A40 West of St. Clears

Stage 1 Scheme Assessment Report
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1. INTRODUCTION

1.1 What is this report?

1.1.1 The Stage 1 Scheme Assessment Report is a summary report of the investigations undertaken by the Transport Directorate of the Welsh Assembly Government and its consultants, between August 2002 and September 2004, to determine to which standard, single or dual carriageway, the A40 trunk road west of St Clears in South West Wales should be improved.

1.1.2 The detailed investigations, their assessment and appraisal, are reported fully in the Route Options Report, the Stage 2 Environmental Assessment Report, the Economic Assessment Report and the Technical Appraisal Report. These are supported by a number of specialist reports. All these reports are listed at Annex 1.

1.1.3 The requirements for this report are given in the Design Manual for Roads and Bridges, Volume 5, Section 1, Part 2, TD37/93.

1.2 Why was a study required?

1.2.1 In November 2001 the National Assembly for Wales published *The Transport Framework for Wales*. This stated that the east-west transport corridor in west Wales, had been the subject of a multi-modal study, which concluded that the A40 west of St Clears needed improvement. The Assembly’s programme for the trunk road network would reflect this.

1.2.2 In March 2002 the *Trunk Road Forward Programme 2002* (TRFP) was published. The following is an extract from the relevant section of the document:

> 4.3.3. The multi-modal study concluded that improvements to public transport including rail, bus, freight and integrated bus and rail on the corridor could be implemented in the near future but the costs associated with enhanced passenger services are likely to exceed revenue, thus requiring an operating subsidy. Improvements to public transport will not reduce the amount of traffic on the A40 over this length or on the A477. Improvement of the A40 trunk road, whether it be to single or dual carriageway standard, is beneficial in economic terms. Improvement to the road would not affect the number of people travelling on public transport significantly. The Assembly Government is collaborating with the Strategic Rail Authority on the possibility for realistic improvements on rail in West Wales and is also reviewing the long distance bus services as part of an all-Wales appraisal.

> 4.3.4 The A40 in West Wales forms the lowest standard section of the Trans European Road Network in the United Kingdom and that there are major problems associated with upgrading the freight carrying capacity on rail in this area which means that significant improvement in the foreseeable future is not viable.

> 4.3.5 We are therefore satisfied that improvement to the A40 between St Clears and Haverfordwest is needed and that economic benefits will accrue. Upgrading of the road to dual carriageway standard is likely to be justified but before a decision is finally made,
we need more information on the environmental implications associated with alternative standards. As a first step in the delivery of this strategy we will carry out an environmental assessment to help determine, within 18 months, whether the improvement should be to single or dual carriageway standard and how it can best be provided. The previously proposed bypass for Robeston Wathen will be included within the assessment of the whole length of the A40 between St Clears and Haverfordwest. However, there is a pressing need to provide relief to the community from the effects of trunk road traffic in the village. This factor will be taken into account in the development of the overall improvement strategy. Improvements on the A40 between Haverfordwest and Fishguard and the A477 will be limited to discrete improvements to improve safety and accessibility."

1.2.3 In August 2002, the Transport Directorate, the arm of the Welsh Assembly Government responsible for the delivery of the TRFP, commissioned the consulting engineering firm of Parsons Brinckerhoff (Cardiff) to investigate, assess, appraise and report on options for improving the A40 trunk road between St Clears and Fishguard. Parsons Brinckerhoff appointed sub-consultants TACP (environmental studies) and Berkeley Hanover Consulting (economic studies) to assist them with the more specialist aspects of the investigation.

1.3 What did the study involve?

1.3.1 Having established that improvements to the A40 west of St Clears were necessary, the Welsh Assembly Government had to determine whether a single or dual carriageway should be provided and whether there were any significant environmental constraints which could prevent the implementation of either standard of improvement.

1.3.2 The study involved:

- Establishing a set of scheme objectives against which options could be appraised. The objectives were developed from the Trunk Road Forward Programme 2002 and listed under the five transport assessment criteria of Accessibility, Economy, Environment, Integration and Safety.

- Agreeing an appraisal methodology.

- A desk top study and appraisal of broad corridor options between St Clears and Fishguard to identify which corridor(s) would best meet the scheme objectives. (see Section 3 for further details)

- Development of single and dual carriageway route options within the selected corridor for assessment. (see Section 4 for further details)

- Environmental survey work to establish baseline conditions and enable assessment of route option impacts. (see Section 5 for further details)

- Appraisal of the route options against the scheme objectives and the five transport assessment criteria (see Section 4 for further details)
• Identification of the route options which could be taken forward for further technical consideration and appraisal.

• Technical appraisal of those route options.

1.3.3 The above assessment and appraisal informed the decision making process on the environmental impact of the improvements considered, the standard of improvement required and whether public consultation would be appropriate.
2 THE APPRAISAL PROCESS.

2.1 Sustainable Development

2.1.1 In line with the Assembly Government's scheme for Sustainable Development, the Transport Framework for Wales and the Trunk Road Forward Programme 2002 take social, economic and environmental issues into account. The Programme supports the Assembly's economic, social and environmental aims of improving the economic and social conditions in Wales through increased efficiency and accessibility, whilst endeavouring to minimise adverse environmental effects.

2.1.2 The extent to which options achieve these objectives, as defined in sustainable development policies is therefore assessed and their qualitative and quantitative performance summarised in appraisal tables for consideration by decision makers.

2.2 The appraisal method to be used.

2.2.1 At the time of the commencement of the study, the Welsh Assembly Government was in the early stages of developing its own transport appraisal guidance, having decided that the appraisal methodologies used in England were no longer appropriate for use in Wales. Pending the issue of new guidance in Wales, the Welsh Assembly Government decided to use the draft Scottish Transport Appraisal Guidance (STAG) for appraising transport schemes.

2.2.2 STAG is a document to aid planners and decision makers in the development of transport policies, plans and programmes. Its structure and breadth allows it to be applied in a very wide variety of settings and enables different challenges to be met.

2.2.3 Whilst STAG sets out required practice it is written on the basis of a core belief that good planning and appraisal result in good transport. It is an intention of STAG that the development and implementation of proposals will be to the satisfaction of all stakeholders, most important of which is the public.

2.3 Setting the Scheme Objectives.

2.3.1 STAG requires the setting of objectives for a scheme under the headings of the UK Government's five transport assessment criteria of:

- Accessibility
- Safety
- Environment
- Economy
- Integration

The process of developing the scheme objectives for this scheme is indicated at Annex 2.
2.3.2 The proposed assessment and appraisal process and the setting of the objectives was discussed with the scheme's Environmental Liaison Group, comprising representatives of the Transport Directorate and its consultants, the Environment Agency, the Pembrokeshire Coast National Park, the Countryside Council for Wales, Pembrokeshire County Council and Carmarthenshire County Council. Regular meetings of the Group were held during the period of the study to solicit their views and to keep them informed of progress.

2.3.3 Having set and agreed the scheme objectives a two-stage identification, assessment and appraisal process commenced. The gathering of data about the existing situation was an essential pre-requisite of the assessment process. It was necessary, prior to that, to establish the area to be studied. Therefore a Stage 1 appraisal was commenced to determine the most appropriate corridor(s) for a possible road improvement.
3. STAGE 1 - BROAD ROUTE CORRIDOR ASSESSMENT AND APPRAISAL

3.1 The aims at this stage were:

- To identify broad route corridors between St Clears and Fishguard through which an improvement of the A40 trunk road could be located.
- To consider broadly, at a desk top study level (Stage 1), how well those route corridors would meet the scheme objectives and which of the corridors would be suitable for further consideration.

3.2 The basic principles to be adopted in this consideration were to:

- avoid impact on the Pembrokeshire Coast National Park or minimise impact if avoidance was not practical;
- minimise impact on the environment and avoid statutorily designated areas such as SSSIs, SACs etc;
- provide opportunity for a cost effective improvement that would demonstrate value for money

3.3 Several route corridors were identified, including the existing road corridor, which broadly met the principles outlined above. The corridors were assessed and appraised against the scheme objectives. A broad assessment of the route corridors was undertaken using available desk top study information. This was used to determine whether route options within a broad route corridor could meet the scheme objectives and the above principles.

3.4 The process of assessment and appraisal was recorded on Stage 1 Appraisal Summary Tables (AST1s). The appraisal concluded that routes developed within the existing corridor between St Clears and Haverfordwest would best meet the scheme objectives. This is fully reported in the Stage 1 Corridor Appraisal Report. (Annex 1 Ref. 17) The corridors investigated are shown in Annex 3.

3.5 A route corridor that had a significant adverse environmental impact, or was not considered value for money due to high costs and small benefits, was discarded. Making use of the previous investment in the existing trunk road was considered likely to achieve better value for money than constructing remote off-line corridor options. However, if necessary, the assessment process would be subject to review and a discarded corridor option could be reconsidered at a later stage.

3.6 The TRFP 2002 stated that improvements to the A40 between Haverfordwest and Fishguard would be limited to discrete improvements only. Detailed investigations were therefore confined to the section of A40 between St Clears and Haverfordwest.
4. STAGE 2 - ROUTE OPTION IDENTIFICATION, ASSESSMENT AND APPRAISAL

4.1 The following sets out the aims and basic principles of the Stage 2 assessment and appraisal process in identifying and considering route options, within the selected route corridor. A review of the initial Scheme Objectives was undertaken and minor adjustments were made in the light of the experience gained during the Stage 1 process. These changes are recorded in the revised Scheme Objectives shown at Annex 2.

4.2 The aims at this stage were:

- To identify and consider single and dual carriageway route options, within the corridor as taken forward from Stage 1, at a more detailed assessment and appraisal (Stage 2) level
- To assess how these route options perform against the 5 assessment criteria and the Stage 2 scheme objectives.
- To obtain sufficient assessment and appraisal information to inform a decision on whether to improve the trunk road to a single or dual carriageway standard.
- To identify routes that the Assembly could take forward for further consideration.

4.3 In order to best meet these aims route options should, as a general principle:

- avoid impact on the Pembrokeshire Coast National Park, or minimise impact if avoidance is not practical;
- avoid impact on statutorily designated areas such as SSSIs, SACs etc;
- provide a cost effective improvement that demonstrates value for money
- minimise the numbers of private accesses on to single carriageway options.
- permit access on to dual carriageway options only at a minimal number of road junctions.
- be to full standard design ie to 120kph (70mph) design speed for dual carriageway options and only incorporate a reduction in standard where constraints require it, or significant other benefits would accrue.
- be to full standard design ie to 100kph (60mph) design speed for single carriageway options.
- achieve a balanced earthworks profile ie excavated material equals fill material, thus minimising the need to find places to use or dispose of material off site.
- relieve the communities of Robeston Wathen and Llanddewi Velfrey from the intrusion caused by trunk road traffic.

Routes were then developed within the existing corridor for both dual and single carriageway options.

4.4 During this stage of the study detailed environmental surveys were undertaken to provide baseline data for a variety of assessment criteria. These were principally in relation to landscape, ecology, nature conservation and cultural heritage. Surveys were undertaken in
accordance with the standards set out in Volume 11 of the DMRB for Stage 2 Environmental Assessments.

4.5 This level of data collected enabled an environmental constraints map to be produced which aided the identification of routes and the subsequent assessment and appraisal process (see Annex 9). Routes were adjusted where necessary to avoid sensitive locations, or mitigation measures included within the cost estimates.

4.6 Further information on the environmental survey baseline data and the qualitative assessment and appraisal process is described in more detail in the Stage 2 Environmental Assessment Report (EAR) (Annex 1 Ref. R31). This records the full detail of this aspect of the study.

4.7 In addition, various traffic surveys, including roadside interviews and turning movement counts, were undertaken to provide existing traffic data. Traffic growth trends were used to generate a traffic model to accurately predict future traffic conditions. This data and its interpolation is recorded in several reports listed at Annex 1 culminating in the Traffic Forecasting Report (Annex 1 Ref. R26) The conclusions of this report are summarised in Section 6.1.

4.8 The traffic and relevant engineering data of each route option was input into the cost benefit analysis program, COBA 11, version 4. This generated the likely discounted present value costs and benefits of each option to aid the appraisal process. Further information is given in the Economic Assessment Report (Annex 1 Ref. R29) and its conclusions are summarised in Section 7.7.

4.9 Each route option was assessed to determine it's technical implications, the environmental impact and the economic benefits that could be gained from its implementation. The route assessment and appraisal process and its conclusions is recorded in the Route Options Report (ROR) (Annex 1 Ref. R27)

4.9.1 This report describes the appraisal process, the options considered, together with their engineering, traffic and environmental implications and concludes with a recommendation on the routes to be considered for further technical appraisal.

4.10 Those routes identified by the Route Options Report were assessed in more technical detail. Routes that could be recommended for further consideration for both a single or dual carriageway standard were identified in this appraisal. At this stage no decision had been made as to whether the improvement would be to single or dual carriageway standard. The detailed technical appraisal is recorded in the Technical Appraisal Report (TAR) (Annex 1 Ref. R32)
5 THE EXISTING CONDITIONS

5.1 Along with the M4, the A477 and the A48, the A40 in west Wales forms part of the Trans European Road Network (TEN-T), an important strategic link between Europe, the rest of the UK and Ireland via the ferry ports of Fishguard and Pembroke Dock.

5.2 At the Pensarn roundabout in Carmarthen the A40 is joined by the A48 from the east. Traffic flows increase considerably as this corridor through Carmarthen forms the main arterial road to Pembrokeshire and South West Wales. The A40 west of Carmarthen is part of the London - Fishguard Trunk Road and is of dual carriageway standard from Carmarthen through to St Clears, where the traffic splits between the A477 trunk road to Pembroke Dock and to Haverfordwest and the port of Fishguard, the section of A40 that is the subject of this study (see Annex 4A).

5.3 The Consultants were instructed to confine their investigations to the section between St Clears and Haverfordwest. As stated in the Trunk Road Forward Programme 2002, improvements to the A40 between Haverfordwest and Fishguard would be discrete safety improvements only. The Stage 1 Corridor Appraisal Report concluded that further investigations would be confined to the existing route corridor only.

5.4 The A40 between St Clears and Haverfordwest passes through the counties of Carmarthenshire and Pembrokeshire. It is a predominantly rural area with a richly patterned landscape. The combination of topography, vegetation cover and small scale settlements produces an intimate landscape, characterised by agriculture, woodland and hedgerow, and hedge bank. Between Canaston Bridge and Slebech the existing trunk road forms the boundary of the Pembrokeshire Coast National Park.

Typical landscape of the study area
5.5 Proceeding westwards from the St Clears roundabout, the existing A40 crosses over the Swansea to Haverfordwest railway line at Pont-y-Fenni and again just west of Whitland. It then passes through the communities of Llanddewi Velfrey and Robeston Wathen and westward to Slebech and Haverfordwest. The major watercourses crossed are the Afon Taf and Afon Marlais, just west of Whitland, and the Eastern Cleddau at Caaston Bridge.

5.6 A large number of properties and farms border the existing trunk road and have direct access onto it. The main industries within the area are agriculture, tourism and small businesses. Oakwood Leisure Park is a significant leisure facility located to the south of the A4075/A40 junction west of Robeston Wathen.

5.7 For most of its 32 km length between St Clears and Haverfordwest the existing trunk road is 7.3 metres wide, with, in places, 1.0 metres wide hardstrips and variable width grass verges. There are more than 200 direct accesses to properties, farms and fields, excluding those within the communities of Llanddewi Velfrey and Robeston Wathen.

5.8 The scheme study length was divided into 8 sections for ease of reference and the following paragraphs describe the salient existing features of each section. These sections are shown on the plan at Annex 4B.

5.8.1 Section A - St Clears - Whitland Bypass

During the past twenty years three major improvement schemes have been completed between St Clears and Whitland, resulting in this section of road being to good single carriageway standard with reasonable lengths of safe overtaking opportunity and little community severance.

![Looking west from St Clears Roundabout](image)

Looking west from St Clears Roundabout
(westbound climbing lane is visible)

5.8.2 Section B - Whitland Bypass
This bypass was opened in 1996 and provides a high standard single carriageway to the north of Whitland, terminating in at-grade roundabouts at either end. There is a long length of safe overtaking available in both directions on the bypass.

5.8.3. Section C - Whitland BP - Llanddewi Velfrey

From the western roundabout at the end of the Whitland Bypass the existing road climbs Pengawse Hill, which has a westbound climbing lane, this being one of the improvement schemes carried out in recent years. There have been some serious accidents and fatalities on this hill in recent years. From the top of Pengawse Hill, the trunk road continues westwards and passes through the community of Llanddewi Velfrey.

5.8.4 Section D - Llanddewi Velfrey - Penblewin Roundabout
Over this section of the trunk road the alignment is generally of a low standard and its width reduces to about 6.5 metres, in particular through Llandewi Velfrey. There are no hardstrips and verges are often narrow or non-existent ie less than the 2.5 metre width appropriate to this class of road. Footways, where provided, are generally less than 1 metre in width. Properties front the trunk road with direct access onto it, these include a petrol filling station with a mini market and a public house. Little provision exists on the trunk road for traffic wishing to turn right and delays can result. Turning right on a busy trunk road without a right turning lane can be a hazardous manoeuvre and consequently the trunk road through the village has a poor accident record at junctions. A 40 mph speed restriction is in force. As the road leaves the village the alignment marginally improves towards Penblewin roundabout junction with the A478. Apart from limited junction improvements in Llanddewi Velfrey this section has not been improved recently.
5.8.5.1 Proceeding from Penblewin roundabout to Robeston Wathen, the trunk road is generally 7.3 metres wide, with reasonable width verges. Forward visibility is adequate but at some locations this is impaired where verges are overgrown. Frontage development is limited to small numbers of residential properties at Blackmore Hill and Redstone Cross. The junction at Redstone Cross with the B4313 has poor visibility for traffic wishing to join the trunk road and has a history of accidents. Improvements to the junction have recently been introduced and have reduced accidents. The junction however remains below standard.

5.8.5.2 Between Redstone Cross and the village of Robeston Wathen the trunk road is of a reasonable standard and forward visibility is adequate, but not sufficient to provide good lengths of safe overtaking.

5.8.5.3 Through the village of Robeston Wathen the existing trunk road is of a low standard of alignment. The road width reduces to below 6.5 metres in places and footways and verges are narrow. The combination of poor alignment, narrow footways and verges and the close proximately of a number of properties to the trunk road, results in poor forward visibility. A 30mph speed restriction applies through the village. This section of the trunk road also has a poor accident record and traffic calming measures have been introduced in recent years to address this. This has been a success and the number of accidents has reduced.
5.8.5.4 On leaving the village the trunk road falls at a gradient of almost 7%, flattening out as it approaches the junction with the A4075 and then crosses the Eastern Cleddau river at Canaston Bridge. Downhill speeds tend to be high over this section and although forward visibility is good the junction has a history of accidents.

5.8.6 Section F - Canaston Bridge - Slebech Park

On crossing the Eastern Cleddau river the trunk road climbs in a westerly direction towards Slebech Park. The road forms the northern boundary of the National Park for about 3.5 miles from Canaston Bridge to Slebech. The trunk road from Canaston Bridge to Slebech is of an acceptable single carriageway standard with a 7.3 metre wide carriageway and reasonable width verges. Whilst forward visibility is generally acceptable it does not provide
opportunities for safe overtaking. A retail park is located within the small community of Slebech, adjacent to the northern edge of the trunk road. Accidents have occurred at the access to the retail park, resulting in it being designated an accident cluster site.

![Slebech at junction to retail park](image.png)

5.8.7 Section G - Slebech Park - Deeplake Farm

On leaving Slebech the trunk road falls at a gradient of almost 8% down Arnolds Hill towards Deeplake Farm. Arnolds Hill has an eastbound climbing lane that gives an opportunity for safe overtaking. Traffic speeds on the hill have been of concern to the police. As such, measures have been implemented to try and limit speeds on the approaches to the foot of the hill where the trunk road alignment is sub-standard.

5.8.8 Section H - Deeplake Farm - Haverfordwest

Proceeding westwards from Deeplake Farm the trunk road is 7.3 metres wide with edge markings but no hardstrips. Verges are reasonable, but overgrown in places. There is little frontage development and few side roads or private accesses join with the trunk road. Safe overtaking can be achieved in either direction within this section of the trunk road.
At the Haverfordwest Golf Club, on the outskirts of Haverfordwest, the trunk road enters a recently introduced 40mph speed restriction zone.

Continuing westwards to the Scotchwell roundabout at Haverfordwest the standard of alignment of the trunk road deteriorates with low standards of horizontal curvature and a downhill gradient approaching 5%. Over the final section of the trunk road it enters a more urban setting. The amount of frontage development and direct access on to the trunk road increases, particularly on its northern side, where there are a number of private dwellings and a car dealership. On the immediate approach to the Scotchwell roundabout the trunk road crosses over the main Swansea - Haverfordwest railway line via a large span bridge.

5.9 Road Pavement Condition
Data obtained from the West Wales Trunk Road Agency (WWTRA) on their routine maintenance surveys provided information on the condition of the existing road pavement. These surveys included tests to assess the existing strength of the road and its residual life i.e. the time period before major reconstruction works are needed and the surface texture of the road, which is used to determine its resistance to skidding. For most of its length the condition of the existing road pavement is good, with certain sections having a residual life well in excess of 20 years. The report on the pavement condition survey was passed to WWTRA to supplement their database, so that future maintenance requirements and programmes could be adjusted if necessary.

5.10 Condition of Existing Bridges

The existing bridge structures along the trunk road have all been examined by the Transport Directorate, as part of their bridge assessment and strengthening programme. Most were found to meet the current highway loading standards. However, the bridge over the Eastern Cleddau just west of the A4075 junction near Canaston does not meet current standards for abnormal loading, but meets the standards for normal conditions of highway loading.

As a general principle, all structures to be incorporated within any road improvement scheme for the A40 will be re-assessed for compliance with current standards.

5.11 Geology

5.11.1 The route corridor from St Clears to Haverfordwest crosses rocks ranging in age from the Ordovician to Silurian geological periods, i.e. between 500 million and 400 million years old. The majority of the route is underlain by rocks of Ordovician age. Most soils along the route have resulted from the in situ weathering of the underlying solid geology. There are isolated pockets of drift soils, whilst recent alluvium deposits are confined to the river valleys.

5.11.2 From the beginning of the Cambrian period (~ 500 million years ago), extending through to the end of the Silurian period, sediments were deposited in a major geosyncline formed by subsidence of the underlying Pre-Cambrian rocks. Thus the majority of rocks along the route corridor are of sedimentary origin. The Ordovician rocks are comprised of a sequence of shales, mudstones, sandstones, limestones and pyritic shales, with a number of minor units of conglomerate, ash and micaceous sandstones. These are overlain by the Silurian strata comprising shales, sandstones and conglomerates, which grade up into mudstones. The subsidence was marked by periods of up-lift, during which intense erosion took place in restricted locations. These sediments were subsequently uplifted and folded during two particular periods of geological activity. Due to these and other earth movements, all rocks in South West Wales are folded into anticlines and synclines, and broken by faults and thrusts. The area was subjected to the effects of glaciation during the last ice age when the Irish Sea Ice spilled over into the Bristol Channel. The glacial till deposited is rich in erratics, (large pieces of rock) foreign to Wales.

Further details of the geology of the area can be found in the Stage 2 Environmental Assessment Report.
5.12 Mining and Quarrying

Mining has taken place at various locations throughout Pembrokeshire and western Carmarthenshire. However, little has taken place along or near to the line of the current A40, which is well to the north of the outcrop of the Pembrokeshire Coalfield. Extensive mining of that coalfield took place between the late medieval period and the mid-twentieth century. None of these would have any impact on the A40. No existing licensed quarries have been identified; although it is likely that small localised quarrying has taken place to provide local building stone.

5.13 Drainage

5.13.1 In general, surface water run-off from the existing trunk road drains into roadside verges, adjacent fields or ditches. Apart from the more recently improved sections, the trunk road does not have a positive system of kerbs and gullies, channels, or filter drains, that discharge to specific outfalls. The surface water from the road eventually finds its way to the Cleddau and Taf river systems outfalling into Milford Haven and Carmarthen Bay respectively.

5.13.2 Welsh Water/Dŵr Cymru abstract water under licence from the Eastern Cleddau downstream of Canaston Bridge and the quality of river water is an issue. Surface water from the existing road has the potential to adversely affect water quality and any road proposals that may increase this risk would need to be investigated with the Environment Agency.

5.14 Public Utilities

Enquiries made of the public utilities indicated that there are gas, electricity distribution, water supply, sewerage and communications services in the vicinity of the trunk road. There are also proposals to construct a new high pressure gas pipeline from the Milford Haven terminal to Aberdulais which may cross the line of the trunk road at several locations.

An electricity sub-station and a Department of Transport weighbridge facility are located within or close to the existing road corridor and form constraints to an improvement alignment.
5.15 Existing Traffic and Accident Conditions

5.15.1 Existing Traffic Conditions

Traffic surveys were undertaken during October/November 2002 and again in August 2003, to supplement information available from permanent automatic traffic counters (ATCs). Understanding existing traffic levels and trip patterns is an important factor in investigating the need for road improvements. The types of surveys carried out were:

- Roadside interview surveys to obtain information about the origin, destination, purpose and frequency of journey;
- Turning movement surveys at major junctions to obtain information necessary for the consideration of junction type and size as well as traffic movements;
- Automatic traffic counts (ATCs) at junctions where turning movement surveys were not justified due to low flows;
- Journey time surveys to ascertain typical journey durations between set points on the route.

From this data, various information could be graphically presented. The following examples illustrate the existing traffic conditions. Further detail can be found in the Report on Traffic Data and Surveys. (Annex 1 Ref. 20 and 33).

5.15.2 An example of the daily traffic flow profile experienced on the A40 is shown in the following figure. This illustrates the lack of pronounced morning and afternoon peak but shows the peak flows continuing over about a six hour period.

![Typical Daily Traffic Flow Profile](image)

**Fig 5.1** Typical Daily Traffic Flow Profile
(A40 West of St Clears)
5.15.3 A typical monthly variation in flow profile on the A40 for 2002 is shown in the following figure. This illustrates that there is a pronounced August traffic peak, whereas January is the quietest month, which is typical of a seasonal holiday route.

**Fig 5.2 Monthly Variation in Traffic Flow Profile for 2002**

5.15.4 The table below shows the average daily (24hr) two-way traffic flows in October 2002 and August 2003 along various sections of the A40 as recorded by the permanent automatic traffic counters (ATC).

**Table 5.3 Summary of 2002 & 2003 Traffic Flow Data from ATC Sites**

<table>
<thead>
<tr>
<th>Location of ATC</th>
<th>Average 24 hour two-way traffic flow</th>
<th></th>
<th></th>
<th>% Increase on Oct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neutral month</td>
<td>Peak month</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oct 2002</td>
<td>%HGV</td>
<td>Aug 2003</td>
<td></td>
</tr>
<tr>
<td>Pontyfenni</td>
<td>10,040</td>
<td>13.1</td>
<td>14,260</td>
<td>42%</td>
</tr>
<tr>
<td>Whitland BP</td>
<td>8,200</td>
<td>12.6</td>
<td>12,440</td>
<td>52%</td>
</tr>
<tr>
<td>Llanddewi Velfrey</td>
<td>10,540</td>
<td>11.7</td>
<td>14,930</td>
<td>42%</td>
</tr>
<tr>
<td>Robeston Wathen</td>
<td>10,400</td>
<td>12.4</td>
<td>15,210</td>
<td>46%</td>
</tr>
<tr>
<td>Canaston</td>
<td>12,000</td>
<td>10.7</td>
<td>16,400</td>
<td>37%</td>
</tr>
</tbody>
</table>

*Note HGV = Heavy Goods Vehicle*
5.15.5  **Journey Times**

Journey time surveys established that the average journey time travelling east and westbound between St Clears and Haverfordwest was 30 minutes with an average vehicle speed of 41 mph.

5.16  **Operational Capacity of the Existing Trunk Road**

5.16.1  A condition that affects journey times and their reliability to the traveller, is congestion. In traffic engineering terms this is when the average traffic flow regularly exceeds the capability of the carriageway to move freely the volume of traffic. The road's operational capability is defined by means of its congestion reference flow (CRF) and this will vary from section to section depending upon width, gradient, bendiness etc.

5.16.2  The CRF is, more specifically, the traffic flow at which the carriageway is likely to become congested in peak periods on an average day. There are about 500 weekday peak hours per year i.e twice each working day of the year. A road is considered to be congested when the average annual daily traffic flow exceeds the CRF value for about half of those hours i.e on about 250 peak hours in a year. This is only an indicator of when the effects of congestion i.e reduction in speed, delays, queues etc are likely to be unsustainable and is usually the trigger to when some form of intervention is required by the highway authority.

5.16.3  Apart from on a few days in August, particularly during the Pembrokeshire County Show in Haverfordwest, the traffic flow on the sections of A40 between St Clears and Haverfordwest does not reach the congestion reference flow, so the road is not considered to be congested.

5.17  **Accidents**

5.17.1  Accidents on the trunk road network involving personal injury (PIA’S) are recorded by the Police and the information about an accident is entered into a database, managed by the Welsh Assembly Government. Accident casualties are recorded as fatal, serious or slight.

5.17.2  During the 5 year period to December 2001, the following accidents were recorded for the A40 between St Clears and Haverfordwest. In addition the 2002 data has been included for comparison purposes.
### Table 5.4  Accident Severity Split 1997-2001

<table>
<thead>
<tr>
<th>Category</th>
<th>Fatal</th>
<th>Serious</th>
<th>Slight</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Injury Accidents (PIAs in 1997-2001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>1</td>
<td>6</td>
<td>32</td>
<td>39</td>
</tr>
<tr>
<td>1998</td>
<td>2</td>
<td>7</td>
<td>27</td>
<td>36</td>
</tr>
<tr>
<td>1999</td>
<td>2</td>
<td>4</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>2000</td>
<td>0</td>
<td>9</td>
<td>21</td>
<td>30</td>
</tr>
<tr>
<td>2001</td>
<td>2</td>
<td>6</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>32</td>
<td>110</td>
<td>149</td>
</tr>
<tr>
<td>Casualties</td>
<td>8</td>
<td>56</td>
<td>236</td>
<td>300</td>
</tr>
<tr>
<td>Average No.of PIA's per year</td>
<td>1.4</td>
<td>6.4</td>
<td>22</td>
<td>29.8</td>
</tr>
<tr>
<td>2002 PIAs recorded</td>
<td>1</td>
<td>6</td>
<td>21</td>
<td>28</td>
</tr>
</tbody>
</table>

5.17.3 The table above shows there was no significant change in the number of accidents that occurred in 2002 when comparing to the average from the previous 5 years between St Clears and Haverfordwest.

5.17.4 A higher proportion of fatal and serious injury accidents (26.2%) is being experienced along the A40 between St Clears and Haverfordwest compared with the UK national average (18%) for all classes of road. This is shown in the figure below.

**Fig 5.5**  Comparison of Casualty Severity (1997-2001)

**St Clears to Haverfordwest**

- **Fatal**: 4.7%
- **Serious**: 21.5%
- **Slight**: 73.8%

**UK National Average**

- **Fatal**: 2%
- **Serious**: 16%
- **Slight**: 82%
5.17.5 Accident Clusters

Locations where repeated personal injury accidents occur, such as four in 3 years within 100 metres of each other, are defined as accident cluster sites, or town and village cluster sites if they occur within 500 metres of each other. Cluster sites have been identified at the junction with A4075, Slebech retail park junction, at the Commercial Cross junction in Llanddewi Velfrey and in Robeston Wathen.

5.18 The Environment of the Existing Road Corridor

5.18.1 The environment of the existing A40 is predominantly rural and is at an elevation between approximately 10m and 130m AOD. The vegetation pattern is defined by agricultural land use. The fields are generally pasture, bounded by hedges, mature hedgerows, hedgebanks and stockproof fences. There are numerous blocks of deciduous, coniferous and mixed woodland and sparse woodland within river valleys.

5.18.2 This rural environment provides a rich mosaic of wildlife habitats, wet woodland, ancient woodland, rush pasture, species-rich meadow and hedgerows which are important in the local context. These habitats provide suitable living environments for a range of protected species such as bats, otters, barn owls and badgers. Signs of otter activity were found in thirteen of the twenty watercourses surveyed, the most numerous positive evidence of otters being along the Eastern Cleddau River and its tributaries. Badger activity occurs along the majority of the A40. Parts of the existing A40 route corridor are of national importance for bats particularly in view of the presence of Greater and Lesser Horseshoe bats which forage on adjacent and nearby land.

5.18.3 The existing A40 corridor hosts a number of statutory designated sites:

- **National Park**

  The northern boundary of the central sector of the Pembrokeshire Coast National Park is located along the southern side of the existing A40 between Canaston Bridge and Arnolds Hill. The Park authority view the Canaston Bridge area as a natural gateway to the National Park, as approached from the east along the existing A40. The boundary at this point also follows the western edge of the A4075 as it proceeds southwards away from the route corridor.

- **Areas of Outstanding Natural Beauty**

  There are no designated Areas of Outstanding Natural Beauty located within the route corridor. However, there is a locally designated area of Special Landscape Value north of Canaston Bridge encompassing the Eastern Cleddau river valley.

- **Sites of Special Scientific Interest (SSSI)**

  The stage 2 desk survey has indicated that there are eight SSSIs within the study area. These are as follows:
• Pont- y-Fenni Quarry SSSI
• Robeston Wathen Quarries SSSI
• Eastern Cleddau River SSSI
• Slebech stable yard loft, cellars and tunnels SSSI
• Milford Haven Waterway SSSI
• Western Cleddau River SSSI
• Smallbrook Railway cutting & pit SSSI
• Taf Estuary SSSI

• **Candidate Special Areas of Conservation (cSAC)**
  
  There are two areas within the study area which are subject to cSAC designation under the EC Directive on Conservation of Natural Habitats and of wild fauna and flora 92/43/EEC. These are listed below.

  • Eastern Cleddau River cSAC
  • Western Cleddau River cSAC

  Other more remote cSAC’s that may be affected by route options are:

  • Pembrokeshire Marine cSAC
  • Carmarthen Bay Estuary cSAC

  The boundaries of the cSAC generally (with some exceptions) include the river banks and two metres either side.

5.18.4 **Known Archaeological Sites**

The existing A40 follows an ancient route leading to the south west corner of Wales. Sections of a roman road are crossed by the A40. Previous investigation of the roman road at Whitland revealed a well made structure dating from the late 1st century. There are many surviving monuments dating from the Bronze Age close to the line of the existing A40, these include round barrows and burnt mounds and suggest a well settled landscape during the Bronze Age, particularly from the middle to late Bronze Age.

5.18.5 **Community Facilities**

The existing road corridor is predominantly rural in character throughout its length resulting in relatively few community facilities. There are thirty three footpaths, two cycleways (regional routes), one cycleway (local route) and one bridleway within the study area. The Landsker Borderlands Trail also crosses the existing A40 at Toch Bridge (Canaston). The predominantly rural nature of the road corridor results in the majority of these paths appearing to have very little usage. Exceptions to this are where they occur within or close to settlements. In addition, recognised recreational routes attract both local and wider tourist use. General views from the existing A40 are across rural farmland typical of Pembrokeshire. The most noteworthy views are to the north of Llanddewi Velfrey with attractive views across rolling farmland to the Preseli Hills. An
additional significant view towards the Pembrokeshire Coast National Park landscape are those of the Cleddau estuary from Slebech.

5.18.6 Topography & Land Use

The study area ground levels range from a low point of 10 metres AOD at Canaston Bridge up to a high point of some 130m AOD at Llanddewi Velfrey. The ground profile comprises a series of hills and valleys with the existing A40 Trunk Road following the contours closely to provide a series of reasonable gradients acceptable for traffic. The valleys generally have watercourses that provide natural drainage to the area. The land in the study area is predominantly agricultural with the majority of holdings being for grazing with some small areas of land being used for arable crops. Grazing land is used for fattening stock and dairy herds. Much of the land falls into category 3b of the Agricultural Land Classification, with some areas classified as 3a. There are a number of individual farmsteads north and south of the existing A40. Major settlement comprises St Clears, Whitland and Haverfordwest with smaller scale settlements being located at Llanddewi Velfrey, Robeston Wathen and Slebech. Associated with these settlements are Whitland Rugby and Cricket Ground, varied small businesses, Llanddewi Velfrey cricket field and local recreation area and Slebech Retail Park. Individual residential properties and farmsteads are scattered through the route corridor and there are a number of picnic sites.
6. **PREDICTED TRAFFIC GROWTH AND ACCIDENT SAVINGS.**

6.1 Traffic

6.1.1 Historically, the volume of traffic on the UK road network has continued to grow. In order to predict the likely level of growth as accurately as possible, factors based upon a range of indicators including population growth, household size, road fuel price and GDP, are derived and published by the UK Government as the National Road Traffic Forecasts (Great Britain) (NRTF). The current edition is NRTF 1997 which gives factors for low and high growth conditions.

6.1.2 Actual traffic growth on a road may not be consistent with NRTF for a number of reasons. For example, if an improvement is made to a road, traffic may transfer to it from another route and then traffic may grow by a factor greater than NRTF. It is important therefore to validate the proposed traffic growth model by looking at historical growth and factors such as whether traffic would transfer from another route and whether the provision of the new road would generate more traffic that was otherwise constrained.

6.1.3 The validation of the traffic model for this scheme is reported in the **Local Model Validation Report** (Annex 1 Ref. 25) and this confirmed that the NRTF figures were representative of the actual traffic growth experienced on the A40 West of St Clears. Actual growth figures for the A40 were representative of median growth NRTF factors ie between high and low growth.

6.1.4 From the application of these factors the traffic volumes forecast in the assumed opening year of 2009 and the design year of 2024 (15 years after opening) are as tabulated below.

**Table 6.1 Predicted Traffic Flows on A40 at Automatic Traffic Counter Locations.**

<table>
<thead>
<tr>
<th>ATC Location</th>
<th>2002 AADT</th>
<th>2009 AADT (Opening Year)</th>
<th>2024 AADT (Design Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Growth</td>
<td>High Growth</td>
<td>Low Growth</td>
</tr>
<tr>
<td>Pontyfenni</td>
<td>9,900</td>
<td>10,800</td>
<td>11,300</td>
</tr>
<tr>
<td>Whitland Bypass</td>
<td>8,650</td>
<td>9,450</td>
<td>9,900</td>
</tr>
<tr>
<td>Llanddewi Velfrey</td>
<td>10,850</td>
<td>11,850</td>
<td>12,400</td>
</tr>
<tr>
<td>Robeston Wathen</td>
<td>10,860</td>
<td>11,870</td>
<td>12,410</td>
</tr>
<tr>
<td>Canaston Bridge</td>
<td>12,350</td>
<td>13,500</td>
<td>14,100</td>
</tr>
</tbody>
</table>

6.1.5 A detailed analysis of the forecast traffic flows compared with the congestion reference flow (see paragraph. 5.16) indicated that, if current (median NRTF) traffic growth trends continue, the traffic flows will not reach a level at which significant effects of congestion on the existing single carriageway would be experienced, until at least 2020 on even the busiest section ie west of the A4075 junction at Canaston Bridge.
6.1.6 Whilst there may already be periods of high traffic flows linked to specific summer local events, when limited congestion effects may be experienced, these are insufficient in frequency and flow to justify additional road capacity. However, it is recognised that if traffic continues to grow at the present rate then additional road capacity, or other intervention measures, may be required at some future date.

6.2 Accidents

COBA has predicted accident savings over the section of trunk road from St Clears to Haverfordwest with either a single or dual carriageway improvement. The predicted accident savings, are, however, substantially higher with the provision of a dual carriageway.
7. ROUTE OPTIONS

7.1 General.

7.1.1 To assess the need and justification for either single or dual carriageway improvements the cost, economics and environmental impact of both route options had to be evaluated. To obtain sufficient information for such an evaluation, an investigation into suitable routes for both standards was required. At certain locations along the route on-line improvement was not appropriate, or did not address the need, and more than one alternative off-line route was considered. These alternatives were investigated to determine which route options would be acceptable and which could be discarded.

7.1.2 As stated in paragraph 5.8, to simplify the evaluation of route options the existing trunk road was divided into 8 sections.

7.1.3 The design standards for the alignment of road improvement schemes are described in the Design Manual for Roads and Bridges (DMRB) and in particular the Technical Directive TD9/93 (Highway Link Design) and any subsequent amendments.

7.1.4 For the consideration of options, the following standards were adopted.

<table>
<thead>
<tr>
<th>Single Carriageway</th>
<th>100 kph (60 mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Speed</td>
<td>100 kph (60 mph)</td>
</tr>
<tr>
<td>Carriageway Width</td>
<td>7.3 metres, with 1 metre hardstrips and 2.5 metre wide verges. (overall width 14.3 metres)</td>
</tr>
<tr>
<td>*Note – verge width may need to be increased at certain locations to provide the required visibility. Limited number of private access junctions.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dual Carriageway</th>
<th>120 kph (70 mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Speed</td>
<td>120 kph (70 mph)</td>
</tr>
<tr>
<td>Carriageway width</td>
<td>Dual 7.3 metre with 4.5 metre central reservation, 1 metre hardstrips and 2.5 metre wide verges. (overall width 26.1 metres)</td>
</tr>
<tr>
<td>* Note – verge and central reservation widths may need to be increased at certain locations to provide the required visibility. Access limited to be at junctions only.</td>
<td></td>
</tr>
</tbody>
</table>
7.2 BRIEF DESCRIPTION OF SINGLE CARRIAGeway OPTIONS

7.2.1 Section A - St Clears to Whitland

This section has been significantly improved in recent years and is considered to be of good standard overall and not in need of general improvement as a single carriageway. However, the existing junctions with unclassified roads at Pwll Trap and to Grovelands, had been identified as having a poor accident record so options for improving them were considered. These included the provision of a roundabout, a single lane dualling junction and various turning movement prohibitions, including closure.

7.2.2 Section B - Whitland Bypass

This bypass was opened as a full standard single carriageway in 1996 and no further improvement is required.

7.2.3 Section C - Whitland Bypass to Llanddewi Velfrey

Measures to improve safety over the climbing lane section at Pengawse Hill were considered and as these are likely to be restricted to road marking, they would be undertaken by the maintaining agents of the Assembly.

7.2.4 Section D - Llanddewi Velfrey to Penblewin Roundabout

7.2.4.1 Eight route options were investigated to improve this largely un-improved section, primarily to give relief to the village of Llanddewi Velfrey from the adverse impact imposed by trunk road traffic and improve journey times.

7.2.4.2 The options included an on-line improvement, six off-line alignments to the north and one alignment to the north of the village initially, then crossing the existing trunk road near the village centre before continuing south of the village. Their start points varied from Gwyndy Farm and Bethel Chapel to the east, terminating mostly near Ffynnon Wood to the west. No improvement was considered necessary west of Ffynnon Wood to Penblewin roundabout. Route options to the south of the village were constrained by the topography and existing development and were not developed further.

These options are illustrated on the plan at Annex 5.

7.2.4.3 The main differences between the options are their proximity to the village and their impact on the ecologically important Blaen Pen-troydin wet woodland, the landscape and agricultural interests. Routes 1 and 4 are northern routes, with different termination points and would pass through the woodland, Route 2 would be a short route passing to the north of the village terminating at the Commercial Cross junction, Route 3, a Do-minimum on-line improvement. Route 5 would be to the north of the village from Gwyndy Farm, pass under the existing road around Commercial Cross, near the village centre and then continue to Ffynnon Wood to the south. To minimise or avoid impact on the woodland, Routes 6, 7 and 8 were developed.
Section E - Penblewin Roundabout to Canaston Bridge

For investigation purposes this section was sub-divided into two sections. These are between Penblewin Roundabout and Flimstone Lane and from there to Canaston Bridge.

For the first sub-section the primary objective was to consider options that would improve or avoid the B4314 junction at Redstone Cross. Three options were developed and these are illustrated on the plan at Annex 5.

Option1 would follow a line to the south of Blackmoor Hill from Penblewin roundabout to a new junction at Redstone Cross.

Options 2 and 3 would follow, with a minor re-alignment, the line of the existing road from Penblewin roundabout, with Option 3 tying into the existing road at Redstone Cross via a new junction and Option 2 passing to the north of Redstone Cross tying back into the existing road west of the Sodston House access.

The second sub-section was developed to address the need to provide relief from severance caused by trunk road traffic to the community of Robeston Wathen and to reduce accidents. A bypass to Robeston Wathen had been the subject of previous investigation and Public Consultation in 1994, with a Preferred Route to the south of the village being announced in 1996. Therefore no alternative route alignments were investigated, but a number of junction options were considered.

Ten junction combinations were investigated utilising at-grade roundabouts, grade-separated junctions, single lane dualling and simple bridge junctions with varying slip road configurations.

Two additional factors were taken into consideration in developing options for the junction with the A4075 near Canaston Bridge. Firstly, various ways of providing a new link from the minor road to Llawhaden located just west of Canaston Bridge, to the new A4075 junction, with a view to stopping-up the existing minor road junction were considered. Secondly, the need to provide safer means for non-motorised road users (pedestrians, cyclists and equestrians) to cross the trunk road and the river, was taken into consideration.

The option for a bypass to Robeston Wathen is illustrated on the plan at Annex 5.

Section F - Canaston Bridge to Slebech Park

The primary consideration for this section, which is a reasonably good section of single carriageway, is that it does not have adequate forward visibility for safe overtaking. The provision of a westbound climbing lane would address this. Routes for this were considered immediately north of the existing road. Routes to the south were not considered due the need to avoid incursion into the National Park and the potential impact on important hedgerows.

The climbing lane would terminate near the property known as Meadow View.
7.2.6.3 Between Meadow View and Slebech Park no improvement to the existing trunk road is proposed.

7.2.7 Section G - Slebech Park to Deeplake Farm

7.2.7.1 The primary consideration for this section was to consider options to reduce the accidents at the entrance to the Slebech Retail Park and to address the problems with accidents at the junctions near the foot of Arnolds Hill.

7.2.7.2 Five options were developed for Slebech. These comprised 4 off-line routes, aligned to the north and south of the existing trunk road, and a junction improvement scheme at Slebech retail park.

These options are illustrated on the plan at Annex 5.

7.2.7.3 Apart from Option 2, all options ie 1,3,4 and 5 would impact upon a protected species, the bat, either by crossing known bat flight paths or feeding areas and Options 1 and 5 would additionally involve incursion into the National Park.

7.2.7.4 Three junction options were investigated at Deeplake Farm to improve safety at the existing junction of the trunk road with the minor roads to Wiston, to the north and the minor road to Millin Cross, to the south. The three options were a single lane dualling, a roundabout and a small grade separated junction with the side roads passing under the trunk road.

7.2.8 Section H - Deeplake Farm to Haverfordwest

7.2.8.1 This section of the trunk road is good standard single carriageway with safe overtaking opportunity in both directions. No improvement options were considered necessary, apart from at the Narberth Road junction just east of Scotchwell roundabout.

7.2.8.2 A minor road re-alignment of the trunk road to the south, to incorporate a new single lane dualling junction, was the only option considered for the Narberth Road junction.
7.3 BRIEF DESCRIPTION OF DUAL CARRIAGEWAY OPTIONS

7.3.1 Section A - St Clears to Whitland Bypass

From St Clears roundabout to Whitland Bypass the option was confined to widening the existing road to dual carriageway standard, going off-line over short sections to achieve an acceptable alignment. The existing junction at Pwll Trap would be closed and traffic re-routed through St Clears. A new roundabout junction would be provided at Grovelands.

The largely on-line improvement route is illustrated on the plan at Annex 6.

7.3.2 Section B - Whitland Bypass

As previously stated the Whitland Bypass is a full standard single carriageway. As such the most effective option would be widening on line, mainly on its north side to avoid existing property. Existing bridges may need to be widened, or replaced, to accommodate a dual carriageway.

The on-line improvement route is illustrated on the plan at Annex 6.

7.3.3 Section C - Whitland Bypass to Llanddewi Velfrey

Over this section the most effective improvement option would be on-line dualling. A dual carriageway would either follow, or be closely aligned alongside the existing trunk road. This section would commence at the terminal roundabout of the Whitland Bypass and terminate at a new roundabout located east of Llanddewi Velfrey.

The largely on-line improvement route is illustrated on the plan at Annex 6.

7.3.4 Section D - Llanddewi Velfrey to Penblewin Roundabout

7.3.4.1 Five route options were investigated to provide a dual carriageway relief road to the village of Llanddewi Velfrey.

7.3.4.2 The options comprise four routes to the north of the village and one route which proceeds north of the existing road before crossing it near the centre of the village, the option is then aligned south and again north of the existing trunk road. All options would commence at a roundabout junction east of Llanddewi Velfrey and terminate at the existing Penblewin roundabout. These roundabouts would need to be enlarged to accommodate a dual carriageway. As with the single carriageway options a constraint affecting the routes to the north of the village is the Blaen Pen-troydin wet woodland.

The options are illustrated on the plan at Annex 6.
7.3.5 Section E - Penblewin Roundabout to Canaston Bridge

For investigation purposes this section has been sub-divided into two further sections. These are between Penblewin Roundabout and Redstone Cross and from there to Canaston Bridge.

7.3.5.1 Between Penblewin Roundabout and Redstone Cross two options were investigated. Option 1 would commence at Penblewin Roundabout and proceed to Redstone Cross south of the existing trunk road and the properties at Blackmoor Hill. Option 2 follows closely the alignment of the existing trunk road for much of its length and just north of the properties at Blackmoor Hill. Access to properties at Blackmoor Hill and Redstone Cross would be provided probably via lengths of the existing trunk road.

The options considered are illustrated on the plan at Annex 6.

7.3.5.2 From Redstone Cross to Canaston Bridge a dual carriageway would provide relief from trunk road traffic to the community of Robeston Wathen. As with the single carriageway option, the alignment would follow closely that of the previously announced Preferred Route, ie to the south of the village. No alternative alignments were therefore investigated and only differing junction types and locations were considered.

7.3.5.3 Eight junction arrangements for the A4075 and B4314 junctions were investigated and comprised roundabouts, compact grade separated junctions, and simple bridge junctions with various slip road configurations. As with the single carriageway options various means of improving the Llawhaden junction by the provision of links to the new junction with the A4075 at Canaston Bridge were considered.

7.3.5.4 A new river bridge would be required to accommodate the dual carriageway and link road to the Llawhaden road. This would be designed to accommodate the safe crossing of the trunk road and the river by non-motorised road users such as pedestrians, cyclists and equestrians.

The option considered for a bypass to Robeston Wathen is illustrated on the plan at Annex 6.

7.3.6 Section F - Canaston Bridge to Slebech Park

7.3.6.1 Over this section only one dual carriageway improvement option was investigated. This would follow closely the alignment of the existing trunk road, widened on its north side to avoid encroachment into the Pembrokeshire Coast National Park and the potential impact on tree cover and important hedgerows.

The largely on-line improvement route is illustrated on the plan at Annex 6.

7.3.7 Section G - Slebech Park to Deeplake Farm

7.3.7.1 Four route options were developed for a dual carriageway improvement between Slebech Park and Deeplake Farm. These included two options north of Slebech and
then immediately north of Arnolds Hill. The further two options passed south of Slebech and then immediately south of Arnolds Hill.

7.3.7.2 The two options north of Slebech would have an impact on important bat feeding grounds and those to the south would cross bat fight paths and encroach into the Pembrokeshire Coast National Park.

These route options are illustrated on the plan at Annex 6.

7.3.8 Section H - Deeplake Farm to Haverfordwest

7.3.8.1 For the purpose of investigation the section has been sub-divided into three sections, namely a Deeplake Farm junction improvement, where the previous section would terminate, Deeplake Farm to Haverfordwest Golf Club and Haverfordwest Golf Club to Haverfordwest (Scotchwell Roundabout).

7.3.8.2 Two junction improvement options were considered at Deeplake Farm, a roundabout and a compact grade separated junction.

7.3.8.3 From Deeplake Farm to the Golf Club, the only alignment option investigated would be aligned just south of the existing trunk road and terminate at a roundabout located just west of the Haverfordwest Golf Club. From this roundabout to the Scotchwell roundabout, the improvement would be an on-line single carriageway. A new at-grade junction would be provided to improve access to properties.

7.3.8.4 A further two options westward from the Golf Club were investigated. The first entails the dual carriageway continuing to the Scotchwell roundabout and aligned just south of the existing trunk road. With the second option the dual carriageway would terminate at a roundabout west of the Golf Club. It then would continue as a single carriageway crossing the railway and a major watercourse before joining with the A40 Haverfordwest Eastern bypass via a new roundabout junction.

These options are illustrated on the plan at Annex 6.

7.4 Engineering Issues

There will clearly be differences between the options considered in terms of their engineering difficulty to design and construct, the volume of earthworks material to be moved and the impact upon existing traffic. However, there would not appear to be engineering issues with any of the options that would significantly influence the choice of option. Ground conditions at specific locations may require special measures but this would be determined during the more detailed design process.

7.5 Environmental Impact

The Stage 2 Environmental Assessment has identified that there are no features of such significance, or value, that would prevent any of the options identified in the Technical Appraisal Report for further consideration from being progressed. There are important areas of environmental concern such as the statutorily protected sites, species and habitats, ancient
hedgerows and woodlands and areas of particular interest. The final detailed design of the road improvements would seek to avoid or minimise any impact and suitable measures would be considered to mitigate the impacts.

7.6 Cost

An estimated cost for each of the route options considered has been produced and the breakdown of these cost estimates can be found in the Route Options Report. The cost of implementing the improvement of the A40 to a single carriageway standard was estimated at £35m and this includes all consultant's design fees, the costs of supervision of the works, an estimate of the land compensation costs and VAT. To construct an improvement to dual carriageway standard would cost about £165m (Incl)

7.7 Economic Appraisal (COBA)

7.7.1 The relative benefits of an improvement scheme are assessed using the cost benefit analysis program known as COBA. This program compares the costs of providing road schemes with the benefits derived by road users, in terms of journey time saving and reduction in vehicle operating costs and in the number of accidents. COBA calculates these benefits over a period of 30 years from the year when the road is opened. Benefits can arise from improvements in road standards, increases in average speeds and reductions in route length. The monetary value of these benefits is calculated using values common to all road schemes and low and high traffic growth forecasts, as produced by the UK Government.

7.7.2 The economic viability of a scheme is assessed mainly using two factors calculated by COBA. The Net Present Value (NPV) of a scheme is the calculated benefits minus the costs. The benefit cost ratio (BCR) is the benefits divided by the costs. A scheme with an NPV greater than zero and a BCR greater than one is considered to be economically viable. This is because the value of the benefits the scheme offers is greater than the costs related to constructing the scheme. However, economic viability is only one of the criteria considered in the assessment of schemes.

7.7.3 The NPV and BCR values for the route options considered are tabulated in the Route Options Report. The most economically beneficial options were combined to produce an overall indication of the economic performance of the two options of single and dual carriageway improvements between St Clears and Haverfordwest. This indicated that both options would be economically neutral in traffic terms, assuming an opening year of 2009. In other words there would be marginal economic benefits from traffic related improvements ie from journey time savings, reduction in accidents and vehicle operating costs, with either a single or dual carriageway standard improvement.

7.8 Wider Economic Benefits

7.8.1 The study concluded that at best there would be only marginal wider economic benefits from the proposed improvements and that they would be similar for either single or dual carriageway standard. The study was unable to find any reliable evidence that economic activity in Pembrokeshire was constrained by the lack of a dual carriageway trunk road
into the county, particularly as there is no evidence that the existing trunk road currently suffers from significant periods of traffic congestion.
8. **APPRAISAL RESULTS**

8.1 **General.**

8.1.1 The Stage 2 STAG appraisal of the route option assessment was recorded on Stage 2 Appraisal Summary Sheets (AST2s) supported by Worksheet Summary Tables (WST2s), which contained the more detailed assessment data. A typical example of an AST2 can be found at Annex 7. The full set of AST2s for each of the route options investigated are included in the Route Options Report.

8.1.2 Each AST2 records some basic data about the route option and tabulates a summary of the assessment of how that option performed against the 5 transport assessment criteria of Accessibility, Safety, Environment, Economy and Integration. It concludes by stating whether the appraisal process considered the route worthy of further consideration.

8.1.3 To inform and aid the appraisal process, all the relevant data obtained for each route option was summarised in a spreadsheet format. This information formed separate matrices for both single and dual carriageway options and enabled a manageable comparison of options. Due to their size in electronic format they could not be reproduced for this report. Copies are included in the Route Options Report.

8.1.4 The route options were initially appraised against the 5 transport assessment criteria using the Stage 2 Scheme Objectives to measure performance. The results of this are briefly summarised below under the five criteria headings and are summarised in tabular format at Annex 8.

8.2 **Accessibility**

8.2.1 The Stage 2 Scheme Objectives related to
- improving both local and regional accessibility
- improving links with Ireland, UK and Europe
- reducing community severance.

8.2.2 In terms of accessibility, both locally and with other parts of the UK, it was considered that a dual carriageway would improve accessibility better than a single carriageway. The means of measuring this was by consideration of journey time savings. In broad terms, as calculated by COBA, a theoretical journey time saving of about a minute would be achieved by the single carriageway improvements, from largely the relief roads to Llanddewi Velfrey and Robeston Wathen. This compares with a saving of about 3 minutes with a dual carriageway improvement. These times are likely to be greater in practice dependent upon traffic volume and vehicle speed. However, the factor of 3 is likely to remain, confirming that from a local and regional accessibility aspect a dual carriageway improvement would perform better than a single carriageway. Relief roads of either standard would provide a similar level of relief from the effects of traffic severance to the principal communities of Llanddewi Velfrey and Robeston Wathen.
8.3 Safety

8.3.1 The scheme objectives related to
- improving safety on the trunk road by a reduction in the number and severity of road traffic accidents
- improving safety in the local communities by removal of traffic, or speed reduction.
- Providing stopping and rest places on the network, and
- Improving detection and notification of incidents.

8.3.2 The COBA analysis predicted that both single and dual carriageway improvements would reduce the number of accidents. However, a dual carriageway would be inherently safer with a more significant reduction in the numbers of accidents over 30 years. This is primarily due to the segregation of vehicles travelling in opposite directions and the removal of private accesses and right turning movements. The additional overtaking provision with a dual carriageway would also be a factor in the reduction of accidents.

Both standards would improve safety in the local communities by a reduction in traffic volumes.

8.4 Environment

8.4.1 For the Environment assessment criteria the scheme objectives relate to:
- Improving the quality of life in communities near the trunk road
- Providing opportunities for cycling, walking and healthy lifestyles
- Minimising impact on the environment
- Conservation and enhancement of landscape, townscape and biodiversity.

8.4.2 Route options were found to have considerably varying impacts on the environment in both magnitude and significance as a result of their alignment through different landscapes and habitat.

8.4.3 It was difficult to draw a conclusion as to which standard of improvement would perform better for the Environment criteria. As the relief road options for both single and dual carriageway standard would be on similar alignments and the dual carriageway options would require more land take and have more sections of off-line improvement, a simplistic view would be that a dual carriageway improvement would have a greater environmental impact than a single carriageway.

8.5 Economy

8.5.1 The scheme objectives for economy related to:
- Maintaining and improving the trunk road asset, its standard and function
- Improving the road's operational efficiency
- Providing cost effective means to meet the economic needs of Wales
- Improvement of journey times by 10% and journey time reliability
8.5.2 The trunk road asset and its function would be improved by any improvement to either single or dual standard. Its operational capacity should also improve, although a dual carriageway, by providing additional capacity and additional overtaking opportunity, achieves this objective better than a single carriageway.

8.5.3 As stated under the heading of Accessibility, journey times with a dual carriageway improvement, would improve by the 10% objective, ie 3 minutes off a 30 minute journey, whilst a single carriageway would probably not.

8.5.4 Journey time reliability would be enhanced by either option, as the causes of delay through the two communities would be removed from the trunk road. However, the greater opportunity for safe overtaking offered by a dual carriageway would provide greater journey time reliability.

8.5.5 The study concluded that neither a single or dual carriageway improvement would have a significant impact on the economy of Pembrokeshire, or Wales in general. It also concluded that at best there would only be marginal wider economic benefits from an improvement irrespective of whether it is a single or dual carriageway.

8.5.6 The cost, in November 2002 prices, of the optimum single carriageway improvement, estimated at about £35m, would be considerably less than the cost of the optimum dual carriageway improvement estimated at about £165m.

8.5.7 The results of the cost benefit analysis program COBA, indicated that the ratio of the net present value of the cost compared with the traffic related benefits, ie the cost benefit ratio (CBR), was approximately unity for both standards of improvement.

8.5.8 In value for money terms a dual carriageway improvement performs less well than a single carriageway improvement.

8.6 Integration

8.6.1 The scheme objectives relate to:

- Improving modal interchange
- Taking account of SWWITCH and other Local Authority transport policies
- Taking account of local planning and agriculture needs

8.6.2 Neither improvement option would provide significant improvement or opportunity for modal interchange.

8.6.3 The local authority (Pembrokeshire County Council) and SWWITCH have strongly indicated their desire for a dual carriageway as being an essential feature for their development plans. However, the study did not reveal any evidence that the lack of a dual carriageway standard road into Pembrokeshire is inhibiting economic growth.
8.6.4 Local agriculture and trunk road traffic would be assisted by the provision of a dual carriageway, as agricultural vehicles could use the old de-trunked sections of road as a local road network, thereby maintaining their existing field access. Trunk road traffic would therefore be unhindered by agricultural vehicles. A single carriageway improvement would not achieve this and agricultural vehicles would continue to use the trunk road.

8.6.5 A single carriageway improvement would require less agricultural land take than a dual carriageway improvement.
9. CONCLUSIONS

9.1 The study concluded that:

- There were no environmental issues that would preclude either a single or dual carriageway improvement or give significant weighting in favour of either.

- The economic return in traffic terms for both standards is approximately neutral. No wider economic benefits would accrue with a dual carriageway.

- Improved journey time reliability and a reduction in road traffic accidents would be achieved with either standard of improvement but more so with a dual carriageway.

- Relief from the effects of community severance in the villages of Llanddewi Velfrey and Robeston Wathen would be achieved with either standard of improvement.

- The existing trunk road does not currently suffer from significant congestion effects apart from a few isolated days in August.

- If current traffic growth trends continue a dual carriageway could be required in operational capacity terms on the section of the A40 west of Canaston Bridge in about 2020.

- An improvement to single carriageway standard would cost approximately £35m at November 2002 prices.

- An improvement to dual carriageway standard would cost approximately £165m at November 2002 prices.

9.2 There is likely to be a need in the longer term to provide a dual carriageway between St Clears and Haverfordwest for the road to operate efficiently. Timing will depend upon the rate of traffic growth in the interim but is unlikely, with current forecast traffic growth, to be required in the short or medium term (before 2020). August will however continue to be an increasingly busy month on the road.

9.3 On 7 December 2004, as part of his announcement of a 15 year programme to deliver a world class integrated transport system for Wales, Andrew Davies (AM), the Assembly Government Minister for Economic Development and Transport, announced the following in relation to the nation's road network:

"The significant investment in the gateways of North and South Wales will be complemented by a wide ranging and comprehensive programme to improve safety, accessibility and environmental aspects of our road network and facilitate regeneration opportunities the length and breadth of Wales and include:

- bringing forward the completion of the A465 between Abergavenny and Dowlais Top to within the next ten years:"
• improvements to the A40 west of St Clears, including the provision of bypasses for Robeston Wathen and Llanddewi Velfrey.

9.4 During the Plenary debate in the Assembly Chamber on 7 December, following the Minister's announcement, and in response to a question from Nick Bourne AM, the Minister said:

"There have been numerous studies into the use of the A40. The most recent consultant's report looked at both the business and environmental case for upgrading the A40, looking at both upgrading on the single carriageway option and dualling. The business case could not be proved for dualling for another 20 years, given current and projected traffic growth on the corridor. The price difference is substantial. There is a difference between £30 million for upgrading to single carriageway standard and £120 million for dual carriageway standard. On that basis the announcement I made today is about upgrading the single carriageway status, initially starting with work on the Robeston Wathen Bypass, which I hope will start by the end of 2007, subject to statutory procedures".

9.5 The two separate improvements schemes will be the A40 Penblewin to Slebach Park Improvement, which will be the lead scheme and the A40 Llanddewi Velfrey to Penblewin Improvement. Both schemes are included as Phase 2 schemes i.e. they could be ready to start by 2010, subject to satisfactory completion of statutory procedures and availability of finance. It is intended that the lead scheme, from Penblewin to Slebech Park, which will include a bypass of Robeston Wathen, should start by the end of 2007. The line of the bypass would follow the line of the Preferred Route announced in 1996.

9.6 The second scheme would be principally a bypass of Llanddewi Velfrey. The investigation and technical appraisal of the route options concluded that there were two routes which should be taken forward for public consultation. These would comprise a route to the north of the village, similar to Option 8 and a route closer to the existing road similar to Option 5. The other options considered were discarded from further consideration.

9.7 It should be noted therefore that all other single and dual carriageway route options, shown on the plans at Annex 5 and Annex 6 have been discarded from further consideration.

9.8 Announcements regarding the progress of these two improvement schemes and any public consultation on route options or exhibitions to inform the public about the proposals will be advertised as and when appropriate.
References

**Background Documents**

1. A40 Haverfordwest to St Clears Dual carriageway Improvement Desktop Feasibility Study (Howard Humphreys & Partners – January 1998)
3. A40 St Clears to Haverfordwest – Multi-Modal Corridor Study (Babtie Group - April 1999)
4. The Transport Framework for Wales (The National Assembly for Wales – November 2001)
5. The Trunk Road Forward Programme 2002 (Welsh Assembly Government – March 2002)
8. Fishguard and North Pembrokeshire Regeneration Plan (February 2003)
12. Census 2001
13. National Road Traffic Forecasts (Great Britain) 1997 (Department of the Environment, Transport and the Regions)
15. Scottish Transport Appraisal Guidance (STAG) (Scottish Executive draft 2001)
16. Economic Effects of Road Infrastructure Improvements (DTZ Pieda - February 2004)

**Study Reports (18 No.)**

17. A40 West of St Clears - Stage 1 Corridor Appraisal Report (Parsons Brinckerhoff – September 2003)
19. A40 West of St Clears – Environmental Scoping Proposals (TACP – February 2003)
22. A40 West of St Clears - Preliminary Sources Study -Phase 1 Report (Parsons Brinckerhoff - March 2003)
28. The Wider Economic Impact of Improvements to the A40 Trunk Road West of St Clears (Berkeley Hanover Consulting – December 2003)


34. A40 West of St Clears - Safety of Children, Pedestrians, Equestrians and Cyclists Report (Parsons Brinckerhoff- April 2004 draft)
<table>
<thead>
<tr>
<th>THE 5 TRANSPORT ASSESSMENT CRITERIA</th>
<th>STRATEGIC AND CORRIDOR OBJECTIVES FROM THE TRANSPORT FRAMEWORK FOR WALES</th>
<th>OBJECTIVES FOR ASSESSMENT AND APPRAISAL</th>
<th>SCHEME OBJECTIVES</th>
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<td><strong>ACCESSIBILITY</strong></td>
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<td>To meet the needs of disabled people</td>
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<td>To give priority to the core network</td>
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<td><strong>SAFETY</strong></td>
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<td>To contribute towards safer communities including managing the speed of traffic to appropriate levels</td>
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<td>To improve safety generally but particularly on the A40 west of Carmarthen</td>
<td>To improve safety generally but particularly on the A40 west of Carmarthen</td>
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<td>To provide or encourage appropriately spaced stopping/resting places and facilities on the network</td>
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<td>To promote cycling and walking and provide opportunities for healthy lifestyles</td>
<td>To promote cycling and walking and provide opportunities for healthy lifestyles</td>
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<td>To minimise any adverse effects on the environment generally</td>
<td>To conserve and enhance, where appropriate, landscapes, townscapes and historic and cultural resources</td>
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<td>To conserve and enhance, where appropriate, bio-diversity on the network through the Bio-diversity Action Plan</td>
<td>To conserve and enhance, where appropriate, bio-diversity on the network through the Bio-diversity Action Plan</td>
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<td></td>
<td>To preserve and enhance the operational efficiency of the trunk road network and help meet Wales’ wider economic needs in a cost effective manner</td>
<td>To preserve and enhance the operational efficiency of the trunk road network</td>
<td>Help meet Wales’ wider economic needs in a cost effective manner</td>
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<td>To monitor and reduce journey time variability on the trunk road network</td>
<td>To improve journey time reliability on the A40 between St Clears and Haverfordwest</td>
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<td>To improve journey times between St Clears and Haverfordwest on the A40 by at least 10%.</td>
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<td>To take account of the interface between the network and the strategy and plans of the SWWITCH consortia and other transport authorities</td>
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<td>To make available information about the current and predicted level of service on the M4 motorway and associated roads and to facilitate the delivery of integrated transport solutions</td>
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## TABLE 2  REVIEW OF STAGE 1 SCHEME OBJECTIVES RESULTING IN STAGE 2 SCHEME OBJECTIVES

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<th>TRANSPORT ASSESSMENT CRITERIA</th>
<th>OBJECTIVES FOR STAGE 2 ASSESSMENT AND APPRAISAL</th>
<th>REASONS WHY SOME OBJECTIVES CAN BE DELETED FROM THE APPRAISAL, COMBINED OR SPLIT</th>
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<td>To meet the needs of disabled people</td>
<td>This is a legal requirement, to take account of the needs of disabled people and whatever corridor option is developed further, the same provisions will have to apply.</td>
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<td>To give priority to the core network</td>
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**TABLE 1** REVIEW OF STAGE 1 SCHEME OBJECTIVES RESULTING IN STAGE 2 SCHEME OBJECTIVES

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<td>-----</td>
</tr>
<tr>
<td>ENVIRONMENT</td>
<td>To improve the quality of life for people in communities close to the trunk road network</td>
<td>To improve the quality of life for people in communities close to the trunk road network</td>
<td>To improve the quality of life for people in communities close to the trunk road network</td>
<td>To improve the quality of life for people in communities close to the trunk road network</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To promote cycling and walking and provide opportunities for healthy lifestyles</td>
<td>To promote cycling and walking and provide opportunities for healthy lifestyles</td>
<td>To promote cycling and walking and provide opportunities for healthy lifestyles</td>
<td>To promote cycling and walking and provide opportunities for healthy lifestyles</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To minimise any adverse effects on the environment generally; to conserve and enhance, where appropriate, landscapes, townscapes and historic and cultural resources.</td>
<td>To minimise any adverse effects on the environment generally.</td>
<td>To minimise any adverse effects on the environment generally.</td>
<td>To minimise any adverse effects on the environment generally.</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To conserve and enhance, where appropriate, landscapes, townscapes and historic and cultural resources</td>
<td>To conserve and enhance, where appropriate, landscapes, townscapes and historic and cultural resources</td>
<td>To conserve, where appropriate, landscapes, townscapes and historic and cultural resources</td>
<td>To conserve, where appropriate, landscapes, townscapes and historic and cultural resources</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To conserve and enhance, where appropriate, bio-diversity on the network through the Bio-diversity Action Plan</td>
<td>To conserve and enhance, where appropriate, bio-diversity on the network through the Bio-diversity Action Plan</td>
<td>To conserve, where appropriate, bio-diversity on the network through the Bio-diversity Action Plan</td>
<td>To conserve, where appropriate, bio-diversity on the network through the Bio-diversity Action Plan</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is considered that some developed options may ‘conserve’ but not ‘enhance’ whilst some may ‘enhance’ but not ‘conserve’. However, at corridor consideration stage, this distinction would not be possible so this objective could be split at Stage 2.</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is considered that some developed options may ‘conserve’ but not ‘enhance’ whilst some may ‘enhance’ but not ‘conserve’. However, at corridor consideration stage, this distinction would not be possible so this objective could be split at Stage 2.</td>
<td></td>
<td></td>
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<td>12</td>
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</table>

ANNEX 2
<table>
<thead>
<tr>
<th>TRANSPORT ASSESSMENT CRITERIA</th>
<th>NETWORK OBJECTIVES</th>
<th>E-W(S) CORRIDOR OBJECTIVES</th>
<th>STAGE 1 SCHEME OBJECTIVES</th>
<th>REASONS WHY SOME OBJECTIVES CAN BE DELETED FROM THE APPRAISAL, COMBINED OR SPLIT FURTHER</th>
<th>STAGE 2 SCHEME OBJECTIVES</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECONOMY</td>
<td>To bring up to standard and maintain the function of the trunk road network and to improve and maintain the trunk road asset.</td>
<td>To bring up to standard and maintain the function of the trunk road network.</td>
<td></td>
<td></td>
<td>To bring up to standard and maintain the function of the trunk road network.</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>To improve and maintain the trunk road asset.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To preserve and enhance the operational efficiency of the trunk road network and help meet Wales’ wider economic needs in a cost effective manner.</td>
<td>To preserve and enhance the operational efficiency of the trunk road network</td>
<td>Help meet Wales' wider economic needs in a cost effective manner</td>
<td></td>
<td>Help meet Wales' wider economic needs in a cost effective manner</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>To monitor and reduce journey time variability on the trunk road network.</td>
<td>To improve journey time reliability on the A40 between St Clears and Haverfordwest</td>
<td></td>
<td></td>
<td>To improve journey time reliability on the A40 between St Clears and Haverfordwest</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>To improve journey times between St Clears and Haverfordwest on the A40 by at least 10%.</td>
<td>To improve journey times between St Clears and Haverfordwest on the A40 by at least 10%.</td>
<td></td>
<td></td>
<td>To improve journey times between St Clears and Haverfordwest on the A40 by at least 10%.</td>
<td>16</td>
</tr>
<tr>
<td>TRANSPORT ASSESSMENT CRITERIA</td>
<td>NETWORK OBJECTIVES</td>
<td>E-W(S) CORRIDOR OBJECTIVES</td>
<td>STAGE 1 SCHEME OBJECTIVES</td>
<td>REASONS WHY SOME OBJECTIVES CAN BE DELETED FROM THE APPRAISAL, COMBINED OR SPLIT</td>
<td>STAGE 2 SCHEME OBJECTIVES</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
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<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>INTEGRATION</td>
<td>To facilitate improved interchanges between transport modes for people and freight.</td>
<td>To facilitate improved interchanges between transport modes for people and freight</td>
<td>To facilitate improved interchanges between transport modes for people and freight</td>
<td>To facilitate improved interchanges between transport modes for people and freight</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To improve integration with the Celtic Trail Cycle Route (National Cycle Network, Swansea to Fishguard)</td>
<td>To improve integration with the Celtic Trail Cycle Route (National Cycle Network, Swansea to Fishguard)</td>
<td>No corridor option assessed at Stage 1 interacted with the Celtic Trail Cycle Route, so this objective is not relevant in subsequent assessment</td>
<td>To take account of the interface between the network and the strategy and plans of the SWWITCH consortia and other transport authorities</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To take account of the interface between the network and the strategy and plans of the SWWITCH consortia and other transport authorities</td>
<td>To take account of the interface between the network and the strategy and plans of the SWWITCH consortia and other transport authorities</td>
<td>To take account of the interface between the network and the strategy and plans of the SWWITCH consortia and other transport authorities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To improve and develop travel and transport information systems.</td>
<td>To make available information about the current and predicted level of service on the M4 motorway and associated roads and to facilitate the delivery of integrated transport solutions</td>
<td>The Directorate has a policy related to the provision of traffic information systems and whatever corridor option is developed further, this policy would apply.</td>
<td>To take into account the needs for local and national planning and agriculture.</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To take into account the needs for local and national planning and agriculture.</td>
<td>To take into account the needs for local and national planning and agriculture.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
REDSTONE CROSS OPTIONS

LLANDDEWI VELFREY OPTIONS

Key

- Existing A40 Trunk Road
- Route Option

Please refer to Section 9 of the report for status of routes i.e. whether discarded or not.

PRELIMINARY
CANASTON TO SLEBECH PARK

ROBESTON WATHEN OPTIONS

Key

- - - Existing A40 Trunk Road

--- Route Option

OPTION 1 TO 3
COMMON CENTRELINES WITH VARIOUS JUNCTION OPTIONS AT B4376 & A4875

ON-LINE IMPROVEMENT WITH WESTBOUND CLIMBING LANE

PLEASER REFER TO SECTION 9 OF REPORT FOR STATUS OF ROUTES 1-3. WHETHER DISCARDED OR NOT.
REDSTONE CROSS/ROBESTON WATHEN OPTIONS

Key

- Existing A40 Trunk Road
- Route Option
- On-Line Duddling

ALL ROUTE OPTIONS DISCARDED SEE SECTION 9

ANNEX 6

PRELIMINARY

This drawing was produced using AutoCAD and should on no account be used without the consent of the designer.

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## STAGE 2 APPRAISAL SUMMARY TABLE (AST 2)

<table>
<thead>
<tr>
<th>Scheme</th>
<th>ROBESTON WATHEN RELIEF ROAD</th>
<th>Route Option</th>
<th>Robeston Wathen Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section</td>
<td>ROBESTON WATHEN RELIEF ROAD</td>
<td>Route Option</td>
<td>Robeston Wathen Option 2</td>
</tr>
<tr>
<td>Sub-Section (if applicable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type *</td>
<td>Single carriageway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brief Description</td>
<td>Single carriageway scheme with single roundabout at each end of scheme. Canaston Bridge not affected. No changes at Llawhaden junction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option length</td>
<td>3.41km</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Transport Assessment Criteria

| Facts: Journey time saving over Section length = -24 seconds/vehicle due to delays at roundabouts |
| Removes through traffic from Robeston Wathen. No significant change in terms of accessibility to the village. Facilities for buses maintained. |
| Summary of Assessment Comments from Stage 2 Worksheet Summary Tables (WST2) |
| Summary of Assessment Comments from Stage 2 Worksheet Summary Tables (WST2) |
| ACCESSIBILITY |
| SAFETY |
| ENVIRONMENT |
| ECONOMY |
| INTEGRATION |
| CONCLUSION |

## Summary of Assessment Comments from Stage 2 Worksheet Summary Tables (WST2)

### ACCESSIBILITY

- Journey time saving over Section length = -24 seconds/vehicle due to delays at roundabouts
- Removes through traffic from Robeston Wathen. No significant change in terms of accessibility to the village. Facilities for buses maintained.

### SAFETY

- Village accident cluster site - 5 personal injury accidents in 3 years (1999 to 2001) within 500m
- Accident cluster site (A4075 Canaston Bridge Junction) - 5 personal injury accidents in 3 years (1999 to 2001) within 100m
- Predicted accident saving over 30 years; 1.2 fatal 16.8 serious 129.1 slight (Using observed accidents in COBA)
- Overtaking value over section length; 43% westbound 43% eastbound
- Improves trunk road safety.
- Improves safety in village by removing through trunk road traffic and side road traffic. Significantly improved overtaking opportunity.

### ENVIRONMENT

- Moderate positive to moderate negative significance.
- Moderate negative significance
  - Ecologically valuable hedge banks and hedgerows at Woodford Lane.
  - River Cleddau cSAC and environs important.
  - Protected species issues (Otters, bats and badgers).
  - Farms rendered less effective, mainly due to access issues
- Small (moderate) negative significance
  - Impact on medieval settlement and field system, possibly also (of lesser significance) at Canaston Bridge.
- Moderate positive significance
  - 20 properties within Robeston Wathen will experience reduced noise levels of 5dBA or greater
- Adjoins and does not physically impinge on the National Park.
- Impinges on floodplain; highly significant potable water intake dependent upon complete mitigation.

### ECONOMY

- Facts: Cost. £ 8.5m COBA 11 Net present value £ -9.0m
- PVC: £ 8.2m PVB: £-0.8m
- Lowest cost option. Poor economic return.
- Potential loss of passing trade.

### INTEGRATION

- Reduces community severance by removing trunk road traffic from village.

### CONCLUSION

- Route to be taken forward but junction provision to be reviewed. Low cost. Poor economic performance.
### Annex 8 - Appraisal of Improvement Options Against Scheme Objectives

<table>
<thead>
<tr>
<th>Key Criteria</th>
<th>Scheme Objective</th>
<th>Single Carriageway Improvement</th>
<th>Dual Carriageway Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACCESSIBILITY</strong></td>
<td>To improve links with west Wales, Ireland, the English trunk road network and Europe.</td>
<td>A single carriageway improvement to the A40 would meet this objective by virtue of the fact that it is an 'improvement' - however it would only be a minor improvement. It would provide a good standard route over 32km with improved overtaking opportunity.</td>
<td>MET TO A MODERATE DEGREE</td>
</tr>
<tr>
<td></td>
<td>To improve regional accessibility and mobility.</td>
<td>Accessibility to west Wales, particularly Pembrokeshire, would be improved minimally in terms of the area's peripherality, but junction closures could result in longer local routes. Mobility within the region would be modestly improved by the provision of relief roads at Robeston Wathen and Llanddewi Velfrey.</td>
<td>MET TO A MODERATE DEGREE</td>
</tr>
<tr>
<td></td>
<td>To reduce severance caused by traffic for communities on the A40 west of St Clears.</td>
<td>Communities of Robeston Wathen and Llanddewi Velfrey would benefit from reduced severance.</td>
<td>MET</td>
</tr>
<tr>
<td><strong>SAFETY</strong></td>
<td>To contribute towards safer communities including managing the speed of traffic to appropriate levels.</td>
<td>The provision of relief roads at Robeston Wathen and Llanddewi Velfrey will significantly reduce traffic levels through the communities thereby improving safety. Traffic calming measures on the de-trunked road through the villages could be introduced to control vehicle speeds.</td>
<td>MET</td>
</tr>
<tr>
<td></td>
<td>To improve safety generally but particularly on the A40 west of Carmarthen.</td>
<td>32km of single carriageway to current design standards with improved overtaking opportunity would reduce the number of accidents on the trunk road and make it safer.</td>
<td>MET</td>
</tr>
<tr>
<td>Key Criteria</td>
<td>Scheme Objective</td>
<td>Single Carriageway Improvement</td>
<td>Dual Carriageway Improvement</td>
</tr>
<tr>
<td>--------------</td>
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<td>-------------------------------</td>
</tr>
<tr>
<td><strong>ENVIRONMENT</strong></td>
<td>To improve the quality of life for people in communities close to the trunk road network.</td>
<td>This improvement includes for relief roads at Robeston Wathen and Llanddewi Velfrey which would improve the quality of life for residents in those communities.</td>
<td><strong>MET</strong></td>
</tr>
<tr>
<td><strong>ENVIRONMENT</strong></td>
<td>To promote cycling and walking and provide opportunities for healthy lifestyles.</td>
<td>It is policy to provide facilities for cyclists and pedestrians and this would be complied with. A new structure at Canaston bridge would incorporate shared facilities under the improved trunk road for walkers, cyclists and equestrians. The latter currently have a designated trail, which uses a short length of the trunk road. Where bypasses are provided the old road would become a safer route for cyclists and pedestrians. So objective to provide opportunities would be met.</td>
<td><strong>MET WHEREEVER POSSIBLE</strong></td>
</tr>
<tr>
<td><strong>ENVIRONMENT</strong></td>
<td>To minimise any adverse effects on the environment generally.</td>
<td>The single carriageway strategy would in general have a lesser adverse impact on the environment than a dual carriageway by virtue of it having less off line sections and a smaller footprint. The road would be designed to minimise impacts as far as possible so objective would be met.</td>
<td><strong>MET</strong></td>
</tr>
<tr>
<td><strong>ENVIRONMENT</strong></td>
<td>To conserve, where appropriate, landscapes, townscapes and historic and cultural resources.</td>
<td>A single carriageway scheme would achieve conservation of existing landscape, historic and cultural resources better than a dual carriageway scheme by virtue of the lesser land take and number of off-line sections. Conservation would be attempted wherever possible and justifiable, so objective would be met marginally.</td>
<td><strong>COULD BE MET (by careful design)</strong></td>
</tr>
<tr>
<td><strong>ENVIRONMENT</strong></td>
<td>To enhance where appropriate, landscapes, townscapes and historic and cultural resources.</td>
<td>The opportunity exists within a single carriageway scheme to provide features that would enhance the landscape and historic/cultural resources. To differentiate between the strategies at this stage is conjectural.</td>
<td><strong>COULD BE MET</strong></td>
</tr>
<tr>
<td><strong>ENVIRONMENT</strong></td>
<td>To conserve, where appropriate bio-diversity on the network through the Bio-diversity Action Plan.</td>
<td>A single carriageway scheme would probably achieve conservation of bio-diversity less well than a dual carriageway scheme by virtue of greater adverse impact on existing road verges but to differentiate between the strategies at this stage is conjectural.</td>
<td><strong>COULD BE MET</strong></td>
</tr>
<tr>
<td>Key Criteria</td>
<td>Scheme Objective</td>
<td>Single Carriageway Improvement</td>
<td>Dual Carriageway Improvement</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Does Improvement Meet Objective?</td>
<td>Summary</td>
</tr>
<tr>
<td><strong>ECONOMY</strong></td>
<td>To bring up to standard and maintain the function of the trunk road network and enhance its operational efficiency.</td>
<td>A single carriageway scheme would bring the A40 up to current standards for a single carriageway, maintaining its function and slightly enhancing its efficiency.</td>
<td>MET TO A MODERATE DEGREE</td>
</tr>
<tr>
<td></td>
<td>Help meet Wales' wider economic needs in a cost effective manner.</td>
<td>The Berkeley Hanover report indicated that road improvements (single or dual) were unlikely to have, at best, more than a minimal effect in the economic regeneration of west Wales and would not generate any significant national wider economic benefits. COBA results were neutral. At an estimated gross cost of £35m (Nov 2002), the single carriageway improvement is about a fifth the cost of the dual.</td>
<td>WOULD ASSIST BUT DEPENDENT ON OTHER FACTORS</td>
</tr>
<tr>
<td></td>
<td>To improve journey time reliability on the A40 between St Clears and Haverfordwest.</td>
<td>A single carriageway improvement would reduce journey time marginally and also would improve reliability marginally.</td>
<td>MET TO A MODERATE DEGREE</td>
</tr>
<tr>
<td></td>
<td>To improve journey times between St Clears and Haverfordwest on the A40 by at least 10%.</td>
<td>A single carriageway improvement would improve current journey time of 28 minutes by about one minute, which is less than 10%.</td>
<td>NOT MET</td>
</tr>
</tbody>
</table>

*To enhance, where appropriate, bio-diversity on the network through the Bio-diversity Action Plan.*

The opportunity exists within a single carriageway scheme to provide features that would enhance biodiversity. There is arguably less scope for this with a single carriageway scheme, which could have an adverse impact on existing road verges and have lesser opportunity to create diverse habitat.

**COULD BE MET**

The opportunity exists within a dual carriageway scheme to provide features that would enhance biodiversity. There is arguably more scope for this with a dual carriageway scheme, which could have a lesser adverse impact on existing road verges and have greater opportunity to create diverse habitat.

**COULD BE MET**

*To bring up to standard and maintain the function of the trunk road network and enhance its operational efficiency.*

A single carriageway scheme would bring the A40 up to current standards for a single carriageway, maintaining its function and slightly enhancing its efficiency.

**MET TO A MODERATE DEGREE**

A dual carriageway scheme would bring the A40 up to current standards for a dual carriageway, maintaining its function and enhancing its efficiency.

**MET**

*Help meet Wales' wider economic needs in a cost effective manner.*

The Berkeley Hanover report indicated that road improvements (single or dual) were unlikely to have, at best, more than a minimal effect in the economic regeneration of west Wales and would not generate any significant national wider economic benefits. COBA results were neutral. At an estimated gross cost of £35m (Nov 2002), the single carriageway improvement is about a fifth the cost of the dual.

**WOULD ASSIST BUT DEPENDENT ON OTHER FACTORS**

The Berkeley Hanover report indicated that road improvements (single or dual) were unlikely to have at best, more than a minimal effect in the economic regeneration of west Wales and would not generate any significant national wider economic benefits. COBA results were neutral. At an estimated gross cost of £155m (Nov 2002), the dual carriageway improvement is about five times the cost of the single but only provides little additional economic gain.

**WOULD ASSIST BUT DEPENDENT ON OTHER FACTORS**

*To improve journey time reliability on the A40 between St Clears and Haverfordwest.*

A single carriageway improvement would reduce journey time marginally and also would improve reliability marginally.

**MET TO A MODERATE DEGREE**

A dual carriageway improvement, whilst reducing journey time marginally, would improve reliability significantly by providing significantly greater overtaking opportunity than a single carriageway.

**MET**

*To improve journey times between St Clears and Haverfordwest on the A40 by at least 10%.*

A single carriageway improvement would improve current journey time of 28 minutes by about one minute, which is less than 10%.

**NOT MET**

A dual carriageway improvement, when completed, would reduce journey time by about 3 minutes on a 28 minutes existing journey time i.e in excess of 10% so objective would be met.

**MET**
<table>
<thead>
<tr>
<th>Key Criteria</th>
<th>Scheme Objective</th>
<th>Single Carriageway Improvement</th>
<th>Dual Carriageway Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTEGRATION</td>
<td>To facilitate improved interchanges between transport modes for people and freight.</td>
<td>A single carriageway improvement would provide little opportunity to improve interchange facilities on its own. Unless there is corresponding investment in rail facilities only bus services would benefit from a road improvement. The existing rail line is too distant from the trunk road west of Whitland to facilitate better interchange.</td>
<td>A dual carriageway improvement would provide little opportunity to improve interchange facilities on its own. Unless there is corresponding investment in rail facilities only bus services would benefit from a road improvement. The existing rail line is too distant from the trunk road west of Whitland to facilitate better interchange.</td>
</tr>
<tr>
<td></td>
<td>To take account of the interface between the network and the strategy and plans of the SWWITCH consortia and other transport authorities.</td>
<td>The strategy and plans of the local authority would be taken into account for a single carriageway scheme.</td>
<td>The strategy and plans of the local authority would be taken into account for a dual carriageway scheme.</td>
</tr>
<tr>
<td></td>
<td>To take into account the needs for local and national planning and agriculture.</td>
<td>A single carriageway improvement would minimise land take, maximise use of the existing trunk road, but only make a small reduction in the number of agricultural accesses. The requirements of Pembrokeshire CC, who desire a dual carriageway, would not be met.</td>
<td>A dual carriageway improvement would take more land and allow the existing road, supplemented by a series of private means of access, to be used as a local link road and limit agricultural access on to the trunk road. Objective met more advantageously than with a single carriageway and it would meet the requirements of Pembrokeshire CC, who desire a dual carriageway.</td>
</tr>
</tbody>
</table>

Summary:

<table>
<thead>
<tr>
<th>Does Improvement Meet Objective?</th>
<th>Summary</th>
<th>Does Improvement Meet Objective?</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>LITTLE OPPORTUNITY ON LENGTH OF THIS CORRIDOR</td>
<td>MET</td>
<td>LITTLE OPPORTUNITY ON LENGTH OF THIS CORRIDOR</td>
<td>MET</td>
</tr>
<tr>
<td>LARGELY MET UP TO 2020 BUT DEPENDENT ON OTHER FACTORS</td>
<td></td>
<td>WOULD MEET LOCAL DESIRES BUT NEED DEPENDENT ON OTHER FACTORS</td>
<td></td>
</tr>
</tbody>
</table>