

LNMS Evaluation Report

A12 Stanway to Spring Lane Interchange




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LNMS Evaluation Report

A12 Stanway to Spring Lane Interchange

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1. Introduction

BACKGROUND

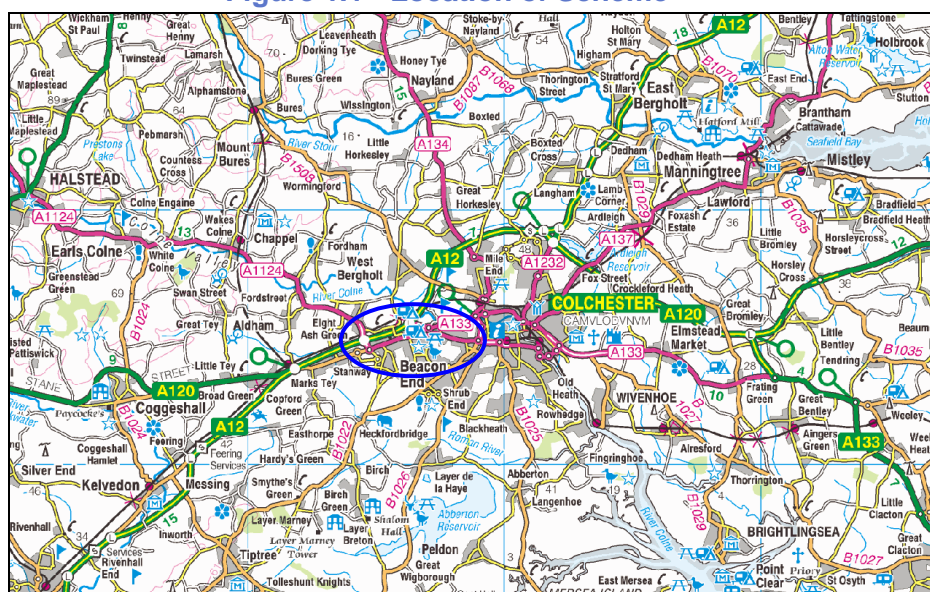
Context

- 1.1 The A12 in Essex forms the main north-south transport link connecting the towns of Brentwood, Chelmsford, Witham and Colchester. It is an important route for the movement of freight, holiday traffic and commuters. It also forms the national route between the Thames and the Wash serving the Norfolk Broads and coastal towns in East Anglia such as Felixstowe, Harwich, Great Yarmouth, Lowestoft and Ipswich.
- 1.2 The A12 is a heavily trafficked strategic road (two way AADT of 86473) which has been improved in a piecemeal manner over the past forty years, mainly as a series of bypasses. Consequently the route consists of a variety of widths and standards as each section has been upgraded to the standards pertaining at the time of improvement.

The Study Area

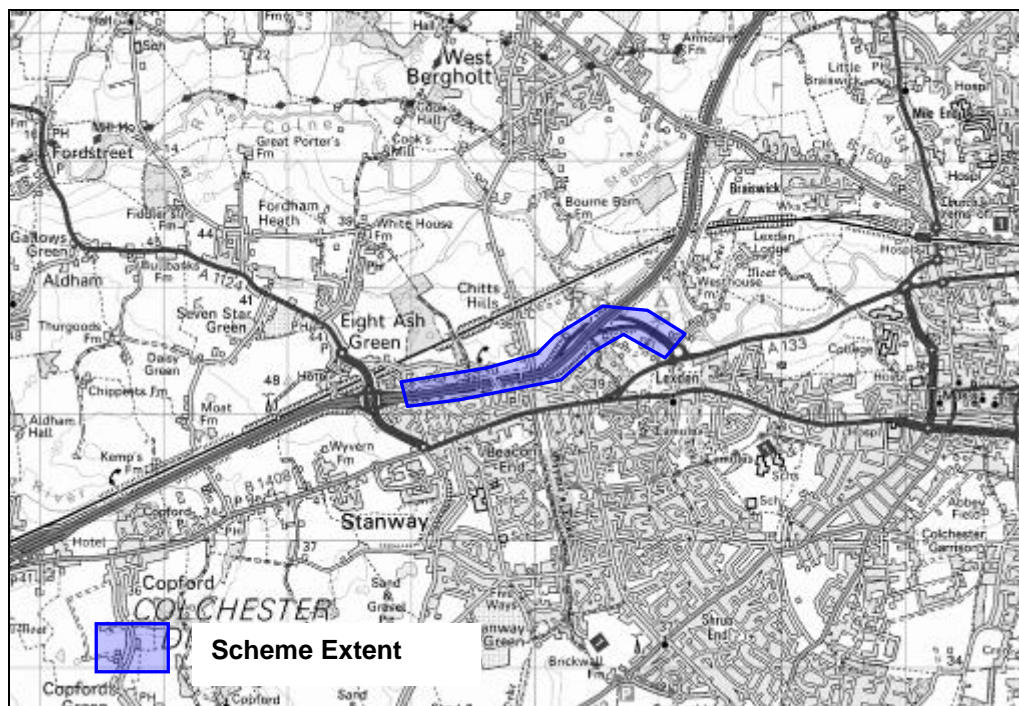
- 1.3 The study area is the section of the A12 Stanway bypass near Colchester in Essex between the Eight Ash Green Interchange (J26) and the Spring Lane Interchange (J27). It is located wholly within Highways Agency (HA) Area 6. The Spring Lane Interchange is located approximately 37 miles northeast of the Brook Street Interchange and 17 miles southwest of the Copdock Interchange. To the east of Colchester it connects with several principal roads, one of which being the A133 at Spring Lane Interchange (**Figures 1.1 and 1.2**).

Figure 1.1 - Location of Scheme



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Figure 1.2 - Scheme Detail

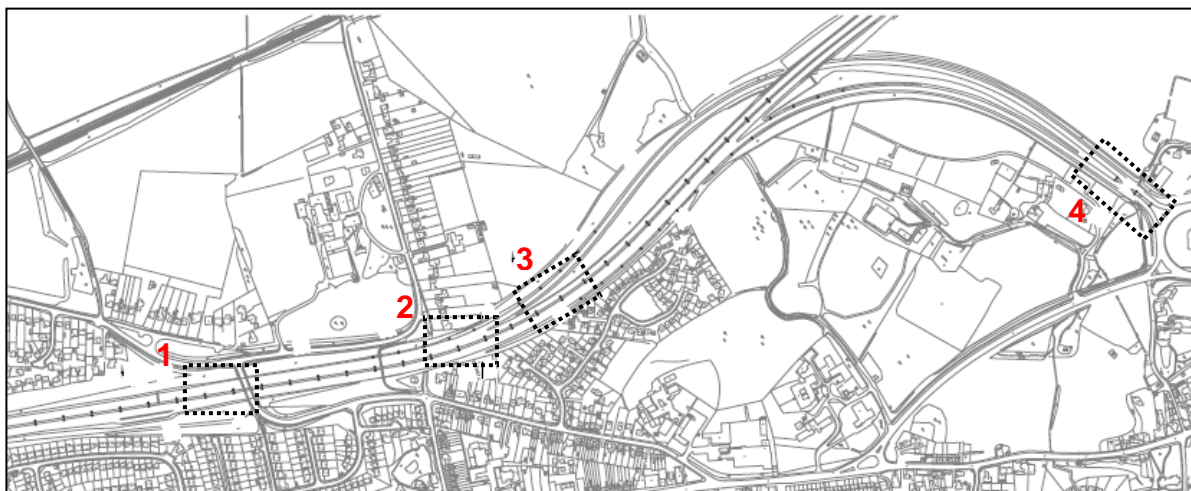


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The Problems

- 1.4 The scheme was initially identified within the A12 Route Management Strategy and subsequently an accident study was commissioned in 2002 entitled '*A12 Spring Lane Accident Study*'. The accident study identified four accident cluster sites with a high night-time accident problem in the period. These cluster sites are illustrated in **Figure 1.3** and include:
1. **Halstead Road Bridge, London Bound Carriageway** - Main accident type is Pedestrian Accidents;
 2. **Entering Spring Lane off Slip, Ipswich Bound** - Main accident type is Loss of Control Accidents;
 3. **Change from 3 to 2 Lanes, Ipswich Bound** - Main accident types are Nose-to-tail and Lane Change Accidents; and
 4. **Spring Lane Roundabout Exits** - Main accident type is Loss of Control Accidents.

Figure 1.3 – “A12 Spring Lane Accident Study” Accident Cluster Sites



Source: Atkins Highways and Transportation (MAC)

- 1.5 This study informed the design team of the improvement measures required in order to improve safety at the interchange and helped to establish the geographical extent of the scheme.

SCHEME DESCRIPTION

- 1.6 The initial improvements were completed on 30 June 2006. Key features of the scheme included:
- ◆ Street lighting installed on the A12 between J26, Eight Ash Green Interchange and the J27 Spring Lane slip roads (approx 2.5km);
 - ◆ A new concrete safety barrier in the central reserve and improvements to the road markings and signs;
 - ◆ Lane reductions at the off and on slips at J27 Spring Lane;
 - ◆ The signing gantry on the northbound carriageway has been relocated approximately 350m south from its previous location;
 - ◆ Additional signs have been fixed to overbridges immediately north and south of the new gantry location to improve lane discipline;
 - ◆ Signing on the J27 Spring Lane exit slip road has been improved with new bend warning and chevron signing; and
 - ◆ Re-locating the pedestrian crossing at the Spring Lane slip road.
- 1.7 Following the scheme opening in June 2006, the lane reduction element of the scheme at the J27 off slip was found to result in significant queuing in peak periods. Remedial measures were implemented in September 2006, details of which can be found in **Section 2** of this report. The scheme was fully operational by October 2006.

SCHEME CATEGORISATION AND OBJECTIVES

- 1.8 Local Network Management schemes (LNMS) are categorised according to which of the five assessment objectives of Safety, Economy, Environment, Accessibility and Integration is primarily addressed by the scheme. As detailed in the PAR document, the scheme objectives were to:
- ◆ Reduce the number of Personal Injury Accidents (PIAs) occurring during the night time;
 - ◆ Improve the safety of road users;
 - ◆ Protect sign posts and other street furniture; and
 - ◆ Implement the A12 signing Strategy.
- 1.9 The scheme has therefore been categorised as a **safety scheme**.

PURPOSE OF THIS REPORT

- 1.10 As part of an ongoing requirement of the Highways Agency to re-evaluate the impacts of new trunk road schemes, Atkins Consultants Ltd has been commissioned by the Highways Agency to undertake post-opening evaluations of large Local Network Management Schemes (LNMS) with an implementation cost of between £1m and £5m. The aim of this process is to assist the Highways Agency (HA) and their managing agents to:
- ◆ Quantify the outturn benefits and disbenefits 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 impacts of highway schemes on safety, congestion, environment, accessibility and integration in the future; and
 - ◆ Ensure that the HA continues to deliver schemes that offer the greatest value for money and that are most effective solutions to problems on the core network.
- 1.11 This document sets out the results of the Post Opening Project Evaluation (POPE) of the A12 Stanway to Spring Lane safety improvements scheme as implemented in October 2006 (following remedial works). More specifically the report examines the economic, safety, environmental, accessibility, and integration impacts resulting from the implementation of the safety measures.

POPE METHODOLOGY OVERVIEW

- 1.12 This report presents the forecast and outturn effects of the scheme on a common basis. This process ultimately presents two assessments of the scheme:
- ◆ **Assessment 1:** The original Full PAR Assessment (using version 3.3). This represents the forecast benefits of the scheme; and
 - ◆ **Assessment 2:** An Evaluation Summary Table based on the out-turn effects of the scheme using a methodology consistent with the original PAR assessment undertaken prior to scheme opening.

- 1.13 All costs are presented in 2002 prices, discounted to 2002.
- 1.14 POPE is based on an evaluation of the schemes out-turn impacts against the five core 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 the ability with which people can reach different locations and facilities by different modes; and
 - ◆ **Integration** - aims to ensure that all decisions are taken in the context of the Government's integrated transport policy.

REPORT STRUCTURE

- 1.15 Following this introduction, the report has been structured as follows:
- ◆ **Section 2 – Scheme Detail and Stakeholder Feedback:** Provides details of the scheme including 'as built' plans and photos illustrating the schemes key features and summarises stakeholder feedback;
 - ◆ **Section 3 – Economy Impacts:** Summarises the out-turn traffic and economic impacts of the scheme;
 - ◆ **Section 4 – Safety Impacts:** Analyses the key safety impacts of the scheme;
 - ◆ **Section 5 – Environment, Accessibility and Integration;**
 - ◆ **Section 6 - Summary of Findings and Recommendations:** Summarises the findings of this post opening evaluation and key lessons to be learnt from the scheme.

2. Scheme Detail

INTRODUCTION

- 2.1 This section examines the details of the scheme and compares the pre and post opening scheme layout. The specific aims of this section are to identify and provide further details of the measures implemented as set out in **Section 1**.

MEASURES IMPLEMENTED IN JUNE 2006 (BEFORE REMEDIAL WORKS)

Street Lighting and Safety Barrier

- 2.2 The scheme involved the installation of thirty 12m high street lighting columns in the central reserve distributed over 1.3km. Street lighting was also provided for a short distance along each of the verges at the Spring Lane Interchange slip roads where these merge with the A12.
- 2.3 Three columns were replaced at the Spring Lane roundabout and relocated from the central reserve to the verge. The existing steel safety fence in the central reserve of the A12 was replaced with a continuous concrete barrier approximately 0.9m high along the extent of the street lighting in the central reservation. The street lighting columns were mounted on top of this barrier (**Figures 2.1 and 2.2**).

Figure 2.1 – Pre and Post Scheme Opening Safety Barrier and Lighting



Figure 2.2 – Location of ‘as built’ Lighting Columns

■ = Lighting Column



Source: Atkins Highways and Transportation

Signing

- 2.4 Existing road signing and road markings have been amended between J26 Eight Ash Green I/C and J27 Spring Lane I/C to improve lane discipline and reduce sign clutter. The nosing road markings at the slip off at J27 Spring Lane have been lengthened to improve the visibility of the slip road diverge.
- 2.5 The existing signing gantry on the northbound carriageway has been relocated approximately 350m south from its current location and additional signs fixed to over bridges immediately north and south of the new gantry location to improve lane discipline (**Figure 2.3**).

Figure 2.3 – Re-located Signing Gantry

‘Before’ Opening



‘After’ Opening



- 2.6 Signing on the J27 Spring Lane exit slip road has been improved with new bend warning and chevron signing (**Figure 2.4**). This signing has been designed to highlight the presence of the bend in the road to drivers, particularly at night.

Figure 2.4 – Chevron Signing Implemented

'Before' Opening



'After' Opening



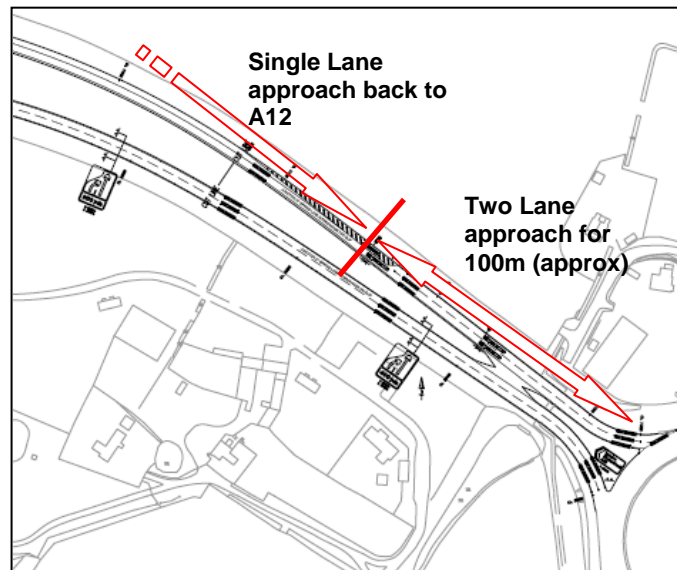
Pedestrian Crossing Facility

- 2.7 The crossing at Spring Lane roundabout has been re-located to the edge of the roundabout circulatory so that vehicles on the entry slip have improved visibility of the pedestrian crossing. The alignments of pedestrian footways at the junction have also been modified.

Lane Reduction

- 2.8 The slip roads at J27 were both reduced to a single lane on/off slip, as it was assessed that the number of lanes merging/diverging was a contributing factor to the number of accidents. **Figure 2.5** shows the initial layout of the lining that was installed under the works. It shows how the approach to the roundabout at J27 off-slip was reduced to a single lane with hard shoulder until approximately 100m from the roundabout.

Figure 2.5 – ‘As built’ Lane Reduction to Spring Lane Roundabout Layout Completed in June 2006



Source: Atkins Highways and Transportation (MAC)

REMEDIAL MEASURES (IMPLEMENTED SEPTEMBER 2006)

- 2.9 The improvements shown in **Figure 2.5** resulted in a significant queue that would extend back to the northbound mainline carriageway and subsequently impact the through traffic heading north on the A12.
- 2.10 Remedial works were then undertaken to reinstate part of the two lane approach to the roundabout and create additional stacking capacity (**Figure 2.6** – red circle denotes the start of the two lane operation). These amendments were made over two nights on the 29/30 September 2006 and opened to traffic on 1 October 2006.

Figure 2.6 – Remedial Measures Implemented at J27 Off-slip



- 2.11 This new arrangement has since resolved queuing delays and prevented the use of the hard shoulder as a running lane.

Summary – Section 2:

- ◆ The scheme was implemented as per the PAR specification.
- ◆ Remedial measures were implemented in September 2006 which involved reinstating 2 lanes on part of the off-slip in order to reduce the queuing delays caused by the initial improvements. These took place over two nights at a cost of £25k.

3. Data Collection and Stakeholder Feedback

INTRODUCTION

- 3.1 This chapter sets out the data collection process used to support this scheme evaluation. More specifically this chapter:
- ◆ Lists the datasets used to undertake the scheme POPE assessment; and
 - ◆ Provides a summary of the feedback from various stakeholders regarding the overall effectiveness of the scheme in achieving the intended objectives.

DATASETS USED TO SUPPORT THE POPE EVALUATION

- 3.2 A number of data sets were used to inform the 'before' and 'after' opening comparisons made in this POPE study, as follows:

Par Supporting Data

- ◆ Personal Injury Accident (PIA) data for the period July 1997 to June 2002 between Eight Ash Green and Braiswick Road over bridge;
- ◆ Non Motorised User (NMU) Audit (November 2005/Atkins H&T);
- ◆ Cultural Heritage appraisal;
- ◆ Construction noise assessment (June 2005/Atkins); and
- ◆ Ecological constraints survey (July 2005/Atkins).

Post-Scheme Evaluation Data

- ◆ Personal Injury Accident (PIA) data for the period February 2001 – January 2006 and October 2006 – September 2007 within the extents of the scheme;
- ◆ AADT data between 2001 and 2007 on the A12 at ATC count sites 6100 (Southbound) and 6101 (Northbound) extracted from the TRADS2 database;
- ◆ Journey time data on the 2km stretch of the A12 between J26 and J27 obtained from the Highways Agency's (HA) journey time database (JTDB);
- ◆ Light level readings were undertaken on Firstone Drive on the nights of 28/09/06 and 05/10/06; and
- ◆ Nitrogen Dioxide diffusion tube monitoring data from Essex Air Quality Consortium for Lucy Lane South (site 13) located directly adjacent to the A12, 400m east of J26.

STAKEHOLDER FEEDBACK

MAC Team Leader

- 3.3 Overall the scheme was regarded as a success as it appears that the scheme has specifically achieved a reduction in accidents in daylight hours as well as in the dark.
- 3.4 The Highways Agency Information Line (HAIL) reports that since the scheme opened it has become more difficult to merge onto the A12 at J26 (Eight Ash Green) as traffic is now 'getting in lane' earlier. Post-opening on site observations have not demonstrated any difficulty in merging onto the A12 at J26.
- 3.5 Prior to remedial works being implemented, the road layout changes at the J27 off-slip demonstrated that the volume of traffic using the slip road was sufficient to result in the slip road operating at full capacity during the peak hours. As such remedial measures were considered appropriate since they were able to provide the additional stack capacity required to minimise queues.

A12 Route Maintenance Engineer

- 3.6 Overall the scheme was regarded as having had the desired effect of improvements to safety in this area. The more advanced warning signing on the northbound carriageway has resulted in an improvement to lane discipline mainly with HGVs moving out of lane 1 prior to the Eight Ash Green on slip.
- 3.7 There appears to be a reduction in accidents since the scheme opened. Accidents involving street furniture have resulted in very slight injuries. The central reserve concrete barrier has been struck on a number of occasions, but unlike the traditional safety fence the HA have not had to carry out repairs to the concrete barrier.

Project Sponsor

- 3.8 Consultation with the Project Sponsor was undertaken on 11 December 2007. He stated that overall the scheme has greatly improved safety on this part of the network, although he had no evidence to support this claim at the time of consultation.
- 3.9 The project sponsor alluded to one adverse issue which was the reduction to one lane of the Spring Lane northbound exit slip road which tended to cause a queuing problem that stretched back on to the A12 for a short time in the AM peak. Whilst the affect on journey times was not regarded as significant, there were slightly adverse safety issues. He confirmed that the two lanes had since been partially reinstated (i.e. an 'opening up' from one to two lanes)
- 3.10 The project sponsor suggested the main environmental issue was the introduction of street lighting into an area where none had existed previously. He confirmed there were some complaints about the lighting affecting properties, but there was no general opposition to this from local people.

Essex Police - Traffic Management Unit

- 3.11 Consultation with Essex Police was undertaken via a postal questionnaire with comments received on 28 January 2008. In this response it was stated that overall the scheme has greatly improved road safety at this location.
- 3.12 Specifically the street lighting element of the scheme has improved night time safety for road users and the incidence of night time serious collisions appears to have reduced.
- 3.13 The Police stated that there has been *“less visible evidence of late lane changing taking place”* since the improvements were made. The Police also stated that they were not aware of any additional delays resulting from the lane reduction elements of the scheme and also stipulated that any reduction in road traffic accidents would have a positive impact on reducing delays.
- 3.14 The Police further identified the wider benefit of a reduced need for the emergency services to attend accidents in the area with a ‘knock on’ benefit of greater resources for other incidents/duties.

Summary – Section 3:

- ◆ The following Stakeholders were invited to provide feedback regarding the positive and negative impacts of the scheme:
 - Team leader at the time of design;
 - A12 Route Maintenance Engineer;
 - Project Sponsor;
 - Essex Police - Traffic Management Unit;
 - Essex County Council;
 - Colchester Borough Council; and
 - Environment Agency.
- ◆ Feedback from the above suggests that the scheme has had the following positive effects:
 - Improved night time safety for road users with the incidence of night time and day time collisions being reduced;
 - Reduction in road traffic accidents have a positive impact on reducing delays;
 - Improvement to lane discipline;
 - Reduced need for the emergency services to attend accidents in the area with a ‘knock on’ benefit of greater resources for other incidents/duties; and
 - HA have not had to carry out repairs to the concrete barrier unlike the previous ‘traditional’ safety barrier.
- ◆ Feedback from the above suggests that the scheme has had the following negative effects:
 - New lighting affecting properties; and
 - More difficult to merge onto the A12 at J26 (Eight Ash Green) as traffic is now ‘getting in lane’ earlier.

4. Economic Impacts

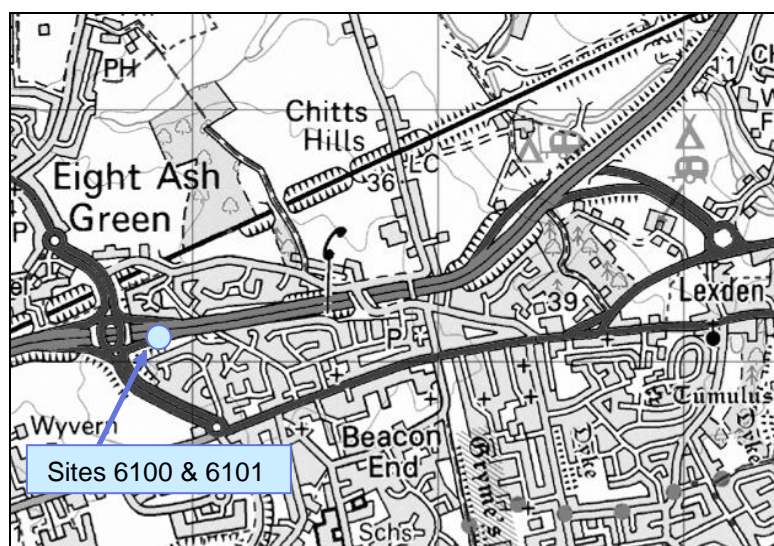
INTRODUCTION

- 4.1 This section summarises the economic impacts of the scheme and includes:
- ◆ A review of the changes in traffic volumes over the period January 2001 to June 2007;
 - ◆ A summary of the scheme's journey time impacts; and
 - ◆ An assessment of the scheme's out-turn costs.

TRAFFIC VOLUME CHANGES

- 4.2 Traffic volume changes are examined in order to ensure that benefits/disbenefits of the scheme are attributed solely to the improvements made at the junction and not a result of background changes in traffic volumes during the assessment period. Furthermore such analysis helps to identify whether any additional traffic (induced traffic) has been attracted to the junction as a result of its enhancements.
- 4.3 Permanent count sites 6100 (Southbound) and 6101 (Northbound) are located on the A12 to the east of the junction with the A1124 as illustrated in **Figure 4.1** below. **Table 4.1** shows the variations in Annual Average Daily Traffic (AADT) flows at the ATC count locations extracted from TRADS2 database for a six and a half year period between 2001 and 2007 on the A12.

Figure 4.1 – ATC Count Locations



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- 4.4 The AADT data for the period January to May has been extracted for each year (to allow a consistent comparison of annual traffic data) and then averaged to enable 'before' and 'after' scheme opening trends to be identified. Flows are two way and measured over a 24 hour period.

Table 4.1 - Variations in Traffic Flows at ATC Count Locations

Year	Two Way AADT	Index	Index (Central NRTF97 All Roads)
2003	86270	1.000	1.000
2004	86373	1.001	1.017
2005	88018	1.020	1.034
2006	87072	1.009	1.052
2007	86473	1.002	1.068
Total Growth		No change	6.8%

Note: Data from TRADS sites 6100/6101 (A12)

- 4.5 Averaging the 38 months of 'before' (January 2003 – February 2006) and 14 months of 'after' data (July 2006 – August 2007) shows very little change in AADT (-0.2% decrease in traffic in a northbound direction and 1% increase in the southbound direction). NRTF central growth factors indicate that, based on national growth estimates, background traffic is likely to have increased by 6.8% in the period 2003 to 2007. This indicates that local traffic is likely to have increased well below NRTF estimates (as assumed in the PAR).

ECONOMIC EFFICIENCY

Scheme Costs

- 4.6 The scheme had a predicted total PVC of **£2.184m** (2002 prices, discounted to 2002 at 3.5%). This included an optimism bias adjustment of 3% and a risk allowance of £0.071m but no annual maintenance costs. A predicted corrected cost was calculated in order to account for the use of incorrect RPI and RPF values in the original PAR.
- 4.7 The outturn cost of the scheme was **£2.854m** (2002 prices, discounted to 2002 at 3.5%). In contrast to the PAR, these costs include an annual maintenance cost of £0.025m (2002 Prices) which amounts to £0.534m over 30 years.
- 4.8 The PAR and PAR predicted corrected Works, Land & Other PVC (discounted to 2002 at 3.5% discount rate) include a general taxation factor of 1.209. In the outturn scenario it is assumed that tax is included in the total works cost.
- 4.9 **Table 4.2** demonstrates that the outturn scheme cost is **£0.670m** higher than the predicted corrected cost of the scheme. The reasons for the difference in PAR predicted corrected and outturn costs are:
- ◆ PAR predicted corrected analysis did not include any annual maintenance costs, annual maintenance costs in the outturn scenario amount to £0.534m (PVC in 2002 prices discounted to 2002 at 3.5% discount rate) over 30 years (£0.025m per year); and
 - ◆ Outturn costs include the costs of remedial measures implemented after the original scheme opened. This amounts to £0.022m (2002 prices).

- 4.10 On a like for like comparison taking account of the points above, the outturn costs were **£0.196m** higher than predicted (£2.320m - £2.102m - £0.022m).

Table 4.2 - Summary of Predicted and Out-turn Scheme Costs

Costs	PAR Predicted	PAR Predicted Corrected	Outturn
Total Works Cost	£1.818m	£1.745m	£2.573m
Total Land Costs	£0	£0	£0
Site Preparation Costs	£0.036m	£0.034m	Included in total works cost
Site Supervision Costs	£0.091m	£0.087m	£0.095m
Risk Allowance	£0.071m	£0.073m	-
Optimism Bias Adjustment	£0.060	£0.058	-
Total Project Costs Undiscounted	£2.076m	£1.999m	2.668m
Works, Land & Other PVC, Including Optimism Bias (<i>discounted to 2002 at 3.5% discount rate</i>)	£2.184m*	£2.102m*	£2.320m**
Maintenance PVC	Not Included	Not Included	£0.534m
Total Project PVC (inc. maintenance costs)	£2.184m	£2.102m	£2.854m

Note: All costs in 2002 Prices, PVC in 2002 prices discounted to 2002 at 3.5% discount rate

*Includes general taxation factor of 1.209

**Assumes tax is included in total works costs

Journey Time Savings

PAR Predictions and Assumptions

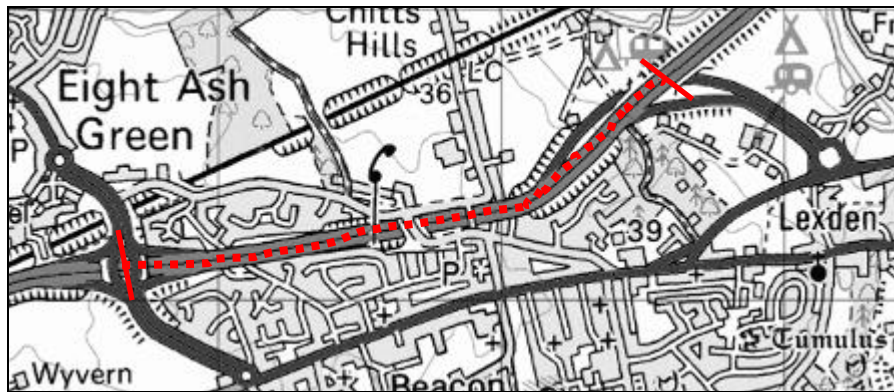
- 4.11 The PAR predicted that there would be no economic efficiency benefits/disbenefits resulting from the scheme.

Outturn

- 4.12 The Highways Agency's (HA) journey time database (JTDB) has been used to obtain journey times¹ on the 2km stretch of the A12 between J26 and J27 (**Figure 4.2**). The analysis has been undertaken in the 'before' scheme opening scenario (January 2005 – January 2006) and in the 'after' scheme opening scenario (October 2006 – October 2007).

¹ The average time for a vehicle to travel through the link.

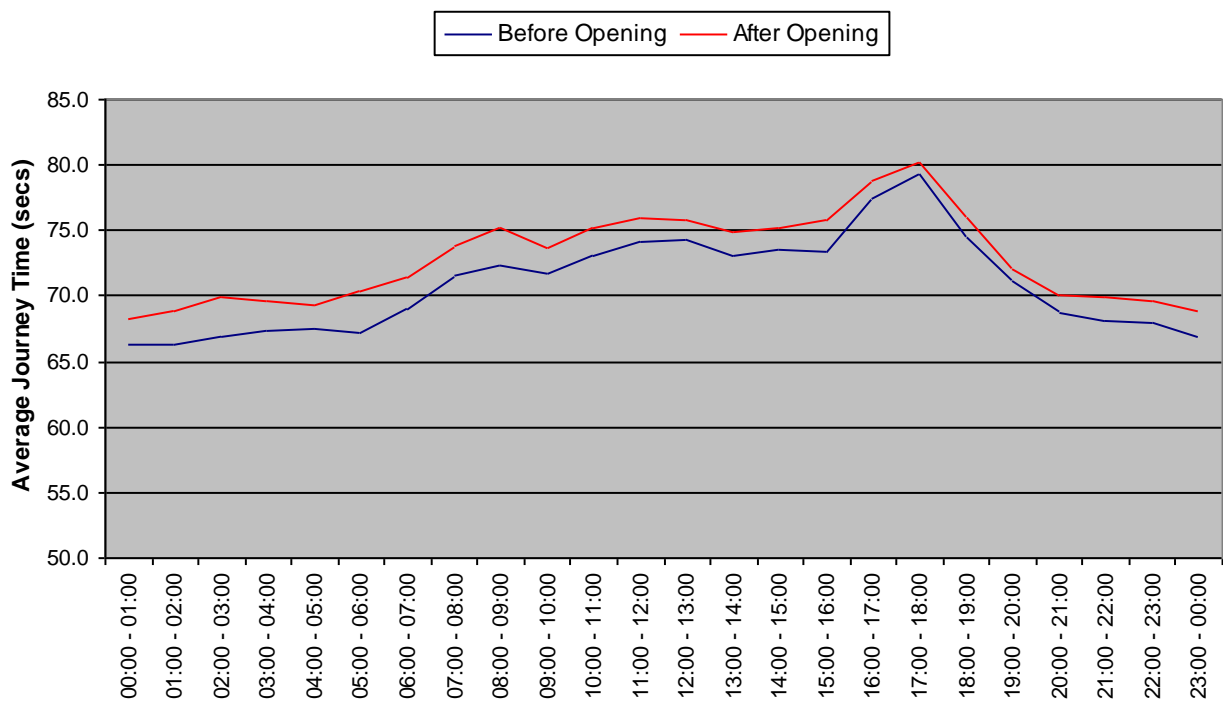
Figure 4.2 – JTDB site AL211 (A12 J26 to J27)



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4.13 **Figure 4.3** illustrates the variation in average journey times ‘before’ and ‘after’ scheme opening.

Figure 4.3 – Comparison of Average Journey Time on the A12 ‘Before’ and ‘After’ Scheme Opening



Source: Highways Agency Journey Time Database site AL211

4.14 This analysis shows that the average daily journey time has increased from 70.9 seconds to 72.9 seconds, an increase of 2 seconds per vehicle per day. Total delay (calculated by subtracting the average journey time from the average journey time in free flow conditions) has increased by an average of 1.5 vehicle seconds.

- 4.15 Prior to the scheme's implementation 46% of delay was considered to be non recurrent i.e. delay that can be attributed to incidents/roadworks. Following scheme opening a much lower proportion of delay (11%), can be considered to be non recurrent. This observed reduction in incidents and/or roadworks suggests that the increase in journey time subsequent to scheme opening has been a result of a minor increase in recurrent delay i.e. the nominal increase in journey time could be a result of small growth in traffic or changes to scheme layout.
- 4.16 Unfortunately there is no further journey time data to verify whether such a small increase in journey time has materialised for other movements across the junction. As such the outturn benefits are considered to be in line with PAR assumption and therefore the scheme has had '**no measurable impact**' on journey times.

Summary – Section 4:

- ◆ A comparison of before and after data shows there has been virtually no change in traffic (-0.2% decrease northbound and 1% increase southbound) since the scheme opened;
- ◆ The scheme had a predicted corrected cost of **£2.102m** (2002 prices, discounted to 2002 at 3.5%). The outturn cost of the scheme was **£2.854m** (2002 prices, discounted to 2002 at 3.5%). A large majority of this difference was due to an inclusion of annual maintenance costs in the outturn costs that was not included in the original PAR appraisal;
- ◆ Data from the TRADS database suggests there has been a nominal increase in journey time (2 seconds) and delay (1.5 seconds). From the data available it is not possible to say with confidence whether this change increase can be directly attributed to the site improvements hence it has been concluded that the scheme has had no measurable impact on journey times through the interchange.

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 dis-benefit. The objectives of this section are to:
- ◆ Ascertain whether the scheme has achieved the safety objectives set out in **Section One**;
 - ◆ To determine whether there has been any change to the number, location and causation of personal injury accidents (PIAs) following scheme opening; and
 - ◆ Determine if the scheme has resulted in an overall safety benefit or disbenefit.

ORIGINAL PAR ANALYSIS AND ASSUMPTIONS

- 5.2 In the original PAR assessment, PIA data was collated between July 1997 and June 2002 between Eight Ash Green and Braiswick Road over bridge. The PAR extracted accident details from the A12 Spring Lane Interchange Accident Study, March 2003. Key features of the PAR include the following:
- ◆ The PAR demonstrated 53 accidents in the five year period amounting to an observed accident rate of 10.6 PIA/yr;
 - ◆ The severity index² was 30% prior to scheme opening;
 - ◆ The observed accident rate was 0.162 PIA/mvkm compared to a national average of 0.226 PIA/mvkm (as detailed in the COBA manual, DMRB 13.1.2); and
 - ◆ An accident saving of 3.5 in the opening year and an accident saving of 100.45 (low growth - 1.32) and 115.15 (high growth – 1.60) over the 30 year design period was predicted.
- 5.3 The predicted accident saving of 3.5 accidents in the opening year was partly derived from TA 49/86³ (current HA standard at that time). This states that:
- “There is considerable variation in results from studies so far on accident reduction due to road lighting, but for this purpose, lighting can be assumed, on average, to reduce after dark accidents by 30% on Trunk Roads and Trunk Road Motorways.”*
- 5.4 TA 49/07, the current HA standard, states that a reduction in after dark accidents of 10% can be expected on motorways and all purpose dual carriageways. As this is not purely a lighting scheme the predicted savings quoted in the PAR cannot be verified and therefore it has been assumed that these predictions are acceptable.

² Fatal + Serious/ All accidents as percentage

³ Appraisal of New and Replacement Lighting on Trunk Roads and Trunk Road Motorways

POST OPENING EVALUATION (POPE)

PAR Predicted Corrected Analysis

- 5.5 In order for a like-for-like comparison of predicted and outturn impacts to be made a PAR 'predicted corrected' appraisal of the scheme has been undertaken, utilising the most recent five years of 'before' scheme opening PIA data (February 2001 – January 2006) as provided by the managing agent.
- 5.6 The PAR predicted corrected was also necessary to reduce the size of the study area in accordance with the scheme extent (**Figure 1.2**, page 2) i.e. the PAR assumed a much larger study area not appropriate to the out-turn scheme.
- 5.7 Between February 2001 – January 2006, 50 accidents were recorded in the study area, 34 slight, 13 serious and 3 fatal resulting in a severity index of 32% (**Table 5.1**). The observed accident rate of 10 PIA/year amounts to 0.129 PIA/mvkm (compared to an original PAR assessment of 10.6 PIA/yr and 0.162 PIA/mvkm).

Table 5.1 – Accident Pre and Post Scheme Opening Summary

Period	No. of Years	Accident No./Rate	Slight	Serious	Fatal	TOTAL	Severity Index
"Before" Scheme Opening	5	Accident No.	34	13	3	50	32%
		Accident Rate per year	6.8	2.6	0.6	10.0	
"After" Scheme Opening	1	Accident No.	3	1	0	4	25%
		Accident Rate per year	3.0	1.0	0.0	4.0	

Note: 'No. of Years' refers to the number of years over which the observed accident rate was calculated

Outturn Impacts

- 5.8 The outturn assessment of the scheme's safety impacts is based on the following assumptions:
- ◆ The 3 PIA's occurring in the construction period (February 2006 – June 2006) have been excluded from the analysis;
 - ◆ The post opening period has been assessed from October 2006 – September 2007 (12 months) (after the remedial measures were implemented);
 - ◆ In the intervening period between June 2006 and October 2006 there was one slight accident which has been excluded from the assessment;
 - ◆ Accidents which were deemed to have occurred for reasons not attributable to the scheme (for example police pursuits, vehicle mechanical failure, extreme weather and highway maintenance) were specifically excluded from the analysis. In total 6 accidents were excluded on this basis; and

- ◆ In order to provide a direct comparison between pre and post opening accident data on a 'like for like' basis the outturn safety impacts of the scheme have been evaluated using accidents within the same area as the PAR predicted corrected analysis.

5.9 It is standard practice for accident savings to be evaluated for at least three years after scheme opening in order to gain a fair reflection of the post opening accident trends. Consequently the results presented in this report should be regarded as indicative only. The results of the out-turn assessment of scheme impacts are summarised in **Table 5.1**. Key trends emerging from the accident analysis include:

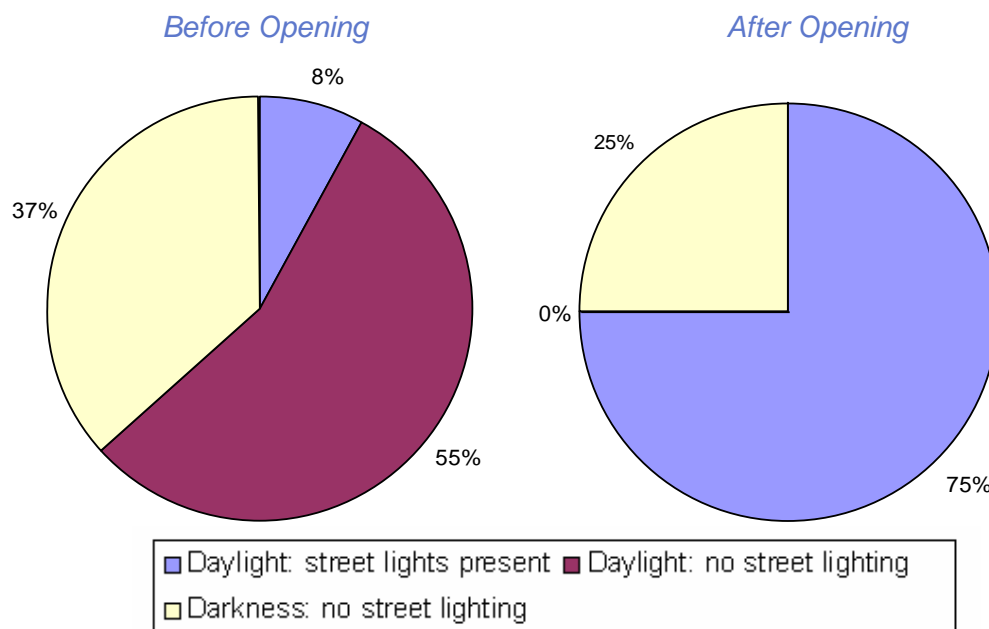
- ◆ Four PIAs have occurred in the 12 months between October 2006 – September 2007 (a PIA rate of 4.0 PIA/year) compared to an average of 10 per year in the before period);
- ◆ The severity index has decreased from 32% to 25%;
- ◆ The post opening observed accident rate of 4 PIA/year amounts to 0.050 PIA/mvkm (compared to 0.129 PIA in the before period); and
- ◆ There have been no fatalities at the interchange since scheme opening.

Accident Causation Factors

5.10 Prior to scheme opening there was a high proportion of night time accidents at the junction. **Figure 5.1** shows that before the scheme opened 18 (37%) of all PIAs occurred in the hours of darkness.

5.11 Following scheme opening one reported PIA occurred in the hours of darkness. It was reported that this accident occurred where there were no street lights; however, the location of the accident suggests street lighting was present and as such this should be regarded as an error in accident reporting.

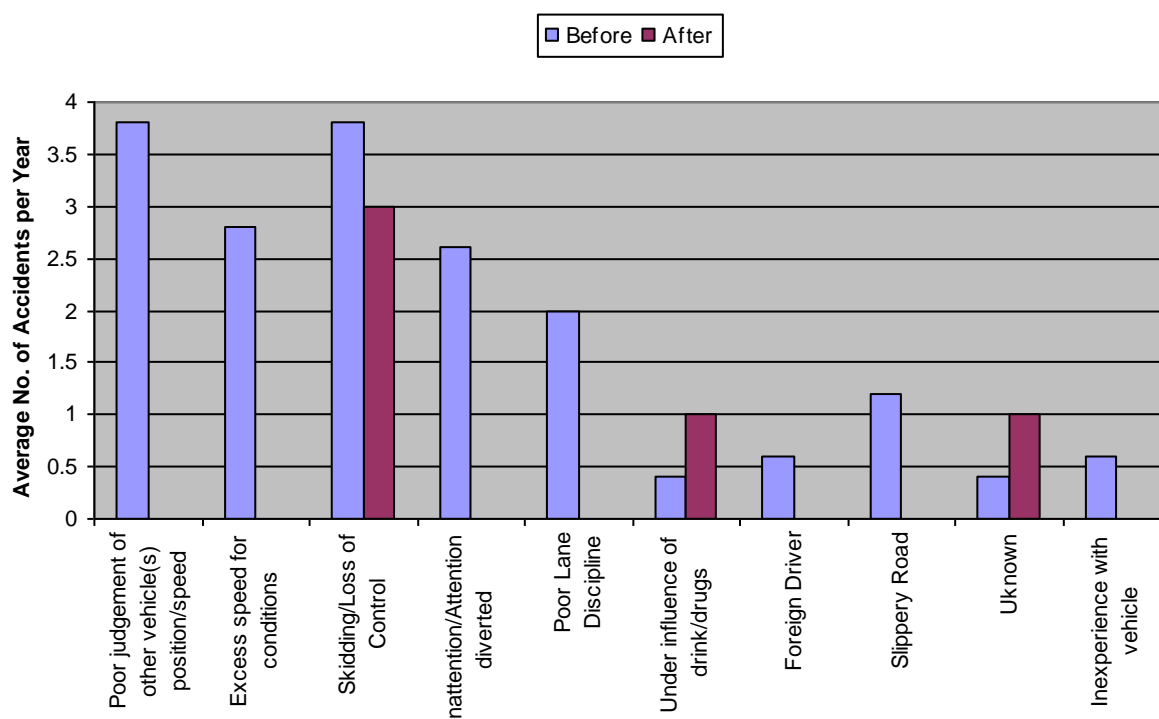
Figure 5.1 – Comparison of Lighting Conditions of PIAs ‘Before’ and ‘After’ Scheme Opening



5.12 **Figure 5.2** provides a further breakdown of PIA causation factors before and after scheme opening. Before scheme opening 19 accidents (3.8 per year) involved one or more vehicles misjudging another vehicles distance, speed and/or position and 3.8 accidents per year involved loss of control of the vehicle (63% of these accidents occurred at night). Following scheme opening the number of PIA's resulting from such causation factors have fallen to 8.5.

5.13 There has been a minor reduction in accidents caused by skidding or loss of control at the junction. Before scheme opening 10 accidents a rate of 2 per year involved poor lane discipline as one of the contributory factors for the PIA. After the scheme opened no reported PIAs were deemed to have been caused by poor lane discipline.

Figure 5.2 - Comparison of 'Before' and 'After' Opening PIA Causations

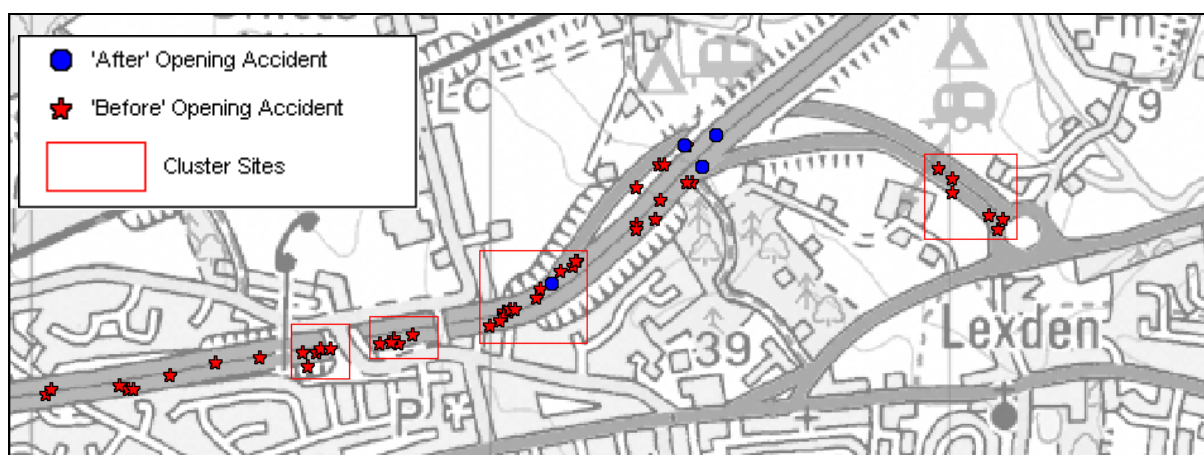


Note: PIA causation has been derived from a combination of National Contributory factors (post 2005) and local Essex contributory factors (pre 2005).

Accident Clusters

5.14 Analysis of accident locations both 'before' and 'after' scheme opening (**Figure 5.3**) has shown that accidents have been removed at the four historical cluster sites. Whilst one of the accidents that occurred after the scheme opened occurred at a pre scheme opening cluster site. This accident occurred at the exit for J27 when the vehicle lost control for an unknown reason.

Figure 5.3 – Comparison of ‘Before’ and ‘After’ Scheme Opening Accident Locations



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Monetisation of Accident Savings

- 5.15 The outturn accident benefit of 6 PIA/yr amounts to a benefit of £0.548m (2002 prices discounted to 2002 at 3.5%) in the opening year. **Table 5.2** below presents the 30 year accident cost benefits attributed to the scheme:

Table 5.2 – Comparison of PAR, PPC and Outturn Accident Analysis

	PAR Predicted	PAR Predicted-Corrected	Out-turn
Number of Personal Injury Accidents saved in opening year	3.5	3.5	6
Number of Personal Injury Accidents saved in 30 year assessment period	107.8	101.5	174
Accident Rate (PIA/mvkm)	0.162	0.129	0.050
Accident Severity Index	30%	32%	25%
Average cost of accident in the opening year	£104,980	£104,980	£104,980
Annual accident benefit in opening year discounted 2002	£0.320	£0.345m	£0.548m
Accident benefits over 30 year assessment period, discounted to 2002	£7.224m	£7.362m	£11.685m

Note: PAR and PAR Predicted Corrected savings are assumed to be the same. 30 year savings are an average of high and low growth

- 5.16 A Chi-squared test has been undertaken to determine whether the out-turn savings between the Par Predicted Corrected and Outturn analysis occurred by chance or is a direct impact of the scheme. From this test **we can be 95% confident that the change in accident rate could have occurred by chance**

alone and therefore the change in accident rates is not necessarily a direct impact of the scheme. A further review of accident trends three years after scheme opening may provide a more accurate reflection of changes in accident trends.

Summary – Section 5:

- ◆ There has been a reduction in accidents equivalent to **6 accidents per year** amounting to a saving of **£11.685m** over the 30 year scheme life (average of low and high growth) since the scheme opened. This is greater than the PAR predicted saving of 3.5 accidents per year.
- ◆ A Chi squared test has revealed that we can be 95% confident that the change in accident rate could have occurred by chance alone and therefore the change in accident rate is not necessarily a direct impact of the scheme;
- ◆ At least 3 years of post opening data is required to conclude scheme impacts with confidence;
- ◆ The observed accident rate per million vehicle km has reduced from 0.129 to 0.050;
- ◆ The severity index has decreased from 32% to 25% suggesting a decrease in serious and fatal accidents in the post opening scenario;
- ◆ There have been no fatalities at the interchange since scheme opening;
- ◆ In the PAR Predicted Corrected analysis, 18 accidents (3.6 per year) occurred in the hours of darkness. In the outturn scenario 1 PIA (1 per year) occurred during the hours of darkness.

6. Environment, Accessibility and Integration Impacts

INTRODUCTION

- 6.1 The PAR stated that with the exception of a beneficial impact on journey ambience all other impacts on the accessibility, integration and environment criteria would be neutral.
- 6.2 This chapter assesses the outturn impacts of the scheme on the built and natural environment. This includes the direct and indirect environmental effects of the transport improvements. The environment impacts of concern include noise, atmospheric pollution of differing kinds, and impacts on the countryside and wildlife, ancient monuments and historic buildings, physical fitness and journey ambience.

ENVIRONMENT

Noise

- 6.3 Noise annoyance is defined by the World Health Organisation (WHO) as '*a feeling of displeasure evoked by noise*⁴'. It should be recognised that, relatively large changes in traffic flows and speeds are required to bring about significant changes to noise levels in the longer term. The original PAR predicted that impacts of noise resulting from the scheme would be **no impact**.
- 6.4 The nearest residential properties are situated up to 30m from the A12. Whilst no noise mitigation was included as part of this scheme, a construction noise assessment was undertaken prior to scheme construction to assess the likely construction noise impacts of the scheme. This proposed that mitigation measures be adopted to reduce the impacts of day-time construction noise levels by at least 10 dB and night-time activities should be avoided altogether.
- 6.5 It is considered that the outturn impacts of noise can be regarded as **no impact** as the change in traffic flow is less than 25%, the change in HGVs is less than 20% and change in speed is less than 5 kph.

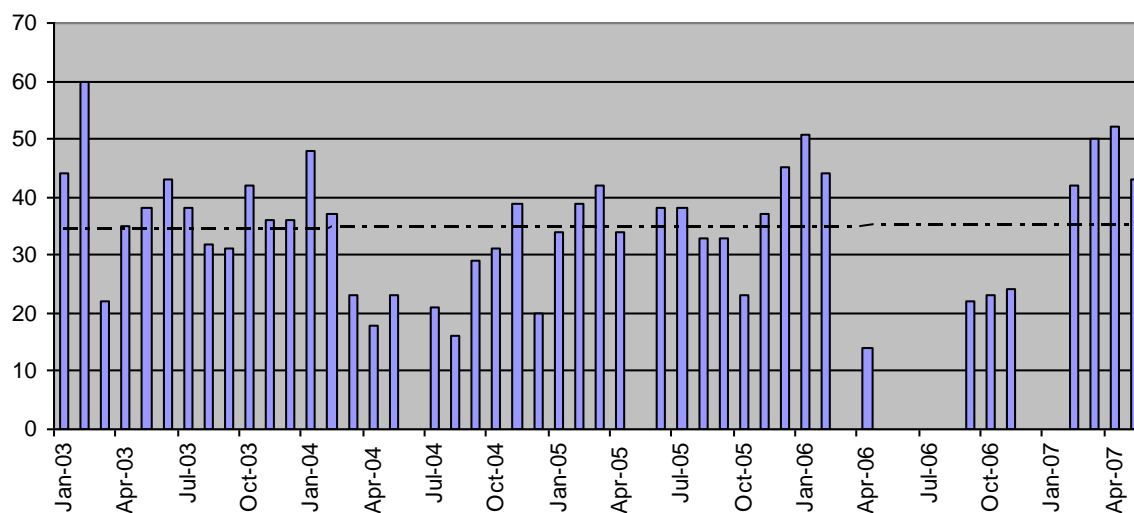
Local Air Quality

- 6.6 The PAR predicted that impacts of the scheme on local air quality would be '**no impact**'. The results of Nitrogen Dioxide diffusion tube monitoring has been obtained for Lucy Lane South (site 13) located directly adjacent to the A12, 400m east of J26. **Figure 6.1** shows a substantial variation in Nitrogen Dioxide levels between January 2003 and May 2007 although the general trend indicates a very marginal increase over the period.

⁴ Transport Analysis Guidance – unit 3.3.2

- 6.7 Data shows an average 'before' opening (March 2005 - January 2006) monthly concentration of Nitrogen Dioxide of 37 $\mu\text{g}/\text{m}^3$ (micrograms per cubic metre). There is no change in this average monthly concentration when compared to 11 months of 'after' opening data (July 2006 - May 2007).

Figure 6.1 – General Trend in Nitrogen Dioxide Levels Adjacent to the A12



Data Source: Essex Air Quality Consortium

- 6.8 Based on the above criteria it is considered that there has been **no impact** on local air quality despite the presence of properties within 30m (approx) of the scheme.

Greenhouse gases

- 6.9 The PAR predicted that impacts of the scheme on greenhouse gases would be **no impact**. PAR guidance states that the impacts can be considered neutral if the change in the total distance travelled on roads affected by the scheme is less than 10%.

- 6.10 Based on the above criteria it is considered that there has been **no impact** on greenhouse gases.

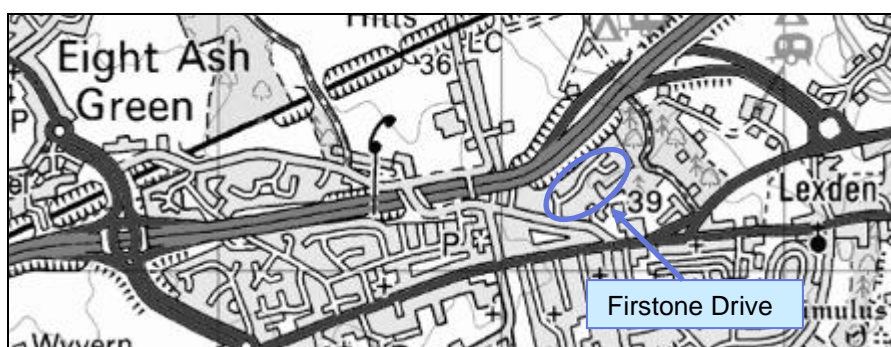
Landscape

- 6.11 The PAR predicted that impacts of the scheme on landscape would be **no impact**. PAR guidance states that the impacts can be considered neutral if the project is wholly within the carriageway or verge, is not adjacent to sensitive sites and does not involve the installation of lighting, signals, large signs, gantries, masts or traffic calming measures.

- 6.12 A key element of the scheme has been the installation of lighting columns. Guidance Notes for the Reduction of Obtrusive Light (GN01) states that light trespass (into windows of properties) in a low district brightness area should not exceed 5 lux. Light level readings were undertaken on Firststone Drive (**Figure 6.2**)

on the nights of 28/09/06 and 05/10/06. These indicated that at no point did light levels exceed this maximum threshold. The maximum reading taken was 3.1 lux.

Figure 6.2 – Location of Light Level Readings



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- 6.13 Whilst the impact of light trespass into windows can be considered neutral given the levels recorded were below maximum thresholds, the visual impact created by the proliferation of lighting columns in this scheme would suggest a **minor adverse** impact on landscape.

Townscape

- 6.14 The original PAR predicted that impacts of the scheme on townscape would be **no impact**. PAR guidance states that Townscape impacts will apply only to projects located in built up areas (cities, towns and villages), or where a project will serve to reduce traffic flows in a built up area and, in doing so, will facilitate improvements to the townscape.
- 6.15 Based on the PAR guidance it is considered that the outturn impacts of townscape can be regarded as **no impact**.

Heritage of Historic Resources

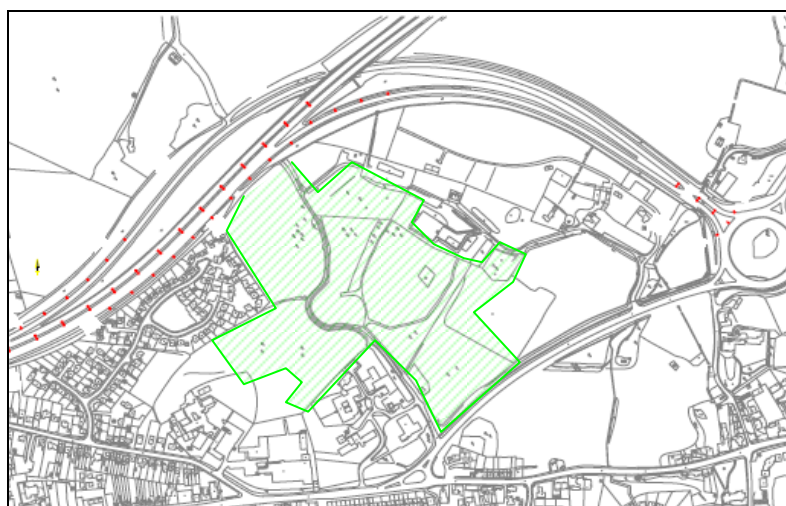
- 6.16 The original PAR predicted that impacts of the scheme on heritage would be **no impact**. PAR guidance states that the impact on Heritage of Historic Resources can be considered neutral if the project is wholly within the highway boundary and there is no impact on archaeological or noteworthy built heritage sites.
- 6.17 A cultural heritage appraisal was undertaken prior to scheme construction which considered a corridor of 500 metres around the scheme. The appraisal identified that, within the study area there are 3 scheduled ancient monuments, 31 Listed Buildings and 11 archaeological find sites.
- 6.18 It was considered that no remains of such importance as to preclude the scheme would be found within the boundaries of the existing road given the nature of excavation and construction previously enacted on the site during the initial building of the A12 and slip roads. As such no archaeological mitigation was considered to be required.

- 6.19 Based on the PAR guidance and the cultural heritage appraisal summarised above it is considered that the outturn impacts of heritage can be regarded as **no impact**.

Biodiversity

- 6.20 The PAR predicted that impacts of the scheme on biodiversity would be **no impact**. PAR guidance states that the impact on biodiversity can be considered neutral if the project is wholly within the highway verge and not adjacent to a sensitive site. There are no protected species or breeding birds or any habitat of value existing prior to implementation that could be affected by the project.
- 6.21 An Ecology report was produced in 2005 prior to scheme construction. This identified that in the vicinity of the scheme there are three sites of county importance for nature conservation. It was considered that the area affected by the works was of negligible value to nature conservation.
- 6.22 Lexden Gathering Grounds, a Site of Importance for Nature Conservation (SINC) is located immediately adjacent to the on-slip at J27 and A12 carriageway close to the Spring Lane roundabout (**Figure 6.3**). As residential street lighting exists on the southern boundary to Lexden Gathering Grounds, it was considered that the additional lighting provision would have a **minor adverse impact** on the designated site.

Figure 6.3 – Location of Lexden Gathering Grounds



- 6.23 The report identified a badger sett within Lexden Gathering Grounds, approximately 55 metres from the scheme boundary. It was considered that given the gathering grounds are designated as a SINC and also support a population of stag beetles, it was necessary to minimise the level of light spill from the scheme across the SINC boundary. It was suggested that this was achieved by adjusting the design of the lamps to be used within the scheme proposals.
- 6.24 As a result of this report full cut-off lanterns were included so as to reduce the impact as far as practical. However, the impact could not be removed completely

without reducing the amount of light on the carriageway and consequently adversely impacting on road user safety.

- 6.25 Based on the above criteria it can be said that the scheme has resulted in a **minor adverse** impact on biodiversity.

Water Environment

- 6.26 The original PAR predicted that impacts of the scheme on the water environment would be **no impact**. PAR guidance states that the impact on the water environment can be considered neutral if there is no change to the highway drainage or to the means of discharge, and there is negligible change to the volume and quality discharged.

- 6.27 Based on the above criteria it is assumed that the scheme has had **no impact** on the water environment.

Physical Fitness

- 6.28 The PAR predicted that impacts of the scheme on physical fitness would be **no impact**. PAR guidance states that the impact on physical fitness can be considered neutral if there is no change to the length and number of walking and cycling trips made as a result of the scheme.

- 6.29 A Non Motorised User (NMU) report completed at the detailed design stage of the scheme identified that there are three Public Rights of Way on the A12 mainline namely:

- ◆ Lucy Lane underpass;
- ◆ King Cole overbridge; and
- ◆ Chitt's Hill overbridge.

- 6.30 The NMU report identified that the scheme would not affect the three crossings on the A12 which were well used prior to scheme opening. A further crossing on the J27 Spring Lane slip road, located approximately 50m prior to the Spring Lane roundabout, was identified as being infrequently used. This crossing has been re-located to the edge of the roundabout circulatory as part of the scheme so that visibility to the crossing is improved. Footway approaches to the revised crossing location have been amended to suit the new location.

- 6.31 Based on the information provided in the NMU report and with reference to current PAR guidance it can be said that the scheme has had a **neutral** impact on physical fitness as it is unlikely that there has been an impact on the length and number of walking and cycling trips made as a result of the scheme.

Journey Ambience

- 6.32 The PAR predicted that impacts of the scheme on journey ambience would be positive. It was anticipated that the scheme would reduce the fear of road users for potential accidents at night through the provision of street lighting. PAR guidance states that the impact on journey ambience can be considered neutral if there is no

change in the roadside facilities provided for road users, to the views from the road, or to the accident rate or to journey times.

6.33 Site observations showed that:

- ◆ Traveller facilities have been improved with the pedestrian crossing re-location at the Spring Lane roundabout;
- ◆ Fear of potential accidents will have decreased as a result of the lighting; and
- ◆ Route uncertainty has been improved by the new road layout and signing.

6.34 Based on PAR guidance and on site observations the outturn impacts on Journey Ambience can be considered to be **minor positive**.

ACCESSIBILITY

6.35 Accessibility can be defined as improving access to facilities for those without a car and to reduce severance and include option values, severance and access to the transport system. The PAR predicted that there would be **no impact** on accessibility as a result of the scheme.

Option Values

6.36 As the scheme has not resulted in a change to the availability of transport services within the study area, the impact of the scheme on option values can be considered to be **no impact**.

Severance

6.37 PAR guidance states that the impact on community severance can be considered neutral if there is no change to the routes used by pedestrians, equestrians or cyclists; or to the standard and quality of the routes which may result in a change of patronage. On this basis the impact on the severance sub objective can be considered **no impact**.

6.38 Whilst the standard of the crossing at the Spring Lane slip road has been improved as a result of improved surfacing and visibility it is considered that this is unlikely to result in a change of patronage. As such the impact of the scheme on severance can be considered to be **no impact**.

Access to the Transport System

6.39 The PAR forecast that the scheme would have a **neutral** impact on access to the transport system.

6.40 Access to the transport system is strongly influenced by two key variables, i.e. access to a private car and proximity to a public transport service. As the scheme has had no impact on these variables the impact of the scheme on access to the transport system can be considered to be **no impact**.

INTEGRATION

Transport Interchange

- 6.41 The PAR assessed the scheme's impact on Transport Interchange as no impact.
- 6.42 The scheme does not affect bus stops, access to park and ride or rail stations and does not affect interchange facilities. The outturn assessment is that there has been **no impact** on transport interchange.

Land Use and Other Policy

- 6.43 Integration can be characterised as ensuring that all decisions are taken in the context of local, regional and national transport policies. A review of this transport policy is provided below.

A12 and A120 Route Management Strategy

- 6.44 The routes covered by this Strategy are the 86km length of the A12 trunk road from its interchange with the M25 at Brentwood to the A14 interchange south of Ipswich and the 26km length of the A120 trunk road from the A12 at Colchester eastwards to the Port of Harwich. The Strategy sets out a plan for the development and management of the roads over the next ten years including priorities for action and a detailed three year programme.
- 6.45 Many of the elements of the Strategy contribute to improving safety but in addition specific studies and actions are intended to improve the safety along roads, junctions and interchanges. The following strategy elements are most relevant to the improvements at the A12 Stanway to Spring Lane Interchange:

9.3.1 Strategy Element - Action: Investigate Accident Cluster Sites

- 6.46 Accident clusters will be continuously monitored and when the programme allows, the following action will be taken.
- ◆ If a suitable short-term measure cannot be identified, the action can advance to a Local Network Management Scheme (LNMS) involving a very detailed study looking at various options and can result in a scheme costing up to £5m. The timescales for this type of work tends to be mid to long-term depending on the statutory orders required, e.g. compulsory purchase of land.
- 6.47 The main government objectives these studies would help meet are the safety objectives, principally:
- ◆ OS1 - To improve safety for all users including cyclists, pedestrians and equestrians;
 - ◆ OS2 - to improve safety during hours of darkness; and
 - ◆ OS3 - to contribute towards meeting the national safety targets;
- 6.48 In addition some economy objectives could be met. These include:
- ◆ OC2 to minimise congestion; and

- ◆ OC3 to improve journey time reliability for all users;

9.3.12 Strategy Element - Light the A12 South of A120 Crown Interchange

- 6.49 Currently the A12 and its junctions are inconsistently lit with very little of the main carriageway illuminated and very few junctions entirely lit. Many routine maintenance tasks can only be carried out on the A12 at night due to the high traffic flows. This can be very hazardous.
- 6.50 Night time accident rates are significant and they would be reduced by installing lighting. As such schemes will be developed to provide lighting along the length of the A12 from the M25 to the A120 Crown Interchange.
- 6.51 Lighting can be detrimental to the environment; therefore, environmental assessments and associated consultations will be carried out for each individual section where lighting is proposed. Schemes will only go ahead where the benefits significantly outweigh the environmental impact.
- 6.52 The main government objectives these studies would help meet are:
- ◆ OS2 - to improve safety during hours of darkness;
 - ◆ OC2 - to minimise congestion;
 - ◆ OC3 - to improve journey time reliability for all users; and
 - ◆ OC4 - to minimise traffic disruption due to road works and works carried out by utilities.
- 6.53 Given that the improvements make a positive contribution towards these transport objectives detailed above, the impact has been assessed as **minor positive**.

Summary – Section 6:

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

	PAR Predicted	Outturn
Noise	No Impact	No Impact
Local Air Quality	No Impact	No Impact
Landscape	No Impact	Minor Adverse
Greenhouse Gases	No Impact	No Impact
Townscape	No Impact	No Impact
Heritage of Historic Resources	No Impact	No Impact
Biodiversity	No Impact	Minor Adverse
Water Environment	No Impact	No Impact
Physical Fitness	No Impact	No Impact
Journey Ambience	Positive	Minor Positive
Accessibility	No Impact	No Impact
Integration	No Impact	Minor Positive

7. Summary and Conclusions

INTRODUCTION

7.1 The POPE assessment of the A12 Stanway to Spring Lane Interchange improvements has utilised the data available to examine the out-turn impacts of the scheme compared to those forecast in the original PAR. The purpose of this section is to:

- ◆ Draw together the key impacts emerging from the POPE evaluation;
- ◆ Summarise the key lessons emerging from this evaluation; and
- ◆ Suggest recommendations that will facilitate and increase the accuracy of future PAR appraisals for schemes similar to that implemented at the A12 Stanway to Spring Lane Interchange.

SUMMARY OF KEY IMPACTS

7.2 **Table 7.1** provides a summary of the monetised benefits of the enhancements at the A12 Stanway to Spring Lane Interchange. The Appraisal Summary Table (AST) and Evaluation Summary Table (EST) are included in **Appendices A and B** respectively.

Table 7.1 – Summary of Scheme Benefits (Predicted, Predicted Corrected and Outturn)

	Predicted	Predicted Corrected	Actual
First Year Benefits	£0.320m	£0.345m	£0.548m
30 Year Benefits	£7.224m	£7.362m	£11.685m
First Year Costs	£2.184m	£2.102m	£2.345m*
Total 30 Year Costs	£2.184m	£2.102m	£2.854m**
Benefit Cost Ratio (BCR)	3.3	3.5	4.1
First Year Rate of Return (FYRR)	15%	16%	23%

Note: All costs are in 2002 prices and discounted to 2002

*Includes £0.025m annual maintenance cost

** Includes £0.534m 30 year maintenance cost

7.3 Key points to note from the above include:

- ◆ The total first year benefits of the scheme were £0.548m, equating to a 30 year benefit of £11.69m, this is £4.323m greater than predicted;
- ◆ The scheme was delivered at a PVC of £2.854m compared to a prediction of £2.184m; and
- ◆ The outturn BCR was 4.1 and the outturn FYRR of 23%, this is marginally better than expected.

- 7.4 The main economy, safety, environment, accessibility and integration impacts of the scheme are listed below:

Economy

- ◆ There were no measurable economy benefits or disbenefits that can be attributed to this scheme. The scheme was 100% safety driven.

Safety

- ◆ There has been a reduction in the number of accidents equivalent to 6 PIAs per year since the scheme opened. This is greater than predicted saving of 3.5 accidents per year;
- ◆ A Chi squared test has revealed that the change in accident rate and severity could have occurred by chance alone and therefore the observed accident saving is not necessarily attributable to the scheme;
- ◆ The severity index has decreased from 32% to 25%;
- ◆ Analysis of accident data has shown that accidents have been removed from the four historical cluster sites; and
- ◆ The proportion of accidents involving occurring in the hours of darkness has fallen from 3.6 per year to 1 per year.

Environment

- ◆ As the site is adjacent to a sensitive site (Lexden Gathering Grounds) and involves the installation of lighting and gantries it can be concluded that the scheme has had a **minor adverse** impact on Landscape.
- ◆ It can be concluded that the scheme has had a **minor adverse** impact on biodiversity as the scheme is adjacent to a sensitive site and a known habitat of value identified prior to implementation which could have been affected following the schemes completion.
- ◆ The impact of the scheme on journey ambience is considered to be positive as there has been a reduction in the number of accidents and an improvement in roadside facilities and signing.

Accessibility

- ◆ The scheme had no measurable impacts on severance, cycling/walking accessibility or access to the transport system and as such the impact of the scheme on accessibility can be considered to be **no impact**.

Integration

- ◆ The objectives of the scheme were in alignment with policy priorities identified in the A12 and A120 Route Management Strategy and as such the impact has been assessed as **minor positive**.

KEY LESSONS LEARNT

- ◆ Lighting schemes can make a significant contribution towards addressing night time safety problems;

- ◆ There was no specific observed 'before' opening data (delays or journey time information) available on the J27 off slip to verify whether the lane reduction elements of the scheme caused a journey time disbenefit.
- ◆ Observed traffic growth will not always follow the national growth trends and this will therefore have impacted on accident saving predictions;
- ◆ The PAR considered all accidents on the link irrespective of accident causation. Only accidents that can be considered to be directly attributable to the road layout (i.e. excluding tyre blow outs, police pursuits etc) should be included in the PAR assessment;
- ◆ There is currently insufficient post opening data to verify with statistical confidence whether accident savings are a direct result of the junction improvements. The first year impacts however show that a combination of lane marking changes, lighting and other minor improvements have delivered safety benefits;
- ◆ Stakeholder feedback has helped to verify and identify issues identified from desktop study and field work observations; and
- ◆ Outturn costs were considerably higher than predicted due to a failure to include annual maintenance costs in the PAR. The maintenance costs of lighting schemes should be included in PAR assessments.

SUMMARY OF RECOMMENDATIONS

- ◆ Any scheme involving a reduction of lanes regardless of whether it is a safety scheme should take into account possible journey time implications. Where possible, observations of delay and/or journey times should be made prior to scheme implementation such that the actual journey time impacts can be assessed;
- ◆ Where more robust data is available regarding future traffic growth, then this may produce a more relevant growth forecast than NRTF97 and TEMPRO;
- ◆ Only accidents of relevance to the scheme should be included in PAR appraisals to avoid an overestimate of savings that can be attributed to a scheme;
- ◆ PAR should include some element of policy research to illustrate how schemes of national relevance fit with the local agenda; and
- ◆ The outcomes from stakeholder engagement should be more visibly traceable within the completed PAR form as they play an essential role in building a business case for a scheme.

CONCLUDING REMARKS

- 7.5 In summary, this report has demonstrated that the scheme has delivered considerable safety benefits particularly in the hours of darkness whilst economic impacts are not considered to be significant. Whilst the JTDB can provide an appreciation of the scheme's likely impact on journey times it does not offer a substitute for scheme specific observed data.
- 7.6 As is the case for many Large LNMS schemes the accident analysis has been based on a single year of post opening data and as such the accident benefits

calculated in this report should therefore only be used to provide the HA and other readers with an indication of the overall scheme benefits.

APPENDIX A – Appraisal Summary Table (AST)

Appraisal Summary Table (AST)		A12 Stanway to Spring Lane		
Objective	Sub-Objective	Qualitative Impacts	Quantitative Measures	Assessment
ENVIRONMENT	Noise	No Impact		Estimated Population annoyed by noise
	Local Air Quality	No Impact		Concentrations weighted for exposure
	Greenhouse Gases	No Impact		Tonnes of CO ₂
	Landscape	No Impact		Score
	Townscape	No Impact		Score
	Heritage of Historic Resources	No Impact		Score
	Biodiversity	No Impact		Score
	Water Environment	No Impact		Score
	Physical Fitness	No Impact		Score
	Journey Ambience	The proposed scheme will reduce the fear of road users for potential accidents during the night time through the provision of street lighting.	N/A	Better
SAFETY	Accidents	The proposed scheme will reduce accidents during the hours of darkness through the provision of street lighting, improvements to signage, markings and linings and alteration to the lane drop.	PIA saved in opening year = 3.5 PIA saved over 30 years = 100.5 - 115.2	Benefit over 30 years (discounted to 2002) £6.777m for low traffic, £7.671m for high traffic
	Security	No Impact		Score
ECONOMY	Public Accounts	No Impact		PVC £m
	Business Users and Providers	No Impact	Central Govt PVC, Local Govt PVC	PVB £m
	Consumer Users	No Impact		PVB £m
	Reliability	No Impact		Score
	Wider Economic Impacts	No Impact		Score
ACCESSIBILITY	Option Values	No Impact		PVB £m
	Severance	No Impact		Score
	Access to Trans System	No Impact		Score
INTEGRATION	Transport Interchange	No Impact		Score
	Land Use Policy	No Impact		Score
	Other Government Policies	No Impact		Score

APPENDIX B – Evaluation Summary Table (EST)

Evaluation Summary Table (EST)		A12 Stanway to Spring Lane		
Objective	Sub-Objective	Qualitative Impacts	Quantitative Measures	Assessment
ENVIRONMENT	Noise	No Impact		Estimated Pop annoyed by noise
	Local Air Quality	No Impact		Concentrations weighted for exposure
	Greenhouse Gases	No Impact		Tonnes of CO ₂
	Landscape	Minor adverse impact due to the proliferation of lighting columns		Score
	Townscape	No Impact		Score
	Heritage of Historic Resources	No Impact		Score
	Biodiversity	Minor adverse impact due to the light spill on Lexton Gathering Grounds		Score
	Water Environment	No Impact		Score
	Physical Fitness	No Impact		Score
	Journey Ambience	Minor positive impact due to reduced fear of accidents during the night time.		Score
SAFETY	Accidents	The scheme has reduced accidents during the hours of darkness and daytime.	PIA saved in opening year = 6 PIA saved over 30 years = 174 (Ave HG & LG)	Benefit over 30 years (discounted to 2002) £11.071m for low traffic, £12.299m for high traffic
	Security	No Impact		Score
ECONOMY	Public Accounts	No Impact		PVC £m
	Business Users and Providers	No Impact	Central Govt PVC, Local Govt PVC	PVB £m
	Consumer Users	No Impact		PVB £m
	Reliability	No Impact		Score
	Wider Economic Impacts	No Impact		Score
ACCESSIBILITY	Option Values	No Impact		PVB £m
	Severance	No Impact		Score
	Access to Trans System	No Impact		Score
INTEGRATION	Transport Interchange	No Impact		Score
	Land Use Policy	No Impact		Score
	Other Government Policies	Minor Positive		Score

APPENDIX C – Glossary

The following table details the acronyms and specialist terms used within the context of this report.

Term	Definition
AADT	Annual Average Daily Traffic. Average of 24 hour flows, seven days a week, for all days within the year.
AST	Appraisal Summary Table. This records the impacts of the scheme according to the Government's five key objectives for transport, as defined in DfT guidance contained on its Transport Analysis Guidance web pages, WebTAG
ATC	Automatic Traffic Count
BCR	Benefit Cost Ratio A ratio identifying the relationship between cost and benefits of a proposed project.
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.
DM	'Do Minimum'
DMRB	Design Manual for Roads and Bridges
DS	'Do Something'
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.
FYRR	First Year Rate of Return
HA	Highways Agency. An Executive Agency of the Department for Transport, responsible for operating, maintaining and improving the strategic road network in England.
HGV	Heavy Goods Vehicle
I/C	Interchange
J	Junction
LNMS	Local Network Management Scheme A contribution to bringing about the changes required by the integrated transport white paper and 10 year plan.

MAC	A Managing Agent Contractor is responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a Highways Agency area.
NRTF	National Road Traffic Forecast. 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. The most recent one is NRTF97 and the one previous was NRTF89.
PAR	Project Appraisal Report
POPE	Post Opening Project Evaluation , before & after monitoring of all major highway schemes in England.
RMS	Route Management Strategy
VOT	Value of Time