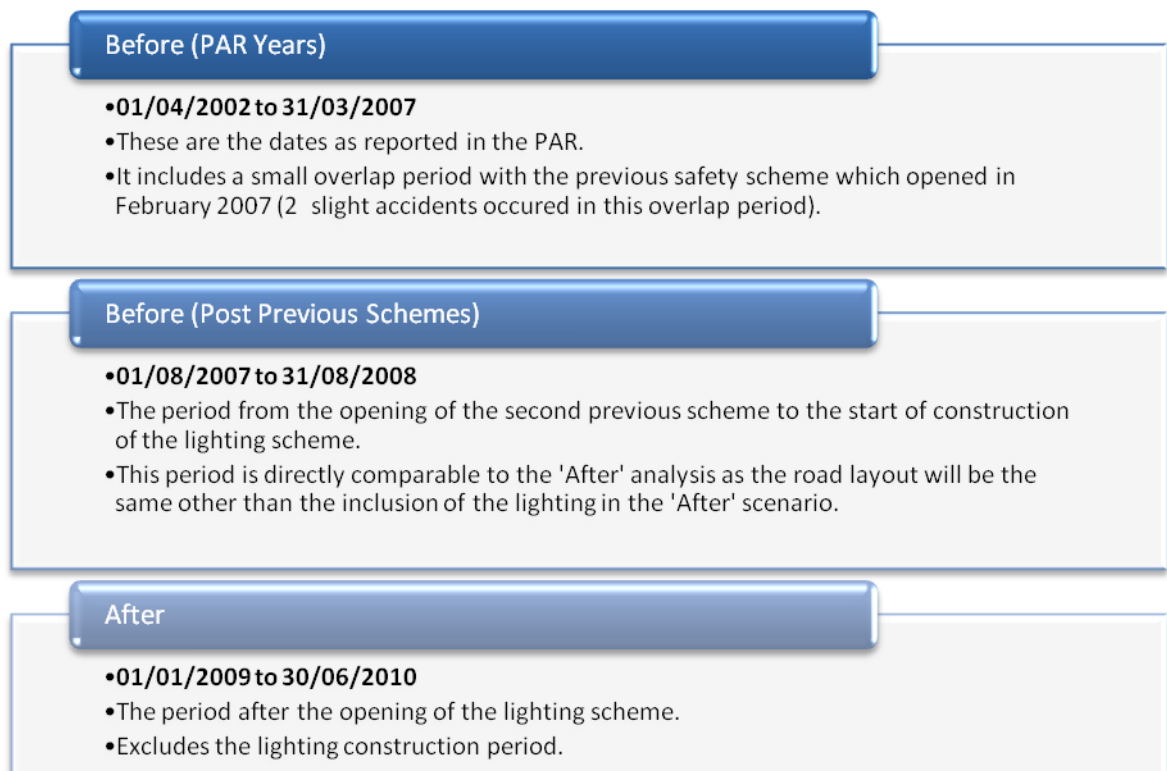
- Nationally, traffic volumes reduced in 2008 and first quarter of 2009 compared to the same months in previous years. This is likely to be related to the economic climate;
- The M20 in the vicinity of the scheme has exhibited slight background traffic reduction since 2006; and
- Local trends are broadly in line with national trends in traffic growth.

## 5. Safety Impacts

### Introduction

- 5.1 This section examines the accidents both 'before' and 'after' scheme opening to establish whether the scheme has resulted in a post opening safety benefit or disbenefit. The aims of the section are:
- To determine whether the scheme has achieved its safety objectives;
  - To determine whether there has been any change in the number, location and causation of PIAs following scheme opening; and
  - To determine if the scheme has resulted in an overall safety benefit or disbenefit and to quantify this change.
- 5.2 The accident data referred to in this report has not necessarily been derived from the national validated accident statistics produced by the DfT. As such, the data may subsequently be found to be incomplete or contain inaccuracies. The requirement for up-to-date information and site specific data was a consideration in the decision to use un-validated data and, as it is sourced from Local Processing Units through the HA's MACs, it is sufficiently robust for use in this context.
- 5.3 As discussed in **Section 1** of this report, the M20/M26 junction has been subject to a number of improvement measures that commenced with a safety scheme that opened in February 2007 and continued with a further economy scheme that opened in July 2007. These schemes are referred to as the "previous schemes".
- 5.4 In order to give a fuller picture of the road safety benefits attributed to this scheme a number of assessment periods have been investigated as illustrated in **Figure 5.1**.

Figure 5.1 – Accident Analysis Assessment Scenarios



## PAR Analysis and Assumptions

### The PAR

5.5 The PAR used accident data from 01/04/2002 to 31/03/2007. The PAR assessment of traffic accidents revealed the following:

- 61 accidents occurred over a period of 5 years, amounting to an observed accident rate of 12.2 PIA/yr;
- The KSI severity index<sup>1</sup> was 24.6% over the same 5 year period, with 2 fatal accidents, and 13 serious accidents;

5.6 A summary of the accident analysis as detailed in the PAR is shown in **Table 5.1**. It should be noted that the data presented in the PAR and in Table 5.1 represent all accidents regardless of the time of day at which that accident occurred.

**Table 5.1 – Summary of Accident Numbers as detailed in the PAR (All Accidents)**

	Period	PIA No./Rate	Slight	Serious	Fatal	Total	Severity Index
'Before' scheme Opening (PAR)	1 <sup>st</sup> April 2002 to 1 <sup>st</sup> April 2007	PIA Number	46	13	2	61	24.6%
		PIA rate per year	9.2	2.6	0.4	12.2	

**Note:** Based on all accidents occurring regardless of time of day.

5.7 In respect of night-time accidents, upon which the predicted saving is based, the following was observed:

- 25 accidents occurred at night over a period of 5 years, amounting to an observed night-time accident rate of 5 PIA/yr;
- The percentage of night-time accidents as a proportion of all accidents is 41%;
- The accident saving in the first year after opening was predicted to be 0.5 (i.e. a 10% reduction in all night-time accidents); and
- The accident saving over the full assessment period (30 years) was predicted to be 20.

5.8 The number of accidents likely to be saved over the full assessment period (30 years) is calculated by multiplying the first year estimate of accidents saved by the appropriate capitalisation factor. In this case the capitalisation factor is 39.31. Capitalisation factors are calculated for the appropriate road type and the traffic growth predicted for the chosen assessment period.

## Post Opening Evaluation

### PAR Predicted Corrected

5.9 To ensure a like-for-like comparison of the predicted and outturn safety impacts of the scheme, a PAR predicted corrected appraisal of the scheme has been undertaken. In this instance, this has been done to:

- Ensure that the same geographical area is used for both the 'before' and 'after' periods;

<sup>1</sup> Fatal accidents and Serious accidents as a percentage of all personal injury accidents.

- Compare before and after night-time accident numbers only (the data presented in the PAR included all accidents – See Para 5.8); and
- Exclude those accidents not directly attributable to the scheme e.g. tyre blowouts. To ensure like for like comparison this is done for both the before (corrected) and after opening scenarios.

5.10 The PIA data is based on the records of personal injury accidents recorded in the STATS19 data collected by the police. Damage only accidents are not included. It is considered that traffic management during the period of construction would have affected driver behaviour; therefore this period has been excluded (08/09/2008 to 22/12/2008).

5.11 **Table 5.2** provides a summary of the accident numbers occurring in the study area both before and after the scheme opened. Unlike the PAR analysis presented in **Table 5.1** the accidents presented are night-time accidents only. In addition the before (predicted corrected) and after data presented below are based on the same geographical area and are therefore directly comparable. Two 'before' scheme opening periods have been presented as follows:

- Prior to the previous schemes for the years as detailed in the PAR (April 2002 to March 2007); and
- Post previous schemes but prior to construction of the lighting scheme (Aug 2007 to August 2008).

**Table 5.2 – Summary of Accident Numbers before and after scheme opening (Night-time Accidents only)**

Scheme Opening	Period	PIA No./ Rate	Slight	Serious	Fatal	Total	Severity Index
<b>(a)</b> 'Before' (PAR Years)	April 2002 to March 2007 (60 months)	PIA Number	21	5	1	27	22%
		PIA rate per year	4.2	1.0	0.2	5.4	
<b>(b)</b> 'Before' (post previous schemes)	Aug 2007 to Aug 2008 (13 months)	PIA Number	4	0	0	4	0%
		PIA rate per year	3.7	0.0	0.0	3.7	
'After' scheme opening	Jan 2009 to June 2010 (18 months)	PIA Number	1	0	0	1	0%
		PIA rate per year	0.7	0.0	0.0	0.7	
<b>Annual Accident Saving (per year)*</b>			<b>3.0</b>	<b>0</b>	<b>0</b>	<b>3.0</b>	<b>0%</b>

\* Saving calculated from (b) 'Before' (post previous schemes) to 'After' scheme opening

5.12 As discussed previously the lighting of the M20/M26 junction came after two previous schemes to improve safety and journey times, the latter of which opened in July 2007. For this reason, any accident saving compared to the PAR year rates (i.e. prior to previous schemes), may be a result of these previous schemes and not the lighting scheme for which this analysis is concerned. Consequently, the annual accident savings have been based on the period post previous schemes. This is deemed appropriate despite the reduced amount of 'before' scheme opening accident data available for comparison as it investigates the true benefit of this scheme only rather than the combined effect of previous improvements.

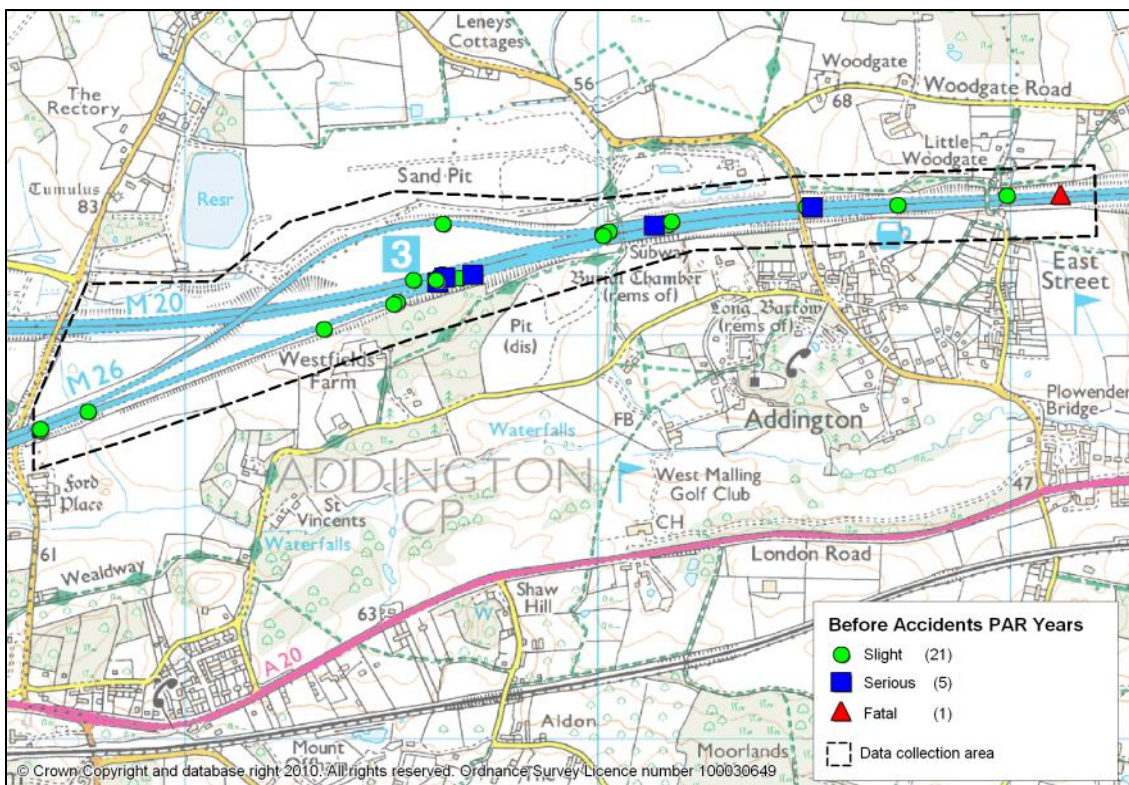
5.13 Key points to note from **Table 5.2** include:

- An annual accident rate of 5.4 night-time PIAs was observed in the PAR years prior to the previous schemes and the lighting scheme;
- The severity index in the PAR years prior to the previous schemes and the lighting scheme was 22% which is higher than average for a motorway;
- Post previous schemes but prior to the lighting scheme, the annual accident rate reduced to 3.7 PIAs with no serious or fatal accidents reported;
- Just one slight night-time accident has been reported at the junction since the opening of the lighting scheme, giving an annual accident rate of 0.7; and
- The annual accident saving of the street lighting scheme alone amounts to 3 PIAs per year.

5.14 The proportion of darkness PIAs on all types of strategic roads is on average 28% of the total PIAs occurring during daylight and darkness<sup>1</sup>. Before any improvements were made at the junction (PAR Years), 43% of accidents occurred in the hours of darkness, compared to 40% before the street lighting scheme opened (post previous schemes) and 11% after scheme opening.

5.15 The locations of night-time accidents prior to the lighting scheme are illustrated in **Figures 5.2** and **5.3**. The location of the night-time accident that occurred after scheme opening is shown in **Figure 5.4**.

**Figure 5.2 – Night-time Accident Locations ‘Before’ (PAR Years)**



<sup>1</sup> TA 49/07 Appraisal of New and Replacement Lighting on the Strategic Motorway and All Purpose Trunk Road Network.

Figure 5.3 – Night-time Accident Locations ‘Before’ (Post Previous Schemes)

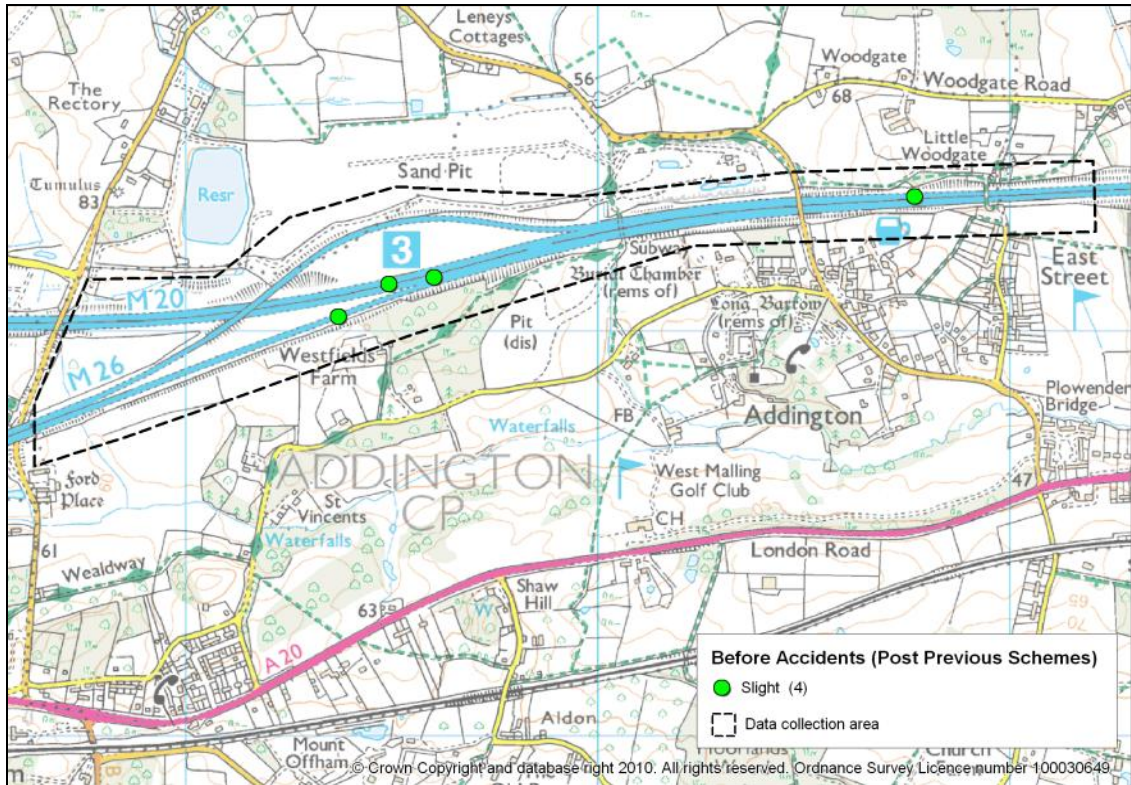
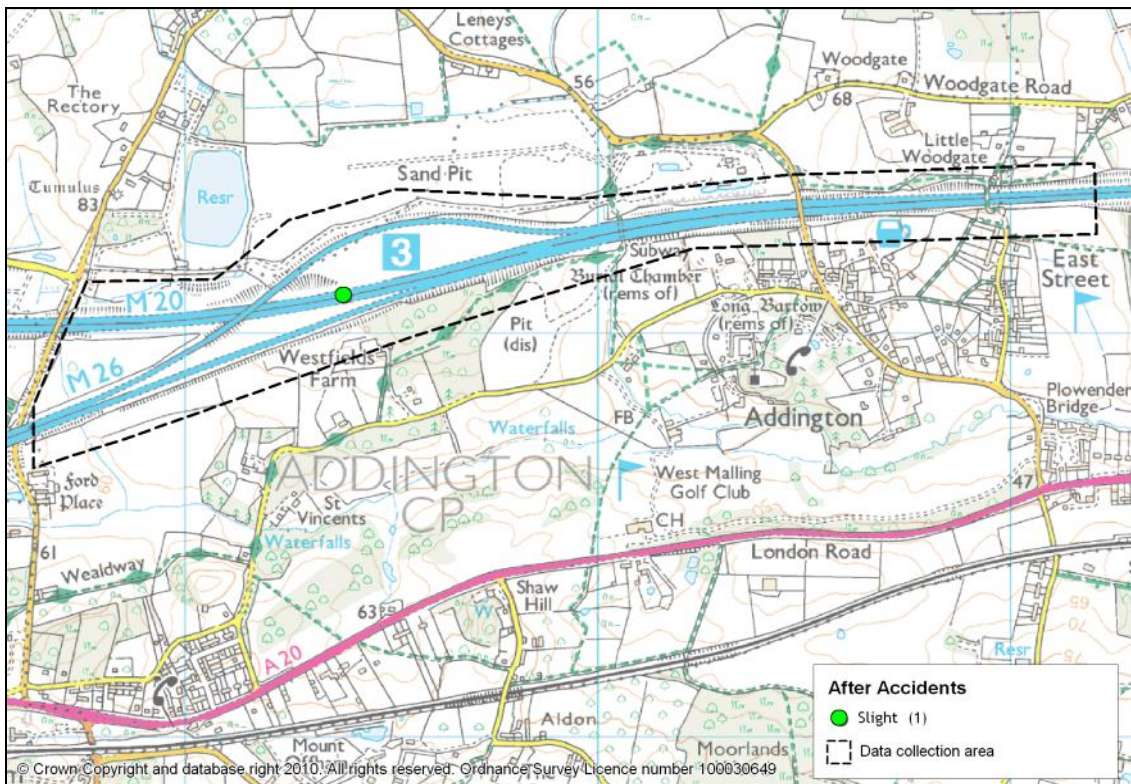


Figure 5.4 – Night-time Accident Locations ‘After’



### Comparison of PAR, PAR Predicted Corrected and Outturn Accident Analysis

- 5.16 By comparing the PAR and PAR Predicted Corrected with the outturn accident savings presented in this section, we can comment on the scheme’s accident savings compared to those forecast. **Table 5.3** summarises this information. The Predicted Corrected accident savings have been calculated using the same proportion of saving in the PAR and applied to the ‘before’ number of accidents in the PAR Predicted Corrected geographical area.
- 5.17 For completeness all PAR predicted corrected scenarios are presented in **Table 5.3** however, for the purposes of this evaluation it is deemed appropriate that the economic benefit of the scheme be derived from the comparison of the outturn accident savings with that of the PAR predicted corrected post previous schemes. The reason being, that a change in the outturn accident rate when compared with that of accident rates prior to the previous schemes may have shown the impact of the previous schemes and not the impact of the street lighting. By comparing outturn accident rates with post previous scheme rates it is ensuring a like for like comparison and hence the true impact of the street lighting can be established. The consequence of this is that there is a smaller before scheme opening dataset available however it is considered that the benefits of this methodology far outweigh the disbenefits.

**Table 5.3 – PAR Predicted, PAR Predicted Corrected & Outturn Accident saving**

		Opening Year Saving (PIAs)	30 Year Saving (PIAs)
PAR Predicted*	PAR Years	0.50	20
Predicted Corrected	PAR Years	0.54	21
	Post Previous Schemes	0.37	15
Outturn (compared to PAR)*	PAR Years	4.33	170
Outturn (compared to predicted corrected)	PAR Years	4.73	186
	Post Previous Schemes	3.03	119

*\*Note: Capitalisation factors and geographical area of analysis differ from Predicted Corrected and Outturn*

- 5.18 It can be seen that the outturn accident savings are considerably higher than the PAR and PAR predicted-corrected forecasts.

#### Summary – Section 5:

- There has been an annual night-time accident rate of 0.7 at the junction since the scheme opened compared to a rate of 3.7 PIAs/yr in the period before the street lighting scheme but after the previous schemes (predicted corrected);
- Using the data post previous schemes, the accident saving in the first year after opening was predicted (corrected) to be 0.4 amounting to 15 accidents saved over the full assessment period (30 years); and
- The actual outturn accident saving was 3 PIAs/year amounting to 119 over the full assessment period (30 years) excluding the benefits associated with the previous schemes.

## 6. Economy

### Introduction

- 6.1 This section of the report presents information regarding the forecast economic impacts of the scheme and the outturn economic impacts of the scheme based on observed data collected before and after the scheme opened. A review of the outturn scheme costs against those predicted is also undertaken.
- 6.2 Economic benefits presented in this section of the report are derived from safety benefits associated with a reduction in the number of accidents only. As you would expect for a scheme of this type, no journey time benefits were predicted in the PAR and therefore no journey time benefits have been estimated in this section of the report.

### Safety Benefits

- 6.3 In scheme appraisal, the economic impact of changes in safety is calculated by assigning monetary benefits to the predicted reduction in the number and severity of personal injury accidents over the appraisal period.

#### Forecast Safety Benefits

- 6.4 The forecast safety benefits for the scheme have been derived from the PAR and are presented in **Table 6.1** below alongside a PAR predicted-corrected safety benefit (for both before the previous schemes, and after the previous schemes), which have been calculated based on the revised geographical area used in the accident analysis in the Safety section of this report.

**Table 6.1 – Calculation of Forecast Safety Benefits: PAR and PAR predicted corrected**

	PAR	Predicted Corrected	
		PAR Years	Post Previous Schemes
Opening year accident saving (a)	0.50	0.54	0.37
Average cost of night-time accident in opening year (b)	£105,910		
Accident Benefits Capitalisation factor (c)	33.13		
Accident Numbers Capitalisation factor (d)	39.31		
30 year accident saving (a) x (d)	20	21	15
<b>Accident benefit in opening year undiscounted (e) = (a) x (b)</b>	<b>£0.053m</b>	<b>£0.057m</b>	<b>£0.039m</b>
<b>Accident benefits over 30 year assessment period (e) x (c)</b>	<b>£1.755m</b>	<b>£1.895m</b>	<b>£1.295m</b>

**Note:** Capitalisation factors, average cost of accident in opening year and discount rates derived from PAR v4.1d guidance

- 6.5 It can be seen from **Table 6.1** that the PAR predicted-corrected safety benefits prior to the previous schemes are slightly higher than the PAR prediction. It can also be noted that when the period post previous schemes is evaluated this is less than the PAR prediction.

### Outturn Safety Benefits

- 6.6 As with the forecast safety benefits, a 30 year monetary benefit has been calculated for the outturn, based on the accident saving observed since the scheme opened compared to before scheme construction.

**Table 6.2 - Calculation of Outturn Safety Benefits: Compared to PAR and Predicted Corrected**

	Outturn Compared to PAR	Outturn Compared to PAR predicted corrected:	
		PAR Years	Post Previous Schemes
Opening year accident saving (a)	4.33	4.73	3.03
Average cost of night-time accident in opening year (b)	£105,660		
Accident Benefits Capitalisation factor (c)	33.13		
Accident Numbers Capitalisation factor (d)	39.31		
30 year accident saving (a) x (d)	170	186	119
<b>Accident benefit in opening year undiscounted (e) = (a) x (b)</b>	<b>£0.458m</b>	<b>£0.500m</b>	<b>£0.320m</b>
<b>Accident benefits over 30 year assessment period (e) x (c)</b>	<b>£15.157m</b>	<b>£16.557m</b>	<b>£10.591m</b>

**Note:** Capitalisation factors, average cost of accident in opening year and discount rates derived from PAR v4.1d guidance

### Comparison of Outturn and Forecast Safety Benefits

- 6.7 A summary of the calculated forecast and outturn 30 year safety benefits is provided in **Table 6.3**.

**Table 6.3 – PAR Predicted, PAR Predicted Corrected & Outturn Accident saving**

<i>Accident benefits in 2002 prices, discounted to Opening Year</i>		Opening Year Safety Benefits (£m)	30 Year Safety Benefits (£m)
PAR Predicted	PAR Years	£0.053m	£1.755m
Predicted Corrected	PAR Years	£0.057m	£1.895m
	Post Previous Schemes	£0.039m	£1.295m
Outturn (compared to PAR)	PAR Years	£0.458m	£15.157m
Outturn (compared to predicted corrected)	PAR Years	£0.500m	£16.557m
	Post Previous Schemes	£0.320m	£10.591m

- 6.8 As mentioned previously, for the purposes of this evaluation it is deemed appropriate that the economic benefit of the scheme be derived from the comparison of the outturn accident savings with that of the PAR predicted corrected post previous schemes.

6.9 The predicted corrected safety benefit of the scheme was £0.039m in the opening year and £1.295m over 30 years compared to an outturn benefit of **£0.320m** in the opening year and **£10.591m** over 30 years.

## Scheme Costs

6.10 This section compares the forecast cost of the scheme with the outturn cost. The opening year was forecast to be 2008. The forecast cost has been derived from the PAR and outturn costs provided by the Highways Agency. A predicted corrected cost has been included due to an error in discounting in version 4.1d of the PAR on which the PAR predicted assessment has been based. Unlike the PAR predicted, the predicted corrected costs in the table below utilise the correct discount factors and are therefore directly comparable to the outturn costs.

**Table 6.4 – Scheme Costs (2002 Prices discounted to opening year)**

Costs	PAR Predicted	Predicted Corrected	Outturn
Works, Land & Other costs ( <i>including general taxation</i> )	£1.844m	£2.230m	£1.469m
Maintenance Costs	£1.207m	£1.207m	£1.207m*
<b>Total Project Costs</b>	<b>£3.051m</b>	<b>£3.437m</b>	<b>£2.676m</b>

\*Maintenance costs are covered by the M25 DBFO 'lump sum' and were not able to be split out. Therefore these have been assumed to be 'as predicted'.

## Summary of Economic Benefits

6.11 **Table 6.5** provides a summary of the monetised benefits of the scheme. Scheme benefits (predicted and outturn) are derived from safety benefits, attributed to a reduction in accidents. The Benefit-Cost Ratio (BCR) is used as a summary of the overall value for money of a scheme over its forecast lifetime (30 years).

**Table 6.5 - Summary of Scheme Benefits (Predicted, Predicted Corrected and Outturn)**

	Predicted	Predicted Corrected	Outturn
First Year Safety Benefits	£0.053m	£0.039m	£0.320m
30 Year Safety Benefits	£1.755m	£1.295m	£10.591m
First Year Costs*	£1.844m	£2.230m	£1.469m
Total 30 Year Costs**	£3.051m	£3.437m	£2.676m
Benefit Cost Ratio (BCR)	0.56	0.38	3.96
First Year Rate of Return (FYRR)	2.9%	1.7%	21.8%

**Note:** All costs are in 2002 prices and discounted to the opening year

\*No maintenance costs in first year

\*\*Includes 30 year maintenance costs

6.12 Key points to note from **Table 6.5** include:

- The total first year benefits of the scheme were £0.320m, equating to a 30 year benefit of £10.591m, this is more than predicted;

- The scheme was delivered at a cost of £2.676m compared to a predicted corrected of £3.437m; and
- The FYRR and BCR were much higher than predicted. This is a result of both the higher benefits of the scheme and the lower costs.

**Summary – Section 6:**

- Economic benefits have been derived from a reduction in the number of accidents only and exclude any journey time changes;
- The outturn annual accident benefit in the opening year is £0.320m, which is higher than the PAR predicted (£0.053m) and the PAR predicted corrected saving of £0.039m;
- The scheme was delivered at a cost of £2.676m which is 20% lower than the predicted cost of £3.437m;
- The FYRR is 21.8% which means it will take just over 4 and a half years to recoup the cost of the scheme; and
- The BCR is 3.96 compared to a predicted BCR of 0.56 and predicted corrected of 0.38.

## 7. Environment, Accessibility and Integration

### Introduction

- 7.1 This section of the report presents an evaluation of the scheme's impacts on the Environment, Accessibility and Integration objectives, against the forecast impacts stated in the scheme's full PAR and Appraisal Summary Table (AST).

### Environment Impacts

- 7.2 The Environmental Assessment Report (EAR) highlighted a number of potential impacts during the construction and implementation of the M20/M26 Street Lighting Scheme. The key environmental effects identified were:
- **Biodiversity** – potential temporary effects on species within the highway verge during construction and longer term impacts on bats due to the presence of new lighting. Overall the impacts of the scheme were not considered to be significant; and
  - **Landscape and visual intrusion** – visual impacts on houses and rights of way in close proximity to the scheme and on the landscape of the North Downs on higher ground to the north. This area is part of the Kent Downs Area of Outstanding Natural Beauty. The impacts were considered to be neutral or slight adverse.
- 7.3 The effect of the scheme on other environmental topics was assessed to be non-significant in the PAR, with the exception of **journey ambience** which was assessed as large beneficial. It is considered that the outturn assessment of the other environmental sub objectives is 'as expected'.

### Consultations

- 7.4 Natural England, Kent Downs AONB unit, Tonbridge and Malling District Council and Addington Parish Council have been contacted regarding their views on the impacts they perceive the scheme has had on the environment, and whether they feel that the mitigation measures implemented have been effective. In addition to the MAC, discussions have also taken place with the members of the HA team involved in the design of the scheme.
- 7.5 Information provided by the HA Part 1<sup>1</sup> team indicates that there have been 27 successful claims to date. Visual impact has been the main factor with lighting being cited as the principal cause for the claims.

### Site Inspection

- 7.6 A site visit was undertaken in January 2011 which allowed the scheme to be inspected from overbridges, underpasses, public footpaths and local roads.

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<sup>1</sup> Under Part 1 of the Land Compensation Act 1973 (as amended), compensation can be claimed by anyone having a qualifying interest in land if the value of that interest has been depreciated by more than £50 by physical factors caused by the use of the altered highway. The physical factors are noise, vibration, smell, fumes, smoke and artificial lighting and the discharge on to the land of any solid or liquid substance.

## Landscape

### Predicted Impacts

- 7.7 The AST stated that the slight adverse impact of constructing light columns would be mitigated as far as possible with off-site planting. The impacts were therefore forecast to be neutral.
- 7.8 The assessment in the EAR concluded that the anticipated impacts associated with the proposed M20/M26 Street lighting scheme would, in the main, be neutral or slight adverse and therefore not significant. It was predicted that the nature of the local landscape and the siting of the junction within the local landform, combined with the use of lighting column design which focused light onto the carriageways and minimised light spill to adjacent areas, restricted the anticipated impacts to a narrow corridor either side of the Motorway.
- 7.9 From the assessment the most sensitive locations in terms of potential light pollution were identified to include land within the AONB to the south of Woodgate Road and properties and public viewpoints in the vicinity of East Street, to the east of Addington village.
- 7.10 Landscape mitigation was proposed in these locations which it was anticipated would reduce the overall impacts on the landscape, making them either neutral or only slightly adverse in the longer term.

### Consultation Comments

- 7.11 Comments were received from the Kent Downs AONB unit who noted that the scheme had had an adverse effect on the AONB as well as on local viewpoints and receptors. The spacing of the columns was raised as an issue and whether they could have been more widely spaced to reduce impact particularly when viewed from the carriageway. The beneficial effect of painting the columns dark green was noted but the use of gloss paint was regretted as it tended to reflect light which 'glinted' off it. A suggestion was made that the height/spacing of the columns could have been varied along the length of the scheme to reflect locations in cutting or embankment to reduce the impact of the scheme. Greater use of tree planting was suggested as a means of reducing adverse visual effects. The use of photomontage for future schemes to illustrate anticipated effects was requested.

### Evaluation

- 7.12 The scheme is located on the edge of the Kent Downs AONB in an area of attractive countryside and the impact of the scheme on the AONB was an important issue. The visual impact on houses in the villages of Addington and Trottiscliffe as well as the North Downs Way and Pilgrims Way was a factor.
- 7.13 In response to consultation comments the lighting columns were painted a dark green colour to blend them into the surrounding vegetation. In combination with the full cut off luminaires this was intended to reduce the impact of the scheme. This section of the motorway is reasonably well screened particularly on the southern side by areas of woodland and tree belts which serve to restrict views of the road. Sections of the motorway are also in cutting which further reduces the impact of the existing road and the lighting.
- 7.14 During daylight hours the columns do tend to blend in well with the surrounding trees and woodlands so that they are not particularly noticeable from most viewpoints around the scheme apart from those in very close proximity. The woodland and tree belts adjacent to the motorway in combination with the sections in cutting also contribute to the reduction in impact. Hedgerows and trees along local roads also serve to limit views from the surrounding area.
- 7.15 At night as would be expected the scheme is more noticeable in the wider landscape. The full cut-off luminaires have been fitted so that the upward spill of light is reduced and 'sky glow' is limited (**Figure 7.1**).

**Figure 7.1 – Daytime and Night-time views from Woodgate Road**



- 7.16 At the subway under the motorway near Addington, several of the luminaires have additional shields fitted to reduce light spillage further, to reduce the effects on bats using the subway. This further reduces the adverse impact of the lighting and perhaps could have been applied to all columns. The luminaires are less effective in wet weather conditions when the moisture in the atmosphere tends to emphasise the light falling from the columns.
- 7.17 In dry conditions and from a distance they are seen as a string of pin point light sources across the darkened landscape. In this rural area there are few other light sources, and those which are present appear randomly scattered across the area. In contrast to this the lighting sources from the scheme are evenly spaced and follow a continuous horizontal alignment. As such they are more noticeable and form a discordant element in night-time views.

- 7.18 Closer to the motorway, the effect of the lights on some views is more noticeable particularly where the road is not in cutting or not screened by vegetation. The lighting also has a greater impact on viewpoints which are close to or below the height of the carriageway, where the light source in the luminaire becomes more visible. In these locations the effect of the lights is greater and has more noticeable effects on some receptors, for example at East Street in Addington (**Figure 7.2**).

**Figure 7.2 – Daytime and Night-time views from the rear of East Street, Addington**



7.19 There is evidence of planting on the motorway embankment near Addington but it is not clear whether this was carried out as part of the scheme and no other planting was noticeable along the scheme. At this stage any mitigation planting would not yet be having an effect. Overall the impact of the scheme on the landscape and other receptors is in line with predictions in the EAR i.e. neutral to slight adverse.

### Summary of Predicted Effects

Table 7.1 - Summary Table of Predicted Landscape Effects

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	Slight adverse impact of constructing light columns will be mitigated as far as possible with off-site planting.	Neutral
EST	The scheme has limited effect during daylight hours but is noticeable and forms a discordant element with adverse visual effects at night.	Slight adverse

## Biodiversity

### Predicted Impacts

- 7.20 The AST stated environment surveys had been undertaken and mitigation put in place to minimise the short term impact on biodiversity. No large scale works were proposed (just foundations for lighting columns and verge trenching) therefore there would be a negligible effect on biodiversity. The impact was assessed as neutral.
- 7.21 The EAR noted that there were several areas designated for ecological value in close proximity to the scheme including Trottiscliffe Meadows SSSI, Ryarsh Wood Site of Nature Conservation Interest (SNCI), the SNCI near The Lilacs and Wrotham Quarry SNCI but it was anticipated that the works would not impact on any of these designated sites.
- 7.22 Protected species known to exist close to the scheme boundary or which utilised the scheme soft estate included great crested newts, reptiles, badgers and bats. There were also terrestrial invertebrates of local and county importance.
- 7.23 Previous studies showed that lighting could have a negative effect on some ecological species, notably some bat species. Surveys for bats along the soft estate were undertaken and mitigation would be put in place to avoid disturbing a known bat flight path under the M20.
- 7.24 The scheme was designed to confine works to 2.5m from the edge of the hard shoulder, within the swathe area predominantly on hard chalky soils. While the soft estate as a whole supported a number of invertebrate species, the construction works were extremely limited in their footprint. Due to the low impact of the construction works and following the implementation of the proposed mitigation, the scheme was expected to reduce the availability of basking areas for reptiles in the short-term, but was not expected to affect the ecology of the site and the species it supported in the medium or long-term.
- 7.25 Following the implementation of mitigation the predicted effect on bats and other protected or notable species, including great crested newts and reptiles, was expected to be neutral.

### Consultation Comments

- 7.26 Consultation comments on ecology were invited but none have been received.

## Evaluation

7.27 The MAC has confirmed that the construction mitigation works were carried out as proposed with clearance and reptile fencing erected before construction was commenced. An ecological watching brief was also put in place when works were carried out near the badger setts identified at the survey stage. Reinstatement works have been carried out and at the site visit it was hard to discern where works had taken place. Close examination of the luminaires near the subway at Addington confirmed that the shields to prevent backward light spill onto the bat flight path had been installed. There has been no subsequent monitoring of bat activity to confirm what effect this has had on this species. No other ecological monitoring has taken place to see if the construction of the scheme has affected the distribution of species previously found on site.

## Summary of Predicted Effects

Table 7.2 -Summary Table of Predicted Biodiversity Effects

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	Environment surveys have been undertaken and mitigation put in place to minimise short term impact on biodiversity. No large scale works (foundations for lighting columns and verge trenching) therefore negligible effect on biodiversity.	Neutral
EST	Construction works appear to have been carried out with appropriate regard to habitats and species and bat mitigation has been carried out. No post opening monitoring has taken place to confirm effects.	As expected

## Journey Ambience

7.28 In keeping with current guidance, a reduction in the annual accident rate results in a beneficial impact on journey ambience due to reduced driver stress and fear of an accident. The AST and EST for journey ambience have thus been scored as 'large beneficial'.

## Accessibility Impacts

7.29 The **Accessibility** objective consists of three main elements:

- Option values;
- Severance; and
- Access to the Transport System.

7.30 This section will examine each of these elements in relation to the scheme.

### Option Values

7.31 For the option values sub-objective the AST states that the impact is not applicable. There has been no change in the availability of transport services within the study area and therefore it is agreed that option values is neutral in this case.

### Severance

7.32 Severance is concerned with the affects of traffic on those using non-motorised modes, especially pedestrians but also includes cyclists and equestrians. The AST states that the impact is not applicable. There has been no change to facilities provided for pedestrians, cyclists or equestrians and it is considered that the impact on severance is neutral in this case.

### Access to the Transport System

- 7.33 For the access to the transport system sub-objective the AST states that the impact is not applicable. The scheme had no impact on access to a private car or proximity to a public transport service therefore the impact is considered to be neutral.

## Integration

- 7.34 The **Integration** objective consists of the following elements:

- Interchange with other transport modes;
- Land Use Policies; and
- Other Government Policies.

- 7.35 Integration is aimed at ensuring that all decisions are taken in the context of the Government's integrated transport policy.

### Transport Interchange

- 7.36 The impact of the scheme on the integration with other transport modes sub-objective was predicted to be not applicable as there was no material impact.
- 7.37 The scheme does not affect access to park and ride, bus or rail stations and does not affect interchange facilities and therefore the impact can be considered neutral.

### Land Use and Other Government Policies

- 7.38 The impact of the scheme on the land use policy sub-objectives was predicted to be not applicable as there was predicted to be no material impact. The score in the AST is considered to be correct.
- 7.39 For the Other Government Policies sub-objective the AST predicted the impact to be not applicable as it was anticipated there would be no material impact.
- 7.40 The scheme provides some support for Government policies aimed at accident reduction but also has a small negative impact on policies to protect the environment. The scheme is not specifically referenced in any of the other Government Policies and these impacts are relatively small. Therefore the score of neutral in the AST is considered to be correct.

**Summary – Section 7:**

Summary of PAR predicted and outturn environment, accessibility and integration impacts:

	<u>PAR Predicted</u>	<u>Outturn</u>
<b>Noise</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Local Air Quality</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Landscape</b>	<b>Neutral</b>	<b>Slight Adverse</b>
<b>Greenhouse Gases</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Townscape</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Heritage of Historic Resources</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Biodiversity</b>	<b>Neutral</b>	<b>Neutral</b>
<b>Water Environment</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Physical Fitness</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Journey Ambience</b>	<b>Large Beneficial</b>	<b>Large Beneficial</b>
<b>Option Values</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Severance</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Access to the Transport System</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Transport Interchange</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Land Use Policy</b>	<i>Not Applicable</i>	<i>Not Applicable</i>
<b>Other Government Policies</b>	<i>Not Applicable</i>	<i>Not Applicable</i>

## 8. Conclusions and Recommendations

### Introduction

8.1 This POPE assessment of the M20/M26 Street Lighting LNMS scheme has utilised all available data to evaluate the outturn impacts of the scheme compared to those forecast in the PAR. The purpose of this section of the report is to:

- Summarise if the scheme has met its objectives;
- Summarise the key findings of the evaluation; and
- Suggest recommendations that may facilitate, and increase the accuracy of, future PAR appraisals for schemes similar to that implemented at the M20/M26 Junction.

### Scheme Specific Objectives

8.2 The evaluation of the scheme's specific objectives as reported in this study are summarised in **Figure 8.1**.

Figure 8.1 – Success against Scheme Objectives



• **Objective 1 - Reduce the number of Personal Injury Accidents (PIA)**

- There has been a reduction in the night-time accident rate amounting to 3 per year at the junction since the opening of the scheme



• **Objective 2 - Reduce the number of Killed and Serious Injury (KSI) accidents**

- There have been no KSI night-time accidents at the junction since the scheme opened. It should however be noted there were no night time KSI accidents in the before predicted corrected (post previous schemes) period. The previous schemes appear to have achieved the reduction in KSI accidents prior to the implementation of the street lighting scheme.

### Key Findings

8.3 The key findings from this evaluation are as follows:

- The objectives of the M20/M26 Street Lighting Scheme have been met in terms of reduced PIAs however it is not possible to assess the success of the reduction of KSIs as there were none reported in the before period (the predicted corrected before period, that included the previous safety schemes);
- Just one slight accident has occurred in the period since the scheme opened, however it should be noted that this is based on one and a half years of post scheme opening data; and
- Outturn accident savings are higher than both the original PAR and the PAR predicted-corrected forecast prior to and post the previous schemes.

## Recommendations

- 8.4 The following are recommendations that may help facilitate and increase the accuracy of future PAR appraisals of schemes similar to the M20/M26 Street Lighting scheme:
- A generic 10% reduction in night-time accidents was predicted at the scheme conception stage. This report demonstrates that outturn savings were considerably greater than predicted. It is recommended that future lighting schemes use evidence derived from previous POPE reports, such as this one, when determining a predicted accident saving;
  - The scheme has generated accident savings beyond that anticipated in the PAR and has been shown to be a successful solution to night time accidents. These findings should be borne in mind when decisions are being made about installing new street lighting, or removing/turning off the existing street lighting;
  - The nature of street lighting schemes suggests that it would be appropriate to provide a breakdown of maintenance costs into categories that cover the replacement and maintenance of equipment separately from the cost of supplying the electricity; and
  - Consideration should be given in the PAR and in the POPE to the impact of this type of scheme on greenhouse gas emissions caused by the increased generation of electricity.

# Appendix A - Appraisal Summary Table (AST)

Objective	Sub Objective	Qualitative Impacts	Quantitative Measure	Assessment
Environment	Noise	Not Applicable	N/A	N/A
	Local Air Quality	Not Applicable	N/A	N/A
	Greenhouse Gases	Not Applicable	N/A	N/A
	Landscape	Slight adverse impact of constructing lighting columns will be mitigated as far as possible with offsite planting. Therefore assessed as neutral	N/A	Neutral
	Townscape	Not Applicable	N/A	N/A
	Heritage of Historic Resources	Not Applicable	N/A	N/A
	Biodiversity	Environment surveys have been undertaken and mitigation in place to minimise short term impact on local biodiversity. Not large scale works (foundations for lighting columns and verge trenching) therefore negligible effect on biodiversity.	N/A	Neutral
	Water Environment	Not Applicable	N/A	N/A
	Physical Fitness	Not Applicable	N/A	N/A
	Journey Ambience	New street and sign lighting will significantly improve driver visibility and driving conditions during hours of dark, increasing the overall journey ambience.	N/A	Large Beneficial
Safety	Accidents		20 accidents saved over 30 years	Opening year £0.053m 30 year PVB £1.755m
	Security	Not Applicable	N/A	N/A
Economy	Public Accounts	Not Applicable	N/A	N/A
	Business Users & providers	Not Applicable	N/A	N/A
	Consumer Users	Not Applicable	N/A	N/A
	Reliability	Not Applicable	N/A	N/A
	Wider Economic Impacts	Not Applicable	N/A	N/A
Accessibility	Option Values	Not Applicable	N/A	N/A
	Severance	Not Applicable	N/A	N/A
	Access to the Transport System	Not Applicable	N/A	N/A
Integration	Transport Interchange	Not Applicable	N/A	N/A
	Land Use Policy	Not Applicable	N/A	N/A
	Other Government Policy	Not Applicable	N/A	N/A

## Appendix B - Evaluation Summary table (EST)

Objective	Sub Objective	Qualitative Impacts	Quantitative Measure	Assessment
Environment	Noise	Not Applicable	N/A	As Expected
	Local Air Quality	Not Applicable	N/A	As Expected
	Greenhouse Gases	Not Applicable	N/A	As Expected
	Landscape	The scheme has limited effect during daylight hours but is noticeable and forms a discordant element with adverse visual effects at night.	Slight Adverse	Worse than Expected
	Townscape	Not Applicable	N/A	As Expected
	Heritage of Historic Resources	Not Applicable	N/A	As Expected
	Biodiversity	Construction works appear to have been carried out with appropriate regard to habitats and species and bat mitigation has been carried out. No post opening monitoring has taken place to confirm effects.	Neutral	As Expected
	Water Environment	Not Applicable	N/A	As Expected
	Physical Fitness	Not Applicable	N/A	As Expected
	Journey Ambience	The street lighting has provided much improved the visibility at the junction. Accident numbers have decreased; therefore the fear of potential accidents has been reduced	Large Beneficial	As Expected
Safety	Accidents	There has been a reduction in the night-time accident rate amounting to 3 per year at the junction since the opening of the scheme (119 accidents saved in 30 year assessment period). There have been no KSI night-time accidents at the junction since the scheme opened. It should however be noted there were no night-time KSI accidents in the before predicted corrected (post previous schemes) period.	PVB – £0.320m (opening year)  PVB - £10.591m (30 years)	Better than Expected
	Security	Not Applicable	N/A	As Expected
Economy	Public Accounts	Scheme costs lower than expected	PVC - £2.676m (30years)	Better than Expected
	Transport Economic Efficiency	Not Applicable	N/A	As Expected
	Reliability	The reduction in collisions is likely to have improved traffic flow and reduced delays caused by emergency lane and carriageway closures so providing more predictable journey times. This is however not quantifiable.	N/A	As Expected
	Wider Economic Impacts	Not Applicable	N/A	As Expected
Accessibility	Option Values	There has been no change in the availability of transport services within the study area and therefore it is agreed that option values is neutral in this case	Neutral	As Expected

	Severance	As there has been no change to facilities provided for pedestrians, cyclists or equestrians it is considered that the impact on severance is neutral this case.	Neutral	As Expected
	Access to the Transport System	The scheme had no impact on access to a private car or proximity to a public transport service therefore the impact is considered to be neutral.	Neutral	As Expected
Integration	Transport Interchange	The scheme does not affect access to park and ride, bus or rail stations and does not affect interchange facilities and therefore the impact can be considered neutral.	Neutral	As Expected
	Land Use Policy	As there is no specific reference to this scheme in any other Government Policies the score in the AST is considered to be correct	Neutral	As Expected
	Other Government Policy			