

Large LNMS Evaluation Report

A45/A445 Ryton-on Dunsmore Junction Improvement




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Contents

<i>Section</i>	<i>Page</i>
1. Introduction	1-1
2. Data Collection and Stakeholder Feedback	2-1
3. Traffic and Economic Impacts	3-1
Summary of Costs	3-11
4. Safety Impacts	4-1
Introduction	4-1
The Par Assessment	4-1
Speed Camera Impacts	4-2
Junction Improvement Impacts	4-2
Accident Location Analysis	4-3
Accident Severity Analysis	4-3
5. Environmental, Accessibility and Integration Impacts	5-1
Introduction	5-1
environment	5-1
Integration	5-2
6. Summary of Findings and Recommendations	6-1

List of Tables

Table 3.1 - Annual Average Daily Traffic (AADT) and NRTF Growth Forecasts	3-3
Table 3.2 – Total Peak Hour Flow (Turning Count Data)	3-4
Table 3.3 – Summary of predicted Journey Time Benefits (as per the PAR)	3-7
Table 3.4 – Summary of predicted corrected Journey Time benefits	3-8
Table 3.5 - A45 Pre- and Post-Opening A45 Journey Times	3-9
Table 3.6 – Summary of Outturn Economic Benefits	3-10
Table 3.7 – Summary of Outturn A45 Off-Peak Disbenefits	3-11
Table 3.8 – The predicted, predicted corrected and outturn costs for the scheme	3-11
Table 4.1 – Accident Analysis	4-3
Table 4.2 – Accident Severity Analysis	4-4
Table 4.3 - Accident Causation Analysis	4-1
Table 4.4 – Predicted and outturn monetary safety benefits	4-1
Table 7.1 – Summary of scheme benefits (predicted, predicted corrected and outturn)	6-1

List of Figures

Figure 1.1 – A45/A445 Junction Location	1-1
Figure 1.2 – Before and After Junction Layout	1-1
Figure 2.1 – Photographs illustrating traffic flow during site visit (6 th February 2007, AM peak)	2-1
Figure 3.1 - HA Traffic Count Permanent Site Location	3-3
Figure 3.2 – A Comparison of Before and After Daily Traffic Profile	3-4
Figure 5.1 – Environmental and Accessibility Mitigation Measure	5-1

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.
Accessibility	Accessibility can be defined as 'ease of reaching'. The accessibility objective is concerned with increasing the ability with which people in different locations, and with differing availability of transport, can reach different types of facility.
AM	Denoting the morning peak period.
AST	Appraisal Summary Table. This records the impacts of the scheme according to the Government's five key objects for transport, as defined in DfT guidance contained on its Transport Analysis Guidance web pages, WebTAG.
ATC	Automatic Traffic Count, a machine which measures traffic flow at a point in the road.
DfT	Department for Transport.
Discounting	Discounting is a technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report.
Do Minimum	A scenario that represents the outturn situation if no scheme were to be implemented.
Do Something	A scenario that represents the outturn situation given implementation of the scheme.
Geometric Delay	The delay caused to traffic as a result of the road layout.
HGV	Heavy Goods Vehicle.
Highways Agency	An Executive Agency of the Department for Transport, responsible for operating, maintaining and improving the strategic road network in England.
IP	Inter Peak, the time between the AM and PM peaks.
KSI	Killed or Seriously Injured.
Light vehicle	Not a HGV. For traffic flow data, it is a vehicle less than 5.2m in length.
Managing Agent	A Managing Agent is responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a Highways Agency area.

MTC	Manual turning count. A survey of the turning movements of vehicles at a junction undertaken by human observers, normally on a single day.
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 These are undertaken for Highways Agency improvement schemes which are not TPI's.
PIA	Personal Injury Accident. A road traffic accident in which at least one person required medical treatment.
PM	Evening peak period.
POPE	Post Opening Project Evaluation, before & after monitoring of all major highway schemes in England.
RPI	Retail Price Index – the most familiar general purpose domestic measure of inflation in the United Kingdom.
RPF	Retail Price Factor - Adjustment factor for RPI.
Severance	Community severance is the separation of adjacent areas by road or heavy traffic, causing negative impact on non-motorised users, particularly pedestrians.
STATS19	A database of injury accident statistics recorded by police officers attending accidents.
TRADS	The TRADS system provides access to traffic flow information collected from England's motorway and major trunk road network.
Vehicle hours	Vehicle hours refers to the total time spent by all vehicles using a road and is expressed normally as a yearly value. For example, if 10,000 vehicles a day used a route with a 6 minute journey time, then the route's vehicle hours for the year would be 365,000.

1. Introduction

BACKGROUND

- 1.1 The junction of the A45, A445 and B4029 lies within Area 11 near the village of Ryton-on-Dunsmore, south of Coventry in Warwickshire (**Figure 1.1**).



Figure 1.1 – A45/A445 Junction Location

- 1.2 Prior to scheme opening, the junction was arranged as a staggered crossroads. The A45 traffic had priority with the A445 and B4029 utilising gaps in the central reservation for straight ahead and right-turn movements (See **Figure 1.2**).
- 1.3 The former junction layout had a poor safety record for many years with 4 fatal, 7 serious and 20 slight accidents (between 1999 and 2004). The majority of these accidents occurred as a result of conflicting movements between turning side road traffic and through traffic on the A45. Speed cameras were installed along the A45 in April 2001 in an effort to reduce accidents at the junction. However, following the introduction of the speed cameras, safety concerns at the junction remained.

SCHEME DESCRIPTION

- 1.4 The scheme opened in August 2005 and included:
- ◆ Replacement of the existing staggered layout with a four arm roundabout;

- ◆ Realignment of the B4029 Wolston Lane to approach the junction opposite the A445 approach and the old section of the B4029 closed off; and
- ◆ Closure of the central reservation gaps.

SCHEME CATEGORISATION AND OBJECTIVES

- 1.5 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 accidents at the junction by removing the need for vehicles to cross the A45 via the gap; and
 - ◆ To reduce the speed of A45 traffic in order to negotiate the junction.
- 1.6 The scheme has therefore been categorised as a **safety scheme**.

PURPOSE OF THIS REPORT

- 1.7 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 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 possible impacts of highway schemes on safety, economy, 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.
- 1.8 This document specifically sets out the results of the Post-opening Project Evaluation (POPE) of the A45/A445 Ryton-on-Dunsmore Junction Improvement Scheme as implemented in August 2005. More specifically, the report examines the economic, safety, environmental, accessibility, and integration impacts resulting from scheme.

POPE METHODOLOGY OVERVIEW

- 1.9 This report initially presents an assessment of the physical impacts of the scheme and more specifically:
- ◆ A comparison of the 'before' and 'after' traffic volumes at the junction to illustrate how overall traffic conditions have changed following scheme opening; and
 - ◆ An outline of changes in accident rates at the junction following scheme opening.
- 1.10 This is then followed by an assessment of the scheme in accordance with the POPE methodology. This methodology aims to provide a method by which forecast and outturn effects of a scheme can be compared on a common basis. This process ultimately derives the following:

- ◆ The original PAR assessment (completed by Optima in March 2004). This represents the forecast benefits of the scheme; and
- ◆ An Evaluation Summary Table based on the outturn effects of the scheme using a methodology consistent with the original PAR assessment undertaken prior to scheme opening.

REPORT STRUCTURE

- 1.11 This report has been divided into 5 further sections as follows:
- ◆ Chapter 2: Data Collection and Stakeholder Feedback;
 - ◆ Chapter 3: Traffic and Economic Impacts;
 - ◆ Chapter 4: Safety Impacts;
 - ◆ Chapter 5: Environmental, Accessibility and Integration Impacts; and
 - ◆ Chapter 6: Summary of Findings and Recommendations.
- 1.12 It is intended that the findings from this report will feed into a wider summary of the outcomes of the POPE process as reported in the LNMS Annual Evaluation report.

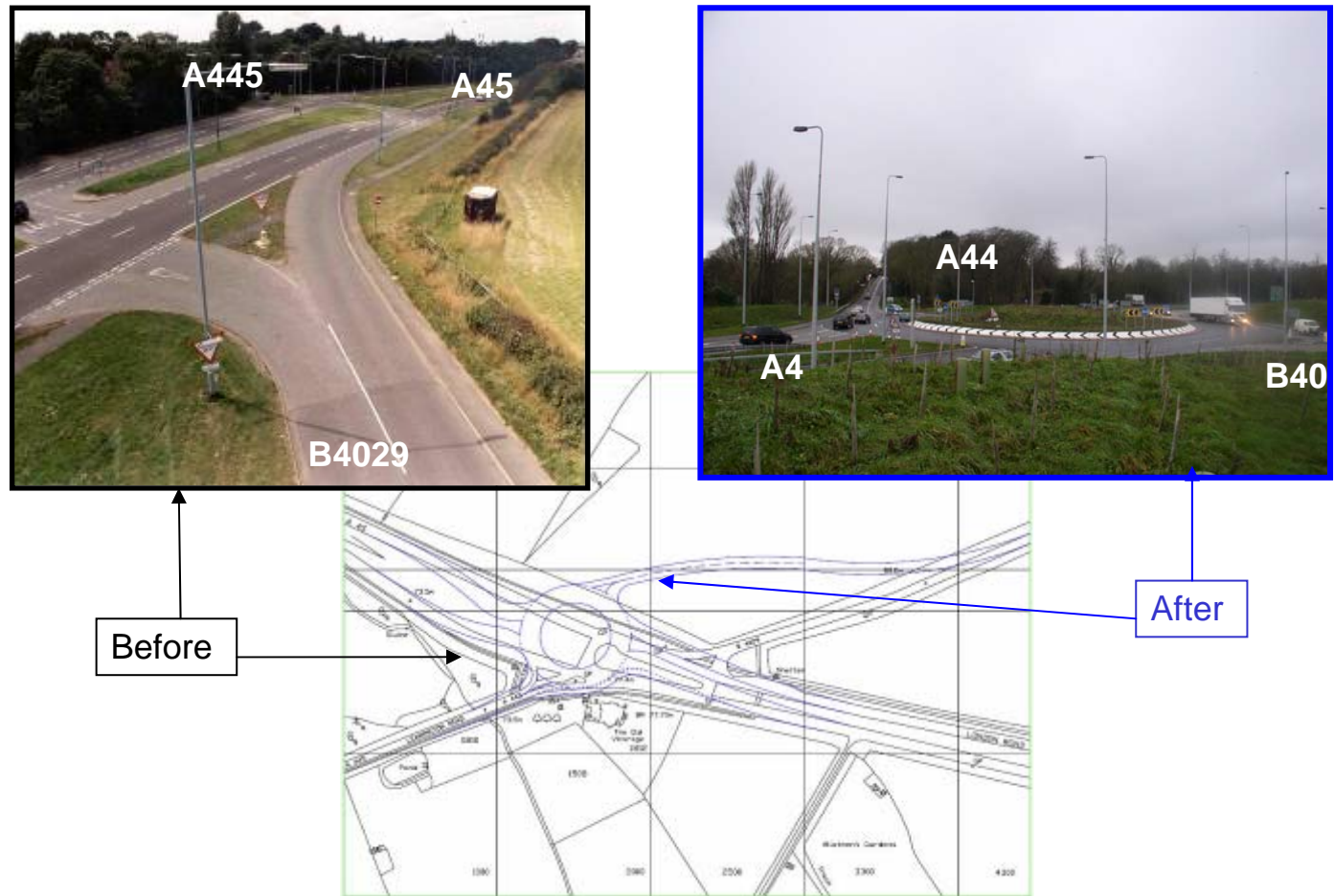


Figure 1.2 – Before and After Junction Layout

2. Data Collection and Stakeholder Feedback

INTRODUCTION

2.1 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;
- ◆ Summarises the outcomes of a site visit undertaken by Atkins in January 2007; 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

2.2 A number of data sets were used to inform this POPE study, these are listed as follows:

Pre-Scheme Opening Data

- ◆ PICADY and ARCADY modelling files used to determine the predicted scheme impacts on junction delay as calculated in the PAR assessment;
- ◆ Highways Agency TRADS 2 Database ATC data, from permanent count sites 11/9641 (eastbound) and 11/9642 (westbound) on the A45 between 2001 and 2004;
- ◆ Full peak hour turning count survey for A45/A445 junction during the AM peak (07:45 – 08:45) and PM peak (17:00 – 18:00), undertaken on 16th January 2001,
- ◆ Personal Injury Accident (PIA) data for the period between January 1999 and December 2004; and
- ◆ Relevant data to support the assessment of the possible scheme impacts on Environment, Accessibility and Integration.

Post-Scheme Opening Data

- ◆ Highways Agency TRADS 2 Database ATC data, from permanent count sites 11/9641 (eastbound) and 11/9642 (westbound) on the A45 between 2006 and 2007;
- ◆ Full peak hour turning count survey for A45/A445 junction during the AM peak (07:45 – 08:45) and PM peak (17:00 – 18:00), undertaken on Tuesday 27th February 2007;
- ◆ Journey time survey results undertaken over a 1.2km section of the A45 including the junction , during March 2007; and
- ◆ Personal Injury Accident (PIA) data for the 15 month period October 2004 – December 2005.

Other Data

- ◆ AM peak hour site observations as conducted by Atkins in January 2007;

- ◆ Consultation with the MAC (Optima);
- ◆ Consultation with the Project Sponsor;
- ◆ Consultation with Warwickshire County Council Officers; and
- ◆ Consultation with Warwickshire Cycle Touring Club.

SUMMARY OF SITE OBSERVATIONS

2.3 A site visit was conducted in January 2007 to observe post-opening traffic conditions at the junction during the AM peak period. The objectives of the site visit were as follows:

- ◆ To ensure that the scheme was implemented as per the original PAR and scheme drawings provided by the MAC.
- ◆ To observe the post-opening junction operating conditions during the AM peak period, with regard to traffic flow and safety; and
- ◆ To provide an assessment of whether environmental mitigation measures had been implemented as detailed in the PAR.

2.4 Post-opening traffic conditions as at the site are illustrated in **Figure 2.1**. The following observations were made during the site visit (environmental, integration and accessibility site observations are dealt with later in the report):

- ◆ All elements of the scheme appeared to have been completed as described in the PAR document and the scheme drawings;
- ◆ Despite the delay imposed by the roundabout to the mainline A45 traffic, the traffic appeared to be moving well with little queuing on these arms;
- ◆ Some misuse of the left turn lane from A45 south-east approach by vehicles travelling straight on was observed;
- ◆ Some queuing was noted on the B4029 (observed to be up to 11 cars at one point during the AM peak), however, the roundabout allowed the queue to move quickly. The speed of the A45 traffic travelling through the roundabout required a quick response from drivers entering from the Wolston Lane approach. A near miss was observed when a vehicle pulled out of Wolston Lane and conflicted with a vehicle travelling on the A45;
- ◆ Some queuing was also noted on the A445 approach to the junction (6 cars were noted to be queuing at one point during the AM Peak period) but again this queue cleared quickly; and
- ◆ Traffic conditions on the circulating carriageway were free flow; however poor lane discipline was observed.

STAKEHOLDER FEEDBACK

2.5 The following points of interest emerged from a discussion with the MAC regarding the relative successes and shortcomings of the scheme:

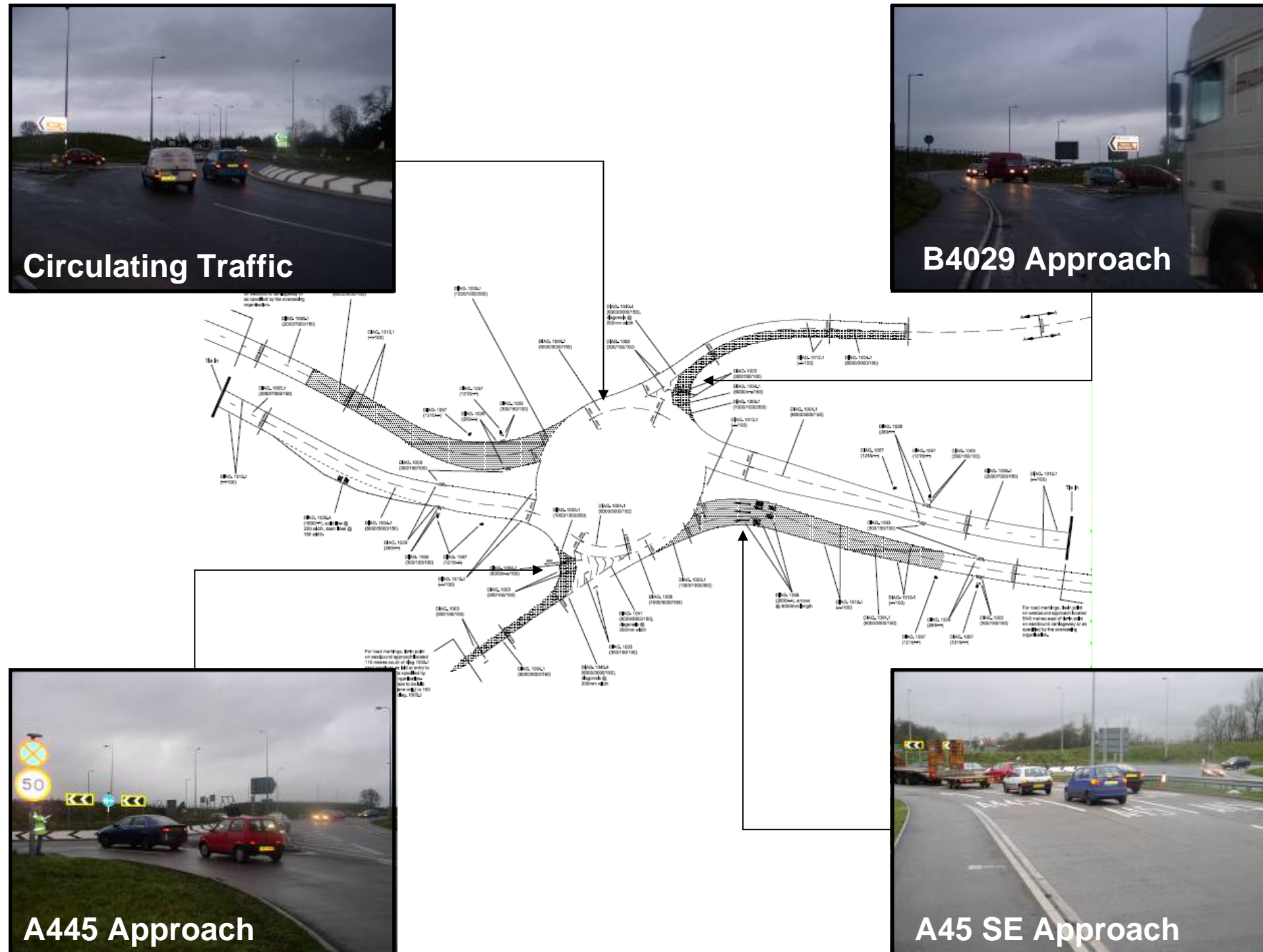
- ◆ The scheme has met its main objective to improve safety as no major accidents have occurred at the junction following the latest improvements; and

- ◆ The only issue of concern was one identified by the Safety Audit and is related to the lane alignments at the roundabout. This is likely be the reason for the misuse of the left-only lane on the A45 East observed on the site visit. This was identified as a minor issue only and is currently being investigated.
- 2.6 Discussions with the Highways Agency Project Sponsor highlighted that the he was particularly happy with how the junction improvements have performed. Particular comments were:
- ◆ The implementation of the roundabout has helped to reduce speeds as well as prevented the need for the central reserve gaps. This has made a huge contribution to safety improvements; and
 - ◆ Operationally, the junction also works very well.
- 2.7 Warwickshire County Council provided the following feedback:
- ◆ The construction of the junction improvements appears to have been very well executed and there have been no operational issues since its completion;
 - ◆ The road gullies on the approach to the island from the A445 approach have not been connected to a suitable drainage system;
 - ◆ Insufficient consideration was given to the speed cameras close to the site prior to the construction of the roundabout, making it difficult for the Warwickshire Casualty Reduction Partnership to install temporary speed cameras in place of those cameras affected by the works; and
 - ◆ On completion of the roundabout it was found that the building of the roundabout had affected the existing Traffic Regulation Order which governed the speed enforcement at the location and that variations to that order were required before enforcement could resume. This rendered the cameras unusable for over 12 months. This was felt to be unacceptable but Warwickshire Police had no option but to await the variation order.
- 2.8 Consultation with Warwickshire Cycle Touring Club suggested that:
- ◆ Vehicle speeds both on the roundabout and approaching the junction are intimidating for cyclists using the roundabout.; and
 - ◆ The cycle path is inadequate and poorly placed. No further explanation was provided.

SECTION SUMMARY

- ◆ The scheme appears to be implemented as detailed in the original PAR and scheme drawings;
- ◆ Site observations illustrate that there is little delay during the AM peak other than a small amount of geometric delay introduced for mainline traffic at the junction;
- ◆ From site observations, there is some delay for the B4029 and A445 traffic, however this appears to be much less than those of the previous layout as described in the PAR (pre-opening delays of 9 minutes);
- ◆ There is evidence that traffic entering the roundabout from the B4029 approach finds it difficult to enter the circulating carriageway due to the speed of traffic approaching from the A45;
- ◆ There is some misuse of the left-turn lane from the A45 westbound approach which resulted in an observed near-miss;
- ◆ Insufficient consideration was given to the speed cameras and related Traffic Regulation Orders prior to the construction of the scheme;
- ◆ Generally, stakeholder feedback has been positive and the improvements are perceived to be working well in terms of safety and operationally; and
- ◆ The Cycle Touring Club highlighted some negative issues, relating to speeds at the junction and the adequacy and location of the cycle paths.

Figure 2.1 – Photographs illustrating traffic flow during site visit (6th February 2007, AM peak)



3. Traffic and Economic Impacts

INTRODUCTION

3.1 Although the primary objective of the scheme was to improve safety at the junction, the PAR identified that there would be some negative impacts on journey times (for through traffic) following scheme opening. This chapter sets out a post opening evaluation of the economic impacts emerging from the scheme. More specifically this chapter will:

- ◆ Provide an appreciation of recent changes in traffic volume and patterns at the junction;
- ◆ Quantify the outturn impacts of the scheme on journey times in order to provide an assessment of the economic benefit of the scheme; and
- ◆ Provide an analysis of the outturn costs and compare them with those predicted in the original PAR assessment.

TRAFFIC GROWTH TRENDS

3.2 It is important to consider the extent to which traffic volumes have changed at the junction before and after the improvements. Such an analysis serves two main purposes:

- ◆ To ascertain whether any additional traffic (induced traffic) has been attracted to the junction as a result of the scheme; and
- ◆ To ensure that the benefits for additional/new users of the junction are considered in the estimation of outturn economic benefits.

Annual Average Daily Traffic (A45)

3.3 Annual Average Daily Traffic (AADT) data for a location east of the A45/A445 Ryton-on-Dunsmore Junction has been collected from the TRADS website for the period 2001 – 2007. **Figure 3.1** illustrates the location of the site in relation to the junction. **Table 3.1** illustrates the change in two way AADT over the period 2001-2007 and helps provide an appreciation of recent traffic growth patterns at the junction.

3.4 The following trends can be noted from **Table 3.1**:

- ◆ The two way AADT east of the junction has increased by 3% between 2001 and 2007, this is lower than the National Road Traffic Forecast (NRTF) of 10% growth over the same period. NRTF is a national growth estimate not specific to any area of the country.
- ◆ Two way flows decreased to 4% below the 2001 baseline during the construction year (2005), but traffic has been attracted back to the junction in subsequent years;
- ◆ The average AADT on the A45 for the period 2001-2004 (24,688) is comparable to that for the period 2006 to 2007 (24,717) indicating there has been no change in A45 traffic following scheme opening; and

- ◆ The closure of the Ryton on Dunsmore Car plant appears not to have resulted in reduced AADT flows at the Ryton on Dunsmore junction, however it may have had an influence on total traffic flows at the junction during peak hours;

Figure 3.1 - HA Traffic Count Permanent Site Location



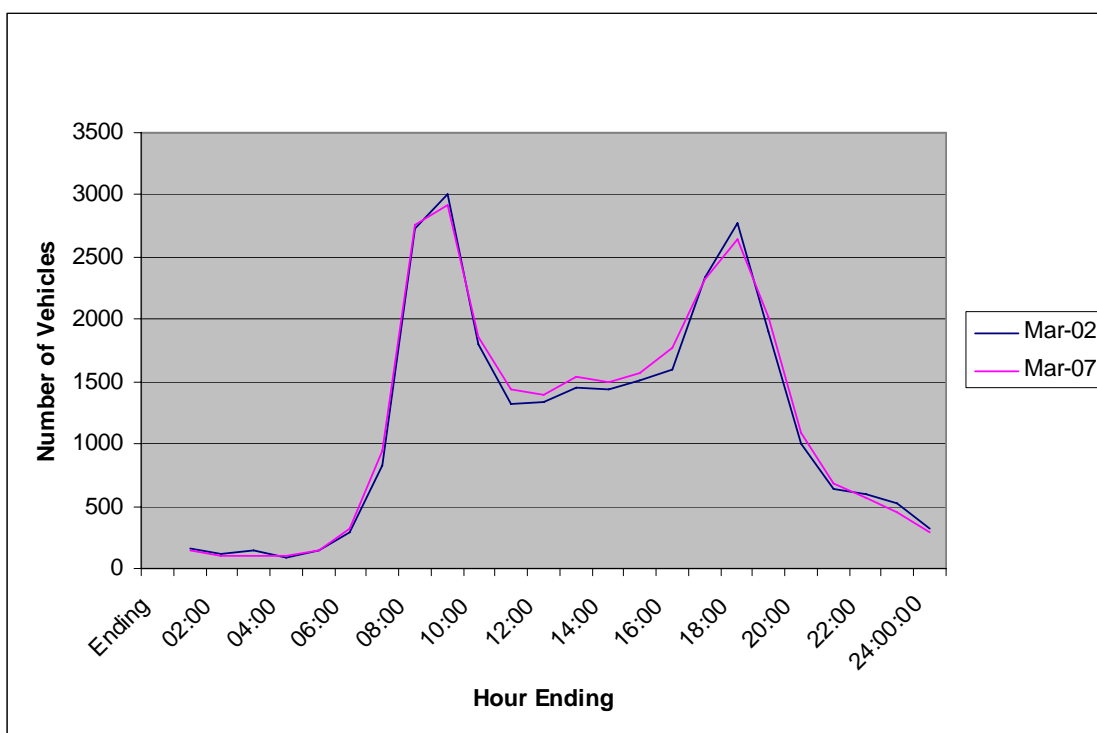
Table 3.1 - Annual Average Daily Traffic (AADT) and NRTF Growth Forecasts

Year	Annual Average Daily Traffic (AADT) in vehicles	Cumulative Growth	NRTF 97 Forecast Growth
2001	24,529	1.00	1.00
2002	24,645	1.00	1.02
2003	24,818	1.01	1.03
2004	24,761	1.01	1.05
2005	23,506	0.96	1.07
2006	24,242	0.99	1.09
2007	25,192	1.03	1.10

Peak Hour Flow Changes

3.5 Closer examination of the daily traffic profile before and after scheme opening illustrates there have been some subtle changes in A45 traffic volumes following scheme opening. **Figure 3.2** provides a snapshot of the daily traffic profile for March 2002 (Pre opening) and March 2007 (post opening).

Figure 3.2 – A Comparison of Before and After Daily Traffic Profile



The following can be noted from a comparison between the two profiles:

- ◆ There has been virtually no change in the distribution of traffic flows across the day and no peak spreading as a result of the scheme;
- ◆ There has been a very slight increase in inter-peak traffic (08:45-17:00) between 2002 and 2007 (4.6%, an additional 598 vehicles); and
- ◆ AM and PM peak periods, flows have changed very slightly with a decrease of -3% (88 vehicles) in the AM peak and of -4% (129 vehicles) in the PM peak period.

Turning Count Analysis

3.6 Full turning counts were undertaken in January 2001 (pre opening) and January 2007 (post opening) for the AM (07:45-08:45) and PM (17:00-18:00) peak periods respectively. **Table 3.2** provides a comparison of observed total flow changes for 2001 and 2007. Analysis of the turning count surveys reveal that the total AM and PM peak hour traffic at the junction (from all arms) has reduced by 5.3% and 2.1% respectively.

Table 3.2 – Total Peak Hour Flow (Turning Count Data)

Peak	January 2001	January 2007	Change in Traffic Vehicle Numbers (%)
AM Peak	3621	3426	-195 (-5.3%)
PM Peak	3057	2991	-66 (-2.1%)

3.7 **Appendix A** contains pre and post opening peak hour turning count diagrams. The key trends that can be identified from an examination of the pre and post opening turning count information are listed as follows:

AM Peak Impacts

- ◆ The proportion of turning movements originating from the side roads (Wolston Lane and the A445) has increased from 9% (2001) to 20% (2007) – an increase of 350 vehicles;
- ◆ The proportion of all turning movements originating from the A45 westbound approach has decreased from 59% to 47% - a reduction of 540 vehicles;
- ◆ The total number of right turning movements originating from the A45 has increased by 1188% (from 25 to 322 movements);
- ◆ Through movements on the A45 have decreased by 25% (685 less vehicles); and
- ◆ Through movements across the A45 have decreased by 42% (47 less vehicles); and
- ◆ The number of HGV's using the junction has reduced from 248 to 168 (33%) in the AM peak.

PM Peak Impacts

- ◆ The proportion of turning movements originating from the side roads (Wolston Lane and the A445) has increased from 10% (2001) to 20% (2007) – an increase of 288 vehicles;
- ◆ The proportion of all turning movements originating from the A45 eastbound approach has decreased from 59% to 47% - a reduction of 297 vehicles;
- ◆ The total number of right turning movements originating from the A45 has increased by 952% (from 25 to 263 movements);
- ◆ Through movements on the A45 have decreased by 23% (555 less vehicles); and
- ◆ Through movements across the A45 have decreased by 63% (71 less vehicles); and
- ◆ The number of HGV's using the junction has reduced from 157 to 95 (40%).

Interpretation of Traffic Impacts

3.8 In the summary, the following conclusions can be reached from the review of pre and post opening traffic trends:

- ◆ Analysis of the AADT data for the A45 shows that cumulative traffic growth between 2001 and 2007 was lower (3%) than that forecast by NRTF (10%);
- ◆ Both the turning count data collected in 2001 and 2007 and the daily classified data collected from the permanent sites in 2002 and 2007 show a slight decrease in peak hour traffic flows at the junction following completion of the

scheme (2% to 5%). The closure of the Ryton car plant in December 2006 appears to have had dramatic influence on total traffic flows at the junction during peak hours;

- ◆ HGV movements have also dramatically reduced at the junction, again this is likely to be a consequence of the Ryton car plant closure and not a result of geometric changes to the junction layout ;
- ◆ Inter-peak traffic data for the A45 suggests that the geometric delay introduced by the installation of new junction has not contributed towards a decrease in the usage of the junction;
- ◆ Potential re-development of the Ryton on Dunsmore is likely to have an impact on future traffic growth at the junction;
- ◆ The new junction layout appears to have attracted new trips to the junction from the A445 and Wolston Lane approaches (particularly for left-turning movements and right-turning movements). The roundabout appears to have created conditions that favour side road movements given that the speed of through traffic on the A45 has been much reduced; and
- ◆ The junction improvements have also facilitated right movements from the A45 in both directions by creating better conditions to turn.

POPE ASSESSMENT

The PAR Appraisal

- 3.9 The original PAR assessment for the A45/A445 junction improvements was undertaken by Optima Infrastructure Management. The PICADY and ARCADY modelling software were used to estimate the journey time benefits that would result from the scheme in the opening year. The PAR made the following assumptions for forecasting the economic impacts of the scheme:
- ◆ First year and 30 year impacts were calculated for all time periods (AM, PM, Weekends, Nights and Daytime Inter peak);
 - ◆ The economic modelling programme JUICE was used to calculate the opening year and 30 year monetary benefits of the scheme;
 - ◆ Traffic was assumed to grow according to the NRTF (central growth of 7%);
 - ◆ Delays on the side roads before scheme opening during the AM were in the region of 9 minutes and predicted to fall to one minute following scheme opening;
 - ◆ The scheme would result in the introduction of a 13 second geometric delay per vehicle for mainline A45 traffic.
- 3.10 It should be noted that following a review of the PAR and the supporting modelling data, there appeared to be no direct linkages between Arcady, Picady, JUICE and PAR outputs. As no clear methodology was made available from the MAC hence Atkins has derived a predicted corrected for the purpose of the post opening assessment of economic impacts (see following section).
- 3.11 The outcome of the original PAR appraisal is summarised in **Table 3.3**. All values are discounted to 2002 and reported in 2002 prices. As a result of the lack of

linkages between the modelling (Arcady, Picady and Juice) and PAR outputs and no evident methodology, it has not been possible to split the original predicted journey time benefits between peak and off-peak periods.

Table 3.3 – Summary of predicted Journey Time Benefits (as per the PAR)

	Benefit
Opening Year Vehicle Hours Saved	-89,537
Opening Year Monetary Benefit	-£1.139m
30 Year Monetary Benefits	-£33.67m

- 3.12 In summary, the PAR appraisal concluded that the scheme would result in a significant benefit to traffic using side roads, this benefit would however be outweighed by the dis benefit experienced by the larger volumes of traffic using the A45. Such impacts equate to an opening year journey time disbenefit of 89, 537 vehicle hours. This is equivalent to a monetary dis-benefit of £1.1m journey in the opening year and -£33.6m over 30 years.

The Predicted Corrected Appraisal

- 3.13 In order to ensure that a like-for-like comparison of the predicted and outturn economic impacts is made, a PAR ‘predicted corrected’ appraisal of the scheme economic benefits has been undertaken. A predicted corrected appraisal has been undertaken for the following reasons:
- ◆ It was unclear as to how the original PAR had calculated the predicted journey time benefits outside of the AM and PM peak periods.
 - ◆ There were no clear links between modelling outputs and the figures inputted into JUICE;
 - ◆ It was also unclear how the journey time benefits for turning movements from the A45 to the side roads were achieved (no suitable journey time surveys to support such assumptions were traced); and
 - ◆ To account for differences in the scheme appraised in the PAR and the scheme implemented on the ground i.e. differences in the junction geometrics.
- 3.14 The predicted corrected assessment assumed the following:
- ◆ Impacts have been derived for weekday AM (07:45 – 08:45) and PM (17:00 – 18:00) peak periods only due to the lack of pre opening data available for the inter-peak, off-peak and weekend periods;
 - ◆ Delays have been re-forecast assuming an opening year of 2005 using the Arcady and Picady models representing the junction (as built);
 - ◆ Delay savings per vehicle were calculated for separate movements i.e. an average saving per vehicle was not assumed;
 - ◆ An average side road peak hour delay of 9 minutes per vehicle;
 - ◆ Benefits for the 30 year assessment period have been capitalised using PAR guidance rather than using JUICE as used in the original PAR appraisal.

3.15 **Table 3.4** summarises the results of the predicted corrected PAR appraisal.

Table 3.4 – Summary of predicted corrected Journey Time benefits

	AM Peak	PM Peak
Peak Hour Benefit in Opening Yr (Vehicle hours)	6536	7087
Opening Year Monetary Benefit	£154,091 (2002 Prices, discounted to 2002)	
30 Year Monetary Benefit	£4.28m (2002 Prices, discounted to 2002)	

3.16 Key differences to note from comparing the PAR predicted and PAR predicted corrected assessments include the following:

- ◆ The predicted corrected appraisal showed an average 21 second delay per vehicle for mainline A45 traffic in the AM peak compared to a 13 second delay as predicted by the original PAR, this may be attributable to differences in the junction geometrics originally appraised and that implemented;
- ◆ Table 3.4 only represents the benefits derived in the AM and PM peak periods and therefore does not consider the geometric dis-benefits to through traffic on the A45 or the small side road traffic journey time savings during the off peak; and
- ◆ In order to undertake an accurate assessment of the inter-peak scheme impacts more detailed information on the PAR methodology would be required.

The Outturn Appraisal of Economic Benefits

3.17 The outturn assessment of economic impacts was undertaken in two stages as follows:

- ◆ Post-opening observed journey times have been compared with modelled 'before journey times' to provide delay savings for mainline traffic travelling straight through the junction on the A45 (61% of all movements); and
- ◆ In the absence of observed pre-opening journey time data for traffic approaching from the junctions minor arms (A445 and Wolston Lane), delay outputs from the PICADY and ARCADY models (using 2007 flows) have been used to determine the journey time impacts resulting from all other movements.

3.18 The assessment of the scheme's outturn journey time impacts assumes the following:

- ◆ Only peak hour period journey time impacts are considered in this appraisal;
- ◆ Capitalisation factors based on guidance set out in PAR have been used to calculate the 30 year benefits of the scheme (as opposed to JUICE as used by the original PAR appraisal);
- ◆ A NRTF central case growth factor was applied to the observed 2001 turning count to represent 2007 Do Nothing traffic flows; Despite evidence that traffic

has grown at the junction much less than that forecast by NRTF, the national forecast has still been used as the lack of growth maybe as a result of the junction improvements themselves and traffic may have grown at national forecast rates.

- ◆ Observed 2007 flows were used in the Do Something Model; and
- ◆ The delay savings derived from the two sources have been added together to provide a total delay saving for the junction in the AM and PM peak.

Observed journey times

3.19 Out-turn journey time savings for through traffic movements on the A45 were calculated using a moving observer method over a 1.2km section. Post-opening journey time surveys were undertaken along the A45 through the junction in the AM peak in March 2007. The following assumptions were made to derive the outturn journey time benefits for the A45 traffic travelling through the junction:

- ◆ Based on the turning count information collected prior to the scheme opening and the layout of the junction at this time, it can be assumed that traffic conditions on the A45 through the junction were free flow. Therefore, for the do minimum situation, journey times through the junction have been calculated based on the assumption that traffic is at free flow travelling at the speed limit of 50mph with no geometric delay;
- ◆ A post-opening journey time survey was undertaken in the AM peak over the same length of the A45 through the junction as that used to calculate the pre-opening journey time. The only delay incurred at the junction was that incurred by the geometric delay of the roundabout, no queuing delay was observed;

3.20 The results of the journey time surveys are shown in **Table 3.5**. In summary, the journey time for traffic travelling through the junction on the A45 has been increased by 22 seconds as a result of changes in the geometrics of the junction.

Table 3.5 - A45 Pre- and Post-Opening A45 Journey Times

Description	Average time taken to travel section (seconds)
Estimated Pre-opening (a)	54
Observed Post-opening (b)	76
(a)-(b)	-22

Modelled Journey Times

- 3.21 The PICADY and ARCADY models were used to estimate the out-turn journey time savings for all other vehicle movements at the junction.
- 3.22 In the absence of any reliable pre-opening journey time information, we have assumed a pre-opening side road delay of 9 minutes per vehicle (as per the PAR

assessment). Arcady was then used to derive the post opening side road delay and delay to users turning left or right off the A45.

- 3.23 A Picady model (as provided by the MAC) was used to predict pre-opening delays for traffic turning left or right off of the A45 corridor.
- 3.24 **Table 3.6** displays the overall outturn peak hour benefits derived from the combined observed journey times and the modelled journey times.

Table 3.6 – Summary of Outturn Economic Benefits

	AM Peak Vehicle Hours	PM Peak Vehicle Hours
Peak Hour Benefit (Vehicle Hours)	7393	6158
Opening Year Monetary Benefit	£152,869 (2002 Prices, discounted to 2002)	
30 Year Monetary Benefit	£4.25m (2002 Prices, discounted to 2002)	

- 3.25 Points to note from the outturn appraisal of economic benefits include:
- ◆ Outturn delay for mainline A45 traffic travelling straight through the junction is a result of geometric delay only (22 seconds) and is approximately as predicted in the predicted corrected appraisal 21 seconds;
 - ◆ Outturn delays savings for vehicles turning left and right from the A45 in both directions are similar to those predicted by the predicted corrected appraisal;
 - ◆ The peak hour journey time saving of 8 minutes quoted in the PAR appears reasonably accurate given that modelling of the post opening scenario illustrates an average side road delay of less than one minute per vehicle compared to 9 minutes of before delay;
 - ◆ The outturn monetary benefit of £152,869 in the opening year and £4.25m over 30 years is marginally less than the predicted corrected of £154,091 and £4.28m respectively;
 - ◆ Whilst the scheme appears to have delivered peak hour benefits, additional pre-opening delay/journey time data would be required to quantify additional economic impacts in the inter-peak period;
 - ◆ The out-turn impacts should be treated with some caution given that there is some dependence upon modelling outputs for the out-turn scheme impact assessment.

OFF-PEAK (OUTSIDE AM AND PM PEAKS) JOURNEY TIME IMPACTS

- 3.26 Traffic travelling straight through the junction on the A45 accounts for an average of 61% of total traffic at the junction following the implementation of the scheme. Post opening moving observer surveys have illustrated that all of this traffic has been subjected to an average of 22 seconds of geometric delay following scheme opening. This equates to an annual dis benefit of £22.43 million (**Table 3.7**). Such an estimate is based on the following assumptions:

- ◆ There was no queuing delay to mainline A45 traffic prior to scheme opening;
- ◆ There is an average hourly traffic of approximately 1500 vehicles outside of the two peak hours (based on the proportion of average off-peak hourly flow against the average peak hour flow at the HA permanent count site on the A45 to the east of the junction);
- ◆ 8260 hours outside of the peaks in a year; and
- ◆ An average geometric delay of 22 seconds per vehicle.

Table 3.7 – Summary of Outturn A45 Off-Peak Disbenefits

	Off-Peak Disbenefit
Off-Peak Opening Year Disbenefit (Vehicle Hours)	-75,716
Opening Year Monetary Disbenefit	-£856,430
30 Year Monetary Disbenefit	-£22.43m

3.27 Although such an assessment excludes the effects of inter-peak side road delay savings, it clearly demonstrates that the peak hour journey time benefits for side road traffic will be more than offset by the small amount of geometric delay incurred by users in the off peak period.

Summary of Costs

3.28 **Table 3.8** illustrates the predicted and outturn costs for the scheme.

Table 3.8 – The predicted, predicted corrected and outturn costs for the scheme

Scenario	Total PVC at 2002 pricing, discounted to 2002
PAR Predicted	£3,082,941
PAR Predicted - Corrected	£3,055,648
Outturn	£4,520,568

3.29 The predicted corrected costs were calculated to account for the correction of the RPF value. The table illustrates that the outturn scheme cost (£3.52m) was approximately 32% more than the PAR predicted-corrected (20% more than the PAR predicted corrected). The underestimate of costs is largely a result of construction costs being higher than expected.

INTERPRETING THE POPE CONCLUSIONS

3.30 Whilst it appears that the improvements at Ryton-on-Dunsmore have been successful in reducing overall junction delay during peak periods, the following caveats must be considered:

- ◆ Due to the absence of observed pre- and post-opening journey time data available for this scheme evaluation, PICADY and ARCADY models has been used to 'estimate' scheme benefits, which in itself introduce a margin of error;
 - ◆ Traffic growth has not occurred on the A45 at the rate forecast by NRTF, thus reducing total journey time dis benefits;
 - ◆ The junction improvements has resulted in some induced traffic on the side roads, this was not predicted by the original PAR;
 - ◆ The side road benefits predicted by the original PAR have been used to estimate the outturn journey time benefits on the basis that this is the most reliable data available. It should however be noted that following a review of before modelling files show there is little evidence to support such assumptions;
 - ◆ The original PAR predicted appraisal considers all periods whereas the predicted corrected and outturn appraisal includes only the AM and PM peak periods.
- 3.31 Overall by comparing the predicted and out-turn peak hour journey time impacts, the scheme has broadly performed (in economy terms) as expected. Atkins would also agree with the statement in the PAR that such benefits are likely to be offset by new geometric delays in the off peak.

SECTION SUMMARY

- ◆ Analysis of the AADT data for the A45 shows that cumulative traffic growth between 2001 and 2007 was lower (3%) than that forecast by NRTF (10%);
- ◆ Both the turning count data collected in 2001 and 2007 and the daily classified data collected from the permanent sites in 2002 and 2007 show a slight decrease in peak hour traffic flows at the junction following scheme opening (2% (AM) to 5% (PM));
- ◆ The closure of the Ryton car plant in December 2006 appears to have had an influence on total traffic flows at the junction during peak hours;
- ◆ HGV movements have dramatically reduced at the junction by 33% in the AM peak and 40% in the PM peak. This is also likely to be a further consequence of the Ryton car plant closure and not a result of geometric changes to the junction layout;
- ◆ The new junction layout appears to have attracted new trips to the junction from the A445 and Wolston Lane approaches. The roundabout appears to have created conditions that favour side road movements given that the speed of through traffic on the A45 has been much reduced;
- ◆ The new junction layout has introduced a geometric delay of 22 seconds for A45 traffic.
- ◆ Traffic on the side roads has experienced delay savings of 8 minutes during the AM and PM peak hours;
- ◆ The outturn monetary benefit of £152,869 in the opening year and £4.25m over 30 years is marginally less than the predicted corrected of £154,091 and £4.28m respectively; and
- ◆ Post opening moving observer surveys have illustrated that through traffic on the A45 has been subjected to an average of 22 seconds of geometric delay following scheme opening. This equates to an annual off-peak dis benefit of £22.43 million.

4. Safety Impacts

INTRODUCTION

- 4.1 This section examines the changes in 'before' and 'after' accident trends in order to quantify the out-turn safety benefits of the scheme. The objectives of this section are:
- ◆ To understand the impact of speed cameras installed in 2001 on accident rates in the vicinity of Ryton upon Dunsmore Roundabout;
 - ◆ Provide an appreciation of the changes in the number, distribution and causation of accidents before and after scheme opening; and
 - ◆ Ascertain the overall monetary safety benefit derived from junction layout changes at the A45/A445 junction.

THE PAR ASSESSMENT

- 4.2 The PAR used accident data for the period April 2001 – January 2004. It did not take into consideration the impact of the speed cameras installed prior to the junction improvements.
- 4.3 Key pre-scheme accident trends that can be identified from the PAR include:
- ◆ There were an average of 4.3 PIAs (Personal Injury Accidents) per year in the before scheme opening;
 - ◆ The accident severity index¹ was 25%; and
 - ◆ The observed accident rate before opening was above the comparable national average accident rate of 2.6 (COBA Manual, DMRB 13.1.2) as detailed in the PAR.
- 4.4 The PAR predicted that the scheme would result in an opening year accident saving of 2.82 (a 35% accident saving). This is equivalent to a monetised opening year benefit of £0.221m and £4.145m over 30 years (2002 prices, discounted to 2002).
- 4.5 A review of the PAR supporting documents suggests that the following assumptions were made:
- ◆ Only accidents related to the junction layout or traffic conditions were included in the assessment; and
 - ◆ Accidents on all arms within 20 metres of the junction were also included.
- 4.6 A review of the accident assessment made in the PAR appears to be correct and therefore no predicted corrected appraisal is required.

¹ Fatal Accidents + Serious Accidents/(Total Accidents)

POPE ASSESSMENT

- 4.7 The calculated safety benefits have been isolated from the impacts of the speed cameras at the end of this section. However, for completeness, this section provides an illustration of the camera impacts.
- 4.8 In assessing the accident benefits of the speed cameras and the junction improvements, the following assumptions have been made:
- ◆ The construction period of the junction improvements lasted for a duration 7 months between January 2005 and July 2005. Accidents within this construction period will be excluded from this accident analysis;
 - ◆ Only accidents related to the junction layout or traffic conditions were included in the assessment; and
 - ◆ Accidents on all arms within 20 metres of the junction were included.
- 4.9 A summary of observed accident savings emerging from the camera installation and the junction improvements is given in **Table 4.1**.

Speed Camera Impacts

- 4.10 Prior to the implementation of the speed cameras (January 1999 to March 2001), there was an average of 5.8 accidents per year. This compares to an annual accident rate of 4.53 following the implementation of the cameras but before the implementation of the junction improvements (April 2001 – December 2004). This equates to an opening year accident saving of 1.27.

Junction Improvement Impacts

- 4.11 In the 14 months following the implementation of the opening of the junction improvements (August 2005 – November 2006) no accidents have occurred at the junction. This equates to an outturn accident saving of 4.53 in the opening year. This is almost twice that predicted by the PAR (2.82).
- 4.12 Prior to scheme opening the PIA rate per million vehicle kilometres was 1.258 accidents over the length of the scheme of 0.4 km (0.2 km either side of the junction along the A45). This is greater than the default, 0.174 accidents per million vehicle kilometres, as stated by COBA for this type of road.
- 4.13 A Chi-squared test has been undertaken to determine whether the outturn savings between the observed pre-opening accident analysis and the Outturn analysis occurred by chance or is a direct impact of the scheme. From the test **we can be 95% confident that the change in accident rate is not a result of chance alone and therefore the scheme has had a direct impact on accident rates.**

Table 4.1 – Accident Analysis

Scenario	Number of Months	Observed Number of Accidents	
		Over observed period	Per Year
Pre-Speed Camera Implementation (01/1999 to 03/2001)	27	13	5.8
Post-Speed Camera Implementation and Pre-Junction Improvements (04/2001 to 12/2004)	45	17	4.53
Post-Junction Improvements (August 2005 to November 2006)	14	0	0
Observed Accident Savings in the opening year of Speed Cameras (Post-Opening) Assessment			1.27
Observed Accident Savings in the opening year of Junction Improvements (Post Opening) Assessment			4.53
Predicted Accident Savings in the opening year of Junction Improvements Pre-Opening (Original PAR) Assessment			2.82

Accident Location Analysis

- 4.14 Accident location analysis has been carried out for the periods pre- and post-scheme opening of the junction improvements. The following points should be noted regarding pre-opening accidents:
- ◆ Five accidents have occurred in and around the gaps in the central reservation;
 - ◆ 15 accidents have occurred close to the junction of the A445 with the A45 and a further 5 near to the junction of Wolston Lane with the A45. Three of these accidents were fatal; and
 - ◆ Two accidents have also occurred in Wolston Lane close to the give way line.
- 4.15 The closure of the central reservation gaps and the reduction in speed of A45 traffic will have prevented the causation of many of the accidents that have occurred in these locations.

Accident Severity Analysis

- 4.16 The junction had a notoriously poor accident record, the following points should be noted in relation to accident severity:
- ◆ In the period prior to the speed cameras being implemented (January 1999 – March 2001), accident severity stood at 54% including 3 fatalities;
 - ◆ Following the implementation of the speed cameras (April 2001 - -December 2004) the accident severity index fell by 24%;

- ◆ No accidents have occurred following the junction improvements.

4.17 Table 4.2 summarises this information.

Table 4.2 – Accident Severity Analysis

Period	Accident Severity Index
Pre-Speed Cameras (1999 – 03/2001)	54%
Post-Speed Cameras / Pre-Junction Improvements (04/2001 – 12/2004)	24%
Post-Junction Improvements	0%

ACCIDENT CAUSATION ANALYSIS

4.18 Accident causation factors have been analysed for the period pre-speed cameras (01/1999 – 03/2001), post-speed cameras/pre-junction improvements (04/2001 - 12/2004) and post-junction improvements (August 2005 onwards). A summary of the causation factors is provided in **Table 4.3**. Key trends emerging from the post-opening accident analysis include:

- ◆ Many of the accidents (20) that occurred pre-speed cameras and junction improvements were caused by vehicle movements out of the side roads (the A445 and Wolston Road) into the A45. Three of these accidents were fatal. The number of accidents with this causation factor actually increased following the implementation of speed cameras, suggesting that vehicle speeds on the A45 were still too high to prevent such accidents occurring;
- ◆ 5 accidents were caused by vehicle movements to/from the central reservation. One of which was caused by a HGV that could not wholly be accommodated in the central reserve gap as it waited to cross the A45. This resulted in a fatality;
- ◆ Two accidents were caused by vehicles travelling at excessive speeds as they turn into the side roads from the A45;
- ◆ No accidents have occurred post-junction improvements. However, observed misuse of the left-only lane to the A445 from A45 south-east suggests that there may be an issue relating to on-road signing and lane markings. This may result in future accidents.

Table 4.3 - Accident Causation Analysis

Causation	Pre-speed cameras (27 Months)	Time Period Post-Speed Cameras/Pre-Junction Improvements (45 Months)	Post-Junction Improvements (15 Months)
Movement out of side roads into main road (to access central reserve gaps or A45)	8	13	-
Movement out of central reservation gaps	2	1	-
Movement between lanes on A45 in order to access side roads	2	-	-
Central reserve not large enough	1	-	-
Excess speed turning into side roads	-	2	-
Driver confusion relating to road layout	-	1	-

Monetised Accident Savings

- 4.19 **Table 4.4** provides a summary of the predicted, predicted corrected and outturn safety impacts.

Table 4.4 – Predicted and outturn monetary safety benefits

	PAR Predicted	Outturn
Number of accidents saved in opening year	2.82	4.53
Number of accidents saved over 30 year assessment period	78	126
Average cost of accident in the opening year	£80,660	£80,660
Annual accident benefit in opening year (2002 prices)	£245,658	£394,621
Annual accident benefit in opening year discounted 2002	£221,583	£355,948
Accident benefits over 30 year assessment period, discounted to 2002	£4,348,578	£9,856,203

4.20 Key points to note from **Table 4.4** include:

- ◆ The outturn safety benefit was 44% greater than predicted; and
- ◆ The outturn opening year accident saving of 4.53 PIAs is equivalent to a monetary saving of £355,948 in the opening year, and £9.856m over the 30 year assessment period following scheme opening (2002 prices, discounted to 2002);
- ◆ The first year accident saving was almost double that forecast in the original PAR assessment.

SECTION SUMMARY

- ◆ Following the implementation of the speed cameras, the accident rate per year fell from 5.8 to 4.53 and hence the cameras resulted in a first year accident saving of 1.27;
- ◆ Following the implementation of the junction improvements, the annual accident rate has fallen from 4.53 to 0 and hence the scheme has resulted in a first year accident saving of 4.53 compared to a predicted saving of 2.82;
- ◆ The junction improvements appear to have resulted in safety benefits 3.5 times greater than achieved by the speed cameras implemented in April 2001;
- ◆ The speed cameras resulted in a reduction in accident severity from 54% (including 3 fatalities) to 24%, this still includes 1 fatality;
- ◆ We can be 95% confident that the change in accident rate following the completion of the junction improvements is not a result of chance alone.
- ◆ The first year outturn safety benefit in the opening year is equivalent to £355,948, compared to a predicted estimate of £221,583; and
- ◆ The outturn 30 year safety benefit (£9.856m) is more than twice than the predicted (£4.348m).

5. Environmental, Accessibility and Integration Impacts

INTRODUCTION

- 5.1 This chapter examines the environment, accessibility and integration impacts of the scheme and presents a comparison of the predicted and outturn impacts of the scheme on such objectives. The forecast impacts of the scheme have been derived from the PAR document. The major source of information for the outturn assessment was a site visit that was undertaken by Atkins in January 2007.

ENVIRONMENT

- 5.2 The Appraisal Summary Table (AST) provided an assessment of the predicted environmental impacts and recommended mitigation measures to minimise adverse impacts. The following section outlines the PAR prediction for each sub-objective followed by the outturn impact.

Noise

PAR

- 5.3 The PAR states....'1 property 'The Old Vicarage' gains a 1Db(A) reduction compared to the 'do minimum' – **Slight Beneficial**

Outturn Assessment

- 5.4 No specific noise assessment has been made at this site and therefore it is unclear as to whether the scheme has had a positive or negative impact on noise levels at the Old Vicarage. An increase in braking and acceleration may introduce additional noise and be more noticeable to residents at the Old Vicarage than a steady stream of traffic passing at 50 mph. The scheme impact has therefore been classified as **slightly negative**.

Air QUALITY

PAR

- 5.5 'Concentrations are expected to be below the Air Quality objectives however 1 property will experience deterioration. NO₂ levels will be +6.2 and PM₁₀ +1.2' – **Slight negative**.

Outturn Assessment

- 5.6 Traffic flows have remained largely the same at the junction, however speed has reduced by more than 5% as a result of the new road layout. No specific post-opening air quality assessment has been made but on the basis of this it is assumed that the AST prediction is true and the one property in the vicinity will experience an

increase of NO₂ AND PM₁₀. Therefore, overall the scheme has had a **slight negative** impact on air quality.

GREENHOUSE GASES

PAR

5.7 No assessment of the scheme's impact on greenhouse gases was made.

Outturn Assessment

5.8 Outturn change in total distance travelled was less than 10% therefore it can be assumed that the impact on greenhouse gases is **neutral**.

LANDSCAPE

PAR

5.9 'Suitable landscape mitigation measures are to be built in line with Warwickshire guidelines.' - **Neutral**

Outturn Assessment

5.10 From observations made during the site visit conducted in January 2007 it was evident that landscape mitigation measures had been implemented. The following measures were noted:

- ◆ Screening provided by the creation of embankments on all sides of the roundabout with the exception of the south-west, where existing vegetation sufficiently screens the roundabout;
- ◆ Planting of trees and shrubs has occurred on the embankments to further screen the area, however there was evidence of poor maintenance of this vegetation as many trees and shrubs appeared to be no longer alive.
- ◆ The central island of the roundabout has also been built-up to blend in with the landscape; this does not have any planting on it.

5.11 **Figure 5.1** displays some of the on-site mitigation measures.

5.12 Consultation with Warwickshire County Council did not highlight any landscape issues and therefore it is assumed that the scheme is in line with the Warwickshire Landscape Guidelines.

5.13 The outturn impact of the scheme is **neutral**.

TOWNSCAPE

PAR

5.14 No assessment of the scheme's impact on Townscape was made.

Outturn Assessment

- 5.15 The junction is located away from an urban or built up area therefore there is **neutral** impact on Townscape.

HERITAGE OF HISTORIC RESOURCES

PAR

- 5.16 A **Moderate adverse** impact on regional or possibly national significant remains (Bonze Age/Early Iron Age settlement) was predicted and the impacts were stated to be offset through an archaeological excavation prior to scheme construction. A neutral affect on historic buildings and parks and garden was predicted. Overall, the scheme will have a **moderate adverse impact.**'

Outturn Assessment

- 5.17 An archaeological dig task order confirms the occurrence of the archaeological dig. The results of the dig are not available and therefore it can only be assumed that the impacts of the scheme on the Heritage of Historical Resources are as predicted by the PAR. Therefore, there has been a **moderate adverse impact.**

BIODIVERSITY

PAR

- 5.18 No assessment of the scheme's impact on Biodiversity was made.

Outturn Assessment

- 5.19 Although the scheme was outside the highway boundary and involved taking up land for the realignment of Wolston Lane, no sensitive sites are located nearby. Land was returned to vegetation where the old alignment of Wolston Lane previously existed. Therefore there has been a **neutral** impact on Biodiversity.

WATER ENVIRONMENT

PAR

- 5.20 No assessment of the scheme's impact on the Water Environment was made.

Outturn Assessment

- 5.21 Alterations to drainage at the roundabout were carried out as part of this scheme; however consultation with Warwickshire County Council highlighted that road gullies on the approach to the island from the A445 have not been connected to a suitable drainage system. The full effect of this, if any, has not been measured.
- 5.22 Given that the traffic flows were not significantly altered as a result of the scheme, the risk of contamination of surface water by road vehicles is unchanged; therefore the impact on the water environment is regarded as **neutral.**

PHYSICAL FITNESS

PAR

- 5.23 'It is difficult to assess given the existing severance imposed on the junction'. However, information was obtained from consultations and workshops with the Ramblers Association and Cycle Touring Club and it was predicted that there would be an increase in the number of people undertaking less than and more than 30 minutes of activity per day. Thus, resulting in a predicted slight beneficial impact upon physical fitness.' – **Slight Beneficial Impact.**

Outturn Assessment

- 5.24 From site observations the following points were noted in relation to physical fitness:
- ◆ Improvements to cycling and pedestrian facilities have been made including new cycle ways, pedestrian footways, pedestrian crossing points with dropped kerbs and tactile paving and pedestrian signing. As a result, severance has decreased and NMU movement through the junction has been facilitated;
 - ◆ There is no evidence to suggest that usage by pedestrians and cyclists has increased, but without pedestrian and cyclist counts it is difficult to quantify any change. It is apparent from site observations that cyclists use the roundabout, with 5 cyclists recorded during the AM peak period between 7.30am and 9.00am during a visit to the site.
 - ◆ Consultation with Warwickshire Cycle Touring Club suggested that the vehicle speeds at the roundabout were still too high and the cycle path is inadequate and poorly placed. This may suggest that conditions for cyclists have not improved as much as expected and the increase in the number of cyclists may not be as large as anticipated.
 - ◆ Overall the scheme has resulted in slight positive impact on physical fitness

JOURNEY AMBIENCE

PAR

- 5.25 'The introduction of the proposed roundabout will provide multi-modal improvements in traveller journey quality resulting in an overall large beneficial impact.' – **Large Beneficial Impact.**

Outturn Assessment

- 5.26 Site observations showed that:
- ◆ Traveller facilities have been improved with cyclist and pedestrian shared-use paths and crossings, as well as improved road surface with anti-skid.
 - ◆ Driver stress has decreased with the introduction of the roundabout, turning movements in and out of the side roads have been facilitated and delays reduced. Some additional driver stress may have been introduced for those using the A45 due to the requirement to slow down upon the approach to the junction. Pedestrian and cyclist stress will also have decreased due to the improved facilities such as crossings and signage.

- ◆ Fear of potential accidents will have decreased greatly as a result of the roundabout. Pedestrian and cycle crossings with dropped kerbs and tactile paving have been implemented to ease movement through the junction. However, comments received from the Cycle Touring Club in Warwickshire expressed concerns for cyclists relating to vehicle speed, both on the roundabout and on approach to it, intimidating cyclists going around the roundabout. It was also suggested that the bike path is inadequate and poorly placed.
 - ◆ Route uncertainty has been improved by the geometry of the new road layout. However, site observations showed that some misuse of the dedicated left-turn lane for the A445 is occurring at the junction, resulting in vehicles crossing the lane alignments on the circulatory carriageway. From the site visit it was apparent that this could be due to markings indicating the left –turn lane starting too close to the junction and therefore, not allowing enough time for vehicles to change lanes before entering the roundabout. This resulted in several conflicting movements on the circulatory carriageway. This observation was confirmed through consultation with the MAC.
- 5.27 Overall, the scheme has resulted in **a large beneficial impact** on journey ambience.
- 5.28 **Figure 5.1** displays some of the environmental mitigation measures put in place at the junction.

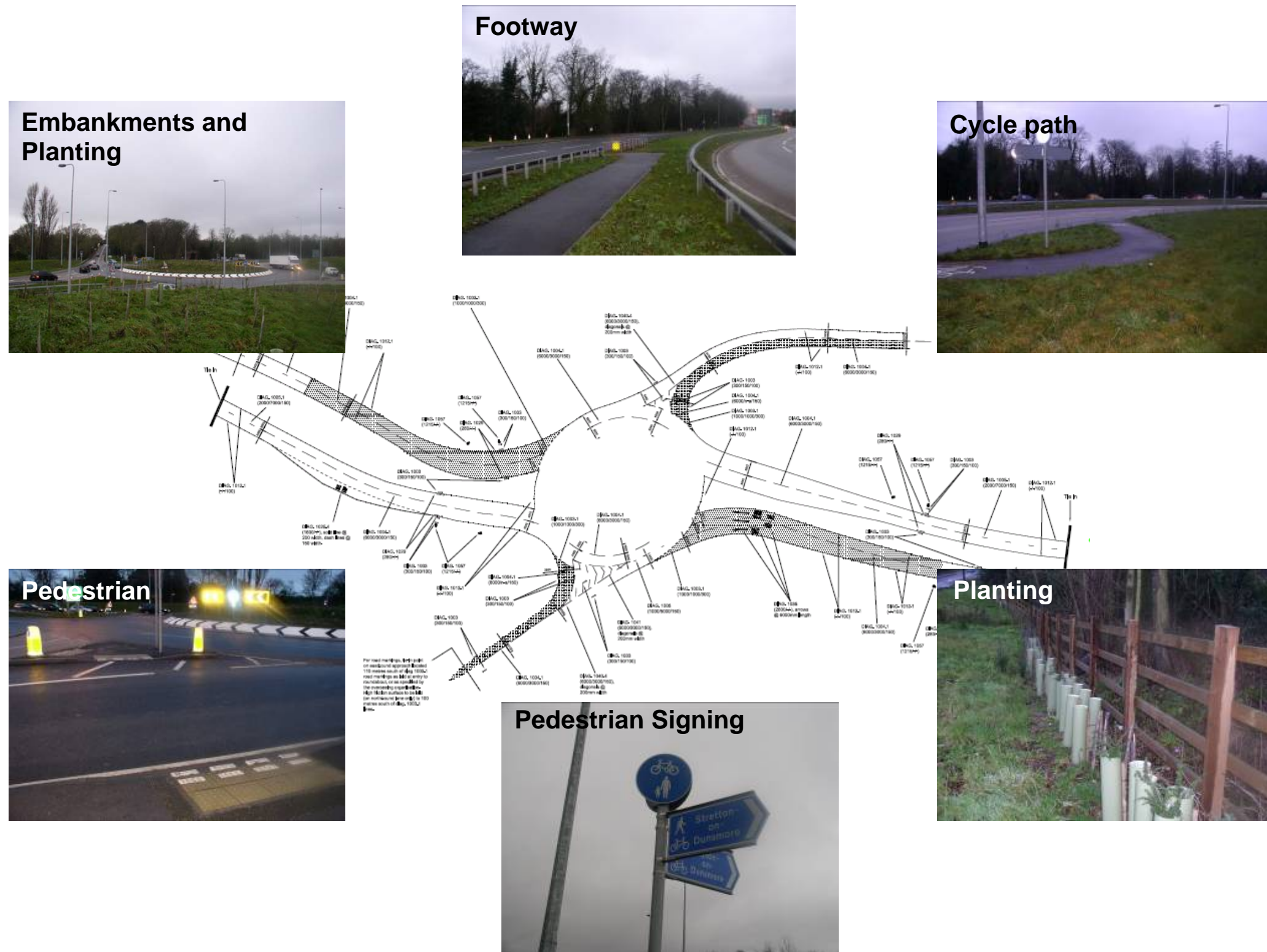


Figure 5.1 – Environmental and Accessibility Mitigation Measure

ACCESSIBILITY AND INTEGRATION IMPACTS

Option Values

PAR

- 5.29 No assessment was made by the PAR on the scheme's impact on option values.

Outturn Assessment

- 5.30 The scheme provides no new public transport services. The outturn assessment of option values is therefore **neutral**.

Severance

PAR

- 5.31 The PAR predicted that there would be a **slight positive** impact on severance for the population of Ryton-on-Dunsmore and Wolston. This is due to the construction of a purpose built footway / cycle ways around the junction and links, creating a dedicated network of routes making all areas more accessible to pedestrians and cyclists.

Outturn Assessment

- 5.32 Site observations relating to the scheme's impact on severance include:
- ◆ The scheme has provided shared use cycle and footways along all arms of the roundabout;
 - ◆ Gaps in the central reserve along the A45 along with dropped kerbs, tactile paving, lining and signing provide clear routes for pedestrians and cyclists through the junction in all directions, creating a dedicated network of routes;
 - ◆ Improvements on the A45 east arm of the junction include a cycle turning lane and these improvements now provide a link for pedestrian and cyclists through the junction between the villages of Ryton-on-Dunsmore and Wolston as well as along the A45.
 - ◆ The overall impact of the scheme on severance is slight positive.

Access to the Transport System

PAR

- 5.33 The PAR forecast that the scheme would have **a neutral impact** on access to the transport system with the relocation of a bus stop and no physical integration impacts.

Outturn Assessment

- 5.34 Site observations showed that the bus stop at the junction had been relocated to the westbound exit arm of the A45. The improvements to the pedestrian and cycling facilities at the junction will have improved accessibility to this bus stop therefore there has been a **slight positive** impact on access to the transport system.

INTEGRATION

Transport Interchange

PAR

- 5.35 The PAR did not assess the scheme's impact on Transport Interchange.

Outturn Assessment

- 5.36 As part of the scheme the bus stop at the junction has been relocated to ensure there is no impact on transport interchange from this stop. In addition, the scheme does not affect access to park and ride or rail stations and does not affect interchange facilities. The outturn assessment is that there has been a **neutral impact** on transport interchange.

Land-Use and Other Government Policy

PAR

- 5.37 The PAR did not assess the scheme's impact on land-use or other local policies.

Outturn Assessment

- 5.38 The A45/A445 junction lies within the section of network covered by the M1 to Birmingham Route Management Strategy (RMS) (2006). The RMS process was designed to help with planning and investment in the trunk road network and in the delivery of local, regional and national strategic plans.
- 5.39 As part of the work carried out for the RMS including extensive consultation, safety at the A45/A445 junction at Ryton-on-Dunsmore was highlighted as a specific route issue. The implementation of this roundabout has improved safety at the junction and therefore contributed towards the objectives of the RMS and a wide range of other policy documents related to this section of network as outlined in the RMS.
- 5.40 More specifically, the completion of the junction aligns with several of the objectives of the Warwickshire Transport Plan (2006-2011) which have been set out in order to achieve its vision for the county (**'to make Warwickshire the best place to live and work'**). Importantly it also contributes to the transport specific priorities of the LTP, which include:
- ◆ Accessibility - The improved pedestrian and cycling facilities have reduced severance and improved accessibility between the villages of Wolston and Ryton-on-Dunsmore;
 - ◆ Road Safety – No accidents have occurred since the opening of the improvements (accident saving pf 4.53 in opening year). The scheme has dramatically improved safety and a notorious accident hotspot; and
 - ◆ Congestion: - The scheme has resulted in a decrease in delays for traffic on the side roads (A445 and B4029) and minimal delay has been created for A45 traffic.

5.41 Given that the improvements make a positive contribution towards these transport objectives detailed above, the impact has been assessed as **slightly beneficial**.

6. Summary of Findings and Recommendations

INTRODUCTION

6.1 The POPE assessment of the A45/A445 junction improvements has utilised the data available to examine the outturn impacts of the scheme compared to those forecast in the 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 A45/A445 junction.

SUMMARY OF KEY IMPACTS

6.2 **Table 6.1** provides a summary of the monetised benefits of the enhancements at the A45/A445 Ryton-on-Dunsmore junction.

Table 6.1 – Summary of scheme benefits (predicted, predicted corrected and outturn)

All costs are in 2002 prices, discounted to 2002	Predicted	Predicted Corrected	Outturn
First Year Benefits	-£1.17m	£0.375m	£0.505m
30 Year Benefits (PVB)	-£29.32m	£8.63m	£14.11m
Costs	£3.08m	£3,055,648	£4.52m
Net Present Value (NPV)	-£33.14m	£5.58m	£9.59m
Benefit Cost Ratio (BCR)	N/A	1.83	2.1
%FYRR	N/A	12.3%	11%

(Predicted Corrected and Outturn values are for the AM and PM peak hours only)

6.3 Key points to note from **Table 6.1** include:

- ◆ The scheme has resulted in positive peak hour benefits in the opening year of £508,000, around 70% of this benefit came from safety benefits;
- ◆ The scheme was delivered 32% (£1.4m) over the predicted corrected cost estimate (£2.624m);
- ◆ Whilst the out-turn FYRR is relatively low (11%), the scheme offers excellent longer term benefits over 30 years (BCR 2.1);
- ◆ The total Net Present Value (NPV) (£9.59m) is 71% higher than the predicted corrected estimate;
- ◆ The BCR has increased by 14% from the predicted corrected to the outturn.
- ◆ Whilst the scheme has resulted in positive peak hour benefits, it is important to note that disbenefits during the off peak (caused by geometric delay increase)

are likely to offset such benefits significantly. The monetised disbenefit to through traffic on the A45 alone is estimated to be £22m.

- 6.4 A summary of the schemes main economy, safety, environment, accessibility and integration impacts of the scheme are listed below.

Economy Impacts

- ◆ Analysis of the AADT data for the A45 shows that cumulative traffic growth between 2001 and 2007 was lower (3%) than that forecast by NRTF (10%);
- ◆ Both the turning count data collected in 2001 and 2007 and the daily classified data collected from the permanent sites in 2002 and 2007 show a slight decrease in peak hour traffic flows at the junction following scheme opening (2% (AM) to 5% (PM));
- ◆ The closure of the Ryton car plant in December 2006 appears to have had an influence on total traffic flows at the junction during peak hours;
- ◆ HGV movements have dramatically reduced at the junction by 33% in the AM peak and 40% in the PM peak. This is also likely to be a further consequence of the Ryton car plant closure and not a result of geometric changes to the junction layout;
- ◆ The new junction layout appears to have attracted new trips to the junction from the A445 and Wolston Lane approaches. The roundabout appears to have created conditions that favour side road movements given that the speed of through traffic on the A45 has been much reduced;
- ◆ The new junction layout has introduced a geometric delay of 22 seconds for A45 traffic.
- ◆ Traffic on the side roads has experienced delay savings of 8 minutes during the AM and PM peak hours;
- ◆ The outturn monetary benefit of £152,869 in the opening year and £4.25m over 30 years is marginally less than the predicted corrected of £154,091 and £4.28m respectively; and
- ◆ Post opening moving observer surveys have illustrated that through traffic on the A45 has been subjected to an average of 22 seconds of geometric delay following scheme opening. This equates to an annual off-peak dis benefit of £22.43 million.

Safety Impacts

- ◆ Following the implementation of the speed cameras, the accident rate per year fell from 5.8 to 4.53 and hence the cameras resulted in a first year accident saving of 1.27;
- ◆ Following the implementation of the junction improvements, the annual accident rate has fallen from 4.53 to 0 and hence the scheme has resulted in a first year accident saving of 4.53 compared to a predicted saving of 2.82;
- ◆ The junction improvements appear to have resulted in safety benefits 3.5 times greater than achieved by the speed cameras implemented in April 2001;
- ◆ The speed cameras resulted in a reduction in accident severity from 54% (including 3 fatalities) to 24%, this still includes 1 fatality;

- ◆ We can be 95% confident that the change in accident rate following the completion of the junction improvements is not a result of chance alone and therefore the scheme has made a direct contribution to reducing accidents at the junction;
- ◆ The first year outturn safety benefit in the opening year is equivalent to £355,948, compared to a predicted estimate of £221,583; and
- ◆ The outturn 30 year safety benefit (£9.856m) is more than twice than the predicted (£4.348m).

Environmental Impacts

- ◆ The scheme has resulted in a slight adverse impact on noise;
- ◆ Air quality has suffered a slight negative impact as a result of the scheme;
- ◆ Due to the location of an archaeological site on land affected by the junction improvements and although an archaeological excavation was undertaken the scheme has a moderate adverse impact on Heritage of Historic Resources;
- ◆ The inclusion of improved pedestrian and cyclist facilities has likely to have resulted in a slight positive impact on Physical Fitness; and
- ◆ The conversion of the road layout from a staggered crossroads to a roundabout resulted in reductions in driver stress and fear of accidents, among other things this has resulted in a large beneficial impact on journey ambience.

Accessibility Impacts

- ◆ Pedestrian crossing points have been implemented across all arms of the junctions as well as cycle paths which has a slight positive impact on severance at the junction.

Integration Impacts

- ◆ The scheme has aligned with a number of local policies (including LTP objectives) and has therefore had a slight positive impact on land use and other government policy.

KEY LESSONS LEARNT

- ◆ The conversion of the junction from a staggered crossroads to a 4-arm roundabout has reduced speeds and provided better facilities and conditions for side road traffic (evident through the journey time savings experienced by users from such approaches). Such a trend suggests that the perception of safety at this location has improved;
- ◆ Geometric delay alone is unlikely to result in re-routing away from the junction affected;
- ◆ Traffic growth at this location has been suppressed by the closure of the Ryton Car Factory. Regeneration of the factory site may result in future traffic growth at the junction;
- ◆ Safety benefits were under-predicted, accident savings in the first year were almost twice that predicted by the PAR

- ◆ The speed cameras implemented in April 2001 provided a small reduction in accidents (1.27 accidents saved in opening year) and reduced accident severity significantly (from 54% to 24%);
- ◆ The junction improvements had a greater affect than the speed cameras, with no accidents occurring following scheme opening;
- ◆ Cycling facilities at the junction may have required more thought and consultation;
- ◆ The scheme has made a positive contribution to regional and local transport policies;
- ◆ The original PAR was poorly supported with relevant technical notes and empirical data to support the impacts claimed in the pre-opening appraisal. Consequently this assessment has largely focused upon peak hour benefits using a combination of modelled and observed delay/journey time data.

SUMMARY OF RECOMMENDATIONS

- ◆ Replacing a priority junction with a roundabout can lead to positive safety impacts and can assist in providing safe entry and exit from the core network and could therefore be considered elsewhere on the network where queues and accidents (between conflicting turning movements) prevail at key entry points to the network;
- ◆ Lane alignment and the location of markings should be considered carefully prior to implementation to ensure that traffic are safely directed through the junction and conflicts are minimised;
- ◆ A clear audit trail for journey time/delay impacts derived from modelling tools and JUICE should be provided (this could include a supporting technical note);
- ◆ Collection of pre and post-opening journey time data will enable the POPE and pre-scheme appraisal processes to derive a more accurate appreciation of outturn journey time benefits;
- ◆ Possible changes in land use should be considered in future assessments of schemes. Such changes may mean local growth factors may be more appropriate for scheme appraisal than NRTF97 factors.
- ◆ The location of cycling facilities at schemes such as this should be considered carefully to ensure maximum utilisation;
- ◆ All new drainage implemented as part of the scheme should be suitably linked up to gullies; and
- ◆ PAR should include some element of policy research to illustrate how schemes of national relevance fit with the local agenda.

CONCLUDING REMARKS

- 6.5 In summary, this POPE evaluation has demonstrated that the scheme at Ryton has delivered safety benefits far greater than those predicted in the original PAR assessment. The conversion of the junction from a staggered crossroads to a roundabout has improved safety at the junction significantly and therefore achieved the scheme's main objective.

- 6.6 In terms of the economic impacts, the new junction layout has provided substantial journey time savings for traffic entering the A45 from the side roads. Furthermore improvements to safety aspects of the junction have clearly helped to attract additional users to the junction. Although the roundabout has introduced additional geometric delay for mainline A45 traffic travelling straight through the junction, it appears to be causing minimal disruption to the flow of traffic through the junction. Such geometric delays have not deterred regular users of the junction to use alternative routes.
- 6.7 The calculation of the economic benefits of this scheme involved the use of both observed and modelled journey times. No pre-opening journey times were collected. Whilst modelling can provide an appreciation of likely delays or journey times occurring at a junction it does not offer a substitute for observed data. Consequently, as is the case for many large LNMS, there was a lack of 'before' observed data and therefore the journey time benefits calculated in this report should only be used to provide the HA and other readers with an indication of the overall scheme benefits.
- 6.8 Overall, as well as attaining the schemes main objective of improving safety, the junction improvements have also provided overall journey time benefits resulting in a positive BCR.

Appendix A

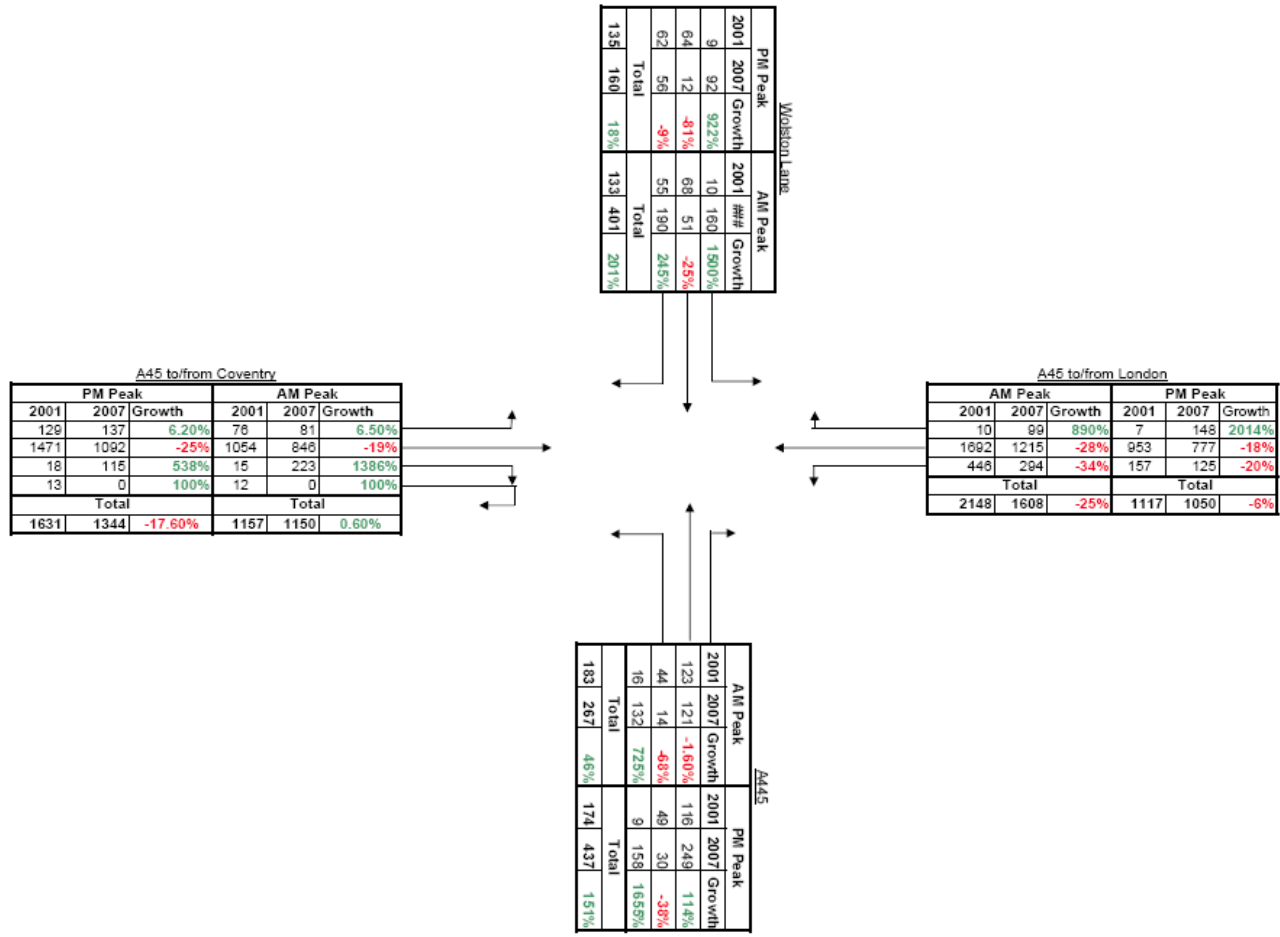


Figure 1 – Before and After Scheme Opening Turning Counts and Growth