HIGHWAYS AGENCY

Post Opening Project Evaluation

Meta-analysis Summary Report

March 2009

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Glossary of Terms

Term	Abbreviation	Description where appropriate
Area of Outstanding Natural Beauty	**AONB**	Treasured places in England and Wales where the landscape is considered worthy of protection by law for future generations. There are 41 **AONB**s in England and Wales, covering some 15% of the total land area.
Appraisal Summary Table	**AST**	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**
Automatic Traffic Count	**ATC**	A machine which measures traffic flow at a point in the road.
Benefit Cost Ratio	**BCR**	This is the ratio of the **PVB** divided by the **PVC**.
British Horse Society	**-**	Represents and promotes horse riding in the U.K. and abroad, including training, welfare, safety, and career qualifications
British Waterways	**-**	Public corporation that cares for the 2,200 mile network of canals and rivers in England, Scotland and Wales.
Cost Benefit Analysis	**COBA**	**CO**st **B**enefit **A**nalysis – a computer program which compares the costs of providing road schemes with the benefits derived by road users (in terms of time, vehicle operating costs and accidents), and expresses the results in terms of a monetary valuation. The **COBA** model uses the fixed trip matrix unless it is being used in Accident-only mode.
Design Build Finance & Operate	**DBFO**	Roads built with private capital transferring the risk to the private sector as a part of the Government's Private Finance Initiative (PFI).
Design Year	**-**	A set period after the opening of a scheme for which the scheme is designed to be fit for purpose. This is usually 15 years after the planned opening year.
Department for Transport	**DfT**	A Government department whose objective is to oversee the delivery of a reliable, safe and secure transport system that responds efficiently to the needs of individuals and business whilst safeguarding our environment. The **HA** is an executive agency of the **DfT**.
Design Manual for Roads and Bridges	**DMRB**	A comprehensive manual system which sets out current standards, Advice Notes and other published documents relating to Trunk Road works.

Term	Abbreviation	Description where appropriate
Do-Minimum	**-**	In scheme modelling, this is the scenario which comprises the existing road network plus improvement schemes that have already been committed.
Do-Something	**-**	In scheme modelling, this is the scenario detailing the planned scheme.
Environment Agency	**EA**	Public body for protecting and improving the environment in England and Wales.
Economic Assessment Report	**EAR**	A report presenting the economic appraisal of a scheme.
English Heritage	**EH**	The Government's statutory adviser on the historic environment.
Environmental Statement	**ES**	This must be submitted with the initial planning application and covers all potential significant impacts that the road project may have.
Evaluation Summary Table	**EST**	In **POPE** studies, this is a summary of the evaluations of the **NATA** objectives using a similar format to the forecasts in the **AST**.
Five Years After	**FYA**	Relating to five years after a scheme opened.
Highways Agency	**HA**	An Executive Agency of the Department for Transport, responsible for operating, maintaining and improving the strategic road network in England.
Highways Agency Traffic Information System	**HATRIS**	The **HA** currently maintains, operates and develops three traffic databases and associated applications. The Traffic Flow Data System (**TRADS**) holds information on traffic flows at sites on the network. The Journey Time Database (**JTDB**) system holds information on journey times and traffic flows for links of the network. These two databases are known collectively as the HA Traffic Information System (**HATRIS)**.
Handover Environmental Management Plan	**HEMP**	Issued at the end of the 5 year after care period with recommendations for long term management and maintenance of environmental measures which were put in place with the scheme.
Journey Time Database	**JTDB**	Holds information on journey times and traffic flows for links of the network. Contained within the **HATRIS** database.
Local Model Validation Report	**LMVR**	A mandatory key element in reporting model reliability. Its purpose is to demonstrate the model reproduces an existing situation; summarise the accuracy of the base from which the forecasts are derived; to present validation procedures, and details of adjustments made during calibration
Major Schemes programme	**-**	The **HA**'s programme of investment in improvements to the Trunk road and Motorway road network comprised of a number of major schemes each costing more than £5m. Formerly known as **TPI.**

Term	Abbreviation	Description where appropriate
Meta-analysis	**-**	A quantitative method of combining the results of independent studies and synthesizing summaries and conclusions from which new and improved processes can be developed.
Motorway Incident Detection and Signalling system	**MIDAS**	Inductive loops installed in the carriageway monitoring speeds, vehicle types and flows. The prime aim of **MIDAS** is to protect the back of queues, which have formed or are about to form, by automatically setting suitable signals to warn approaching traffic.
New Approach To Appraisal	**NATA**	New Approach to Transport Appraisal (1998) the basis of the standard current **DfT** appraisal approach.
National Trust	**-**	A charity completely independent of Government which works to preserve and protect the buildings, countryside and coastline of England, Wales and Northern Ireland, in a range of ways, through practical conservation, learning and discovery.
Natural England	**NE**	The government's advisor on the natural environment, whose remit is to ensure sustainable stewardship of the land and sea so that people and nature can thrive.
Non-Motorised Users	**NMU**	A generic term covering pedestrians, cyclists and equestrians
Net Present Value	**NPV**	The net surplus of discounted benefits.
National Road Traffic Forecasts	**NRTF**	This document defines the latest forecasts produced by the **DfT** of the growth in the volume of motor traffic. The most recent one is **NRTF**07 and the one previous was **NRTF**97.
National Traffic Control Centre	**NTCC**	A National Service set up by the Highways Agency to collect, analyse and disseminate traffic information to the public and road users about traffic flow and journey times. Information is collected through inductive loops and CCTV camera and disseminated primarily through Variable Message Signs.
Off line	**-**	Not following the alignment of the existing carriageway.
One Year After	**OYA**	Relating to one year after a scheme opened.
Project Control Framework	**PCF**	The Framework sets out how the **HA**, together with the **DfT,** manage and deliver major improvement projects. It is designed to ensure delivery of road projects which meet customers' aspirations in a cost efficient and timely manner. The framework includes a project lifecycle which breaks down the development and delivery of a major project into various phases and stages.
Personal Injury Accident	**PIA**	A road traffic accident in which at least one person required medical treatment.
Public Inquiry	**PI**	This is where the public is consulted over an issue of possible concern to them.
Post Opening Project Evaluation	**POPE**	Before and after monitoring of all major highway schemes in England.
Present Value Benefits	**PVB**	Value of a stream of Benefits accruing over the appraisal period of a scheme expressed in the value of a single 'present' year.
Present Value Costs	**PVC**	As for **PVB** but for a stream of costs

Term	Abbreviation	Description where appropriate
Royal Society for the Protection of Birds	**RSPB**	Europe's largest conservation charity, whose aim is to protect birds and the environment
Standard deviation	**-**	Measures the spread of the data about the mean value. Useful in comparing sets of data which may have the same mean but a different range.
Site of Interest for Nature Conservation	**SINC**	A designation used in the United Kingdom for areas of wildlife interest.
Sites of Specific Scientific Interest	**SSSI**	The country's very best wildlife and geographical sites. There are over 4,000 **SSSI**s in England, covering around 7% of the country's land area.
-	**STATS19**	A database of injury accident statistics recorded by police officers attending accidents.
Traffic Appraisal, Monitoring and Evaluation	**TAME**	The team within the **HA** responsible for traffic appraisal, monitoring, evaluation and modelling issues.
Trip End Model Program	**TEMPRO**	A program which provides access to the **DfT**s national Trip End Model projections of growth in travel demand, and the underlying car ownership and planning data projections.
Traffic Impact Study	**TIS**	A study which looks at the impacts of a Highway scheme shortly after opening, focusing on traffic and journey times.
Targeted Programme of Improvements	**TPI**	The **HA**'s programme of investment in improvements to the Trunk road and Motorway road network comprised of a number of major schemes each costing more than £5m. Now called **Major Schemes**.
Traffic Data System	**TRADs**	The Traffic Data System holds information on traffic flows at sites on the network. Contained within the **HATRIS** system.
Transport Users Benefit Analysis	**TUBA**	A computer system issued and maintained by the Highways Agency. The program calculates the costs and benefits that would accrue to users of a transport system, companies, national and local government as a result of making improvements to a transport network.
Vehicle Operating Costs	**VOC**	The use of the road system by private cars and lorries gives rise to operating costs for the user. These include costs of fuel, oil and tyres, and an element of vehicle maintenance.
WebTAG	**-**	**DfT**'s website for guidance on the conduct of transport studies.

1. Introduction

Overview

1.1 The Highways Agency (HA) is responsible for improving the strategic highway network by delivering schemes within the Major Schemes Programme. The Major Schemes programme, (formerly known as Targeted Programme of Improvements – TPI), are improvements to the trunk road network costing £5 million or more. Before the decision to go ahead is made, these schemes are subject to a detailed appraisal that considers the five Central Government NATA (New Approach to Appraisal) objectives for Transport:

- Environment;
- Economy;
- Safety;
- Accessibility; and
- Integration.

1.2 The HA evaluates all schemes after opening to see if the forecast impacts have been realised, and this process is known as POPE (Post Opening Project Evaluation). For each scheme, an individual report is prepared which details all of the predicted impacts and assesses whether these impacts have occurred. These reports are usually produced one year after (OYA) and five years after (FYA) the scheme opened.

1.3 The HA has commissioned Atkins to undertake both the individual scheme reports and this meta-analysis Report on their behalf.

1.4 Figure 1.1 shows a map of the POPE process.

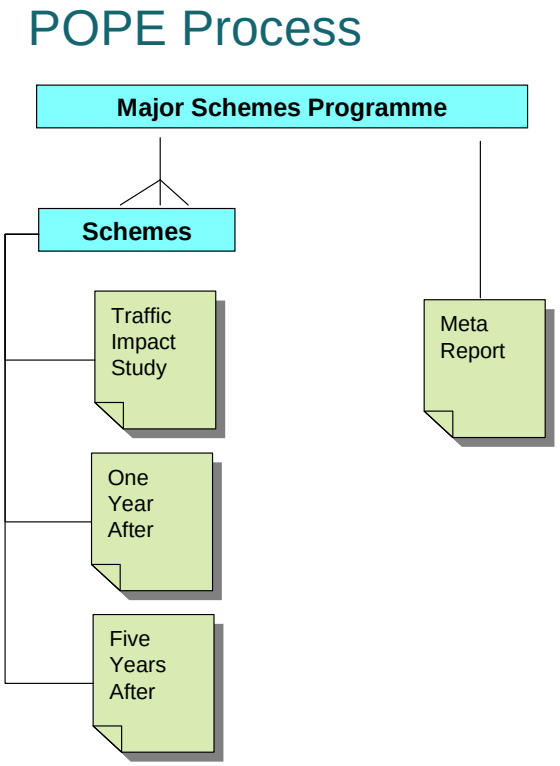


Figure 1.1 – The POPE Process

1.5 A Traffic Impact Study (TIS) may also be prepared if questions are likely to arise about a scheme soon after it opens. A TIS compares traffic volumes observed immediately after the scheme opens with traffic volumes counted just before opening. Typically a TIS is prepared 3-6 months after opening, but is not mandatory.

1.6 As part of the POPE evaluation, an Evaluation Summary Table (EST) is produced, which mirrors the appearance of the Appraisal Summary Table (AST) produced when the scheme is appraised. The AST records predicted benefits and impacts and the EST records outturn benefits and impacts.

1.7 Before 2003, POPE evaluations were primarily focused on the Traffic, Economy, and Safety impacts of schemes. In 2003 a selected number of schemes evaluated in more detail the environmental impacts, piloting a new methodology. This approach was then adopted for all schemes at the start of the current contract. Likewise, following a piloting programme at selected schemes, the Accessibility and Integration objectives have been evaluated in greater detail, and this has been in place since 2007.

Objectives of this Report

1.8 As well as the reporting of all impacts in individual reports, the POPE process is designed to provide an information base to help improve the appraisal methods currently used in England, and this is undertaken by considering the combined impacts from all of the individual evaluations in the form of a 'meta-analysis' Summary Report. A meta-analysis is one which seeks to draw conclusions from a number of evaluations so that general themes and trends can be determined.

1.9 The main objectives of this report are therefore:

- To identify differences between targeted (predicted) and outturn benefits and impacts;
- To interpret these differences using evidence-based methods; and
- To provide feedback on conclusions.

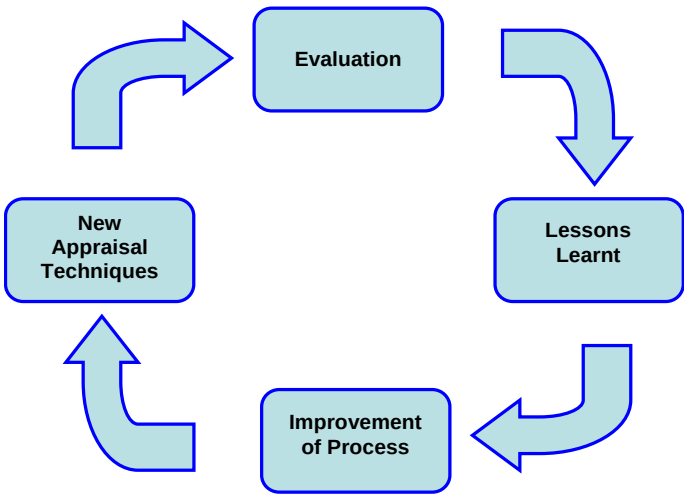
1.10 For the 2008 meta-analysis, this report has been developed from a number of themed 'daughter documents', namely a detailed assessment of five key areas of most concern to the HA. These are:

- Traffic Impacts;
- Economy;
- Safety;
- Environment; and
- Accessibility/Integration and Consultation.

1.11 In summary, this meta-analysis report brings together all POPE schemes to identify common themes in the data. It examines the relationship between scheme predicted and outturn benefits and impacts, across all of the appraisal objectives.

1.12 The Highways Agency will use the outcomes from the meta-analysis to inform their decision-making and 'appraisal' methods. Figure 1.2 shows the cycle between POPE and the improvement to appraisal techniques.

Figure 1.2 – The POPE & Appraisal Cycle



1.13 An inclusive approach has been taken to ensure that this meta-analysis report and accompanying 'daughter documents' would deliver the level of detail required to inform the Highways Agency's appraisal methods. Discussion groups were organised with TAME and Major Projects, including Highways Agency technical advisors on traffic and environmental appraisal. A 4-stage approach was adopted, which included:

- Data gathering, setting out the findings;
- Consultation with internal experts to draft out conclusions;
- Client discussion groups providing feedback on early findings and report structure; and
- Reporting of the findings and conclusions drawn.

Data Sources and Availability

1.14 A meta-analysis report is produced every two years in order to allow time for more scheme evaluations to have taken place. The analysis does not include TIS evaluations. Each meta-analysis report derives data from schemes evaluated in the last two years in addition to the results used in the previous report. Over time therefore, it is hoped that these reports will draw more conclusions and make more informed recommendations as each analysis is derived from a wider evidence base.

The Schemes

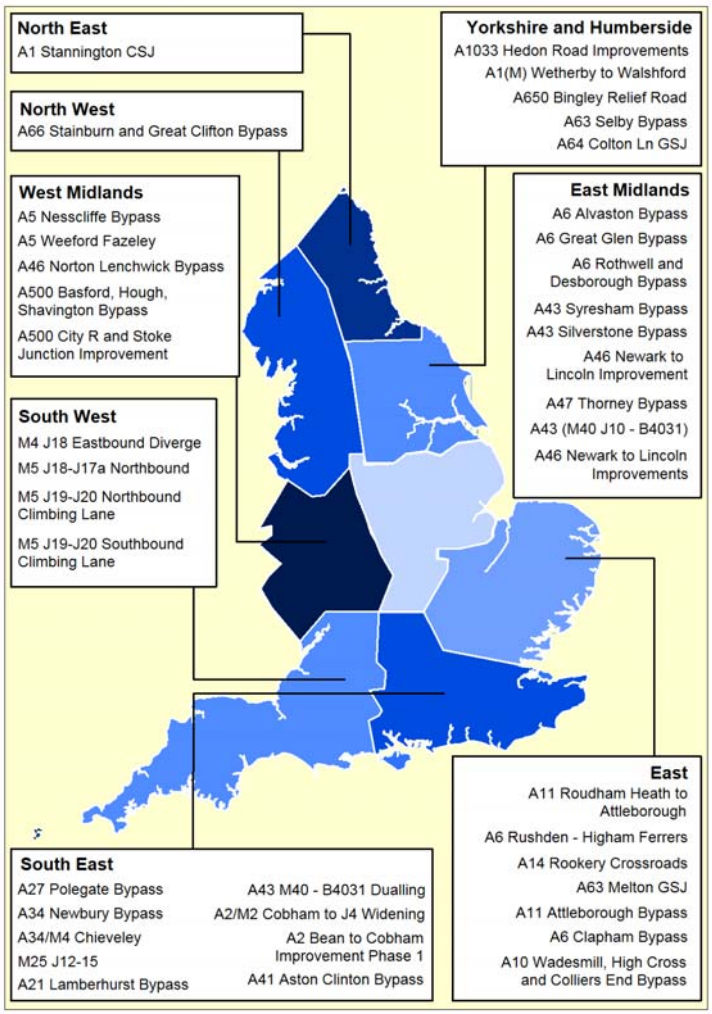
1.15 There were 20 POPE schemes included in the 2006 meta-analysis report. This report considers all POPE schemes evaluated since 2001 and draws information from a total of 40 POPE schemes.

1.16 In some instances, due to the lack of available data, a particular scheme may not be included in all 'daughter documents' and this is why the number of schemes differs for each of the meta-analyses.

1.17 It is mandatory within the POPE process to undertake evaluations One Year After (OYA) and Five Years After (FYA) the scheme has opened, however as the POPE process only started in 2002, and evaluated schemes that opened in mid 2002, there are very few schemes in the 5 Years After stage where the evaluations and approval have been completed, hence, the majority of the conclusions drawn have been for the One Year After stage.

1.18 Figure 1.3 illustrates the locations of the schemes used in this report, by region.

Figure 1.3 – Location of Schemes used in meta-analysis report



1.19 Within each of the meta-analyses, the schemes have been broadly categorised as follows:

- Bypass schemes;
- Junction schemes; and
- Online schemes.

Structure of this Report

1.20 Following on from this introduction, the report is structured as follows:

- **Section 2 – Traffic Impacts**. This section of the report presents a summary of the separate 'daughter document' which assesses the physical impact of the schemes in terms of traffic flows and journey times;
- **Section 3 – Safety.** This section of the report presents a summary of the separate 'daughter document' which assesses the safety impacts of schemes in terms of accident savings and accuracy of predicted safety benefits;
- **Section 4 – Economy.** This section of the report presents a summary of the separate 'daughter document' which assesses the monetised impacts of the schemes in terms of economy benefits comprising of time savings for road users and monetised safety benefits that accrue from accident savings;

- **Section 5 – Environment.** This section of the report presents a summary of the separate 'daughter document' which assesses the Environmental impacts of the schemes for the 10 environmental sub-objectives;
- **Section 6 – Accessibility, Integration and Consultation**. This section of the report presents a summary of the separate 'daughter document' which assesses the schemes' impacts on accessibility and integration, and findings from the consultation process.
- **Section 7 – Conclusions.** This section of the report brings together the conclusions from the meta-analyses presented in Sections 2 to 6; and
- **Section 8 – Recommendations.** This section of the report brings together the recommendations from each of the meta-analyses presented in Sections 2 to 6 based on the conclusions in Section 7.

2. Traffic Impacts

Introduction

2.1 This section of the report summarises the assessment of the physical impact of the schemes in terms of traffic flows and journey times, which is presented in greater detail in a separate 'daughter document' on Traffic Impacts.

Traffic Modelling

2.2 As part of the Appraisal for any scheme, it is usual for detailed modelling techniques to be used to predict how many vehicles will use the new road, the changes on other roads, as well as impacts on journey times. These predictions are fundamental in the justification of the schemes as they directly affect the predictions of economy and safety benefits as well as environmental impacts of schemes.

2.3 Accurate modelling is therefore crucial to understand the impacts of Major Schemes and to provide input to the many aspects of the appraisal process to justify their construction.

2.4 After discussion with the Highways Agency TAME (Traffic Appraisal, Monitoring and Evaluation) section, which is the section of the HA that approves and reports on traffic modelling issues, the key areas of interest on the traffic impacts are to understand and explain the performance of the traffic modelling undertaken during the appraisal stage.

2.5 A significant amount of data on traffic modelling issues has been discussed within the individual POPE reports, however, in order to maximise the usefulness of this report, a series of questions were agreed between all parties that the meta-analysis report and its 'daughter document' on Traffic Impacts should seek to answer.

2.6 These questions are:

- **Are the HA Traffic Models accurately estimating scheme traffic volumes?**
- **What are the main reasons for under or over-estimating traffic volumes?**
- **Are the schemes still successful in terms of monetary benefits despite under or over-prediction of traffic?**

2.7 This meta-analysis of Traffic Impacts specifically looks to address these issues in order to derive a series of conclusions and recommendations for the HA and Department for Transport (DfT) to consider as part of any revisions to the appraisal process. The conclusions and recommendations from this and the following sections are presented in Sections 7 and 8, respectively.

The Schemes

2.8 In order to evaluate the predicted and outturn traffic flows, the schemes were categorised into two broad groups as follows:

- **Bypass schemes**; and
- **Non-Bypass schemes** such as on-line and junction improvements.

2.9 For the evaluation of traffic impacts, this section of the report considers all POPE schemes evaluated since 2001 and draws information from 37 POPE schemes.

Table 2.1 – Number of schemes used in traffic meta-analysis

		Non-Bypass Schemes		
	Bypass Schemes	**Junction Schemes**	**Online Schemes**	**Total**
One Year After (OYA)	19	6	10	**35**
Five Years After (FYA)	1	0	0	**1**
Ten Years After (10YA)[1]	1	0	0	**1**
Total	21	6	9	**37**

Data Source and Availability

2.10 A comprehensive traffic data collection exercise is undertaken for all POPE schemes. This involves collating data from a number of sources and undertaking new data collection where required, before and after schemes open.

Predicted Traffic

2.11 Predicted traffic volumes, data and information are taken from the following scheme assessment reports:

- Appraisal Summary Table (AST) and supporting information;
- Economic Assessment Report (EAR);
- Cost Benefit Analysis (COBA);
- Traffic Forecasting Report; and
- Model Validation Report.

2.12 By examining the extent and quality of the data available for all POPE schemes that are ongoing, not just those that are completed, the following conclusions have been drawn:

- For 77% of schemes, the Economic Assessment Report is available and has been supplied;
- For 64% of schemes, COBA/TUBA data is available and has been supplied;
- The quality and range of information for individual schemes varies with some lacking clarity on the extent of the model network, predicted journey times and what new developments or roads are included;
- Where a scheme has been assessed several times during their preparation, it is often unclear which stage a set of documents refers to; and
- The availability of data has implications for the level of certainty in the conclusions that POPE evaluations can make.

[1] A Ten Year After (10YA) scheme evaluation was undertaken as part of a pilot for the POPE process, and has been included here as there is useful data to add to findings. More details are in the separate 'daughter-document' on traffic.

Outturn Traffic

2.13 Traffic information needs are decided by considering the following:

- Links forecast to have a significant change due to the scheme, as reported in the Traffic Forecasting Reports;
- Liaison with the HA Project Sponsor and Local Authority to understand local perceptions and issues; whilst
- Ensuring that a sensible budget is maintained, i.e. cost effective approach to data collection must be maintained.

2.14 The links most likely to be impacted upon by the scheme are identified and agreed with the HA and local authority, in order to allow for any strategic re-routing that may result from the scheme.

2.15 Data for the HA network is obtained from existing Automatic Traffic Counters (ATCs), some of which can also measure speed. The Traffic Survey report from the scheme planning stage may also provide useful information, if it is not too old.

2.16 The local authorities are also requested to supply ATC data for the roads in their area. In some cases, the Local Authority may also be willing to install temporary counts at additional locations that have been indentified as important.

2.17 Having assessed what survey data is available from the HA and local authority, additional supplementary surveys are carried out where required. This will generally include:

- ATCs (temporary tubes);
- Journey time surveys; and
- Classified turning counts (manual or video) at junctions for certain schemes where a particular requirement is identified.

2.18 Data is collected before scheme construction starts, one year after opening and five years after opening. This gives the POPE evaluation team an excellent database of traffic counts and journey times on links expected to undergo a change after scheme opening as well as picking up on local issues concerning key stakeholders.

2.19 Report availability and content is a key issue in understanding the predictions in terms of changes in traffic characteristics.

Journey Time Savings

2.20 We have also looked at whether conclusions can be drawn about the accuracy of predicted journey time savings. As part of the evaluation within POPE, journey time surveys are undertaken both before and after the opening of the scheme in the peak and inter-peak time periods, and by direction. Hence, we have excellent information on the outturn position.

2.21 Although it is possible to show predicted and outturn journey time saving comparisons, several limitations of the comparison must be considered:

- The predictions are for the ‘Do-Minimum’ and ‘Do-something’ scenarios. The outturn figures are used as a comparison to the ‘Do-Something’ scenario. The ‘Do-Minimum’ scenario assumed that the scheme was not built. As the ‘Do-Minimum’ situation did not occur, measurements in the ‘before’ year are used as a proxy. Therefore we use the change between before and outturn to compare to the predicted difference between ‘Do-Minimum’ and ‘Do-Something’.
- The WebTAG guidance for measuring economic efficiency has changed from presenting the journey time savings in the design year to the opening year, however the schemes reviewed

as part of this meta report generally show design years estimates and therefore need to be factored back to opening year; and

- Journey times and savings are generally not reported within the Forecasting Reports of schemes making it hard to understand how predictions were calculated

Are the HA Traffic Models Accurate?

2.22 This question is clearly of importance to the HA, in that many aspects in the appraisal of schemes are dependent on the accuracy of the traffic models used at the time of the appraisal.

2.23 The simplest method of assessing whether a scheme has performed as predicted is to determine whether the outturn traffic flow lies within a particular threshold of the predicted flow in the opening year. In this case a value of plus or minus 15% was chosen, which is in accordance with the guideline target values for model validation defined within DMRB Volume 12.

Bypass Schemes

2.24 Within the full set of schemes, there are a total of 21 bypass schemes that have been evaluated in the POPE process. The full list of bypass schemes used in this meta-analysis is included in Appendix A.

2.25 The schemes are geographically diverse and also range from small town bypasses to major schemes such as the A34 Newbury Bypass and hence provide a good sample set to derive lessons learnt for this type of investment.

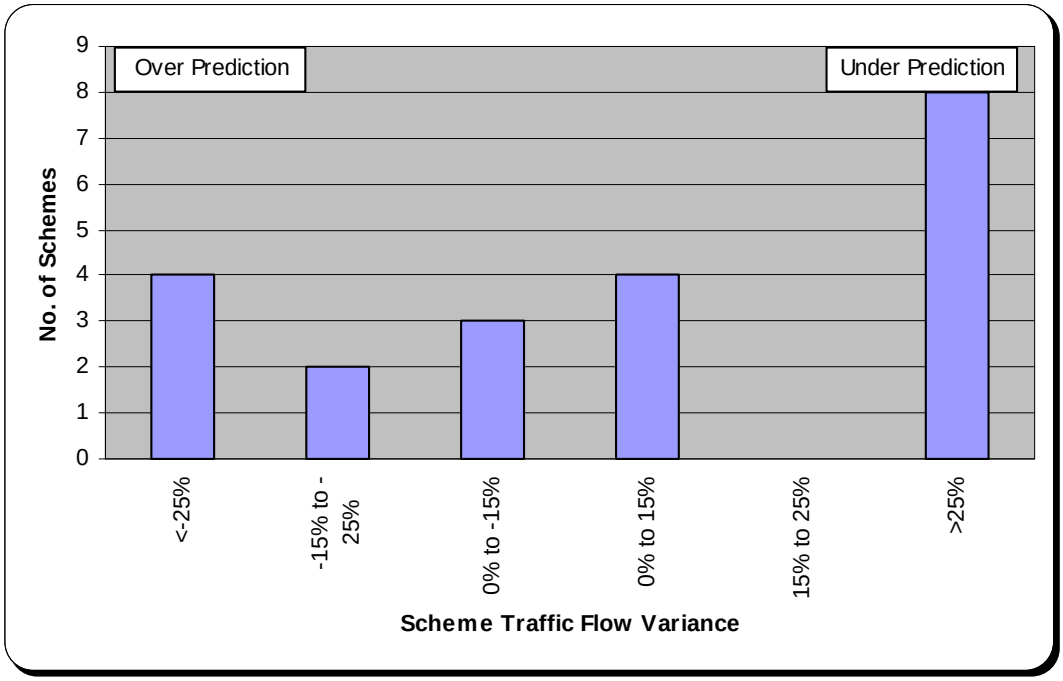
2.26 For a bypass scheme three routes are considered as part of an assessment, that is:

- Old Route – the bypassed route;
- Bypass – the route of the new bypass; and
- Corridor – the combined bypass route and bypassed route.

2.27 The separate 'daughter document' on Traffic Impacts presents in greater detail a summary of whether the outturn traffic volumes lie within the plus or minus 15% threshold of the predicted flow in the opening year for each of the bypass schemes. The key points from this comparison are illustrated in Figures 2.1 to 2.3, and the points below:

Old Route

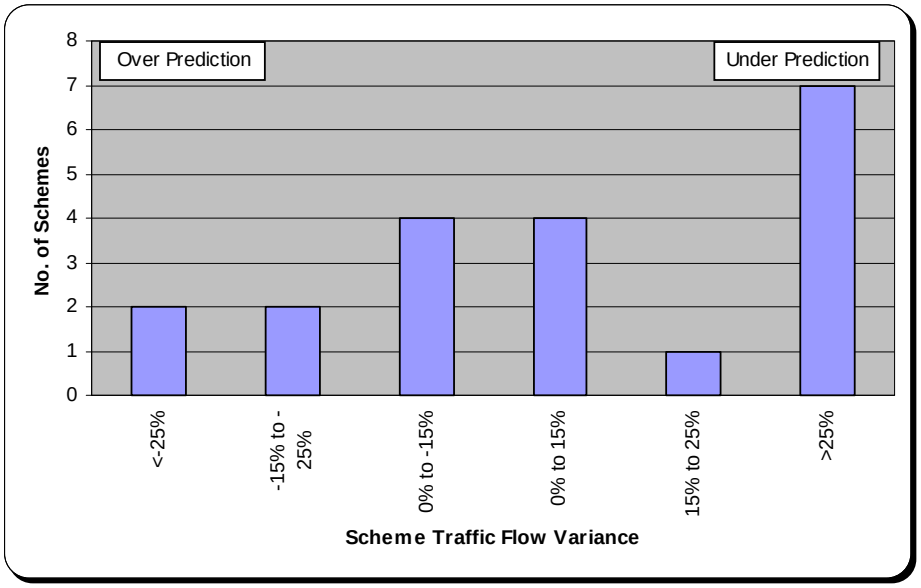
Figure 2.1 – Route - Number of Schemes Under or Over-Predicting Traffic Flows



- Over half of the scheme models have under-predicted traffic volumes on the old route and of these 12 under-predictions, 8 are under-predicted by more than 25%;
- The standard deviation which indicates how far on average the predicted flows are from the 1:1 line is calculated to be 65%;
- The residual flow on the old route is usually very low as most traffic is removed. Therefore a large percentage error does not necessarily mean that the prediction is out by much in absolute terms; and
- The majority of the schemes that have outturn traffic volumes above those predicted are significantly above the 25% threshold, whereas those over-predicting reflect a closer fit.

Bypass Route

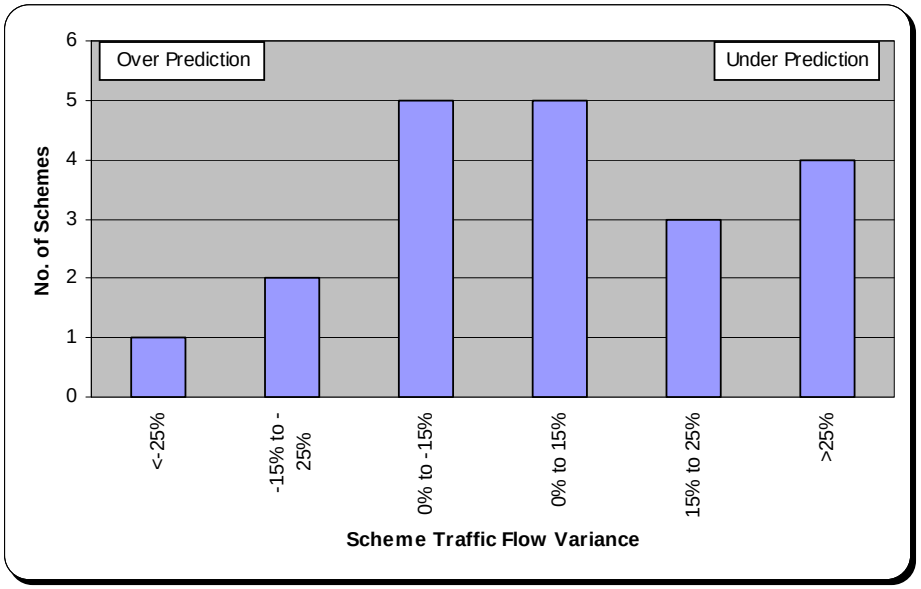
Figure 2.2 – Bypass Route - Number of Schemes Under or Over-Predicting Traffic Flows



- 40% of the bypass schemes evaluated have outturn traffic volumes on the bypassed road within 15% of those predicted;
- A large number of schemes (35%) show differences of greater than 25%, and the majority of these have outturn traffic volumes above those predicted (under-predicting); and
- The standard deviation relative to the mean for the new bypass route has been calculated at 29%, which means a better correlation than for the old route.

Corridor

Figure 2.3 – Bypass Corridor - Number of Schemes Under or Over-Predicting Traffic Flows



- 50% of bypass schemes have outturn traffic volumes on the corridor within 15% of those predicted;
- 60% of scheme traffic models under-predicted traffic volumes for the corridor, and 40% over predicted;

- There are still a reasonably high number of schemes (around 25%) that show differences of greater than 25%, and the majority of these have outturn traffic volumes above those predicted (under-predicting); and
- The standard deviation relative to the mean for the corridor has been calculated at 27%, which means a better correlation than for the old route and bypass route.

Non-Bypass Schemes

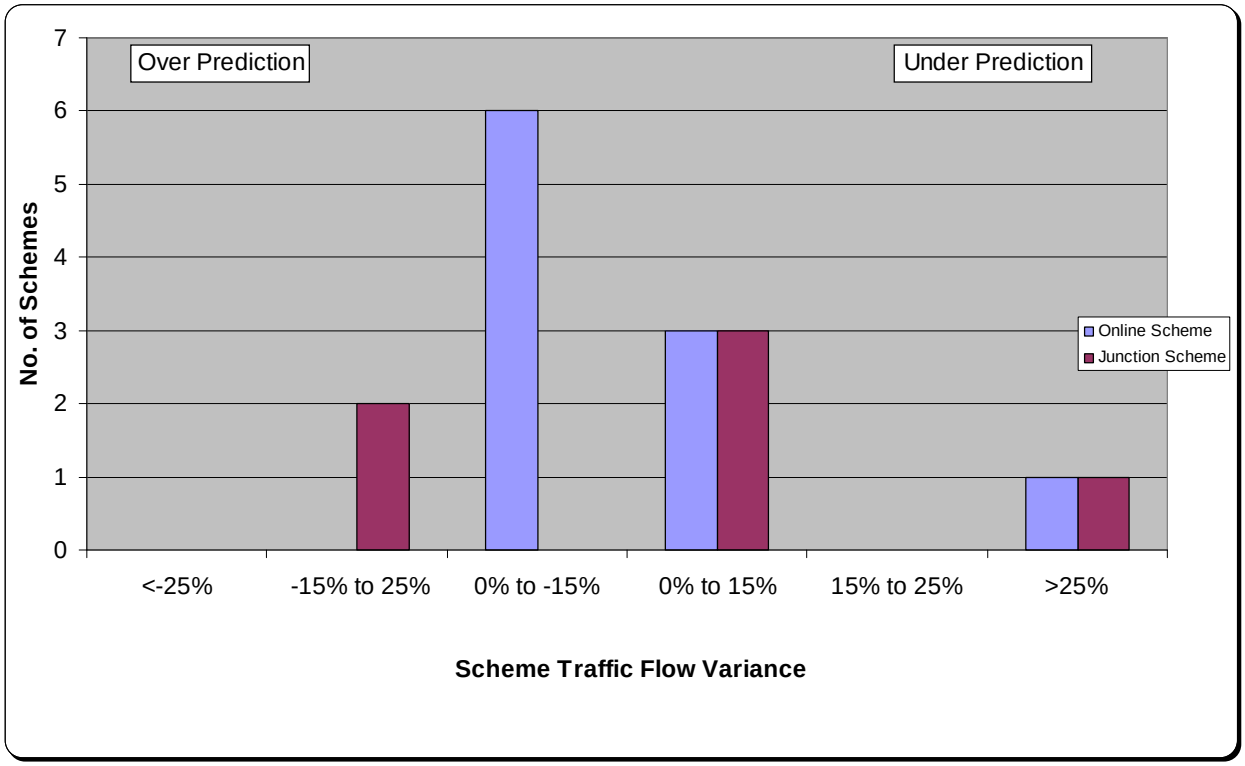
2.28 16 non-bypass schemes have been evaluated in the POPE process. A non-Bypass scheme is identified as either an:

- Online scheme – improvement or widening; or
- Junction scheme – normally grade separation.

2.29 The 16 schemes consist of 10 online and 6 junction schemes, which are listed in Appendix A.

2.30 The separate 'daughter document' on traffic impacts presents in greater detail the comparisons of predicted and outturn flows for non-bypass schemes, and explores possible reasons for schemes that show a significant difference between outturn and predicted traffic volumes. The key findings however from this comparison are illustrated in Figure 2.4 and in the points below:

Figure 2.4 – Non-Bypass Corridor - Number of Schemes Under or Over-Predicting Traffic Flows



- Of the 16 non-Bypass schemes evaluated, 74% have outturn traffic volumes within 15% of those predicted;
- The standard deviation relative to the mean for the non-Bypass schemes has been calculated to be 19% for junction schemes and 18% for online schemes;
- This shows significantly closer predictions to the outturn flows than for Bypass schemes;
- Junction schemes have no significant bias towards under or over-prediction; and
- Of the 10 online schemes assessed, 90% were within a 15% threshold of the forecast.

Reasons for Under or Over-Predicting Traffic Volumes

2.31 The next step is to build a better appreciation of the potential causes for the differences between outturn and predicted traffic volumes. In order to undertake this analysis, it was necessary to review in detail all available reports to determine the predicted traffic volumes and the key assumption on the modelling approach. A common sense view was taken to determine the most likely reason for any significant differences between outturn and predicted traffic volumes.

2.32 Of the 37 schemes considered, 18 schemes had outturn traffic volumes more than 15% above or below those predicted. This included 14 bypass schemes and 4 non-bypass schemes.

Reasons for Variance

2.33 The separate 'daughter document' on Traffic impacts looks in greater detail on a scheme by scheme basis at the possible reasons for the under or over-prediction of traffic flows. This analysis highlighted the five main causes for the variance in predicted opening year traffic volumes, and these are:

- Strategic routing assumptions;
- Local routing assumptions;
- Background growth assumptions;
- Land use issues; and
- Other schemes (that were assumed to be constructed within the traffic model that were not actually completed or schemes that were not modelled, but did actually get constructed).

2.34 The proportion of schemes that under or over-predicted traffic flows for the reasons above are shown in Table 2.2 below:

Table 2.2 – Reasons for Under or Over-Prediction of Traffic Flows[1]

Outturn Flows Higher than Predicted (Under Prediction)	Potential Causes	Outturn Flows Lower then Predicted (Over Prediction)
6 Schemes (33%)	Strategic routing model issues	1 Scheme (6%)
2 Schemes (11%)	Local routing model issues	1 Scheme (6%)
2 Schemes (11%)	Background growth assumptions (lower/ higher)	1 Scheme (6%)
0%	Land Use issues	2 Schemes (11%)
0%	Other schemes not completed	3 Schemes (17%)

2.35 The primary reasons identified above help to explain the vast majority of the differences between predicted and outturn traffic volumes, and although difficult to measure with any confidence the level of newly generated or induced traffic does not appear significant.

Does Traffic Variance Matter?

2.36 This section of the meta-analysis looks at the extent to which the under or over prediction of traffic volumes in the models is reflected in the economic benefits i.e does model error matter? 24 schemes were used in this analysis, this includes 16 bypass schemes, 3 junction schemes and 5 online schemes.

2.37 Analysis was undertaken to assess the relationship between the accuracy of the predictions of traffic volumes and the outturn travel time benefits. This looked at how the outturn travel time benefits changed in response to the outturn traffic volumes that were observed for the scheme. Just the travel time elements of the benefits have been used. This way accident benefits are excluded, which may not be as related to traffic volumes in this analysis.

2.38 The key findings from this analysis are:

- There was a marked difference in the outcome for bypass and non-bypass schemes, although some caution must be exercised given the low sample size of 7 for non-bypass schemes;
- In general, bypass schemes delivered better than expected travel time benefits when traffic volumes were higher, because more people than expected were benefiting; and

[1] Analysis of a base number of schemes where the prediction was out by +/- 15%

- However, for junction and online schemes, where traffic variation is more significant, benefits were higher than predicted when traffic volumes were lower. This is because the extra traffic has impacted on the travel times.

Conclusions

2.39 A summary of the main traffic conclusions addressing the key questions are shown below.

What are the key issues on data availability?

- There was no single archiving system for key scheme data and documents before POPE.
- There are clear benefits in starting POPE involvement before construction, in terms of archiving relevant material and maximising value-for-money in data collection.
- Key traffic appraisal reports are often not following guidance in terms of the presentation of outputs, hindering the explanation of differences between predicted and outturn traffic volumes and journey times.

Are the HA models accurately estimating scheme traffic volumes and journey times?

- Only 40% of bypass schemes are modelled accurately and the predicted traffic volumes generally exceed outturn traffic volumes;
- For online widening or junction improvement schemes, the majority (75%) accurately predict traffic volumes;
- Predicted journey time savings are not clearly reported and lack detail on where and when they apply, which makes comparison with outturn values impossible.

What are the reasons for under or over-predicting traffic volumes?

- The reasons for differences can be categorised into five key areas:
  - **Strategic re-assignment** into the corridor not being modelled accurately or model network not being large enough to pick up all effects;
  - **Local re-assignment** into the scheme corridor from local roads not in the model;
  - **Background traffic growth assumptions** whereby the national forecasts used have not been representative of local growth;
  - **Proposed new developments** may have been assumed in the appraisal that have yet to come to fruition, particularly for One Year After scheme evaluations; and
  - **Other schemes** included in the appraisal traffic modelling have not yet materialised, or new schemes which were not accounted for have been built.
- These primary reasons explain the variance between predicted and outturn traffic volumes for most schemes meaning that, in our view, the level of induced traffic for most schemes is not measurable.

3. Safety

Introduction

3.1 This section of the report summarises the meta-analysis of safety evaluations of major schemes, which is presented in greater detail in a separate 'daughter document' on Safety. The appraisals of the safety impacts of schemes are based upon detailed modelling techniques which produce predictions of the numbers of accidents saved over the appraisal period and the financial benefit thereof. The modelling is based upon modelled traffic volumes, observed accident data and national average accident rates by road type.

3.2 The purpose of the safety meta-analysis is to:

- Identify and examine the accuracy of the predictions for the change in the number of accidents, based on the POPE studies undertaken for these schemes at the one year and five years after stages;
- Identify any trends or inconsistencies in the findings;
- Interpret the differences between the predicted and outturn savings using evidence-based methods; and
- Provide feedback to the appraisal process by identifying conclusions.

3.3 The monetised benefits of accident savings over the appraisal period are considered separately in the Economy section of this report, and dealt with in detail in the 'daughter document' on Economy.

Safety Modelling

3.4 The key areas considered are:

- **How good are the predictions of the safety modelling, compared to the outturn savings?**
- **For schemes which have been evaluated at the One Year After and Five Years After stages, does the comparison of accident results show that predictions will get more accurate as sample time period increases? and**
- **What evidence is there for any change in accident rates due to online widening?**

3.5 In order to provide a comprehensive response to these questions, it was necessary to review in detail the individual scheme evaluation reports, and also undertake further analysis of the sample of schemes for which accident information was available.

Data Sources

Predicted Impact on Safety

3.6 The modelling of the safety impact of a scheme is done at the time of the scheme appraisal through the use of the Cost Benefit Analysis (COBA) software. This provides predictions of:

- The number of personal injury accidents saved:
  - In the opening year;
  - In the design year; and
  - In total over the whole appraisal period of 30 or 60 years;

- Predicted number of casualties saved over the appraisal period by severity of injury (fatal/severe/slight); and
- The predicted monetised benefit of the safety impact over the appraisal period. This is based on the monetised value of the casualty savings taking severity into consideration, and the monetised value of the accident savings including an allowance for damage-only accidents.

3.7 Of these modelled predictions produced by COBA, the only figures normally published are the predicted savings for the whole appraisal period. These feature in the Appraisal Summary Table (AST) produced in accordance with WebTAG.

3.8 Hence, in order to derive predicted estimates of accident changes that can be compared to the outturn situation, access to the COBA model used in the appraisal is required. Therefore only schemes with COBAs were included.

Outturn Accident Impact

3.9 The POPE evaluation of the outturn safety impact of a scheme is based upon calculating the difference between the annual numbers of personal injury accidents in the period before the scheme was built and after opening. The area covered is the road network modelled in COBA, not just the road directly affected by the scheme.

3.10 The source of the observed accident data is the STATS19 data on Personal Injury Accidents collected by the police and processed by local authorities. This is obtained for at least 3 years prior to construction, and for the period following the opening of the scheme which should be at least 12 months.

3.11 There are a number of schemes where the safety evaluation at the Five Years After stage is available, and these have also been assessed so that accident totals are derived five years before and five years after scheme opening.

The Schemes

3.12 In order to examine the predicted and outturn accident savings, the schemes where accident information has been evaluated have been categorised into three broad groups as follows:

- Bypass and predominantly offline schemes;
- Online widening schemes; and
- Junction improvements.

3.13 This meta-analysis considers POPE schemes evaluated since 2002 for which detailed safety modelling has been obtained from COBA, and draws information from 29 different POPE schemes.

3.14 Table 3.1 summarises the number of schemes that have been used within the Safety meta-analysis, identified by evaluation period and by category. The individual schemes used in the analysis are listed in Appendix A.

Table 3.1 – Number of Schemes used in Safety meta-analysis

Scheme type	Number at One Year After Stage	Number at Five Years After Stage
Bypass / Offline	15	7
Online widening	6	2
Junction improvement	8	-
All	**29**	**9**

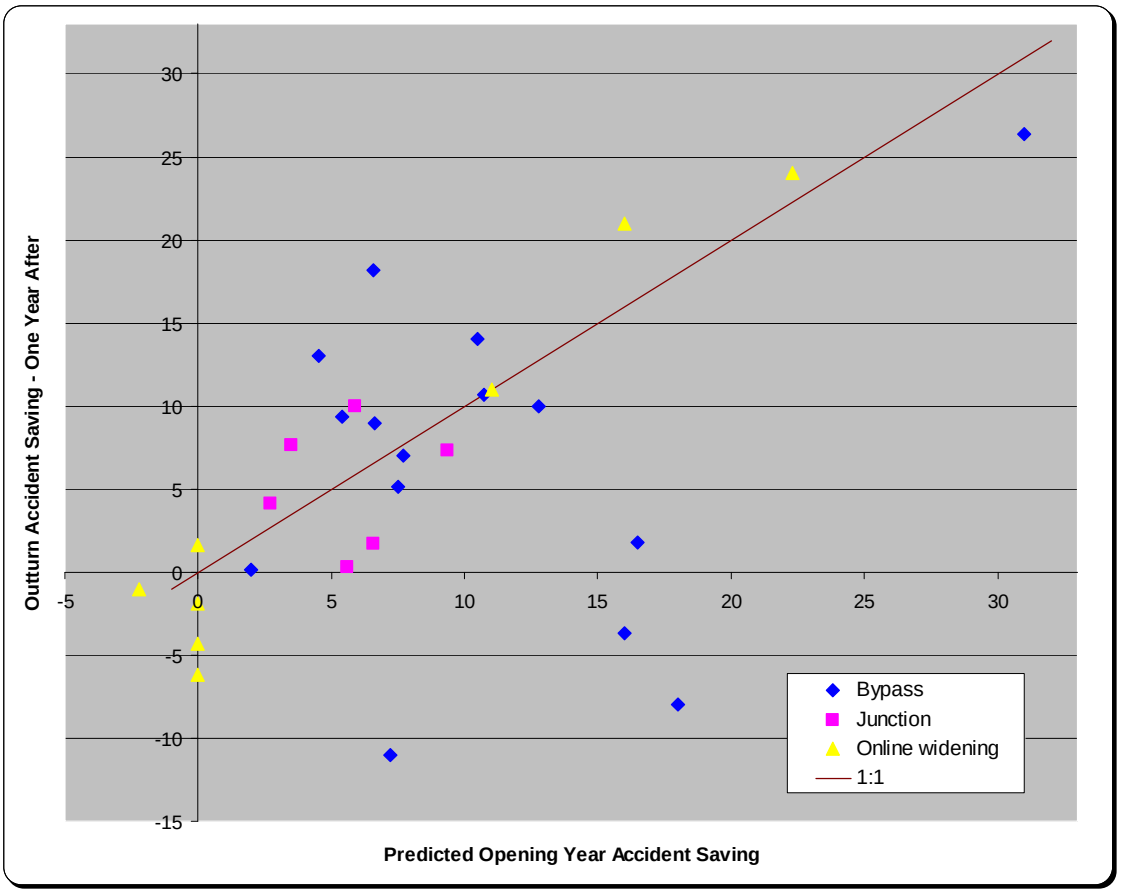
Findings at the One Year After Stage

3.15 Three years is normally considered to be the minimum period for the analysis of accident statistics, however it is included in the POPE One Year After evaluation in order to examine whether any early trends can be identified

Summary of Relationship between Predicted and Outturn Savings

3.16 The relationship between the outturn opening year accident saving and the predicted opening year accident saving is illustrated for the individual schemes in Figure 3.1 against a one-to-one line.

Figure 3.1 – Predicted and Outturn Accident Annual Average Saving (One Year After)



3.17 Further detailed analysis is presented in the separate 'daughter document' on safety, however key findings on the overall prediction accuracy are:

- The scatter plot of scheme results against the one-to-one line show that although there is some correlation between the predicted and outturn numbers of accidents saved in the opening year, there is wide variation through the data set;
- Overall, roughly half of all schemes showed outturn accident savings above the figure predicted and half below predicted, showing that there was no systematic bias in the predictions;
- Analysis showed a total saving of 177 accidents attributed to the impact of these schemes in their opening year, averaging 6.1 per scheme, compared to a predicted saving of 244 accidents, averaging at 8.4 per scheme; and
- Savings are on average 9% or 2.3 accidents below opening year predictions.

Comparison of Accident Savings by Scheme Type

3.18 The importance of safety in the scheme objectives, and the magnitude of the accident savings possible vary considerably. Table 3.2 summarises the accident savings by scheme type.

Table 3.2 – Accident Savings by Scheme Type

Type	No.	Number of Schemes at or Above Predicted	Standard Deviation of Ratio of Predicted-Outturn from 1:1	Total of Predicted Opening Year Savings	Total of Outturn Opening Year Savings	% Difference between Total Predicted and Outturn Savings
Bypass	15	6	11.2	162	102	-37%
Junction	6	3	3.9	34	31	-8%
Online widening	8	5	3.4	47	44	-6%
All types	**29**	**14**	**8.3**	**244**	**177**	**-27%**

3.19 Detailed findings are presented in the separate 'daughter document' on safety, however key findings on accident savings by scheme type are:

Bypass Schemes

- Bypass schemes show wide variability between the magnitude of accident savings predicted and the actual outturn figure. In general there seems to be little correlation between predicted and outturn figures for the opening year;
- Due to their very nature, bypass schemes tend to have higher predictions of accident benefits than other types of schemes, but 60% of the outturn accident savings are below the prediction; and
- Overall outturn accident savings are about a third lower than predicted.

Junction improvements

- Taken as a whole, junction schemes are performing as expected;
- However, on an individual scheme basis, there seems to be almost no correlation between predicted and outturn figures for the opening year; and
- The predicted and outturn accident savings are generally lower than the average savings for bypass schemes.

Online widening

- There is some evidence that online widening forecasting accuracy is good;

- There is clear statistical evidence of the success of online widening for rural single carriageways upgraded to dual carriageway;
- There is insufficient data at this stage to draw any conclusions regarding the safety impact of motorway widening, including motorway climbing lanes; and
- M25 J12 – J15 shows that widening to five and six lanes showed significant benefits in the opening year directly on the widened section. However, it may have had a negative effect on safety on the adjacent sections of motorway, resulting in no net safety impact.

Findings at the Five Years After Stage

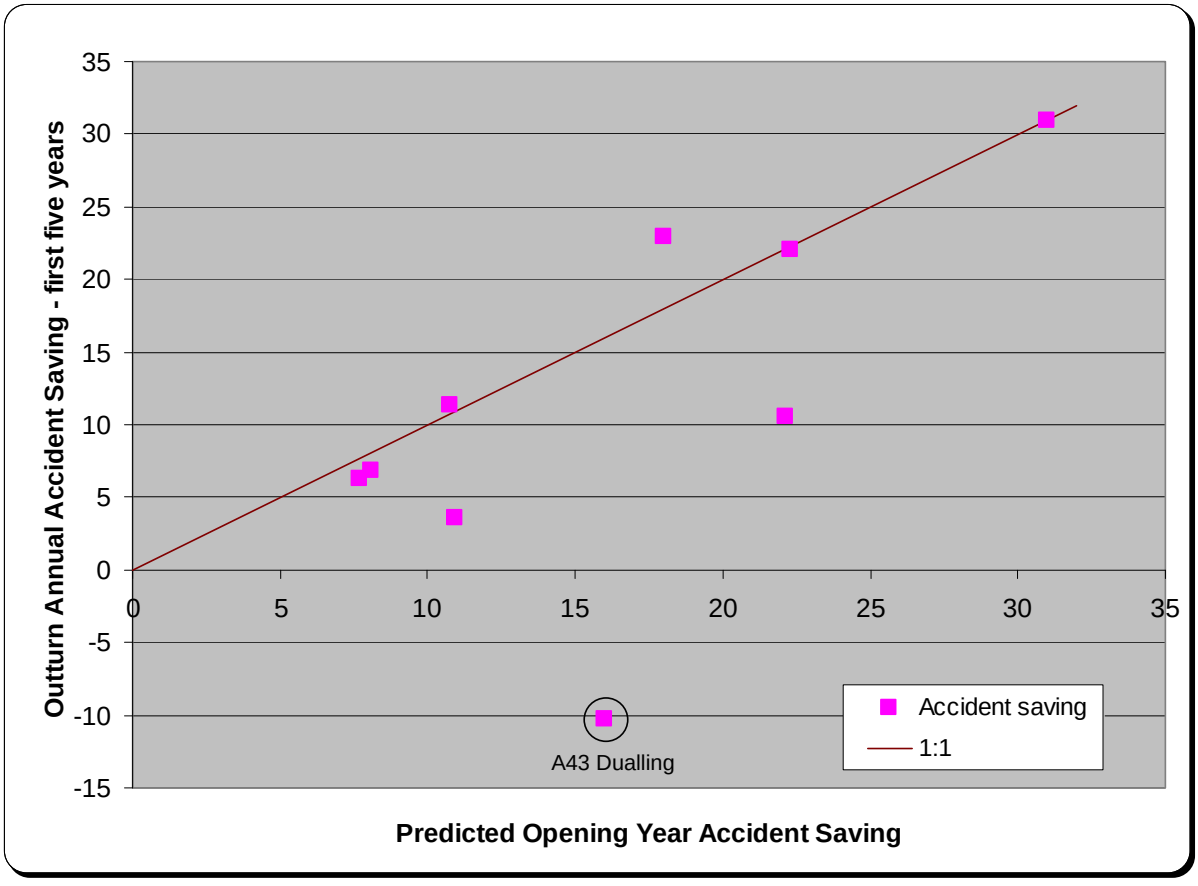
3.20 The aim of the meta-analysis of the POPE safety evaluations at the Five Years After stage is to analyse whether the average annual rate of savings in the first five years is closer to the predicted opening year saving than the outturn saving in the opening year.

3.21 At this stage, there are two Five Years After studies which were completed for pre-TPI schemes and therefore have no One Year After study. There are currently seven schemes at the Five Years After stage of POPE that have previously been evaluated at the One Year stage. None of the Five Years After reports for these latter schemes have been finalised, hence the results presented here should be considered as provisional.

Outturn Savings at Five Years After stage compared to Predicted

3.22 Due to the small number of schemes at the Five Years After stage, the analysis has not been split by scheme type as with the One Year After analysis. From the schemes that were available, the comparison between the opening year accident saving for the scheme as forecast by the model and the average annual accident saving is shown in Figure 3.2.

Figure 3.2 – Predicted and Outturn Annual Average Accident Saving (Five Years After)



3.23 Figure 3.2 indicates that the comparison for one of the schemes (A43 Dualling) is an outlier. There are good explanations for this finding which are explained in more detail in the separate 'daughter document' on safety; hence it has been excluded from the data presented in this summary.

3.24 Excluding the A43 Dualling scheme, the key findings from the 5 Years After analysis are:

- Of the eight schemes, five had annual accident savings close to the predicted number, one was better and two worse;
- Two underperforming schemes had outturn savings that were a lot lower than predicted resulting in the total annual accident saving of 115, 12% below the total predicted;
- Although there is not enough information to provide strong statistical evidence, visually, there appears evidence of correlation between the forecast and outturn saving shown in Figure 3.2; and
- The key finding is that, based on this set of schemes, the results for the Five Years After evaluations are closer to the prediction than at the One Year After stage as illustrated by the reduction in standard deviation from the 1:1 line.

3.25 Guidance recommends that 3 – 5 years of accident data are required for a robust assessment. Therefore, given the random variations of the occurrence of accidents, it could be expected that the annual average saving from the Five Years After data would be more accurate than the data available at the One Year After stage. The results support this.

Conclusions

3.26 A summary of the main safety conclusions addressing the key questions are shown below.

What are the key issues with data availability?

- Accident data is generally well-recorded, with excellent detail recorded in the STATS19 data; and
- POPE has successfully enabled archiving of accident data, background reports and safety forecasts modelled in scheme COBAs.

How good are the predictions in accident savings?

- For individual schemes, the predictions of opening year accident savings show poor correlation with outturn data, with 40% fewer accident savings than predicted for bypass schemes; and
- Online widening and junction improvement schemes show more accurate predictions, with both scheme types within 10% of the outturn situation.

Do predictions get more accurate over time?

- Available data suggests that predictions of accident savings do become more accurate over time; and
- When five years of post opening accident data can be evaluated, the accident savings improve when compared to the first year after opening.

What evidence is there for any change in accident rates due to online widening?

- Widening of rural single carriageway A-roads shows significant outturn benefits in the first year hence it is reasonable to use improved accident rates as per guidance;
- Motorway climbing lane schemes were forecast to have no accident savings and initial findings have been consistent with that forecast; and

- One motorway widening scheme showed significant accident benefits in the opening year directly on the widened section, suggesting that localised changes in accident rates might sometimes be justified. Evaluation of more schemes would be necessary to draw firm conclusions.

4. Economy

Introduction

4.1 This section of the report presents a summary of the meta-analysis of the economic impacts of schemes, which is provided in greater detail in a separate 'daughter document'.

4.2 Typically the decision whether or not to proceed with a scheme is based on the balance of costs and benefits as summarised in the form of an Appraisal Summary Table (AST). These costs and benefits typically fall into two categories:

- Non monetised benefits/costs: relating to those impacts which cannot be easily quantified in monetary terms. Examples include: heritage impacts, water impacts and landscape impacts; and
- Monetised impacts: relating to impacts against which a monetary value can be placed, specific examples include impacts on journey times, accident impacts and impacts on vehicle operating costs.

4.3 As a government agency, the HA has a duty to demonstrate good value for money by continuing to invest in those schemes that offer best value for money.

Background to Economic Evaluation

4.4 This meta-analysis of economic impacts presents the assessment of the monetised impacts of schemes in terms of:

- Economy Benefits: Economy benefits comprise of time savings and also vehicle operating cost savings (VOC); and
- Safety Benefits: These are the monetised benefits that accrue from accident savings.
- Scheme Cost

4.5 The evaluations consider the predicted and outturn scheme costs, then combine these with the assessment of scheme benefits to derive overall economic indicators (Net Present Value and Benefit Cost Ratio) in order to compare the predicted and outturn values.

4.6 This chapter addresses:

- **How accurate are the agency's estimates of scheme benefits?**
- **How accurate are the agency's estimates of scheme costs?**
- **Does POPE confirm schemes as having positive economic outturns?**

The Schemes

4.7 The meta-analysis of economic impacts draws information from 37 POPE schemes. The schemes have been categorised into three groups:

- Bypass schemes;
- Junction Improvement schemes; and
- Online widening schemes.

4.8 Table 4.1 lists the schemes used, identified by evaluation period and by scheme type.

Table 4.1 – Schemes used in meta-analysis of Economic Impacts

	Bypass Schemes	Junction Improvement Schemes	Online Widening Schemes	Total
One Year After (OYA)	19	6	10	**35**
Five Years After (FYA)	1	0	0	**1**
Ten Years After (10YA)	1	0	0	**1**
Total	21	6	9	**37**

4.9 One scheme at the 5 Year After stage (A34 Newbury Bypass) and one at the 10 Year After stage (A46 Norton Lenchwick) have been included, although they were not part of the TPI programme. It was considered that as economic information was still available, they could be evaluated.

Data Sources and Availability

Scheme Cost Data – Predicted and Outturn

4.10 For the POPE evaluation process, predicted scheme cost data has been taken from the most recent economic forecast published prior to the start of scheme construction.

4.11 Outturn scheme cost data for most of the schemes included in this meta-analysis has been obtained from the scheme's project sponsor. In one case, where the scheme Project Manager was unable to supply the costs a figure published in Hansard was used. Since 2008, outturn costs have been obtained from the HA's Regional Finance Managers.

Scheme Benefit Data – Predicted and Outturn

4.12 The predicted economic benefits of the schemes has been taken from the scheme appraisal process where all the benefits are calculated and presented in order to justify the construction of each scheme. The aim is to use as consistent data as possible, but these appraisals were carried out using different major scheme guidance and over a long time span so that the content and techniques used vary. In many cases the economic information that is used in POPE is incomplete and various techniques have had to be used to calculate benefits using limited base information.

4.13 Outturn benefits for the schemes are reforecast over the same appraisal period as the original predictions (30 or 60 years). These figures are calculated for POPE based on the use of observed 'one year after' data to calculate a reforecast of the benefits now expected over the appraisal period. This reforecast is termed the 'outturn benefit'.

Difficulties in Comparing Monetised Costs and Benefits

4.14 Comparing monetised costs and benefits of schemes can be difficult for a number of reasons, these being:

- **Differing Present Value Years** - For each major scheme the post-opening assessment has been undertaken using the same present value year as used in the original assessment. This ensures that each major scheme report is internally consistent. However, when aggregations or comparisons are made across schemes of differing present value year two points must be borne in mind:
  - The only indicator that is directly comparable between schemes of differing present value years is the benefit to cost ratio (BCR). All other indicators such as the Present Value of Benefits (PVB), Present Value of Costs (PVC) and Net Present Value (NPV) should only be directly compared with some degree of caution; and

- The later the present value year of a scheme, the greater the weight that the scheme will contribute to the overall total. Thus a scheme evaluated to a 1998 present value year has a higher value than an identical scheme evaluated to a 1988 present value year and would tend to distort any comparisons that are made between schemes.

- **Differing Opening Years** - For the majority of the evaluated reports, the actual scheme opening year is later than the predicted scheme opening year at the time of the traffic and economic appraisal. The meta-report uses the original forecasts but the delay in scheme opening into other years introduces the potential for variation because of time sensitive factors like cost inflation and traffic growth, hence the outturn benefits are invariably based on a slightly different 30-year or 60-year assessment period than the one used for the appraisal; and

- **Differing Basis of Cost Estimates** – Over the period covered by POPE information availability has been varied. For example, it is not always apparent whether an outturn scheme cost includes elements such as non-recoverable VAT, preparation, or supervision as reporting requirements have changed over time. Therefore, the information on PVC should be treated with some caution. As of 2008, outturn costs are supplied by Regional Finance Managers, which improved the reliability of the cost information significantly.

Availability of Data

4.15 In comparing the predicted and outturn economic evaluation of major schemes, a limiting factor is the availability of the original data files on which the economic evaluation was based. These files are predominantly COBA input files, although it is usually possible to re-create a COBA input file from the corresponding output file. For the major schemes that have been considered in this report, around half of the original COBA data files are available (16 out of 30 schemes). A summary of the COBA availability by scheme is provided in the Appendix.

How Accurate are the Appraisal Estimates of Economic Benefits?

4.16 The accuracy of the forecast of the benefits is critical to answering the question as to whether the scheme will be value for money. This section uses the findings from the POPE evaluations to examine the accuracy of the forecast of economic benefits. POPE economic evaluation is based on using the observed outturn data to calculate a reforecast of the benefits now expected over the appraisal period. This reforecast is termed the 'outturn benefit'.

4.17 In assessing these schemes there is a need to make a judgement as to whether a scheme is performing as predicted. The simplest method of making this comparison is to determine whether the outturn benefits lies within a particular threshold of the predicted benefits. In this case a value of +/- 15% has been chosen, as used in the traffic meta-analysis which is generally in accordance with the guideline target values for model validation defined within DMRB Volume 12, and therefore maintains consistency with the meta-analysis on traffic impacts.

4.18 Economic forecasts for the schemes evaluated under POPE were prepared over a long period using different price bases and discounting rates, thus this meta-analysis of the benefits is concerned with the comparison of differences between predicted and outturn as percentages rather than absolute figures.

4.19 As outlined in the previous section, monetised benefits have been categorised into:

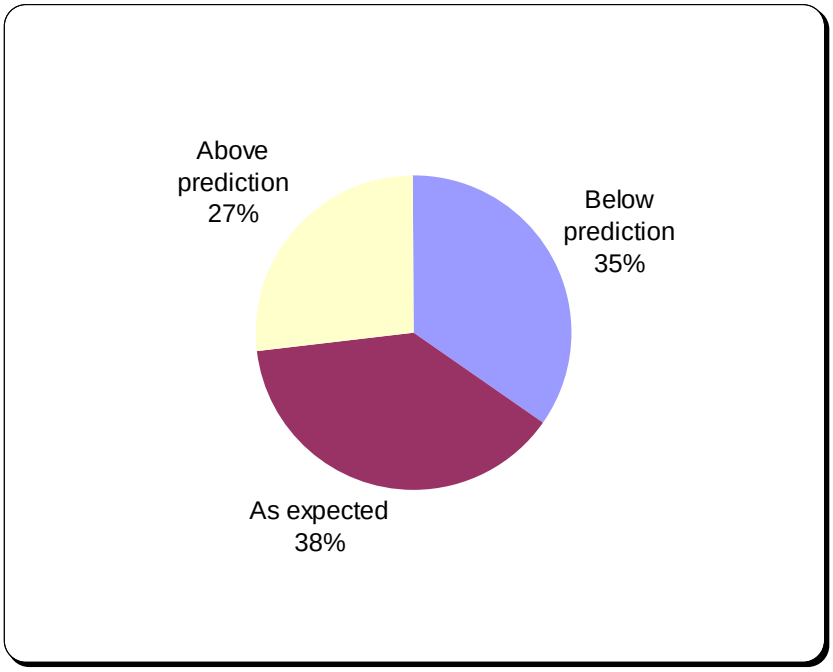
- Economy benefits (travel time benefits only); and
- Safety benefits.

Travel Time Benefits

4.20 Within the full set of schemes, there are a total of 26 schemes with sufficient suitable data that have been included in this analysis. This includes 18 bypass schemes, 3 junction improvement schemes and 5 online widening schemes.

4.21 To provide a comparison of the predicted and outturn economy benefits it was necessary to calculate the time savings attributable to each scheme. This has been undertaken by using the observed traffic data to update the original economic assessment. The separate 'daughter document' on economy presents a summary of the economy benefits for each scheme and a broad indication of the performance of each scheme with outturn values +/- 15% of the predicted values regarded as performing 'as expected'. A summary of the overall performance is shown as a pie chart below in Figure 4.1.

Figure 4.1 – Performance of Outturn Travel Time Benefits compared to Predictions

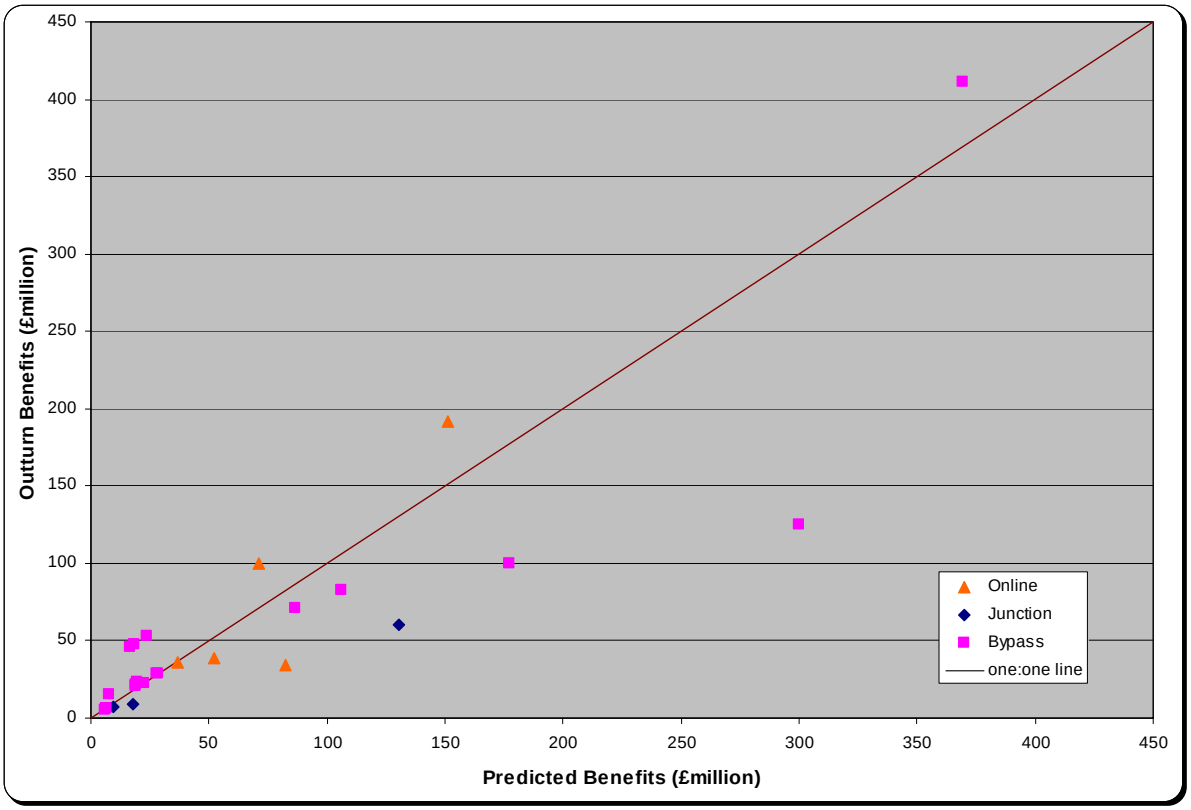


4.22 Key findings from the detailed analysis presented in the separate daughter document are:

- Outturn benefits are within 15% of predicted benefits for 10 (38%) of the 28 schemes;
- 7 (27%) of the 28 schemes had outturn travel time benefits better than predicted, i.e. more than 15% better;
- 9 (35%) of the 28 schemes had outturn travel time benefits worse than predicted, i.e. more than 15% worse predicted;
- There is no obvious bias towards over- or under-predictions of travel time benefits; and

- There is some variation in the accuracy of benefit prediction between the different types of scheme. Bypass schemes tend to have a wider variation from the expected benefits than the other scheme types while on-line and junction schemes appear to have more accurate predictions of scheme benefits (shown in Figure 4.2).

Figure 4.2 – Predicted vs. Outturn Travel Time Benefits

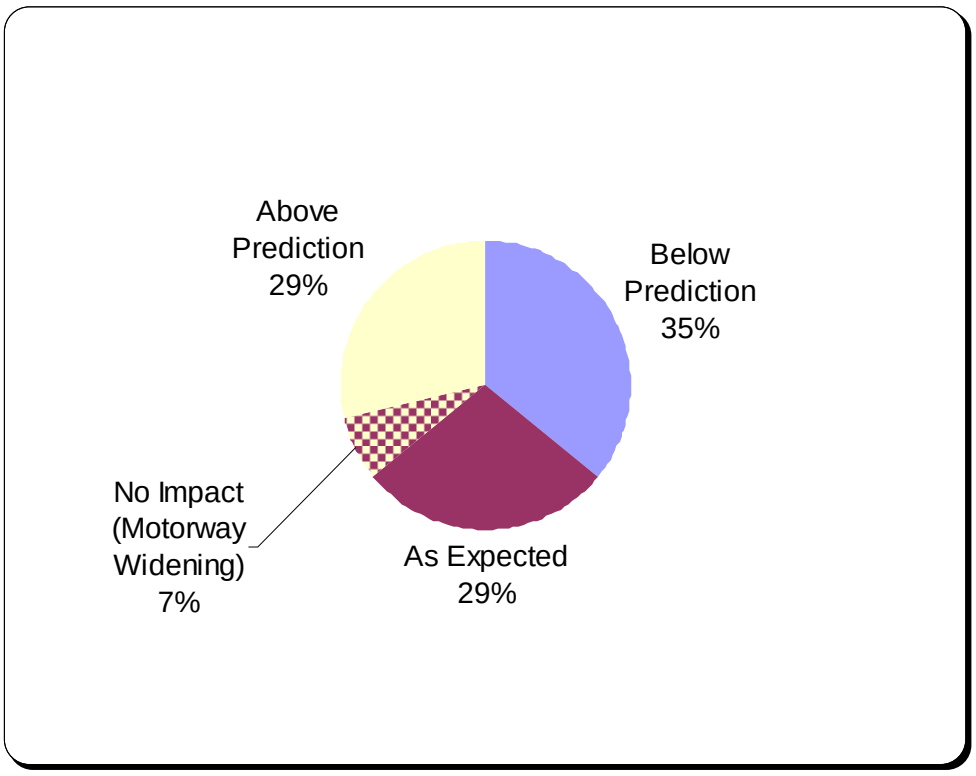


Safety Benefits

4.23 There are a total of 28 schemes that have been included in this analysis, on the basis of having adequate forecasting and outturn data available. This includes 18 bypass schemes, 3 junction improvement schemes and 7 online widening schemes.

4.24 The separate 'daughter document' on economy presents the analysis of safety benefits in more detail however Figure 4.3 summarises the overall performance. As for the travel time benefits, the outturn figures are essentially re-forecasts based on observed data from the first year post-opening. However, while trends in traffic flows and speeds can normally be identified easily within the post opening period, it is normal for a longer period to pass before safety trends become clear. Thus the outturn One Year After safety benefits of the schemes shown here should be considered as less robust than the outturn travel time benefits.

Figure 4.3 – Performance of Outturn Safety Benefits Compared to Predictions



4.25 Key findings from the detailed analysis of safety benefits presented in the separate daughter document are:

- Of the 28 schemes evaluated 8 (29%) schemes have outturn safety benefits as predicted. Of the remaining 18, 10 schemes show below predicted benefits and 8 have benefits above the predicted amount.
- The motorway widening schemes that have been evaluated have not assumed any accident benefits after widening in their appraisal, neither on the widened route itself nor on the wider network.

What are the Main Contributors to Inaccuracies in Forecasting?

4.26 Table 4.2 shows how on average, the predicted and outturn benefits are split between travel time and safety benefits by scheme type. Each scheme has a different split between these two types of benefit, and this is determined by the scheme objectives and actual impacts. The separate 'daughter document' on economy presents this information on a scheme by scheme basis.

Table 4.2 – Average Benefit Split by Scheme Type

Scheme type	Predicted Benefits PVB (£m)		Outturn Benefits PVB (£m)	
	Travel Time	Accidents	Travel Time	Accidents
Bypass	74%	26%	85%	15%
Junction improvement	87%	13%	90%	10%
Online widening (excluding M'way widening)	88%	12%	85%	15%
All	78%	22%	85%	15%

4.27 It should be noted that the average figures presented in Table 4.2 hide the wide variation within individual schemes. The forecasts of travel time benefits as a proportion of the total predicted benefits range from 51 - 100%.

4.28 The key findings from the detailed analysis are:

- Overall, the average predicted split of benefits was 78% from travel time savings and 22% from accident savings;
- The average split of the outturn benefits is 85% from travel time savings and 15% from accident savings;
- Bypass schemes were forecast to derive an average of 26% of their benefits from safety impacts. This was much higher than for other types of schemes. However the POPE evaluations show that based on the observations from the opening year, that on average bypass benefits are only 15% derived from safety, which is similar to the other scheme types;
- Despite this caveat, for all types of scheme, it can be concluded that travel time benefits are more important in the outturn scenario than predicted forecasts.

Scheme Costs

4.29 POPE records scheme cost information as it is a fundamental element of calculating value for money. Where available, the scheme reports give an indication of sources of cost escalation, inaccurate forecasting etc. However, it is important to note that it is not the function of POPE to investigate the reasons for the differences between predicted and outturn cost and Major Projects has already undertaken a separate review of this issue.

4.30 The scheme cost analysis in this section is based on 26 schemes, comprising 16 bypasses, 4 junctions and 6 online widenings. These are the schemes for which it was possible to obtain a forecast cost and outturn cost.

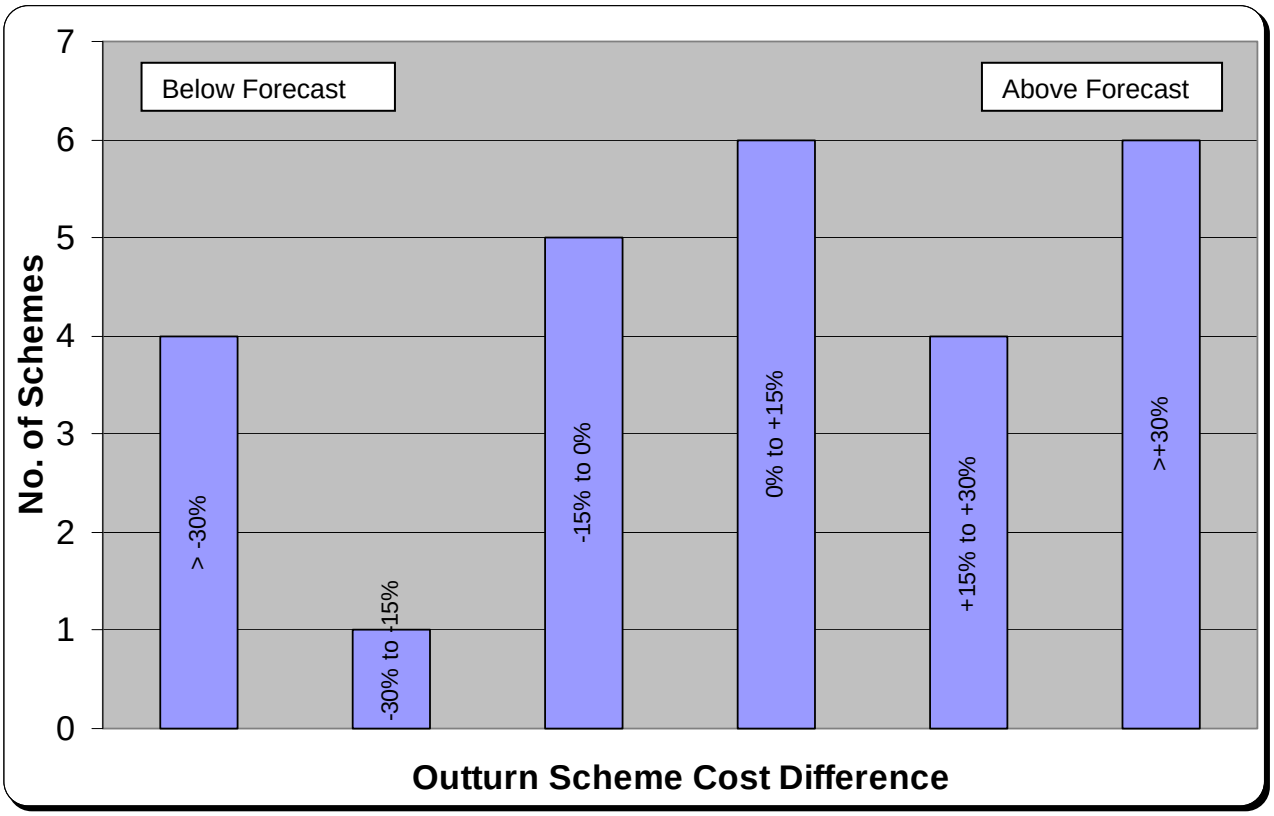
Accuracy of Scheme Cost Forecasting

4.31 The separate 'daughter document' on economy shows how accurate the cost estimates have been on a scheme by scheme basis, again by assessing whether the scheme costs were better, i.e. lower than predicted, worse than predicted or as expected, i.e. within +/-15%.

4.32 Figure 4.4 shows the distribution of schemes by the accuracy of their cost estimates. Key findings from Figure 4.4 and the detailed analysis presented separately, are:

- Scheme costs have been difficult to obtain a consensus view on, but the recent change in sourcing of outturn costs has helped to overcome these problems;
- 42% of schemes were within 15% of the estimate. Of those that were not, it is difficult to know if this is a result of poor scheme cost estimates or poor scheme implementation, but the HA is carrying out more detailed analysis of this issue outside the POPE process;
- There is a small bias towards overspend, the ratio of overspend:underspend is 11:7;
- Where variances did occur, they tended to be quite large, 38% of schemes showed variations in outturn cost of greater than 30% either above or below the predicted cost: and
- Bypass and online widening schemes show the greatest variability in outturn costs, while junction improvement scheme estimates were the most likely to be accurate.

Figure 4.4 – Summary of Scheme Costs



Do the Post Opening Evaluations Show Positive Economic Outturns?

4.33 The Benefit to Cost Ratio (BCR) is one of the key economic indicators used by the DfT in the appraisal of the economic worth of transport schemes. In the POPE process, an outturn BCR is calculated using the POPE calculation of the outturn benefits and the outturn scheme cost as obtained from the HA.

Comparison between Predicted and Outturn BCR

4.34 BCR is a simple ratio between the PVB and the PVC and it is used to provide a standard indicator so that schemes can be compared against each other on a simple basis.

4.35 The overall average BCR across all schemes was predicted to be 2.9 while the outturn BCR has been slightly lower, 2.6, so the programme of schemes as a whole can be considered to be delivering a reasonably accurate prediction of the BCR. However, there are wide variations between schemes that make up this overall average.

4.36 Detailed analysis presented in the separate 'daughter document' on economy shows that:

- There are quite wide variations between predicted and outturn BCR values on individual schemes, but the mix of both positive and negative variations means that the average variation across all schemes is quite small.
- There are very few schemes where the outturn BCR is close to the predicted. Only three schemes were within 15% of the predicted figure while four schemes were over 100% different;
- There is no bias in BCR prediction. Of those schemes where a comparison can be made, 11 of the schemes have performed better than predicted while 13 have been worse.

4.37 Closer analysis of the BCR performance by scheme type shows that:

- Bypass schemes show widely scattered BCRs, with 50% better and 50% worse than forecast;
- Junction and online widening are more likely to deliver a BCR that is in line or below the predicted ratio. The sample size for these schemes is quite low, involving only eight schemes, so as a result the confidence level of these conclusions has to be limited; and
- Bypass schemes are more likely to deliver better than expected BCRs than the other types of major schemes.

Relationship between Scheme Benefits and BCR

4.38 The variations between predicted and outturn BCR are caused by multiple factors. The variation can be caused by higher or lower outturn scheme costs, by higher or lower outturn scheme benefits or by a combination of these two factors. Sometimes these variations work in opposite directions to cancel each other out.

4.39 In table 4.2, travel time benefits were seen to form a much larger proportion of the scheme benefits than safety benefits. Detailed analysis into the relationship between the accuracy of the predictions of traffic benefits and the outturn BCR is presented in the separate 'daughter document' on economy, the key findings from which are:

- The outturn BCR changed in response to the outturn traffic benefits that the scheme delivered;
- In general, those schemes that delivered less than expected traffic benefits suffered a reduced BCR to varying degrees; and
- Those that have accurate predictions saw little change in their outturn BCRs while those that achieved greater traffic benefits delivered better BCRs.

Relationship between Scheme Costs and BCR

4.40 A similar analysis has been carried out into the relationship between changes in scheme costs and changes in BCR, this time by scheme type. Key findings from this analysis show that:

- It is clear that a small majority of schemes have suffered an increase in outturn scheme costs compared with predicted, 18 schemes had higher than expected scheme costs compared with 11 that were cheaper than predicted;
- Some schemes experienced very large increases in BCR as a result of cost savings;
- Other schemes were predicted to deliver a BCR of less than 2.0 and the outturn remained below this threshold;
- Schemes that have suffered large increases in scheme costs have seen consequential reductions in their outturn BCR;
- Other schemes have experienced changes in their outturn BCR that do not appear to be related to a change in scheme cost, and there are also schemes that have experienced a change in cost that has had little or no effect on its BCR. This is because there has also been a change to the economic benefits achieved, i.e. both sides of the cost-benefit analysis have changed and the ratio between them has changed very little;
- Bypass schemes have shown large shifts in their BCR in response to variations in scheme cost;
- Online widening and junction schemes show large variations in response to scheme costs, but the sample size is small so it is difficult to draw firm conclusions; and

- Online widening schemes show the smallest change in BCR and their forecasts are more likely to be accurate than those for other types of scheme.

Conclusions

4.41 A summary of the main economic conclusions addressing the key questions are shown below.

What are the key issues with data availability?

- There is inconsistency in the availability of the most up to date scheme information. The introduction of the Project Control Framework (PCF) is expected to assist in the standardisation of data in the future; and
- Uncertainty in both predicted and outturn scheme costs has been an issue, however the HA has introduced a new system to address this issue for current and future evaluations.

How Accurate are the Estimates of Benefits?

- The forecasting of travel time benefits is not very accurate with only 38% of schemes within ±15% of the actual benefits;
- Accident benefit prediction is also not accurate, with only 29% of schemes within ±15% of the actual benefits;
- However, there is no evidence of systematic bias towards under or over-prediction; and
- The variation in travel time benefits is dependent on the prediction of accurate traffic volumes, where the main reasons for inaccuracy are shown above.

How Accurate are the Estimates of Costs?

- Cost estimates have a relatively low level of accuracy as only 42% of schemes have forecast costs within ±15% of the outturn costs, with a slight bias towards overspending;
- The HA are seeking to improve the accuracy of scheme cost forecasting by addressing the independent research and analysis on this issue addressed in the Nichols Report; and
- There is an inconsistency in the availability of outturn and predicted scheme costs, however the HA have instigated a new system for co-ordinating and publishing major scheme costs.

Do the Post-Opening Evaluations show Positive Economic Outturns?

- The Major Scheme programme is delivering a Benefit Cost Ratio (BCR) in line with predictions (outturn BCR 2.6 against 2.9 predicted), although individual schemes show a high level of variability;
- All schemes show positive economic outturns, although over half (54%) of schemes have a lower BCR than predicted on the AST; and
- Bypass schemes are more likely to deliver better than expected economic benefits than junction and online schemes.

5. Environment

Introduction

5.1 This section of the report summarises the meta-analysis of evaluations of the Environment objective, and is also presented in greater detail in a separate 'daughter document' on environmental impacts.

5.2 Consideration of environmental impacts as part of POPE has only occurred since 2004, beginning with a pilot of a selection of schemes. Environmental aspects of all schemes are now included in POPE. However, there is a smaller selection of schemes available for meta-analysis.

5.3 The environmental analysis was based on:

- The Environmental Statement (ES), AST and other relevant environmental documents;
- A site visit; and
- Consultation with environmental bodies and relevant local authorities.

Environmental Impacts

5.4 The assessment of the environmental impact of the schemes includes 10 environmental sub-objectives. These are:

- Noise;
- Local Air Quality;
- Greenhouse Gases;
- Landscape;
- Townscape;
- Biodiversity;
- Heritage of Historic Resources;
- Water Environment;
- Physical Fitness; and
- Journey Ambience.

What are the key issues?

5.5 This meta-analysis of the environmental evaluations specifically looks to address each of the sub-objectives and derive a series of conclusions and recommendations for the HA and Department for Transport (DfT) to consider as part of any revisions to the appraisal process. The format of this section reflects the qualitative nature of the findings and it was agreed should focus on the following areas:

- **How accurate are the predicted impacts of schemes on the environment?**
- **Key findings from four of the environmental sub-objectives**:-
  - Heritage
  - Biodiversity
  - Water Quality; and
  - Landscape.

- **What responses do we get from the consultation undertaken for POPE?**
- **The current status of the recommendations from the 2006 meta-analysis report.**

5.6 In addition to the topics here, work has been undertaken to evaluate the carbon emissions of schemes. These results were published on the HA website in January 2009 and are included in the daughter document.

The Schemes

5.7 For this meta-analysis of environmental impacts, data was used from 14 schemes where evaluation included detailed consideration of the environment. This does not include schemes where evaluations are currently in draft format. The full list of schemes used in this analysis is provided in Appendix A.

5.8 The list of schemes includes two Five Years Evaluation (A34 Newbury Bypass and A46 Norton Lenchwick) which have been included although they were not part of the TPI programme, however, they were part of the original Pilot project and have valuable environmental data to include in this report.

Data Sources

5.9 The evaluations used the scheme's ES and AST as a baseline.

5.10 In addition, scheme specific background data was requested from the HA Project Sponsor, as listed in Table A.6 of the Appendix. This was based on a standard list and includes information such as 'As Built' drawings for the environmental design and information relating to ongoing maintenance and monitoring. When available, this information greatly improved the quality of the evaluation process.

5.11 Consultation with external parties was also a key part of the evaluation process and their responses are discussed later in this section.

5.12 The primary focus of the examination of environmental objectives in the One Year After evaluation was to confirm to what extent the mitigation measures detailed in the ES have been implemented. In the Five Years After evaluations, the primary focus was to review the ongoing effectiveness of the mitigation measures and to follow up any issues that were not fully evaluated at the One Year After stage. For example, by the Five Years After stage it would be expected that the academic Archaeology report would have been published, and also for landscape and biodiversity the Handover Environmental Management Plan or Landscape Management Plan and ecological monitoring information would be finalised.

Accuracy of Predicted Environmental Impacts

5.13 By comparing the original AST scores against the EST scores for each environmental sub-objective, it was possible to establish how accurate the predicted environmental impacts were. Analysis was undertaken to compare predicted and outturn impacts, which identified whether each of the sub-objectives has scored 'better than expected', 'as expected', or 'worse than expected'.

5.14 The number of schemes evaluated for each environmental sub-objective is provided in Appendix A. In a number of cases the scheme was not evaluated under a particular objective, for example, townscape where schemes would not be impacting on local townscape. Comparison between predicted and outturn impacts

5.15 A comparison of the predicted and outturn environmental impacts is summarised below in Table 5.1.

Table 5.1 – Comparison of Predicted and Outturn Impacts

Sub-Objective	Predicted Vs Outturn			
	Better than Expected	As Expected	Worse than Expected	Not Evaluated
Noise	2	9	2	1 (insufficient info do at 5YA)
Local Air Quality	1	10	3	0
Landscape	0	13	1	0
Biodiversity	0	12	1	1 (no clear evidence)
Heritage	1	11	1	1 (insufficient info do at 5YA)
Water Environment	0	11	2	1
Physical Fitness	0	10	0	4
Journey Ambience	0	10	0	4
Townscape	0	3	0	0
Total	**4**	**90**	**10**	**11**

5.16 The key points to note are:

- Of those evaluated, a significant number (86%) of outturn impacts are as predicted. This is in comparison to 70% reported in the 2006 Meta;
- 4% of sub-objectives were 'better' than predicted, 10% were 'worse' than predicted;
- Landscape and biodiversity had a high level of schemes as predicted (92%);
- For journey ambience and physical fitness 4 schemes had AST entries and were evaluated as expected. Six further schemes were either included in the EST or evaluated in the report and were considered to be as expected. Four schemes were not evaluated; these were all from the pilot, none had AST entries and physical fitness and journey ambience were not carried forward into the evaluation if there was no AST entry.
- For noise, biodiversity and heritage, in one case each, there was insufficient information available and it was suggested that these sub-objective should be evaluated at the five year after stage.

Heritage

5.17 Currently, One Year After reports concentrate on built heritage but POPE also consults with regard to archaeology and further evaluation of archaeology is suggested for the Five Years After reports.

5.18 The evaluation took the information contained in the Environmental Statement as the baseline and consultation was undertaken with English Heritage (EH) and with local authority archaeology staff. Sometimes either EH or the local authority suggested that other interested parties involved in the archaeological aspects of the scheme should also be contacted and this was usually taken forward. Archaeological reports were also requested.

5.19 Further detail on the evaluation of heritage can be found in the 'Daughter Document' on Environment which identifies what the Highways Agency does well and could be shared with others as best practice, and also suggestions for areas of improvement.

5.20 The following key findings have been identified from the scheme data:-

- Evaluation and mitigation measures were generally considered satisfactory;
- English Heritage generally only comments where designated sites are affected;
- Comments received regarding publication of reports and deposition of archives; and
- Differences of opinion between archaeological experts, for example regarding mitigation methodology.

Biodiversity

5.21 Currently, One Year After reports concentrate on whether the biodiversity mitigation measures are in place, as described in the environmental statement. At the Five Years After stage the effectiveness of these measures were evaluated. This was based on post construction monitoring and ongoing management information e.g. for protected species and habitat creation areas.

5.22 Evaluation took the information contained in the Environmental Statement as the baseline and consultation was undertaken with Natural England (NE) (previously English Nature) and with local authority ecologists or countryside teams. Sometimes either NE or the local authority suggested that other parties interested in the biodiversity aspects of a scheme should also be contacted.

5.23 The following key findings were identified:

- Mitigation measures were implemented in line with expectations;
- Limited circulation of lessons learnt and best practice within HA and with other stakeholders;
- Some consultees would welcome more liaison with HA; and
- The availability of monitoring information for species and habitats is variable.

5.24 These findings were presented in greater detail and for specific schemes in the separate 'daughter document' on environmental impacts, and in particular dealt with the following:

- How well are mitigation measures implemented?
- Re-use of soils;
- Establishment of species rich grassland;
- Translocation;
- Availability of Monitoring Information; and
- Communication.

Water

5.25 Currently One Year After reports concentrate on whether mitigation measures are in place as described in the environmental statement. At the Five Years After stage the maintenance of facilities and a review of any secondary function as a biodiversity resource would be considered. The meta analysis aimed to identify what the Highways Agency does well and could be shared with others as best practice and conversely suggestions for areas of improvement.

5.26 Taking the Environmental Statement as the baseline, consultation was undertaken with the Environment Agency (EA) and with local authorities. EA water quality monitoring data was available for local watercourses but for various reasons, for example location of existing sampling points, any changes in water quality may not be attributable to the impacts of a particular scheme.

5.27 Earlier in this section, Table 5.1 showed that the outturn impacts for water quality were 'as predicted' for 11 out of the 14 evaluated schemes. The outturn impact for two schemes was worse than predicted and one scheme could not be evaluated due to insufficient outturn information.

5.28 The following key findings were identified:

- The majority of scheme impacts were as predicted as most scheme mitigation measures have been implemented in line with expectations;
- Concerns regarding ongoing maintenance and management of balancing ponds;
- There were occasional concerns over the lack of communication with HA;
- Consultees made suggestions for improved design of water mitigation measures; and
- Post construction monitoring of water quality and habitat diversity was not available to POPE.

5.29 These findings are presented in greater detail and for specific schemes in the separate 'daughter document' on environmental impacts, and in particular deal with the following:

- The impacts were 'as predicted' for 12 out of the 14 schemes (86%), which is an improvement on the last Meta (2006);
- Generally balancing ponds were seen to be as effective as expected although ongoing monitoring and management for 2 schemes (A5 Weeford and A34 Newbury) raised concerns over potential erosion and maintenance of balancing ponds to remove accumulated silts and contamination to ensure that the facilities maintain their drainage and storage.
- For two schemes communication between the Highways Agency and Environmental Agency was commented on: A63 Selby Bypass at the design stage in relation to undertaking the flood defence work in house; and A34 Newbury bypass post-opening with the level of communication and involvement after opening and information provided about ongoing management and monitoring of mitigation features.
- Some observations were received from EA regarding how scheme design took flood risk into consideration e.g. by incorporating culverts. These included:
  - Size of watercourses should be maintained as existing through new crossings (culvert or bridge) to avoid problems of shallow water restricting fish migration (A47 Norton Lenchwick); and
  - Consider safe passage for mammals under bridges and within culverts during times of severe flood (A46 Norton Lenchwick and A21 Lamberhurst.
- For two schemes the EA provided suggestions as part of its feedback with regard to how aspects of water mitigation measures could, in their view, be improved for future schemes This included examples of:
  - Minimum height for concrete bed at culverts; use of gabion baskets; and alignment of rivers and streams to find their own path for A46 Norton Lenchwick; and
  - Use of more substantial structures for headwalls, rather than sandbags; and the use of marginal planting and retaining remains of old watercourse was considered good design at A21 Lamberhurst.

Landscape

5.30 Currently One Year After reports concentrate on whether mitigation measures are in place as described in the environmental statement and the Five Years After stage evaluation considers the effectiveness of these measures, for example, visual screening, establishment of the planting and integration of the scheme into the local landscape.

5.31 The Environmental Statement was taken as the baseline and consultation was undertaken with Natural England (NE) (formerly Countryside Agency) and with local authority landscape and countryside teams. A site visit was carried out to confirm that mitigation measures are in place, to review establishment of planting, evaluate visual impacts and consider public rights of way, etc.

5.32 The majority of schemes evaluated for this Meta have been 'One Year Afters', and new planting is likely to be more advanced in the five years after schemes which have subsequently been or will be evaluated.

5.33 The following key findings were identified for landscape taken from the 14 scheme evaluation reports being considered. It aimed to identify what the Highways Agency does well and could be shared with others as best practice and conversely suggestions for areas of improvement.

- Implementation of landscape mitigation was in line with expectations;
- The resident surveys raised issues with some of the mitigation measures, either that they are not completed or not extensive enough. However, it is believed that this has more to do with the measures not yet being fully established;
- Appraisals required review where changes to signs, gantries and lighting were introduced; and
- Road improvements in and adjacent to designated landscapes required sensitive design.

5.34 These findings are presented in greater detail and for specific schemes in the separate 'daughter document' on environmental impacts, and in particular deal with the following:

- Based on the schemes evaluated, landscape mitigation measures were implemented in line with expectations. Analysis earlier in this report showed that the outturn impacts for landscape are 'as predicted' for 13 out of 14 schemes;
- Of the 14 schemes being considered there was only two where there have been concerns over the initial establishment of planting. In both cases remedial measures were put in place to overcome any potential issues regarding the mitigation of impacts in the long term. Aftercare in the form of landscape maintenance of planting and seeding was included for all schemes;
- Where the opportunities have been taken to use local vernacular style, reflect historic connections or provide gateway features, this contributed to the creation of a sense of place for schemes and local identity;
- The visual impacts of the introduction of signs, gantries and lighting into schemes were occasionally underestimated; and
- Five of the schemes were located within or adjacent to designated landscapes, of these three received negative comments and two received positive feedback.

Environmental Consultation

5.35 Consultation was a key part of the environment evaluation process and was undertaken to give stakeholders and interested parties the opportunity to provide feedback on schemes where they were involved in the initial design and appraisal process. Consultees were asked to consider how,

in their opinion, the predicted impacts compare with the observed impacts of the scheme after opening.

5.36 The environmental evaluation included consultation with the following bodies:-

- Environment Agency – statutory consultee for water issues ;
- English Heritage – statutory consultee on the historic environment;
- Natural England (formerly the Countryside Agency and English Nature prior to 2006) statutory consultee for the natural environment including landscape and biodiversity issues; and
- Local authorities and the National Park Authority (where applicable).

5.37 The consultation process also involved other interested parties such as the local Parish Council, RSPB, the National Trust, the British Horse Society and Local Wildlife Trusts depending on the nature of the forecast environmental impacts.

5.38 Consultation was carried out using a variety of methods including:

- Questionnaires;
- Telephone discussion;
- Meetings; and
- Email correspondence.

5.39 Consultation questions were tailored to the remit of each agency, with the detail of the questions targeted on specific impacts/ predictions identified in the ES.

5.40 Where local community questionnaires formed part of the main POPE report there was the opportunity to include environment questions, for example, regarding changes to non-motorised user (NMU) facilities and views on benefits to the local street scene once a bypass is opened. These were piloted in 2007 and have now been undertaken on seven schemes.

Consistency of Consultation Responses

5.41 Statutory Consultees were invited to provide feedback on the schemes after opening. It should be noted that prior to 2006 and the formation of Natural England, consultation was carried out separately with the Countryside Agency for landscape and English Nature for biodiversity. Natural England is currently contacted once but asked to respond to both topic areas.

5.42 The main question was to identify the consistency of responses from statutory Consultees once the scheme had been built and to identify reasons why feedback was or was not given. The key findings are presented in greater detail in the ‘daughter document’ on environmental impacts, however the main points are as follows:

- In general, the Statutory consultees were supportive of the Highways agency undertaking post opening evaluation of the environment sub-objectives, even if they have not been in a position to provide any feedback. Natural England and English Heritage often suggested contacting the appropriate local county authority contact;
- Natural England (and previously the Countryside Agency and English Nature) provided responses where designated sites were affected including SSSIs and AONB or where individual staff had detailed knowledge of a particular scheme. Biodiversity mitigation measures were generally implemented in line with expectations and in one instance a Consultee considered them to be better than expected;
- English Heritage provided feedback for schemes where archaeological impacts were of national importance usually where designated sites were effected which indicated that

impacts on the built environment and archaeology generally are as expected. Most feedback confirmed that sufficient evaluation was undertaken;

- The Environment Agency generally provided feedback to confirm that mitigation measures were implemented as expected. Some issues were raised and these are identified within the Water section of this report;
- The main reasons when given, for not providing a response, include:-
  - Lack of data, including original response and monitoring information (11 responses);
  - There were no nationally designated sites affected by the scheme (8 responses);
  - Lack of resources or staff moved on (3 responses);
  - No reason given (12 occasions);
- County Councils were consulted for 11 schemes, of which responses were given for 9 schemes and no response for 2 schemes;
- District Councils were consulted on 7 schemes, of which responses were given for 6 schemes and no response for one scheme;
- The local authorities provided responses on a variety of sub-objectives and often used their local knowledge to comment in depth.

Progress on POPE Recommendations from 2006 Meta-analysis

5.43 The 2006 meta-analysis of environmental impacts included a series of recommendations for future POPE schemes. Progress against these is detailed in the Daughter Document. All 8 have been implemented, but 3 of these still require some ongoing work. This relates to documents which should theoretically be made available to POPE, but which in practice often cannot be obtained.

POPE Process Issues

5.44 The POPE methodology is in the process of being reviewed and updated to take account of process lessons learnt so far. It has been rolled out to all schemes in the Major Projects programme and the next Meta report will have the benefit of being able to use a much larger sample of results for robust reporting which would include more schemes at the Five Years After stage. Recommendations for the POPE process are:

- Environmental monitoring costs are built into scheme costs and environmental monitoring objectives are included and reviewed as part of the POPE process. However, monitoring information was only made available for a small number of schemes, possibly due to the large number of One Year After evaluations. A point of accountability should be established within the HA to track delivery and collation of results of environmental monitoring;
- Environment Management Plans are requested for POPE but are not always available; HEMP should be made a requirement of the PCF process, which did not exist in 2006; and
- It is a project requirement that a full set of appraisal documents are set aside by the Highways Agency for evaluation purposes, however, the retrieval of background information for POPE remains time consuming with the availability of information variable from scheme to scheme. This should also be a requirement of the PCF process.

Conclusions

5.45 A summary of the main environmental conclusions addressing the key questions are shown below.

How accurate are the predicted impacts of schemes on the environment?

- The majority (86%) of environmental impacts turn out as predicted on the AST. Prediction of landscape and biodiversity impacts is particularly accurate (92%).

What are the key findings about Heritage?

- On many schemes there is a lengthy delay in the publication of archaeological reports;
- Some concerns were raised regarding the impact of schemes fragmenting the local historic landscape making it more difficult to understand the history of the landscape; and
- Whilst schemes are generally implemented as expected, there is scope for best practice in design to be transferred between schemes.

What are the key findings about Biodiversity?

- Biodiversity mitigation measures are generally implemented in line with expectations. In two of the 14 instances, design changes resulted in a better than expected outcome;
- There are opportunities for lessons for future schemes to be learnt from the variety of mitigation methods tried on previous schemes, particularly in relation to: re-use of soils; establishment of species rich grassland; and, species translocation. Consideration should also be given to some of these experiences forming the basis for future research projects;
- Some opportunities to safeguard biodiversity are not taken up, for example the potential to safeguard locally important habitats from development as the pre-works site survey did not identify the need for any remedial action and river habitat improvements not being required as no protected species were present; and
- Monitoring information is rarely available, which reduces the opportunities for lessons to be learnt in the future.

What are the key findings about Water Quality?

- Mitigation measures were incorporated as expected for all schemes and there were no concerns raised regarding water issues;
- Pollution control measures have been incorporated into new schemes as expected;
- Generally balancing ponds are seen to be as effective as expected, but ongoing maintenance and management of balancing ponds is still required to maintain effectiveness;
- Although the Environment Agency are consulted throughout scheme development as a Statutory body, for a minority of schemes, the EA would have welcomed more communication on after monitoring; and
- Concerns have been made with regard to the operation of facilities in times of flood, including new tree planting that potentially reduce the culvert capacity, diameter of bridge openings, maintaining existing capacity of watercourses and provision of safe route for wildlife.

What are the key findings about Landscape?

- For landscape impacts, it is too early to comment on effectiveness of landscape planting at the One Year After stage. Ongoing establishment will be included as part of the Five Years After studies;
- The maintenance and management of landscape mitigation measures is essential, this highlights the importance of the draft HEMP at One Year After Stage and completed document at Five years after. Concerns were initially raised at two schemes where the initial planting was considered insufficient, however remedial measures rectified the problem;

- Use of local styles for walls and fencing can successfully contribute to schemes having a stronger local identity and reflect historic connections; and
- The visual impact of signs, gantries and lighting is sometimes underestimated, especially where changes are made late in the scheme's design.

What responses do we get from the consultation undertaken for POPE?

- Statutory Consultees are supportive of the Highways Agency undertaking post opening evaluation of the environmental sub-objectives;
- Statutory Consultees will usually only comment on national issues. As many HA schemes do not impact on designated sites, regional and local bodies have been found to be a good source of feedback.
- POPE resident's surveys have also provided useful feedback on feelings of the local community about the scheme post construction.

What is the current status of the recommendations from the 2006 meta-analysis report?

- Good progress is being made on the environmental recommendations of the 2006 meta-analysis report. There is some progress on all 8 recommendations, with 5 having been completed.

6. Accessibility, Integration and Consultation

Introduction

6.1 This section of the meta-analysis report summarises the evaluations of major schemes against the accessibility and integration sub-objectives, presented in greater detail in a separate 'daughter document'.

6.2 Originally, POPE evaluations focused primarily on traffic, economy and safety impacts with little or no focus on accessibility and integration objectives. Since 2006, all sub-objectives are evaluated.

6.3 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. The integration objective aims to ensure that all decisions are taken in the context of the Government's integrated transport policy.

6.4 The POPE evaluations of the accessibility and integration sub-objectives included:

- A summary of predicted and outturn impacts. The schemes were scored as either having an 'adverse' affect, 'neutral', or 'benefit' or 'not assessed'; and
- A comparison between predicted and outturn impacts. This analysis identified whether a sub-objective has scored 'better than expected', 'as expected', 'worse than expected' or 'not assessed'.

Accessibility

6.5 The accessibility objective contains the following sub-objectives:

- Severance;
- Option Values; and
- Access to transport system.

Integration

6.6 The Integration objective contains the following sub-objectives:

- Interchange and other transport modes;
- Land-use policy; and
- Other Government Policy.

6.7 In addition to the above, POPE also considers two further sub-objectives:

- Quality of Life; and
- Social Exclusion.

6.8 An assessment of these 'additional' sub-objectives, which are not part of an Appraisal Summary Table (AST) assessment, offers a different aspect of evaluation and helps to show how scheme impacts were perceived by those that are impacted on the most. Resident surveys were used to evaluate these sub-objectives where appropriate.

What are the key issues?

6.9 The format of this section reflects the somewhat qualitative nature of the findings and focuses on the following areas:

- **How accurate is the predicted impacts of schemes on accessibility and integration;** and
- **What is the public opinion of schemes once opened?**

Data Sources

Predicted Impact on Accessibility and Integration

6.10 The Appraisal Summary Table (AST) for all Major Scheme Projects appraises the expected impacts of schemes on accessibility and integration objectives. Each objective is assessed on a seven point scale from large negative to large positive impacts. POPE assessed whether these impacts have been achieved.

6.11 In addition to the information from the scheme AST, the predicted impacts are discussed at the scheme 'before meeting' with the HA Project Sponsor and Local Authority in order to determine whether measurable differences are expected.

Outturn Impact on Accessibility and Integration

6.12 The expected impacts in the AST were evaluated to assess whether they have actually occurred. This was generally a subjective assessment whereby schemes were assessed to show whether the impacts were as expected, better, or worse than expected and was based on:

- Post opening site visit to the scheme area;
- After opening meeting with the Scheme Project Sponsor and Local Authority;
- Discussions with relevant departments of Local Authorities;
- Review of local press and coverage of the scheme on the internet; and
- For some schemes, surveys of local residents were undertaken which provided excellent feedback on key issues.

The Schemes

6.13 As mentioned earlier in this section, early POPE evaluations only considered impacts on traffic, economy and safety in detail. For this meta-analysis, data is being used from 36 reports.

6.14 In total, 34 of the schemes are at the One Year After stage and a further 2 at the Five Years After stage. The full list of schemes used in the meta-analysis of accessibility, integration and consultation, are presented in Appendix A, together with the corresponding after opening stage.

Public Consultation

6.15 The outcomes of 5 resident surveys and 1 targeted stakeholder survey have been used in the meta-analysis of accessibility and integration.

6.16 Resident surveys were conducted for the following evaluations:

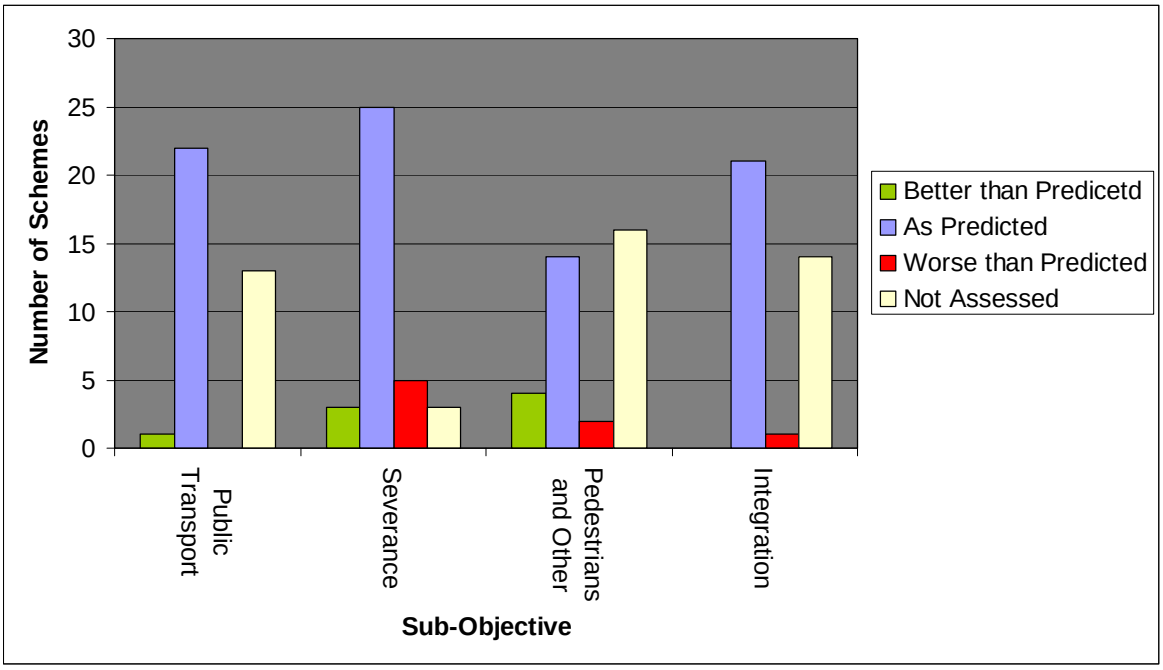
- A47 Thorney Bypass – OYA
- A421 Great Barford Bypass – OYA
- A27 Polegate Bypass – FYA
- A6 Clapham Bypass – FYA; and
- A6 Great Glen Bypass – FYA.

6.17 The targeted stakeholder survey was conducted for the A14 Rookery Crossroad Grade Separated Junction scheme (OYA).

How accurate are the Predicted Accessibility and Integration Impacts?

6.18 The separate 'daughter document' presents in greater detail the comparison between predicted and outturn impacts, however Figure 6.1 shows graphically a summary of the relationship between predicted and outturn impacts by sub-objective.

Figure 6.1 – Comparison between Predicted and Outturn



6.19 In general, most schemes were predicted to have a neutral or positive benefit on the accessibility or integration sub-objectives. The actual impacts are similar to those predicted:

- With 84% of schemes shown to have accurate predictions of accessibility or integration impacts;
- The schemes performing better than expected are generally non-bypass schemes; and

- For the schemes that had outturn impacts that were not as-predicted, there was no bias towards being better or worse than their predictions, with an equal number (8%) in each category.

6.20 Key findings for accessibility and integration with regards to the accuracy of predicted impacts are:

Accessibility

- 96% of schemes produced public transport impacts as predicted, with all producing neutral or beneficial impacts;
- There was little difference between predicted and outturn impacts on severance, with around 80% having beneficial impacts;
- This benefit was evident in the outcomes of the consultations which show the majority of residents observe that their village has come together as one community due to lower traffic levels and improved safety;
- The impact on pedestrians and others showed that more schemes than predicted bring benefits;
- The consultation showed that as a result of bypass schemes more residents are walking and cycling around the villages and local areas due to the reduction in traffic and associated safety improvements. It is easier to cross roads in the bypassed villages and parents are more willing to let their children walk or cycle to school;
- However, many felt that there had been a lack of communication/consultation on changes to public rights of way;
- A common view amongst residents is that with reduced traffic volumes, speeds increase and parking becomes a problem. There was a view that more traffic calming/restraint is required on the old roads and in some instances the promised measures had not been implemented; and
- There was also concern amongst residents that many of the above issues were raised at the scheme pre-implementation consultation or public inquiry but the concerns were ignored or dismissed.

Integration

- There was little difference between the predicted and outturn impacts for the integration sub-objective, with over 70% of schemes having beneficial impacts;
- The resident surveys showed how the quality of life for residents and communities has improved since the bypasses opened. This was due to an improved environment, better safety, especially for vulnerable users and enhanced community spirit;
- The benefits were not universal, with those living nearer to the bypass reporting worsened noise and local air quality. In addition, some residents who did not live in the bypassed village believed their quality of life has been worsened due to knock on effects on traffic (re-routing); and
- Residents in each area also felt that many of the developments in the corridor that have opened since the schemes were introduced are generating increased traffic and this will have an adverse effect on community spirit.

What is the public opinion of schemes once opened?

Public Consultation

6.21 In order to assess the qualitative impacts of schemes on local residents, a number of public consultations were conducted. Whilst these consultations have collected information for a wide

range of issues they have particularly focused on issues affecting severance, quality of life and accessibility.

6.22 The public consultations were initially piloted in 2007 for 4 schemes. This included resident surveys for the following 3 schemes:

- A47 Thorney Bypass (OYA)
- A421 Great Barford Bypass (OYA)
- A27 Polegate Bypass (FYA).

6.23 A focused stakeholder consultation was conducted for the A14 Rookery Crossroad Grade Separated Junction scheme (OYA).

6.24 Following the successful completion of the pilots a further 2 resident surveys were completed for the A6 Clapham Bypass (FYA) and A6 Great Glen Bypass (FYA).

6.25 The scheme evaluation plans for each of these schemes identified a number of objectives requiring a more enhanced POPE evaluation on issues such as:

- Community Severance,
- Quality of life;
- Social exclusion; and
- Environmental Issues (noise and local air quality)

6.26 To evaluate these objectives a survey of residents was carried out in the villages and towns likely to be affected by the opening of the bypasses. For the A14 Rookery scheme stakeholders were contacted directly by letter.

Consultation Responses

6.27 There was a good response rate to all the questionnaires, as shown in Table 6.1:

Table 6.1 – Survey Form Returns

Scheme	% returned
A47 Thorney Bypass	44.5%
A421 Great Barford Bypass	45.3%
A27 Polegate Bypass	26.3%
A6 Clapham Bypass	37.7%
A6 Great Glen Bypass	35.8%
Overall	**35.1%**

6.28 Feedback from the consultations relevant to accessibility and integration is included earlier in this section. There were also a number of important feedback by residents who participated in the consultation exercises relating to:

- Road safety;
- Environment; and
- Scheme Design.

6.29 Key points from this feedback and in general were:

- The high response rates indicated that residents affected by schemes are keen to give their views of how their lives have been impacted;
- The consultations enabled the Highways Agency to address a number of the objectives and issues raised by two reports into the POPE process;
- The resident surveys gathered many important issues and views beyond accessibility and integration, in particularly related to safety, environment and design issues;
- Safety was perceived to have improved on the bypassed road for road users and pedestrians, although the problems of speeding vehicles and parking problems were reducing these safety benefits;
- The environment in the bypassed centres has improved, with better local air quality and less noise pollution;
- A number of residents believe the environmental mitigation measures were either not complete or not extensive enough. However, this may be more to do with the measures not yet being fully established; and
- Some residents raised concerns about scheme design issues. These mainly related to signing, design of traffic roundabouts, lack of traffic calming and the extent of the bypass. Again, many residents viewed these as being issues that were raised but not considered in the scheme planning stages.

Conclusions

6.30 A summary of the main environmental conclusions addressing the key questions are shown below.

How accurate are the Predicted Accessibility and Integration Impacts?

- The majority (84%) of schemes are shown to have accurate predictions (as expected) of accessibility and integration impacts; and
- On-line widening and junction improvement schemes perform better than expected, however, most schemes are predicted to have a neutral or positive benefit.

What is the public opinion of bypass schemes once opened?

- The majority of respondents in all residents surveys consider their quality of life to have improved after the bypass has opened, due to traffic reduction and improved safety and local environment;
- Some however, felt that their views on schemes before construction and the possible effects were either ignored or dismissed;
- Increased speeds, minor rat runs and parking problems were reported by a minority of residents in each of the residents' surveys undertaken to date, and some residents believed promised traffic calming measures had not been delivered;
- Important issues concerning additional congestion or safety issues were also raised, in particular regarding roundabouts where the new and existing roads meet.

7. Key Points from 2009 Meta

7.1 This section of the report provides a summary of the **key findings** from the Meta Report together with **recommendations** to be considered by the Highways Agency to inform their decision making and appraisal techniques.

Traffic

Key Findings
• Only 40% of bypass schemes have predicted traffic volumes within 15% of outturn, whereas the majority (75%) of junction improvement and online widening schemes are within 15%; • A reasonably high number of bypass schemes (around 25%) show differences of greater than 25% and most are under-predicting; and • There are clear reasons why these differences occur, namely quality and scope of the modelling undertaken, which have not reflected the actual changes in traffic volumes on different roads, and the key assumptions used within forecasting.
Key Recommendations
• Future modelling needs to be more clearly defined and consistent considerations applied between schemes; • Consideration should be given to a two-tier model approach utilising Strategic National or Regional Model estimates of demand feeding into a more scheme specific modelling platform; and • New guidance is that a 'Core' scenario modelled with sensitivity tests and alternative scenarios should be reported, however our recommendation would be to go further and adopt a risk analysis approach to the treatment of uncertainty in traffic forecasting, similar to that usually associated with cost estimation.

Safety

Key Findings
• At the one year after stage, there is poor correlation between predicted and outturn accident savings, particularly for bypasses; and • Comparisons of Accident savings improve when five years of after accident data is used.
Key Recommendations
• Adopting the traffic modelling recommendations will also improve the accuracy of accident saving predictions. • It is important to use a sufficiently wide and detailed area in the assessment model for routes where strategic (and local) re-assignment is likely to be an issue.

Economy

Key Findings
• Forecasting of economic benefits is generally not accurate (only 38% of schemes have predicted time benefits and 29% of schemes have predicted accident benefits within 15% of the outturn); • There is no systematic bias (with roughly equal numbers of schemes over and under predicting) and all schemes show positive economic outturns; • Those schemes that show accurate traffic predictions generally saw little change in their outturn benefits. Where there was less traffic than predicted, there were reduced benefits; and • Only 42% of predicted scheme costs are within 15% of the outturn, with a tendency to overspend.
Key Recommendations
• Adopting the traffic recommendations will also improve the accuracy of economic predictions; and • Continual improvement in cost prediction is required, although this is being thoroughly reviewed elsewhere in the HA.

Environment

Key Findings
• The majority (86%) of schemes are accurately predicting opening year environmental impacts; • The availability of environmental management plans to the POPE team is variable. • The associated reports monitoring environmental mitigation and Public Inquiry commitments (e.g archaeological reports) are also unavailable. • Concerns were raised on maintenance of mitigation measures after opening; • There is variability in sharing best practice, despite much good work in implementation; and • Use of local styles within scheme design on walls, fencing and gateway features was considered to be successful.
Key Recommendations
• Ensure that relevant key environmental reports are completed and available at the appropriate times; • More clarity is required as to the ownership of monitoring and maintenance of schemes; • The Highways Agency to identify a vehicle for recording examples of best practice; • Local styles within scheme design are recommended to give the best impact on Landscape.

Accessibility, Integration and Consultation

Key Findings
• The majority (84%) of scheme impacts on accessibility and integration sub-objectives have been as expected; and • The residents' surveys have been successful and mostly providing positive feedback on the scheme. Key concerns are focused mainly on the local road after scheme opening and new congestion/safety issues at junctions where new and existing roads meet.
Key Recommendations
• The outcomes of the consultations should be shared with the relevant departments of the local authorities to enable them to address residents' concerns; • The scheme design issues should be reported to the HA; • The Highways Agency should respond to residents on the key issues that were raised.

and proposed actions.

Appendix A

Table A.1 – Bypass Schemes: Evaluation Parameters

Scheme Name	Report Stage	Opening Year
A1(M) Wetherby to Walshford	OYA	2004
A1(M) Ferrybridge - Hook Moor	OYA	2006
A10 Wadesmill, High Cross and Colliers End Bypass	OYA	2004
A21 Lamberhurst Bypass	OYA	2005
A27 Polegate Bypass	OYA	2002
A34 Newbury Bypass	5YA	1998
A43 Silverstone Bypass	OYA	2002
A43 Syresham Bypass	OYA	2002
A46 Norton Lenchwick Bypass	10YA	1995
A47 Thorney Bypass	OYA	2006
A5 Nesscliffe Bypass	OYA	2003
A5 Weeford Fazeley	OYA	2005
A500 Basford, Hough, Shavington Bypass	OYA	2003
A6 Alvaston Bypass	OYA	2003
A6 Clapham Bypass	OYA	2002
A6 Great Glen Bypass	OYA	2003
A6 Rothwell and Desborough Bypass	OYA	2003
A6 Rushden – Higham Ferrers Bypass	OYA	2003
A63 Selby Bypass	OYA	2004
A650 Bingley Relief Road	OYA	2003
A66 Stainburn and Great Clifton Bypass	OYA	2002

Table A.2 – Summary of Predicted and Outturn Flows of Non-Bypass Schemes

Scheme Name	Scheme Type J-Junction/O-Online widening	Corridor Within 15%
A1 Stannington Grade Separated Junction	J	OK
A14 Rookery Crossroads Grade Separated Junction	J	OK
A34/M4 Chieveley Improvement	J	+
A500 City Rd and Stoke Rd Jn Improvement	J	-
A63 Melton Grade Separated Junction	J	-
A64 Colton Lane Grade Separated Junction	J	OK
A1033 Hedon Road Improvements	O	OK
A11 Attleborough Bypass Improvement	O	OK
A11 Roudham Heath to Attleborough Dualling	O	OK
A2 Bean to Cobham Improvement Phase 1	O	OK
A46 Newark to Lincoln Improvements	O	+
M25 J12 – J15 Widening	O	OK
M4 J18 Eastbound Diverge	O	OK
M5 J18a – J17 Northbound	O	OK
M5 J19 – J20 Northbound Climbing Lane	O	OK
M5 J19 – J20 Southbound Climbing Lane	O	OK

Table note: OK =predicted and outturn are within +/- 15% of observed, + = outturn is larger than predicted by >15% and - = outturn is less than predicted by >15%

Table A.3 – Summary of Available COBA Data

Scheme Type	Scheme	Original COBA Data
Bypass	A1(M) Ferrybridge - Hook Moor	No
	A10 Wadesmill to Colliers End Bypass	No
	A21 Lamberhurst Bypass	Yes
	A27Polegate Bypass	Yes
	A34 Newbury Bypass	Yes
	A41 Aston Clinton Bypass	Yes
	A43 Silverstone & Syresham Bypasses	Yes
	A46 Norton Lenchwick Bypass	Yes
	A5 Nesscliffe Bypass	Yes
	A5 Weeford - Fazeley Improvement	No
	A500 Basford, Hough, Shavington Bypass	No
	A6 Alvaston Bypass	No
	A6 Clapham Bypass	Later version
	A6 Great Glen Bypass	Yes
	A6 Rothwell - Desborough Bypass	Yes
	A6 Rushden - Higham Ferrers Bypass	Yes
	A63 Selby Bypass	No
	A650 Bingley Relief Road	No
	A66 Stainburn and Great Clifton Bypass	Yes
Junction	A1 Stannington Grade Separated Junction	Yes
	A14 Rookery Crossroads Grade Separated Junction	No
	A34 Chieveley/M4 Jct 13 Improvement	Yes
	A64 Colton Ln Grade Separated Junction	No
Online	A1033 Hedon Road Improvements	Yes
	A11 Roudham Heath to Attleborough Dualling	No
	A2 Bean to Cobham Improvement Phase 1	No
	A2/M2 Cobham to Junction 4 Widening	No
	A46 Newark to Lincoln Improvement	Yes
	M25 J12-15 widening	No
	M4 J18 Eastbound Diverge	Yes

Table A.4 – Schemes used in Safety Analysis

Scheme	Results used
A1 Stannington Grade Separated Junction	1 yr
A1(M) Wetherby to Walshford	1 yr
A1033 Hedon Road Improvements	1 yr
A11 Attleborough Bypass Improvements	1 yr
A14 Rookery Crossroads Grade Separated Junction	1 yr
A21 Lamberhurst Bypass	1 yr
A27 Polegate Bypass	1 yr & prelim 5yr
A34 Newbury Bypass	5yr only
A34/M4 J13 Chieveley Improvement	1 yr
A41 Aston Clinton Bypass	1 yr
A43 M40 –B4031 Dualling	1 yr & prelim 5yr
A43 Silverstone Bypass and Syresham Bypass	1 yr & prelim 5yr
A46 Newark – Lincoln Improvement	1 yr & prelim 5yr
A46 Norton Lenchwick Bypass	5 yr only
A47 Thorney Bypass	1 yr
A5 Nesscliffe Bypass	1 yr
A5 Weeford – Fazeley Improvements	1 yr
A500 City Rd and Stoke Rd Junction Improvement	1 yr
A6 Alvaston Bypass	1 yr
A6 Clapham Bypass	1 yr & prelim 5yr
A6 Great Glen Bypass	1 yr & prelim 5yr
A6 Rothwell and Desborough Bypass	1 yr
A6 Rushden and Higham Ferrers Bypass	1 yr
A63 Melton Grade Separated Junction	1 yr
A64 Colton Lane Grade Separated Junction	1 yr
A66 Stainburn and Great Clifton Bypass	1 yr
M4 Jn 18 Eastbound Diverge	1 yr
M5 J18a – J17 Northbound Climbing Lane	1 yr
M5 J19 – J20 Northbound Climbing Lane	1 yr
M5 J19 – J20 Southbound Climbing Lane	1 yr

Table A.5 – Schemes included in the meta-analysis of Environment impacts

Scheme Name	Actual Opening	Type	Report Stage
A1(M) Ferrybridge to Hookmoor Improvements	2004	Bypass	OYA
A10 Wadesmill, High Cross and Colliers End Bypass	2004	Bypass	OYA
A21 Lamberhurst Bypass	2005	Bypass	OYA
A34 Newbury Bypass	1998	Bypass	FYA
A46 Norton Lenchwick Bypass	1995	Bypass	10YA
A5 Nesscliffe Bypass	2003	Bypass	OYA
A5 Weeford Fazeley Bypass	2005	Bypass	OYA
A63 Selby Bypass	2004	Bypass	OYA
A650 Bingley Relief Road	2003	Bypass	OYA
A14 Rookery Crossroads Grade Separated Junction	2006	Junction	OYA
A64 Colton Lane Grade Separated Junction	2005	Junction	OYA
A1033 Hedon Road Improvements	2003	Online	OYA
M25 Jct 12-15 Widening	2005	Online	OYA
M4 Jct 18 Eastbound Diverge	2005	Online	OYA

Seven of these schemes were included in the original Pilot project, which have been shaded. These seven schemes were also considered in the previous 2006 report.

Box 1 below indicates the standard list of information which has been developed to provide background information for evaluations. This list forms part of the current methodology and the exact information requested for previous schemes varies

Table A.6 – Standard List of Documents requested

Box 1:

Standard list of information required to evaluate the environmental sub-objective

- Environmental Statement (ES)
- Appraisal Summary Table (AST)
- Any amendments, updates or addendums to the ES or any relevant further studies or reports. Any significant changes to the scheme since the ES.
- 'As Built' drawings for landscape, ecological mitigation measures, drainage, fencing, earthworks etc. Preferably electronic versions
- Landscape and Ecology Management Plans
- Construction Environment Management Plan
- Relevant contact names, of people with knowledge of the scheme, at:
  - the Statutory Consultees (Environment Agency, English Heritage and Natural England);
  - the local authorities;
  - the designer or environmental coordinators for the scheme and for the MAC; and,
  - any other relevant specialist consultees that were contacted.
- Archaeological reports (popular and academic)
- List of properties eligible for noise insulation
- List of Part 1 Claims regarding noise, air quality or lighting (from HA National Part 1 Team)
- Results of any post opening survey or monitoring work e.g. ecology surveys, water quality surveys pre- and post- construction
- Animal mortality data, pre and post scheme construction (from MAC)
- Any scheme newsletters or publicity material for the scheme
- Copy of the Non-motorised User (NMU) post opening survey
- Information may be available regarding environmental enhancements to streetscape/townscape for bypassed settlements

Table A.7 – Schemes used in Accessibility and Integration meta-analysis

A1(M) Ferrybridge Hookmoor	Bypass	OYA
A1(M) Wetherby to Walshford	Bypass	OYA
A10 Wadesmill, High Cross and Colliers End Bypass	Bypass	OYA
A11 Attleborough Bypass	Bypass	OYA
A21 Lamberhurst Bypass	Bypass	OYA
A27 Polegate Bypass	Bypass	OYA
A34 Newbury Bypass	Bypass	FYA
A41 Aston Clinton Bypass	Bypass	OYA
A43 Silverstone Bypass	Bypass	OYA
A43 Syresham Bypass	Bypass	OYA
A46 Norton Lenchwick Bypass	Bypass	10YA
A47 Thorney Bypass	Bypass	OYA
A5 Nesscliffe Bypass	Bypass	OYA
A5 Weeford Fazeley	Bypass	OYA
A500 Basford, Hough, Shavington Bypass	Bypass	OYA
A6 Alvaston Bypass	Bypass	OYA
A6 Clapham Bypass	Bypass	OYA
A6 Great Glen Bypass	Bypass	OYA
A6 Rothwell and Desborough Bypass	Bypass	OYA
A6 Rushden - Higham Ferrers Bypass	Bypass	OYA
A63 Selby Bypass	Bypass	OYA
A650 Bingley Relief Road	Bypass	OYA
A66 Stainburn and Great Clifton Bypass	Bypass	OYA
A1 Stannington Grade Separated Junction	Junction	OYA
A14 Rookery Crossroads Grade Separated Junction	Junction	OYA
A34/M4 Chieveley Improvement	Junction	OYA
A43 (M40 J10 - B4031)	Junction	OYA
A500 City Rd and Stoke Rd Junction Improvement	Junction	OYA
A63 Melton Grade Separated Junction	Junction	OYA
A64 Colton Lane Grade Separated Junction	Junction	OYA
M5 Climbing Lanes	Junction	OYA
A1033 Hedon Road Improvements	Online	OYA
A11 Roudham Heath to Attleborough Dualling	Online	OYA
A2/M2 Cobham to J4 Widening	Online	OYA
A46 Newark to Lincoln Improvements	Online	OYA
M25 J12 – 15 Widening	Online	OYA
A1(M) Ferrybridge Hookmoor	Bypass	OYA