Llywodraeth Cymru
Welsh Government

A40 St Clears to Haverfordwest Study

Executive Report

June 2015

Contents

1 INTRODUCTION

1.1 Background

1.1.1 In 2004 Parsons Brinckerhoff was appointed to undertake the A40 West of St Clears Study in response to the Welsh Government's Trunk Road Forward Programme 2002. The conclusion of that study was that two bypasses for Robeston Wathen and Llanddewi Velfrey were required using a 2+1 carriageway configuration to enhance road safety and overtaking opportunities. On 7th December 2004, as part of his announcement of a 15 year programme to deliver an integrated transport system for Wales, Andrew Davies (AM), then Assembly Government Minister for Economic Development and Transport, announced two separate improvements:

- A40 Penblewin to Slebech Park Improvement (which was completed and opened in 2011); and
- A40 Llanddewi Velfrey to Penblewin Improvement (which is currently in the National Transport Plan and scheduled for delivery within the next 5 years).

1.1.2 In July 2013, Edwina Hart AM CStJ MBE, Minister for Economy, Science and Transport, published a written statement outlining her priorities for Transport. The statement included that:

"Improving the A40 has been identified as a priority by the Haven Waterway Enterprise Zone Board and I intend to undertake further development of previously proposed improvements."

1.1.3 The issue of the A40 was further brought into focus in November 2014 by the announcement of the closure of the Milford Haven Refinery and its conversion into a 'storage and distribution facility'. On 12th November 2014, in providing an update on the closure of the refinery, the Minister made an oral Statement in Plenary:

"In terms of transport links…I have instructed my officials to accelerate to the fullest extent possible the programme for delivering improvements at Llanddewi Velfrey. I have also asked my officials to conduct further urgent work to explore additional ways to improve the A40, including the potential for dualling."

1.2 A40 West of St Clears Study 2015

1.2.1 The purpose of this study is to update the work completed in 2004 (and reviewed in 2008) and evaluate if changes to conditions in the region warrant additional transport interventions along the A40, such as:

- Changes in traffic patterns, traffic volumes and other conditions along the route in recent years;
- the recession, sustained global economic downturn and subsequent public sector spending reductions;
- the designation of the Haven Waterway Enterprise Zone;
- the formation of the Swansea Bay City Region and Pembrokeshire's role within it; and;
- the closure of the Milford Haven Refinery and the wider problems and opportunities in the Pembrokeshire energy sector, which is key to the economic vitality of the area.

1.2.2 Following feedback in the early stages of this study, traffic problems were also identified on the A4076, a route that leads directly to areas of the Haven Waterway Enterprise Zone and Murco Refinery. Therefore, the study was extended to also consider, in preliminary terms, improvement options to this length of the trunk road.

1.2.3 This study has two distinct elements and these are reported in two separate documents. The first element, carried out by Parsons Brinckerhoff (PB) (see 'Design Options Report Volume 1 - 43696/902') is the consideration in engineering and transport economic terms of Improvement Options for the A40 between St Clears and Haverfordwest, together with further options for works in and around Haverfordwest to improve access along the A4076, heading to the south of the town. These Options have been appraised using a high level WelTAG planning Stage 1 appraisal. The impact on each Option has been assessed against the context of the study corridor as currently exists.

1.2.4 The second element carried out by Peter Brett Associates (PBA) (see 'A40 St Clears to Haverfordwest Economic Activity & Location Impacts (EALI) Study Report - 33459') is to investigate, through consideration of the EALI on the option of dualling the A40, whether the problems associated with the A40 are in some way constraining the economic performance and development of Pembrokeshire. This has in part been carried out through consultation with local stakeholders and businesses.

1.2.5 This document draws together the key findings of these two reports.

1.3 Study Limitations

1.3.1 The study programme precluded full traffic modelling based on new traffic surveys and as a result traffic assessment has been based on recorded link count data supplemented by TrafficMaster journey time data and specifically commissioned turning count data in Haverfordwest. This base data is insufficient to provide validated traffic model flow forecasts or routing information. Therefore it was resolved that traffic performance should be

based on the time and safety benefits accrued by car users at 2015 base year flows. These parameters are considered good measures for the congestion relief and increased overtaking opportunity offered by the study schemes.

1.3.2 The consultation exercise undertaken by PBA identified issues in the region that were not directly related to transport infrastructure issues on the A40, although they were identified by some of those businesses interviewed to potentially be impacting on inward investment and economic regeneration. These issues will be fed into Economy Science & Transport (EST) Business Sector teams for consideration on how addressing these issues could be taken forward.

1.3.3 The EALI analyses the potential impact of dualling on a range of key individual sectors, but is not exhaustive. A more detailed modelling exercise based on transport and regional economic models would be required to provide a comprehensive and consistent estimate of the impacts of A40 dualling across all sectors of the Pembrokeshire economy. It is not considered that this limitation has a material impact of the underlying conclusions of the study.

1.3.4 The EALI study has focussed on the impacts of the option of dualling the A40 only as it is unlikely that other options for a series of improvements on the route (Option 2) would give rise to significant EALI impacts – although they would have benefits on the operation of the trunk road. At Stage 1 of WelTAG, the analysis should ordinarily seek to identify the presence of EALIs and provide qualitative evidence of their existence. This study has gone further than this and additionally attempts to provide quantitative estimates of dualling the A40 where robust data is available.

1.3.5 The two separate reports use a variety of data sources and there may be a degree of difference between some values quoted, depending on the specific source. However, any such discrepancies do not alter the fundamental findings and conclusions of this study.

2 EXISTING CONDITIONS & REGIONAL CONTEXT

2.1 The A40/A477 Trunk Road Corridor

2.1.1 The A40 serves the county town of Haverfordwest, the tourist economy of central and north Pembrokeshire and the town of Milford Haven in the south. It forms the key road link between south-east Wales and Haverfordwest, which itself is a gateway town for connections to the ports of Milford Haven and Fishguard.

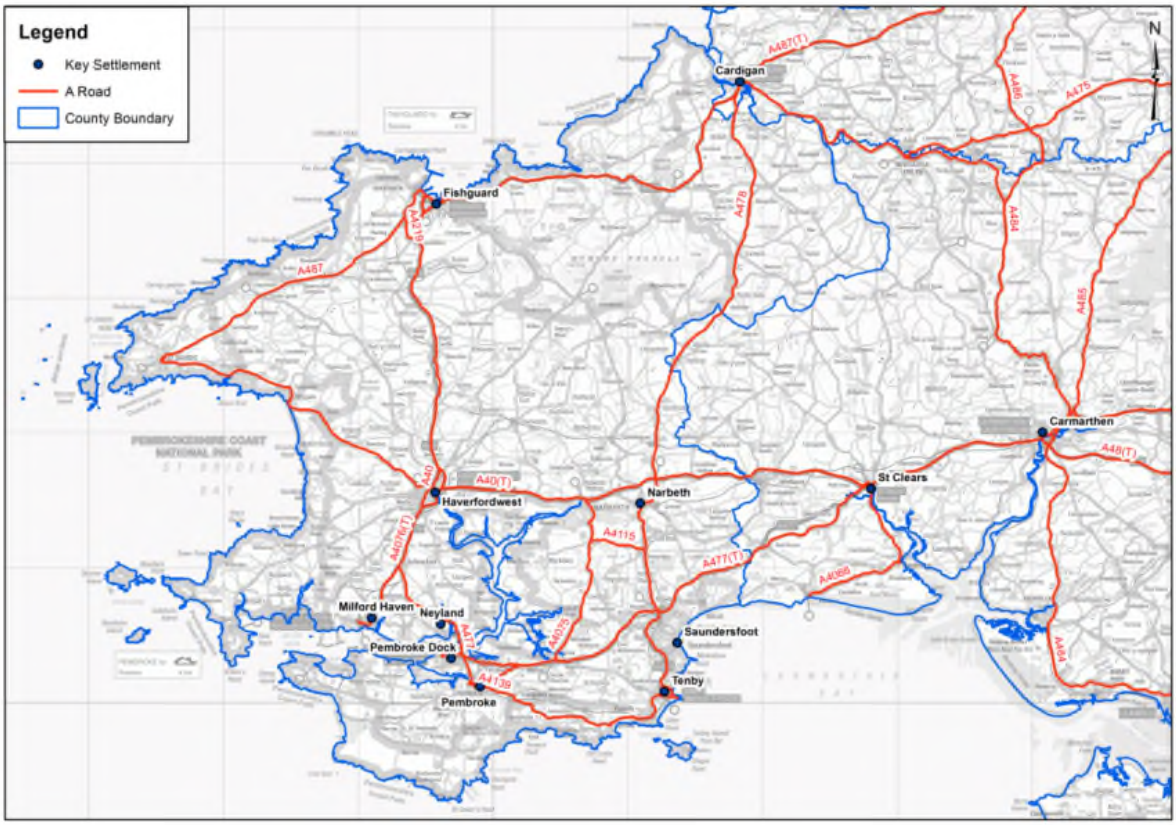

Figure 1 - Study Area

2.1.2 The St.Clears to Haverfordwest section of the A40 has developed over time to connect small villages and hamlets built upon a ridgeway route that follows field boundaries and topographical features. As such the unimproved sections of the A40 pass through the middle of population centres with some tortuous sections of road between. These conditions lead to community severance and instances of poor operation both in terms of link performance and traffic safety.

2.1.3 The A477, which diverges from the A40 at St Clears and runs to the south near Saundersfoot and Tenby is generally of a similar standard to the A40 and offers an alternative route into the south of the County. The A477 serves the industrial hub at Pembroke Dock, the Pembroke refinery, much of the Haven Waterway supply chain and the south-coast tourism destinations

from Amroth to Manorbier. There is local connectivity between the A40 and A477 along their length, through numerous links including the A478 and A4075 as well as the Cleddau Bridge, bringing added network resilience.

2.1.4 At present, journey times to Pembroke Dock (south of the Waterway) via the A477 are considerably quicker than via the A40 whilst journey times to Milford Haven (north of the waterway) are approximately the same on either route although the route along the A477 is slightly longer. There is however a toll on the Cleddau Bridge connecting the south and north of the Haven Waterway.

2.1.5 Both Trunk Roads have a mix of traffic types using the road. In the core winter months, both routes carry:

- local residents (typically car-based traffic);
- commercial vehicles, particularly around ferry arrival and departure times; and
- agricultural vehicles (although the A40 tends to be dominant in this regard).

2.1.6 In the summer months, the above mix is supplemented by a high volume of tourist traffic (increasing in some areas by over 40%) including cars and caravans, whilst agricultural markets also introduce a smaller peak in traffic levels on certain days of the year.

2.2 Socio-Economic Baseline

2.2.1 A detailed review of the Pembrokeshire economy and its strengths and weaknesses (including comparing it with other west Wales local authorities, i.e. Anglesey, Ceredigion and Gwynedd) has been completed as part of the study and has identified the following:

2.2.2 Pembrokeshire is one of the most rural counties in Wales, with an estimated population of 123,300 and a population density of 76 people per km2 (compared to the Welsh average of 149). The two largest settlements in the area are Haverfordwest (population 14,596) and Milford Haven (13,582) with all other settlements below 10,000 people.

2.2.3 Pembrokeshire has an uneven demographic mix compared to Wales as a whole with a lower proportion of people of working age, particularly those aged 30 and below, and a higher proportion of people over the age of 65. The over 65 population is concentrated in the more tourist focussed coastal communities in the north and south whilst the largest proportion of people of working age live in the key population centres of Haverfordwest, Milford Haven and Pembroke Dock.

2.2.4 There is a distinct geography which can be identified in the region in terms of occupational categories, with higher proportions of skilled residents in the south-east and north-west of the County. In contrast, employees in the lower value sectors are concentrated in the south-west of the County. The geographic breakdown of occupations also supports the theory of a 'two-speed' economy, whereby an affluent coastal community of in-migrants and retirees co-exists alongside less affluent areas, particularly inland.

2.2.5 There are lower economic activity rates in the coastal communities in the south which is in part explained by the higher proportion of retirees in these areas. Unemployment is highest in the main industrial areas of Milford Haven and Pembroke Dock.

2.2.6 Labour productivity as measured by Gross Value Added (GVA) per filled job in South West Wales is below that of the Welsh average and grew at a slower rate than Wales as whole between 2007 and 2011. This suggests that since the recession the South West Wales region has lagged behind the other areas in Wales in terms of productivity.

2.2.7 Overall Pembrokeshire has a high concentration of jobs in the tourism and public administration sectors, with the former concentrated in the tourist communities in the south-east and north-west and the latter focussed on Haverfordwest.

2.2.8 The energy sector is a critical private sector employer in the area in terms of providing permanent, full-time, skilled and high value employment. As well as direct employment, there is significant spin-off employment in, for example, construction and transport & storage, and indirect spin-off employment in, for example retail. These manufacturing and construction jobs (which are generally more transport intensive) are concentrated in the south west of the county. Whilst the data suggests that the largest concentration of manufacturing jobs are currently in Milford Haven, with the re-purposing of the Murco site, the focus for manufacturing in future will likely switch to Pembroke and its surroundings.

2.2.9 The number of active enterprises in Pembrokeshire has fallen at a faster rate than Wales as a whole since 2008, with declines in both the tourism and construction sectors. This suggests that the area has been more adversely impacted by the recession than elsewhere in Wales.

2.2.10 Pembrokeshire is perhaps not receiving an equitable share of foreign direct investment projects and this may, in part be due to perceptions of, or the reality of, its peripheral location which are exacerbated by the current standard of the A40.

2.2.11 Pembrokeshire has a large and well developed tourism economy. However, visitor numbers tend to lag behind the other areas of Wales with national parks (particularly Snowdonia), whilst the overall economic impact of tourism in the area is lower than in other tourism driven economies such as Conwy and Powys. Moreover, the expenditure by day visit in Pembrokeshire is amongst the lowest of Welsh local authorities.

2.2.12 Educational attainment in Pembrokeshire is slightly higher than the Welsh average although lower than that of the comparison counties. The south-east and south-west of the County, particularly industrial Pembroke Dock and Milford Haven have the lowest levels of attainment reflecting the wider socio-economic profiles of these areas. The absence of higher education establishments in Pembrokeshire means that prospective students have to leave the County to study.

2.2.13 The Pembrokeshire labour market is relatively self-contained with low levels of in and out commuting to / from the county.

2.2.14 In summary, the economic geography of Pembrokeshire suggests something of a 'two-speed economy'. The industrial and market towns of Pembrokeshire tend to display higher levels of unemployment and deprivation; lower educational attainment; lower average wages; and lower house prices. This is in stark contrast to the more well-off coastal areas which host a more affluent, older demographic.

2.2.15 The evidence, although slightly mixed, does suggest that Pembrokeshire has recovered more slowly from the recession than Wales as a whole. Average annual full-time pay declined between 2008 and 2013, whilst Pembrokeshire also experienced a greater than average decline in the number of active enterprises in the area over a similar time period.

2.3 Environmental Context

2.3.1 The county of Pembrokeshire covers approximately 1,600 square kilometres, which is around 7.5% of the area of Wales. Approximately one third of the County's landmass forms the Pembrokeshire Coast National Park.

2.3.2 The A40 runs along the boundary of the Pembrokeshire Coast National Park for several kilometres between Canaston Bridge Roundabout and Slebech. This area also forms part of the Milford Haven Waterway historic landscape designation.

2.3.3 A number of European protected species have been identified within 1km of the A40, including bats and otters. There may also be a potential impact on the Slebech Stable Yard Loft, designated as a Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC), which although located 9km to

the south-west of the A40, is the site of a Great Horseshoe bat maternity roost and any works could severe habitats.

2.3.4 The existing route and potential options for off-line works pass near or through a number of historic artefacts, including listed buildings and Scheduled Ancient Monuments.

2.3.5 Options for a southern bypass of Haverfordwest would cross the western Cleddau Valley, and the Western Cleddau River which is designated as part of the Pembrokeshire Marine SAC, Milford Haven Waterways SSSI and Cleddau Rivers SAC in various locations.

2.4 Haven Waterways Enterprise Zone

2.4.1 In 2012, the Haven Waterway was declared an Enterprise Zone due to its importance to the energy sector, with the sector in Pembrokeshire important, both locally and nationally. A 2010 study by Cardiff University found that energy (combining oil refining, gas processing and power generation) directly employs over 1,200 people in the Haven Waterway area in highly skilled, well-paying and long-term jobs. Outwith the energy sector, the Pembrokeshire economy is relatively small and self-contained and thus the vibrancy of energy related industries will be an important factor in the future economic performance of the area.

2.4.2 The area has access to energy related specific infrastructure as well as a deep water port facility and sea conditions that are ideal for the development of both Wave and Tidal Stream Marine Energy.

2.4.3 The existing energy sector in Pembrokeshire includes:

- Two refineries producing around 25% of the UK's refined products. The refineries provide product for the inland UK market as well as exporting to destinations in Europe, Africa and North America. *(Note: one of these is the Milford Haven Refinery- see details of current status below)*
- the UK's largest independent Tank Farm oil storage depot with a capacity of 8.7 million barrels.
- Two Liquefied Natural Gas import, storage and regasification plants, at South Hook and Dragon Liquefied Natural Gas (LNG) sites (both to the north of the waterway at Milford Haven) with the capability to provide more than 25% of the UK's natural gas supply
- the UK's leading manufacturer of Vertical Axis wind turbines at Pembroke Dock.
- Wales' first commercial Solar Farm at Rhosygilwen.

2.5 Milford Haven & Pembroke Refineries

2.5.1 The Milford Haven Refinery, located on the north side of the Waterway, was the smaller of the two remaining refineries in the area, with the larger Pembroke Refinery located to the south of the waterway. Operated by Murco and with a refining capacity of 135,000 barrels per day, the refinery was of a significantly lower capacity than the Pembroke refinery operated by Valero (approx. 215,000 barrels per day).

2.5.2 Murco expressed an interest in selling the refinery in 2010. The refining business could not be sold as a going concern and was closed in November 2014, with the loss of around 330 direct jobs and 180 contractor jobs. The Murco site has now been sold to Puma as a storage facility.

2.5.3 The Pembroke Refinery on the south side of the Waterway was purchased by Valero from Chevron in 2011. The Pembroke Refinery employs 1,200 staff (contractors and employees) and is believed to contribute around £1-£1.5 million per week to the local economy.

2.5.4 It is believed that around 90% of the Valero workforce is based in Pembrokeshire and that any future rundown or closure of this site would be of significant detriment to Pembrokeshire and indeed the Welsh economy.

2.6 Tourism

2.6.1 Pembrokeshire is a key part of the Welsh visitor economy. The National Park combined with the high quality coastal scenery and prominent attractions like St David's draw a significant number of annual visitors. The tourism market in Pembrokeshire is very diverse, with approximately 100,000 bed spaces, a large proportion of which are self-catering and caravan sites.

2.6.2 Whilst tourism providers are spread across the County, the largest concentrations are focussed around the coast with approximately 52% bed spaces in north Pembrokeshire (which will mainly use the A40) and 48% in south Pembrokeshire (which will mainly use the A477).

2.6.3 The National Park is a key visitor attraction in the area, with visitor surveys on the Pembrokeshire Coast Path finding that some 70% of users are visitors, the majority of which are staying visitors putting money into the local economy.

2.6.4 The majority of tourism businesses are small and medium-sized enterprises (SME), with a large number of lifestyle businesses and individually owned holiday cottages and lets. However, the County also has a small number of larger providers such as Bluestone and some of the larger holiday parks.

2.6.5 The tourism industry in Pembrokeshire is extremely seasonal. Serviced accommodation percentage occupancy peaks in August when it climbs above that of Wales as a whole (approximately 71% and 76% respectively). However, through the remaining months of the year, levels are much lower, particularly in January, February and November when average occupancy falls below 30% in Pembrokeshire compared to 40%-50% in Wales overall.

2.6.6 The geographic target market for Pembrokeshire is principally settlements along and to the south of the M4 corridor, including London. The Midlands are also a key target market, whilst ferry connections with Ireland open up opportunities in this market. In terms of visitor demographic, Pembrokeshire combines mass market tourism with the 'Independent Explorer' demographic. The main competitors for Pembrokeshire are Devon and Cornwall.

2.7 Agriculture

2.7.1 Pembrokeshire is traditionally an agrarian economy, with a combination of small and large firms combining to create the most diverse agricultural county in Wales. The agricultural economy in the area covers all of the main sectors:

- Cash crops – Pembrokeshire has a high level of production in potatoes (around 35% of the Welsh total) and other such crops, the majority of which is consolidated through Puffin Produce, a local cooperative.
- Dairy production – the County accounts for around 25% of total Welsh dairy production, which is mainly processed at First Milk in Haverfordwest. Cheese is also produced in the area.
- Livestock – Pembrokeshire also produces cattle, sheep and poultry. The County also hosts large numbers of store cattle and sheep, whilst sheep are also imported into the area for grazing over the winter months.

2.7.2 In terms of business structure, there is a wide range of scale in the agricultural sector, with some very large dairy herds through to individual small holdings. As with the agricultural sector throughout the UK, farming businesses (regardless of size) are generally price takers, all the more so in Pembrokeshire where peripherality makes the area relatively less competitive. This issue has been magnified by the long-term impact of the economic downturn on prices and the current supermarket price war, which is putting further downward pressure on prices.

2.7.3 In terms of future prospects, the study identified that whilst agriculture can be profitable, there is very much a reliance on Common Agricultural Policy subsidies. It appears that traffic levels in this sector will remain significant but there does not appear to be a clear trend towards growth.

2.8 Accessibility & Connectivity

2.8.1 The A40 is the strategic road link from Fishguard, Milford Haven and Haverfordwest to Swansea, Cardiff, Bristol, London and the West Midlands. The A477 provides the link to Pembroke Dock, Tenby, Saundersfoot and the other coastal towns on the south coast of Pembrokeshire west of Laugharne. The A40 and A477 split immediately to the west of St. Clears with approximately two thirds of the traffic heading along the A40 and the remainder along the A477. The A48 and the A40 to the east of St Clears provide a good standard dual carriageway road corridor from the end of the M4 motorway to St Clears.

2.8.2 In terms of public transport options, the major towns in Pembrokeshire all have rail connections. Service frequency on these lines is moderately low, and journey times are not competitive with road-based transport on the majority of routes. Table 1 shows rail journey times to Swansea (as a proxy for onwards connections on the South-Wales mainline).

Station	Services per Day (Swansea & Connections)	Journey Time to Swansea	Equivalent Road Journey Times
Fishguard Harbour	6	~ 2:00	~ 1:30
Haverfordwest	10	~ 1:30	~ 1:20
Milford Haven	10	~ 1:50	~ 1:30
Pembroke Dock	8	~ 2:15	~ 1:15

Table 1 - Journey times to Swansea by Rail

2.8.3 With respect to coach services, connections are poor from Fishguard, Haverfordwest and Milford Haven, with almost all journeys requiring at least one change and being considerably slower than rail. As such, it does not offer a competitive alternative to car based travel.

2.8.4 Carmarthen is the only settlement of a reasonable size which is within one hour's drive of Haverfordwest (approximately 45 minutes), highlighting the peripherality of Pembrokeshire. Swansea is over an hour's drive, whilst Cardiff and Bristol are typically within a 2-3 hour drive. London is 4-5 hours drive, whilst the Channel Ports of Weymouth, Poole and Portsmouth also fall into this category.

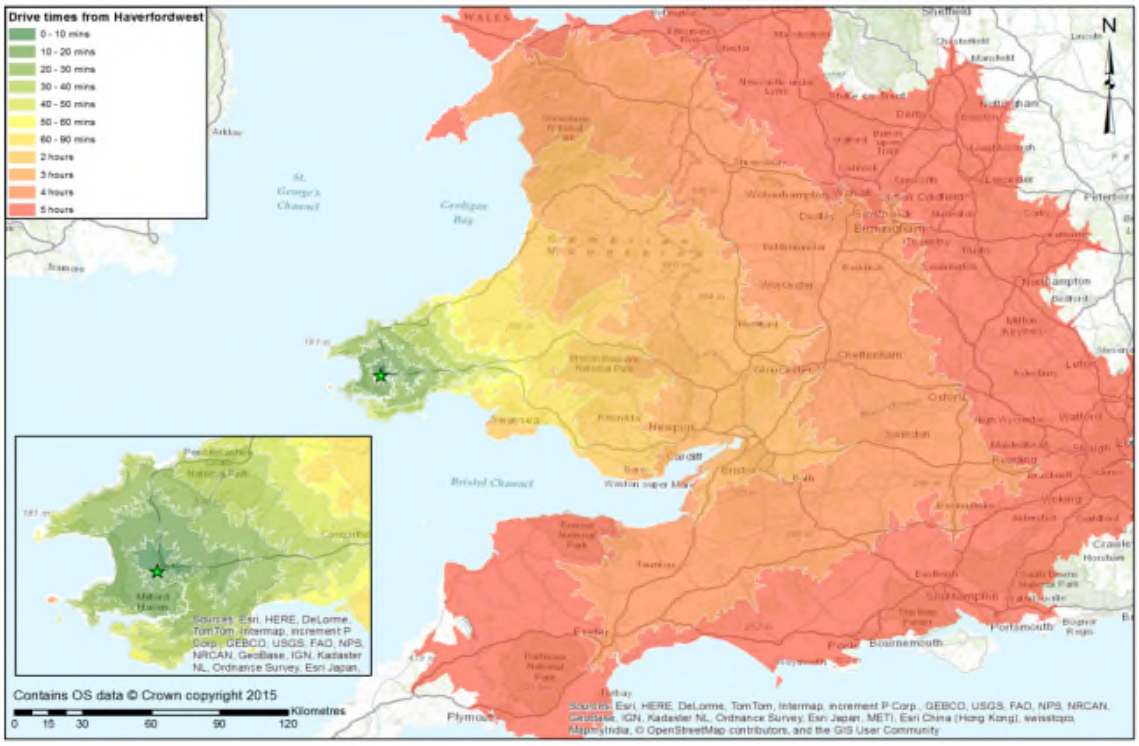

Figure 2 – Car Based Accessibility - Haverfordwest

2.8.5 The relative competitiveness of rail travel with car deteriorates rapidly once longer distance connections are considered. Car travel is by far the quickest option in terms of connectivity between Pembrokeshire and the rest of the UK. Haverfordwest and Milford Haven are reasonably well served by rail to Swansea, and to a lesser degree to Cardiff. However, longer distance journeys involve one or more changes and therefore reduce in competitiveness.

2.9 Port and Ferry Connectivity

2.9.1 There are two ferry routes connecting Pembrokeshire with Ireland;

- Fishguard to Rosslare – operated by Stena Line; and
- Pembroke Dock to Rosslare – operated by Irish Ferries

2.9.2 The routes both offer twice daily sailings in either direction with both crossing options similar with regards to timings. The timetable is built around hauliers accessing key logistics hubs in both countries early in the morning. As a result, the sailing times are such that ferry traffic is generated at off-peak times of the day. For night time sailings, the A40 is quiet and therefore the platoons of ferry traffic have little impact in terms of congestion.

2.9.3 The routing options to St Clears and eastwards from the respective ports are different. From Fishguard, there is an onward car journey of approximately

45 minutes using the A40 and departing from Pembroke Dock vehicles travel along the A477 to St Clears which takes approximately 30 minutes.

2.9.4 Passenger numbers on the two Pembrokeshire – Ireland routes were broadly similar in 2013 (but much lower than Holyhead-Dublin route which represents a far larger market).

Route	Passengers 2013
Fishguard - Rosslare	333,000
Pembroke Dock - Rosslare	328,000
Holyhead – Dublin/Dun Laoghaire	*1,954,000*

Table 2 - Ferry passenger numbers in 2013

2.9.5 The trend in passenger numbers on these routes during the last 10 years shows a significant decline on the Fishguard - Rosslare route (in part due to the rundown and subsequent withdrawal of Stena's High Speed Service in the early 2010s), with 2013 patronage being around half the level of the figure experienced in 2004. The Pembroke Dock route has remained relatively stable throughout the period in comparison. If the trend in passenger numbers were to continue, ferry related traffic on the A40 would be expected to decline in line with the Fishguard - Rosslare route.

2.9.6 Around 65% of commercial vehicles travel on the Pembroke Dock - Rosslare route, which makes the A477 the more intensive route from a ferry freight perspective. The importance of the A477 in this regard is highlighted by the high number of people employed in freight intensive industries within Pembroke Dock and its surroundings.

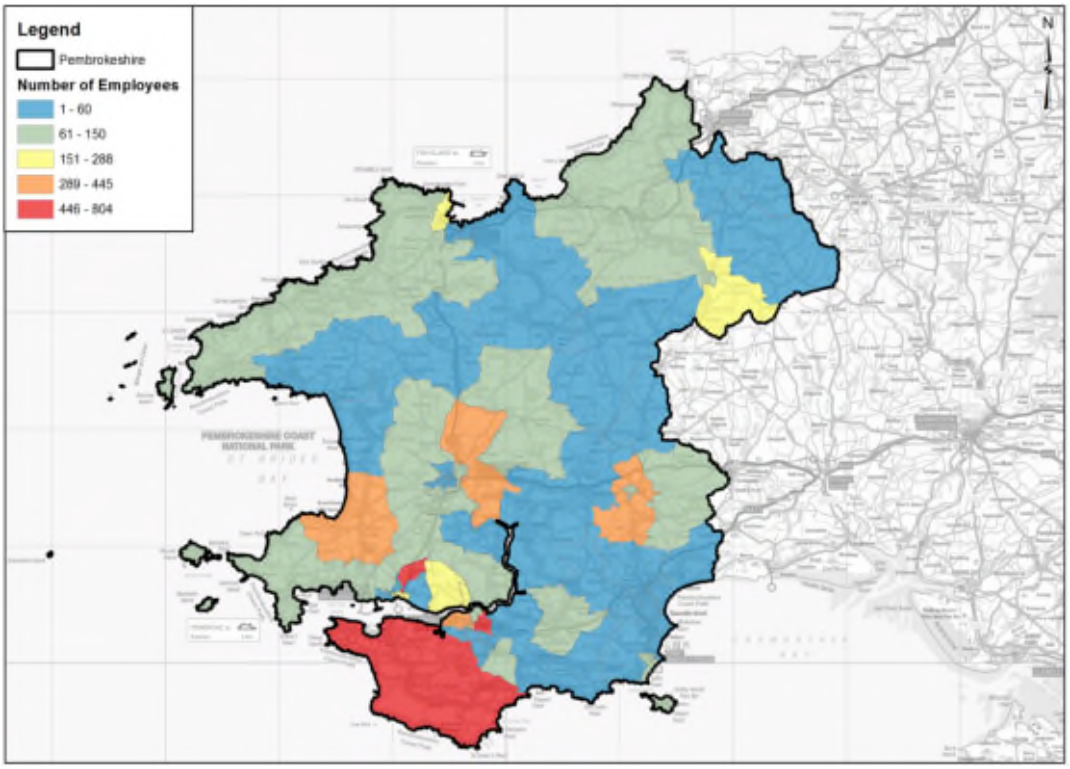

Figure 3 - Number of Employees in Freight Intensive Industries

2.9.7 In terms of trends through time, the figure below highlights a decline at Fishguard, with 2013 being 34% lower than 2004 levels; it experienced a 35% annual decline in 2009, most likely due to the impacts of the recession, particularly in Ireland. Conversely, Milford Haven is experiencing higher freight volumes than in 2004, likely driven by the new pipeline based LNG (Liquefied Natural Gas) terminals. For comparison, Holyhead also exhibits a significant decline in freight tonnage, with significant drop in 2009; 2013 was 19% lower than the volume experienced in 2004.

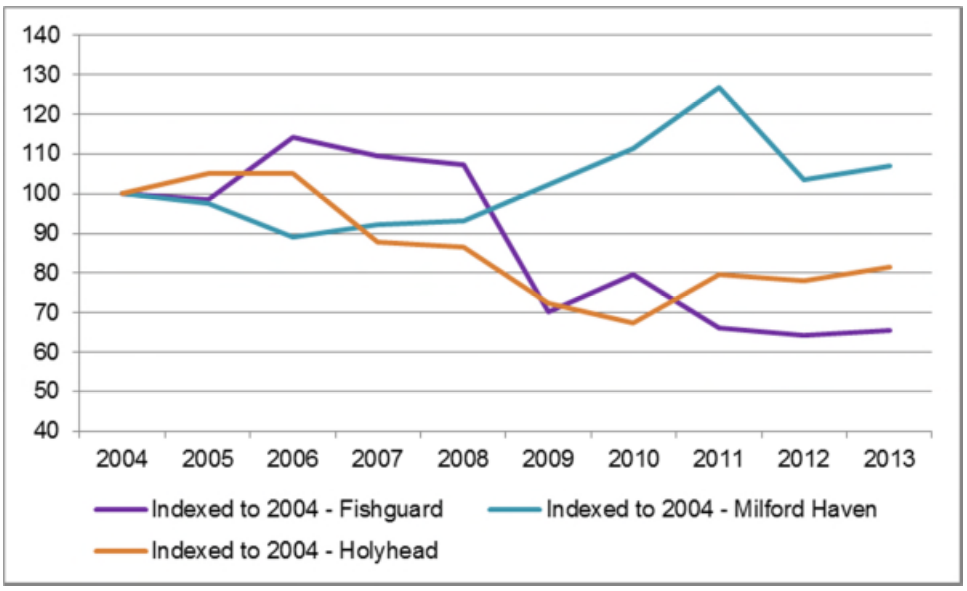

Figure 4 - Trends in freight tonnage passing through ports – indexed to 2004 levels

2.10 Withybush Hospital

2.10.1 Withybush Hospital is located directly off the A40 immediately to the north of Haverfordwest and includes an Accident and Emergency Unit. The hospital is currently the subject of enacted and proposed cuts in service provision. These include the closure of the specialist baby care service and the 24-hour paediatric care unit (cut to 12 hours). Specialist neo-natal care and out of hours paediatric care is now provided at Glangwili Hospital in Carmarthen, at the other end of the A40 from Haverfordwest.

2.11 Withybush Airport

2.11.1 Withybush Airport is located directly off the A40 immediately to the north of Haverfordwest, is owned by the local authority and is included in the Haven Waterway Enterprise Zone. It is a small airfield with two short asphalt runways, which can only accommodate small propeller driven aircraft. There are no navigational aids and fire cover is limited. The airport is not licenced to handle scheduled passenger flights and cannot accommodate jet aircraft.

2.12 The A40 Trunk Road

2.12.1 Whilst providing a strategic link to the ports of Fishguard and Milford Haven, the section of the A40 west of St Clears is generally rural in nature, passing through a number of small communities and is a relatively poor quality route. Part of the A40 forms a section of the (unsigned) Euroroute E30, between Cork and Moscow, which provides a land bridge to Ireland and has previously been referred to as *'one of the lowest standard sections of the Trans European Road Network in the United Kingdom'*.

2.12.2 The A40 between St Clears and Haverfordwest is generally single carriageway, but has six sections that give dedicated overtaking opportunities, two eastbound and four westbound, amounting to some 13% of the total 32.5km length. This remains well below the 30% ratio advised for this type of route.

2.12.3 For the majority of its length the carriageway is 7.3m wide with, in some places 1m hardstrips and variable width grassed verges. There are various types of junction within this length including at-grade roundabouts, staggered crossroads, simple T-junctions (with and without ghost islands) and approximately 200 direct accesses to properties, farms and fields (excluding those in Llanddewi Velfrey).

2.12.4 Where the trunk road passes through the community of Llanddewi Velfrey, the horizontal alignment is generally poor, the road narrows to about 6.5m in places and a 40 mph speed restriction applies. There are no hardstrips and footways, where provided, are narrow with little in the way of verges. Several properties front the trunk road and have direct access onto it. Forward visibility is poor and below desirable minimum levels in places.

2.13 Existing traffic flows

2.13.1 Existing traffic flows along the A40 can be seen in the table below.

Current Location (east to west)	AADT (2013)	HGVs
A40 Carmarthen	*40,011*	*6%*
A40 St Clears – east of A477 roundabout	*18,813*	*7%*
A40 – 1.8km west of A477 roundabout	*12,165*	*7%*
A40 – Whitland	*11,838*	*6%*
A40 – Narberth junction with B4314	*9,161*	*7%*
A40 – 4km east of Haverfordwest	*13,700*	*6%*

Table 3 - Traffic Counts on the A40

2.13.2 At Carmarthen, nine miles east of St Clears, the Annual Average Daily Traffic (AADT) is 40,000, which drops to approximately 18,000 at St Clears where the current dual carriageway ends. St Clears is a strategically important junction where motorists have a route choice between the A40 for central and northern Pembrokeshire and the A477 for southern Pembrokeshire.

Figure 5 - AADT counts along the A40 and surrounding routes

2.13.3 Once onto the single carriageway, the flow is around 12,000 vehicles west of St Clears and only slightly lower at Whitland, five miles further west. The lowest flows on the route are on the section past Narberth, with an AADT of around 9,000. West of here, and five miles beyond the junction with the A4075, the flow is higher at 13,700 on the approach towards Haverfordwest. This suggests significant local trip making in and around Haverfordwest. Heavy Goods Vehicle (HGV) volumes remain relatively constant at 6-7% although this has dropped slightly in the last 10 years in no small part as a result in the decline on the Fishguard - Rosslare ferry route.

2.13.4 The AADT flow on the A477 immediately to the south west of St Clears Roundabout is around two thirds of the traffic on the A40 in the same area. The traffic flows on the two roads are similar around their mid-points (the Narberth junction on the A40 and Tenby junction on the A477). Significantly however, traffic flows on the A477 in the Pembroke Dock area are well in excess of the A40 immediately to the east of Haverfordwest. This is likely a result of local movements on the south-side of the Haven Waterway meeting the needs of the Pembroke Refinery and other businesses in the Pembroke Dock area.

2.13.5 During the last five years, traffic has remained relatively constant, as is illustrated in the chart below:

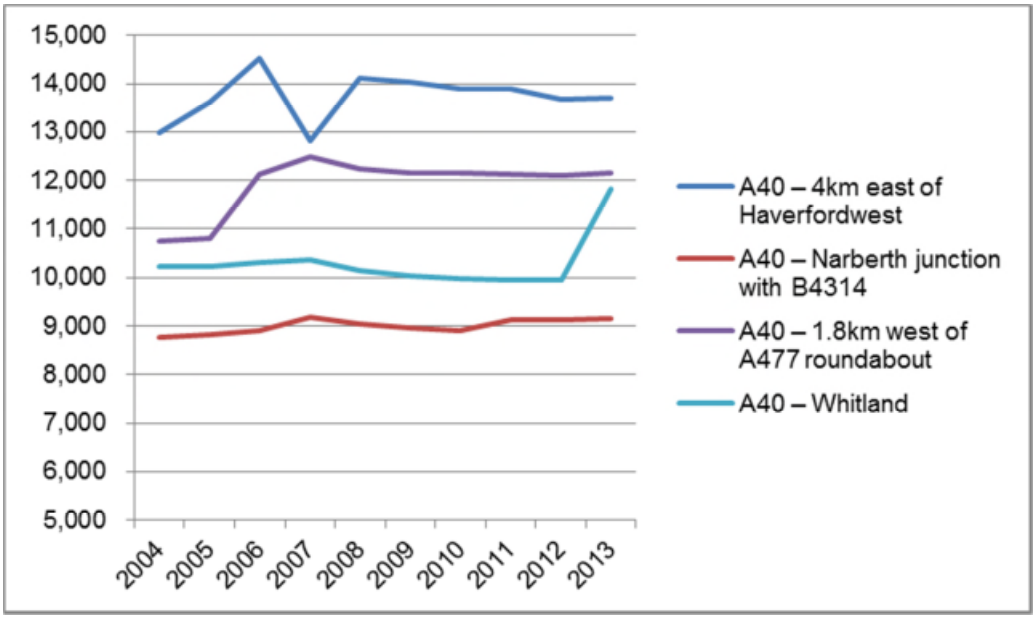

Figure 6 - AADT on A40 – 10 year trends

2.13.6 This is an important finding as the 2004 study and subsequent review in 2008 found then that traffic levels on the A40, even allowing for seasonal traffic increases, were near the bottom of the range as detailed in design standards for when a dual carriageway may be considered economically justifiable. The

traffic levels are also reasonably within the capacity of an improved wide single carriageway and for a wide single 2+1 carriageway. The current situation has not materially changed.

2.13.7 The sharp isolated increase in traffic volumes locally around Whitland in 2013 is likely as a result of a temporary diversion of traffic onto the A40 to avoid roadworks in place as a result of the construction of the A477 St Clears to Red Roses improvement and is now anticipated to return to 2012 levels.

2.13.8 The current average journey time to travel between St Clears roundabout and Haverfordwest (32.5km/20 miles) is around 28 minutes an average travel speed of 44mph.

2.14 Seasonality

2.14.1 Seasonality is an issue on the A40 given the prominence of Pembrokeshire as a tourism destination. As well as the Pembrokeshire Coast National Park, the area contains the City of St David's, as well as many tourism centres such as Solva, Tenby and Saundersfoot and attractions such as Bluestone, Folly Farm and Oakwood.

2.14.2 The A40 experiences increased traffic flow during the summer months including cars and caravans, whilst agricultural markets also introduce a smaller peak in traffic levels on certain days of the year. This is illustrated in the following figure, where AADT figures for the A40 at Whitland, show a significant increase of 46% in August when compared to a neutral winter month (February). This supports the view that tourism generates significant additional trips in the study corridor during the summer period.

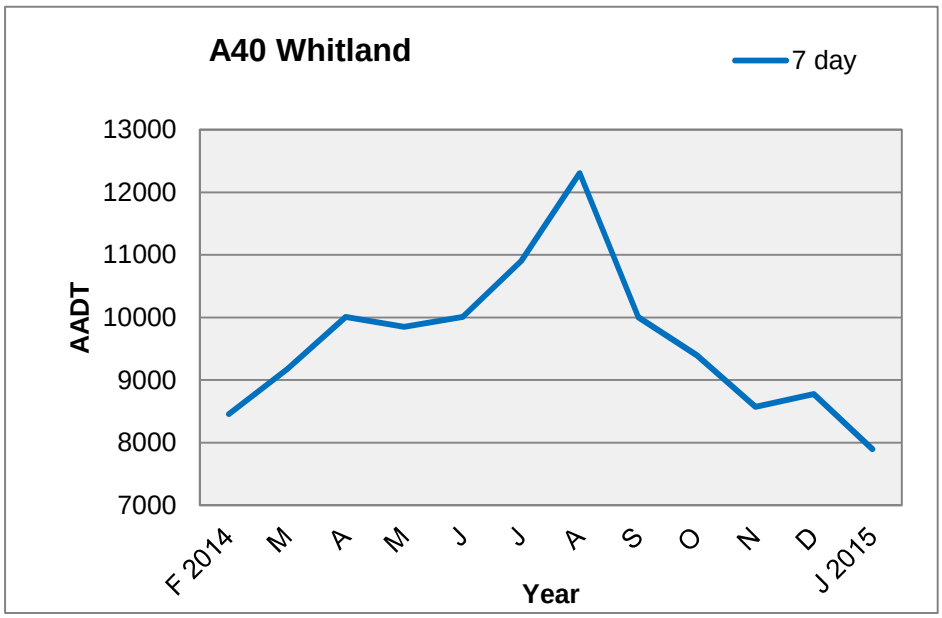

Figure 7 - Monthly AADT figures for the A40 at Whitland

2.15 Future Traffic Flows

2.15.1 Traffic flows are predicted to increase on the A40 as illustrated in the graph below, with the AADT reaching a maximum of around 17,500 by 2040.

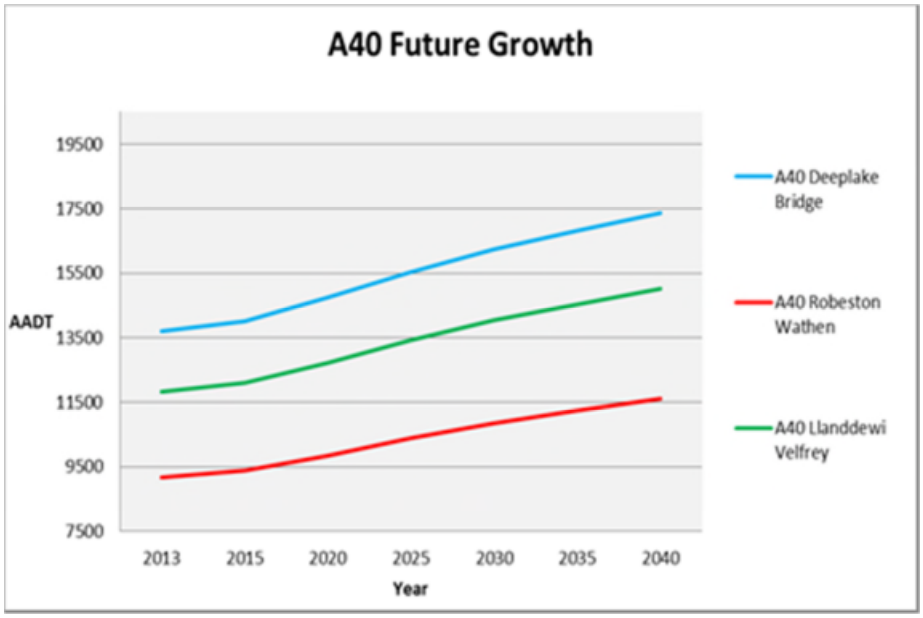

Figure 8 - A40 Forecast AADT

2.15.2 To understand the required carriageway standard along the A40, an assessment of future traffic growth was undertaken in conjunction with the DMRB standard TA 46/97 "Traffic Flow Ranges for Use in the Assessment of New Rural Roads". The TA 46/97 standard recommends opening year economic flow ranges for different standards of roads.

Carriageway Standard	Opening Year AADT	
	Minimum	Maximum
S2 (Single 7.3m)	Up to 13,000	
WS2 (Wide Single 10m)	6,000	21,000
D2AP (Dual 2 lane all purpose)	11,000	39,000
D3AP (Dual 3 lane all purpose)	23,000	54,000

Table 4 - Abstract from TA 46/97 - "Opening Year Economic Flow Ranges"

2.15.3 Existing A40 traffic flows are comparatively low (9,000 to 14,000 AADT). Even allowing for an increase for seasonal traffic they are reasonably within the capacity of an improved wide single carriageway as defined in the table (6,000 to 21000 AADT) and a way below the capacity threshold of 25,000 AADT for a wide single 2+1 carriageway as outlined in the standard. This is also the case in the short and medium term with traffic levels within the same capacity thresholds.

2.15.4 The range of flows where dual carriageway D2AP may be considered economically justifiable are between 11,000 to 39,000 AADT. The current A40 flows are within the capacity range but very near to the bottom and expected to remain so in the short and medium term.

2.16 Road Safety

2.16.1 The tables below illustrate the number and severity of collisions that occurred on the A40 and A4076 during the period January 2009 to December 2013.

Year	Total Collisions	Collisions by Severity		
		Slight	Serious	Fatal
2009	*16*	*14*	*2*	*0*
2010	*10*	*9*	*1*	*0*
2011	*12*	*11*	*0*	*1*
2012	*22*	*20*	*0*	*2*
2013	*17*	*13*	*4*	*0*
Total	***77***	***67***	***7***	***3***

Table 5 - Summary of A40 Collision Statistics

Year	Total Collisions	Collisions by Severity		
		Slight	Serious	Fatal
2009	5	4	1	0
2010	3	3	0	0
2011	4	3	1	0
2012	6	6	0	0
2013	4	3	1	0
Total	**22**	**19**	**3**	**0**

Table 6 - Summary of A4076 Collision Statistics

2.16.2 Three fatal accidents have occurred between 2009 and 2013. They occurred at the following locations:

- A40 Junction at Pont Frolic, to the west of the Whitland roundabout;
- A40 west of the western access junction for Pont-y-Fenni; and
- A40 west of the A478 roundabout

2.16.3 Five cluster sites were identified based on the Welsh Government's definition of a cluster site being where there are 4 or more injury collisions in a 3 year period within a 100m diameter. These were:

- A4076/A487 Merlin's Bridge roundabout - 4 collisions of slight severity;
- A4076 Freemans Way, East of Merlin's Bridge - 4 collisions of slight severity;
- A40 West of Kings Park Farm - 5 collisions of slight severity;

- A40 Canaston Bridge - 4 collisions of slight severity; and
- A40 Slebech - 4 collisions of slight severity.

2.17 Overtaking

2.17.1 The sections of 2+1 carriageway on the existing A40 are listed in the table below. This shows that over the 32.5km A40 route between St. Clears to Haverfordwest, the existing overtaking provision is 10% in the eastbound direction and 17% in the westbound direction. This averages out to approximately 13% of the 32.5km route overall.

Chainage		Overtaking Length (Km)		Constructed
		e/b	w/b	
Ch.32+500	Ch.31+500		1.0	
Ch.28+350	Ch.27+350		1.0	
Ch. 22+200	Ch. 20+400		1.9	
Sub-Total		0	3.9 (12%)	
Ch.13+100	Ch.11+200	1.9		2011- A40 Penblewin to Slebech Improvement
Ch.11+100	Ch.9+500		1.6	
Ch.5+200	Ch.3+900	1.3		2014
	Total	3.2 (10%)	5.5 (17%)	

Table 7 - Existing Overtaking Provision – A40 St.Clears to Haverfordwest

2.18 Problems on the A40

2.18.1 The main problems associated with this section of the A40 are:

a) Limited overtaking opportunities which lead to poor journey time reliability and driver frustration, risky manoeuvres and collision incidents.

b) Inconsistency in the level of overtaking provision between the eastbound and westbound directions. Existing provision gives a total of 5.5km in the westbound direction and 3.2km in the eastbound, amounting to some 13% of the total 32.5km length which remains well below the 30% ratio advised for this type of route.

c) Where overtaking provision does exist it is currently not spread along the length of the A40 such that there are long lengths in each direction with no opportunity for overtaking. For instance there is no opportunity for vehicles travelling east to overtake for at least 19km from Robeston Wathen towards St. Clears roundabout, although this would be addressed in part should the A40 Llanddewi Velfrey scheme be implemented. Similarly for vehicles travelling west there is no

opportunity for vehicles to overtake for at least 9.5km from Canaston Bridge to Haverfordwest roundabout.

d) Occasional convoys of heavy goods vehicles from the ferry ports and slow moving agricultural vehicles, both of which contribute to periods of platooning and journey time unreliability when combined with limited overtaking opportunity.

e) Seasonal spikes in traffic volumes on the A40 and indeed the A477 during the summer months. This leads to slow moving tourist traffic causing journey time unreliability when combined with limited overtaking opportunity.

f) Community severance at Llanddewi Velfrey.

g) Sub-standard sections of existing road, especially at Llanddewi Velfrey.

h) Numerous side road junctions and the high number of direct accesses to property and fields.

i) A mix of traffic types using the road.

j) A lack of strategic public transport connectivity in Pembrokeshire generally means there is a dependence on the private car for inter-urban connections.

In this context of d) above, platooning is the traffic condition, similar to a convoy, where a queue of traffic builds up behind the front vehicle. If the front vehicle is moving at a slower speed than the rest it creates queues of traffic if there is no opportunity for overtaking. In the context of the roads within the region, including the A40 and A477 platooning is particularly experienced:

- When there has been a ferry arrival at either Milford Haven or Fishguard and there are a number of HGVs heading east along the trunk road at the same time – generally occurs at non-peak hours.
- When agricultural vehicles are travelling along the A40.
- When slow moving vehicles such as caravans are travelling along the trunk roads – particularly prevalent during the summer months.

2.19 A4076

2.19.1 The A4076 connects directly to the A40 at the eastern end of Haverfordwest at Salutation Square roundabout. The route runs around the south eastern perimeter of the town on Freemans Way which has a 30mph speed limit until it passes the eastern side of County Hall, at which point it reverts to national speed limit.

2.19.2 Freemans Way crosses the Western Cleddau river via an over bridge and continues west to Merlin's Bridge roundabout where the speed limit reverts back to a 30mph.

2.19.3 From Merlin's Bridge the A4076 heads south towards Milford Haven. The A4076 runs through the town of Johnston where it meets the A477 and continues into Milford Haven leading directly into the Haven Waterfront Enterprise Zone. The A4076 follows a tortuous path through Milford Haven leaving the town to the west before connecting into the local road network to access the Murco Refinery site, Sandy Haven and South Hook LNG Terminal.

2.19.4 The route around Haverfordwest is punctuated by traffic lights, varying speed limits and little opportunity for overtaking. There are frequent instances of localised congestion in and around Haverfordwest at peak periods. In particular at Johnston and at Merlin's Bridge roundabout in the AM peak on the southern approach to the town on the A4076 (T) from Milford Haven.

2.19.5 The route is generally single carriageway although there is one stretch that permits overtaking in the southbound direction. The mid-link town of Johnston is subject to a 30mph speed limit and has a number of properties abutting the carriageway.

2.19.6 The AADT along the route can be seen below.

Current Location	AADT (2013)	HGV
A4076 – Pope Hill (between Merlin's Bridge and Johnston)	*15,981*	*4%*
A4076 – Thornton Road (between Johnston and Steynton)	*8,764*	*2%*

Table 8 - Traffic Counts on the A4076

2.19.7 The Pembrokeshire County Council Local Development Plan includes for significant development in the Haven area off the southern end of the A4076 and are keen to improve access links to attract inward investment and improve economic performance.

2.20 How does the A40 compare with the A55

2.20.1 The A55, which runs from the English/Welsh border at Chester to the major port of Holyhead, was like the A40, single carriageway, with numerous sections passing through busy and historic towns, Conwy for example.

2.20.2 The A55 passes through Wales' other western coastal communities in Anglesey, Ceredigion and Gwynedd and forms part of the TEN-T network. It also connects to one of the most peripheral areas in north Wales which is

served by a sea port which connects to the Irish ferry ports. It therefore provides a useful comparator to the A40.

2.20.3 During the 1990s and early 2000s, the A55 was progressively dualled all the way through to Holyhead (with the exception of the short single carriageway sections over the Menai and Britannia Bridges.) It now provides a high quality dual carriageway connection between the gateway of Holyhead and the M56/M6 (onwards to Lancashire, the Midlands, the north and the south).

2.20.4 Comparing the trend in traffic along the A40 with the A55 in north Wales suggests that annual traffic fluctuations in the former are smaller than the latter. In particular, the A40 appears to have exhibited only a small reduction in traffic during the recession in 2008/2009, suggesting that it is less sensitive to economic activity than the A55 (and indeed less sensitive to the Irish market which suffered heavily during the global economic downturn).

2.20.5 In general, traffic has grown faster on the A40 (and indeed the A55) than in Wales generally. This is illustrated in the figure below.

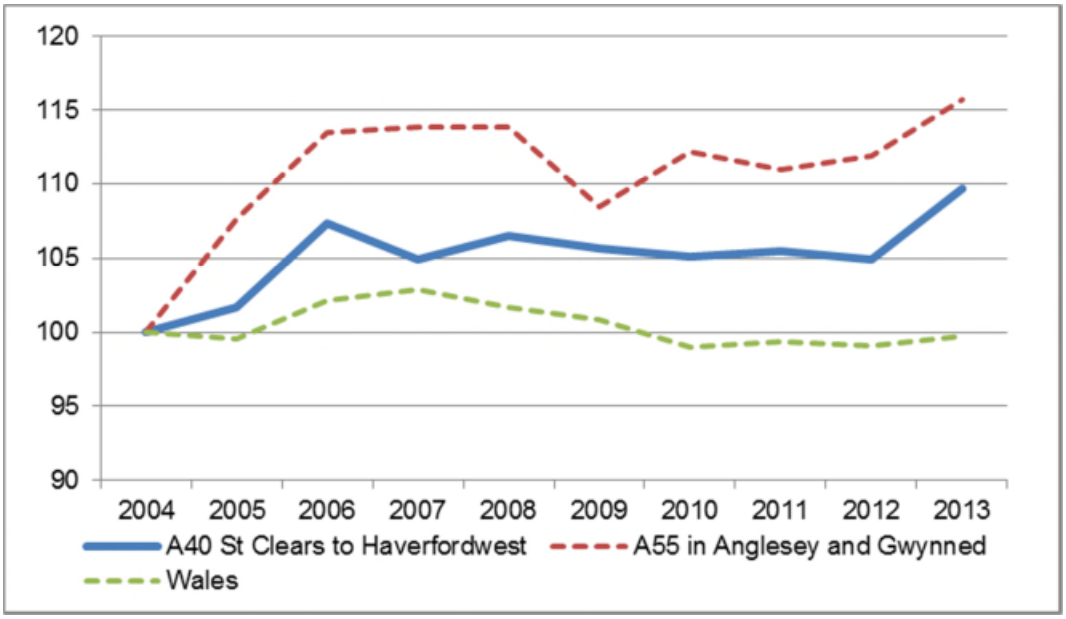

Fig 9 - 2004 indexed trends in traffic – A40, A55 & Nationally

2.20.6 The percentage of HGVs on the A40 is approximately 6-7%, which is slightly higher than the 5% of traffic on the A55 corridor (which is perhaps somewhat surprising given that the A55 forms the 'route to Dublin').

3 POLICY CONTEXT

3.1 Programme for Government

3.1.1 The 'Programme for Government 2011-2016' is the current Government's action plan outlining a commitment to deliver their manifesto. Its high level aims include:

- 'To strengthen the conditions that will enable business to create jobs and sustainable economic growth.
- 'Reducing poverty, especially persistent poverty amongst some of our poorest people and communities, and reducing the likelihood that people will become poor.'
- 'Ensure that rural communities remain vibrant and able to offer people an excellent quality of life with access to high quality employment, affordable housing and public services and sustained by reliable and effective infrastructure in terms of broadband, public transport and utilities.'
- 'Make our communities safer'.

3.1.2 The corresponding key actions the Welsh Government is undertaking to deliver improvements include:

- Improving our infrastructure – By delivering the priorities within the NTP & maximise the accessibility and safety of the trunk road network.
- A thriving rural economy – Prioritisation of the NTP to improve access to key sites and settlements, particularly in rural areas, with an emphasis on improving the quality and provision of healthy and more sustainable travel choice.
- Tackling worklessness and raising household income – Prioritisation of the NTP by improving access in deprived communities.
- Improving safety in communities – Target higher-risk road users (motor cyclists, young drivers and vulnerable road users) through a combination of measures including education, engineering and enforcement.

3.2 Wales Spatial Plan

3.2.1 The Wales Spatial Plan sets the context for planning and policy in Wales with spatial implications. It is intended to ensure that public investment is made in the places and services where it is most needed. The Wales Spatial Plan (WSP) 2004 was updated in 2008 to include the development of the Welsh Transport Strategy (WTS).

3.2.2 The Wales Spatial Plan 2008 update is structured around five themes:

- building sustainable communities;
- promoting a sustainable economy;
- valuing the environment;
- achieving sustainable accessibility, and
- respecting distinctiveness.

3.2.3 The purpose of the WSP is to ensure that what is done in the public, private and third sectors in Wales is integrated and sustainable, and that actions within an area support each other and jointly move towards a shared vision for Wales and for the different parts of Wales.

3.2.4 The WSP identifies six Wales Spatial Plan Area Strategies, one of which is for the 'Pembrokeshire - The Haven'. The vision for this strategy is:

'A network of strong communities supported by a robust, sustainable, diverse high value-adding economy underpinned by the Area's unique environment, maritime access and internationally important energy and tourism opportunities'.

3.2.5 The key strategic priorities for achieving this vision are:

- Overcoming the Area's peripherality by improving strategic transport links and economic infrastructure including improved telecommunication links, and maximising the potential of the Area's maritime assets and proximity to Ireland.
- Developing a more diverse, entrepreneurial knowledge-based economy, working closely with higher and further education institutions, indigenous businesses and multinational companies, in order to increase wage levels and create enough well-paid jobs to establish a critical mass that will both attract people with higher skills and reduce the out-migration of young skilled people. Energy and the environment will be critical to achieving success.
- Increasing higher value-adding economic activities, particularly in the rural economy, by developing an all year, high quality tourism and leisure sector.
- Developing the Area's three strategic hubs (see below). Critical to this is the renewal of town centres, the development of complementary settlement roles within and between hubs, strengthening community, economic and social outreach and spreading benefit and growth to the wider hinterlands and smaller rural communities.

- Raising skill levels through effective partnership working and tailoring learning and up-skilling to better meet existing and future business needs across a range of sectors.
- Sustaining and strengthening communities by taking focused action to address both rural and urban deprivation and economic inactivity and to ensure housing provision appropriate to all.
- Protecting and enhancing the Area's important environmental assets, maximising their potential through exemplary sustainable development.

3.2.6 To help meet these challenges, the Spatial Plan Area Group has identified three strategic hubs (listed a-c below) that perform an important regional role and should therefore be an important focus for future investment. These are:

a) The Haven Towns in the south west of the Area, which cluster around the Milford Haven Waterway, comprising:

- **Haverfordwest**, Pembrokeshire's county town and an important centre for retailing, services, health provision (including the district general hospital in Withybush) and public administration. The town centre is currently underperforming and lacks the range of quality retail, commercial and visitor facilities which are needed to realise its potential. A key focus will therefore be on town centre renewal, which will be centred upon improving the town's retail performance, its commercial premises, its accommodation and leisure offer, accessibility to and within the town, including car parking, and improving the public realm (including e.g. riverside development potential) to provide for the increased population and to attract more visitors to the town.

- **Milford Haven and Neyland** where residential, commercial and town centre property need to be upgraded in order to provide safer, more attractive neighbourhoods and retailing areas.

- **Pembroke and Pembroke Dock** which are anticipated to see employment growth linked to the continued development of the Waterway, port growth and marina development and the science and technology park.

3.2.7 These towns need to develop roles and functions so that, collectively, they complement rather than compete with one another. Further work needs to be undertaken in order to define complementary priorities and market opportunities for the Haven Towns, the nature of their relationship with the other strategic hubs and their interaction with local centres and smaller settlements that make up the Area's significant rural hinterlands.

b) Carmarthen plays a pivotal role between three Spatial Plan Areas: Pembrokeshire - The Haven, Swansea Bay and Western Valleys and Central Wales. As a gateway to West Wales, Carmarthen plays a key role reaching to the east, west and north as a regional centre for retailing, healthcare, administration and agriculture.

c) Fishguard and Goodwick are important drivers of the north Pembrokeshire economy.

3.2.8 The WSP identifies that the Area is strategically placed with important Trans-European Transport Network (TEN-T) road and rail network links, and two ferry ports at Pembroke Dock and Fishguard providing a 'southern corridor' route to Ireland that avoids the increasingly congested Dublin area. The Milford Haven Waterway is one of the UK's largest, deepest and safest harbours, and critical to the continuing success and growth of the Area's internationally important energy sector.

3.2.9 In terms of roads, the WSP highlights that improvements to the A40 are being made with the current scheme of bypasses and that the need for further investment will be kept under review.

3.3 Wales Transport Strategy

3.3.1 The Wales Transport Strategy (WTS) published in 2008 sets the policy framework for transport in Wales and the long term outcomes that transport interventions should contribute to. These outcomes are grouped under the headings of Social, Economic and Environmental. The WTS is a statutory document required by the Transport (Wales) Act 2006.

3.3.2 The WTS notes the importance of good, reliable connections between Wales and other parts of the UK and EU for business and tourism. It recognises the importance of the east-west corridors and in particular the TEN-T routes as priority.

3.4 Wales Infrastructure Investment Plan (WIIP)

3.4.1 The Wales Infrastructure Investment Plan (WIIP) sets out 'improving transport links, particularly East-West transport links' as a high level investment priority.

3.5 National Transport Plan and National Transport Finance Plan

3.5.1 The 'National Transport Plan' (NTP) was published in March 2010 to set out how the WTS is to be delivered over the following five years. The NTP is currently being updated and the Consultation Draft National Transport Finance Plan (NTFP) was published in December 2014 and is expected to be published in July 2015.

3.5.2 Within the NTFP, one of the main aims under 'Targeted investment in Infrastructure' is 'To improve reliability, journey times & safety along the east-west corridor in South Wales'. The NTP continues to identify the A40 west of St. Clears as a route that experiences slower journey speeds. It also records transport connectivity issues that have been raised by the Enterprise Zone Board regarding the Haven, identifying that improved reliability and travel time to the Haven Waterway Enterprise Zone is required, in particular, improvements to the A40.

3.5.3 The A40 Llanddewi Velfrey to Penblewin Improvement is included as a committed scheme in the NTFP. This is subject to the business case still justifying the expenditure and obtaining the necessary statutory consents and a start of works programme of late 2017 is indicated in the NTFP.

3.5.4 In addition to these policies, the Minister for Economy, Science & Transport's written statement in July 2013, outlined priorities for Transport includes the following:

"Improving the A40 has been identified as a priority by the Haven Waterway Enterprise Zone Board and I intend to undertake further development of previously proposed improvements. The A40 and the A477 are the principal routes that serve the Haven Enterprise Zone. Delivery of this project will improve the connectivity of the area with key settlements in Wales from the east as well as other areas such as the English Midlands and Europe supporting the Enterprise Zones in generating jobs and growth."

3.6 Pembrokeshire County Council's and Pembrokeshire Coast National Park Authority's Local Development Plans (LDP)

3.6.1 Within the LDPs, the A40 Llanddewi Velfrey to Penblewin is designated as a protected transport route. The proposed options for engineering works on the A40 route intersects with some mineral resources which are mainly Limestone with some sand and gravel deposits. There is more impact in relation to the options to improve access south of Haverfordwest options including potential encroachment onto retail allocation and 'New and Existing Employment Sites'.

3.7 Swansea Bay City Region - Economic Regeneration Strategy 2013-2030

3.7.1 In July 2013, the Minister for Economy, Science & Transport officially launched the Swansea Bay City Region, the first of its kind in Wales. The City Region has been designed to create jobs, boost prosperity and encourage inward investment.

3.7.2 The Swansea Bay City Region encompasses the four local authority areas of Neath Port Talbot, Swansea, Carmarthenshire and Pembrokeshire. It brings

together business, local government and a range of other partners, working to a common goal of creating economic prosperity for the people who live and work in our City Region.

3.7.3 The Swansea Bay City Region's Vision is:

'By 2030, South West Wales will be a confident, ambitious and connected European City Region, recognised internationally for its emerging knowledge and innovation economy'.

3.7.4 One of the ways it aims to meet this vision is to address strategic transport issues to unlock long-term growth. To this end, one of its strategic aims is to ensure *'Distinctive places and competitive infrastructure'* and this includes *'Improvements to strategic transport corridors'*.

4 OPTION APPRAISAL

4.1 Overview

4.1.1 The Options considered as part of this study for improvement of the A40 consist of:

- Option 1 - Completion of the current Committed Scheme;
- Option 2 - Maximising the 2+1 layout provision along the route;
- Option 3 - A dual carriageway between St Clears and Haverfordwest.

4.1.2 The Options for improvements in and around Haverfordwest consist of the following:

- Option 4 – Improvements within Haverfordwest Town Centre
- Option 5 – Haverfordwest South Eastern Bypass (A40 to A477)
- Option 6 – Haverfordwest South Eastern Bypass (A40 to A4076)

4.2 Methodology – Parsons Brinckerhoff

4.2.1 The Welsh Transport Appraisal Guidance (WelTAG) provides an established template for comparing disparate issues and it was resolved that option appraisal should follow the WelTAG approach. This process is based on the WelTAG Appraisal Summary Table (AST) covering the defined Welsh impact areas of Economy, Environment and Society and sub-indicators and the problem-specific Transport Planning Objectives (TPOs).

4.2.2 The WelTAG appraisal undertaken for this phase of the study is a high level WelTAG planning Stage 1 appraisal appropriate to this phase of this study. The impact areas and TPOs have been assessed using both quantitative and qualitative assessment methods.

4.2.3 WelTAG workshops were held on the 11th March and 14th April 2015 to discuss the options and complete draft ASTs. The workshop was attended by project team members from the Welsh Government, engineering consultants Parsons Brinckerhoff and environmental consultants TACP. Various reports, the WelTAG guidance, plans and engineering drawings were tabled to inform the appraisal as well as the knowledge and professional judgement of the attendees.

4.2.4 WelTAG requires practitioners to adopt an objective-led approach. Problems and opportunities need to be identified and what is to be achieved needs to be defined with the ultimate outcomes expressed as TPOs. The following TPOs were established for the appraisal:

- Improve Journey time and reliability

- Enhance Network Resilience
- Aid Regeneration & Support the Regional Economy
- Minimise and avoid where feasible Adverse Environmental Impact
- Provide Environmental Benefits and enhancements where possible
- Reduce Personal Injury Accidents
- Improve Permeability and opportunities for Active Travel

4.2.5 The results of the assessment of the impact significance in the ASTs was summarised using the following seven-point scale in considering the extent to which each option meet the established TPOs and the Welsh Impact Areas:

- Large beneficial (+++)
- Moderate beneficial (++)
- Slight beneficial (+)
- Neutral (0)
- Slight adverse (-)
- Moderate adverse (- -)
- Large adverse (- - -)

4.2.6 The impact of each option was assessed against the context of the existing study corridor from the A40 St Clears to Haverfordwest and south on the A4076 to Johnston and A477 Sentry Cross. This was considered the 'Do-nothing Option' with only an allowance made for routine maintenance of the existing roads.

4.2.7 A copy of a Collation of the Appraisal Summary Table key findings for all options is attached at Annex B.

4.3 Methodology – Peter Brett Associates

4.3.1 The Economic Activity and Location Impact (EALI) analysis provides an assessment of the impact of transport investment or policy measures on the economy, measured in terms of income (Gross Domestic Product (GDP) or Gross Value Added (GVA)) and/or employment. The EALI analysis assesses the distribution of the national impacts captured through the Transport Economic Efficiency (TEE) and Wider Economic Benefits (WEB), identifying the impacts on different areas. The EALI does not generally identify additional economic impacts that could be added to the TEE or WEB results. However, where market failures exist (the impact of negative perceptions for example) the EALI analysis may capture the economic impacts that the TEE analysis may not have fully assessed. It is also worthy of note that the EALI Guidance also states that *"It is important to recognise that perceptions of problems with the transport system by users, operators, the public at large*

and politicians can be equally as important as problems that can be quantified through analysis of data".

4.3.2 The Welsh Government has pan-Wales responsibilities and it was therefore necessary to look at impacts on the economy at both the Wales and Pembrokeshire level.

4.3.3 The net impact of a transport option on the Welsh economy is captured by the TEE and WEB analysis. In WelTAG, EALIs are reported in two ways:

- as a net impact at the Wales level; and
- in terms of its gross components, which will distinguish impacts on particular areas and/or on particular groups in society.

4.3.4 The EALI has been brought together by analysing, and reporting in a summary table, potential impact of an option on the individual 'sectors' listed below:

- Manufacturing and Processing
- Locally Traded Services
- Externally Traded Services
- Inward Investment
- Tourism
- Day Trippers and Shopping
- Residents; and
- Sectoral Interactions / Synergies.

4.3.5 The analysis in the EALI tables is based on a combination of consultation and business survey results, as well as the original baselining analysis. Elsewhere, professional judgement has been used in applying the information available to ensure that the data collected provided a consistent 'narrative' on the potential impacts of the proposed dualling of the A40.

4.3.6 In all option appraisal cases, and especially where EALIs are central to the case for a specific proposal, it is necessary to be able to demonstrate how the economic development or regeneration outcomes can be attributed to the transport option.

4.3.7 The methodology also explores the potential 'transmission mechanisms' through which investment in the A40 could support and develop the economy of Pembrokeshire.

4.3.8 The study has taken cognisance of recent research undertaken by Venables, Laird and Overman on transport investment and economic performance.

4.4 The Stakeholder Survey Process

4.4.1 In order to more fully explore the economic and transport issues, in-depth survey of a number of stakeholders was undertaken. The purpose of the surveys was to engage directly with the key stakeholders to seek their views on the economic problems and opportunities affecting Pembrokeshire and the extent to which infrastructure, and in particular transport infrastructure, is acting as a constraining factor on economic development in the area.

4.4.2 The engagement process involved a combination of face-to-face meetings and telephone conversations with stakeholders. A full week of face-to-face meetings was undertaken in Pembrokeshire in the week beginning 16th March 2015, with the telephone-based approach adopted to consult with those stakeholders who were unavailable in that week or not located in or near to Pembrokeshire

4.4.3 The business survey was carried out in an online format and went live on 17th March 2015 and was left open until 4th May 2015. The survey was promoted directly by Welsh Government through various departments including Facebook and Twitter feeds. The business survey had 94 respondents in total.

4.4.4 The majority of businesses that responded to the survey have principal offices located in West Wales, with only two located outside of Wales in the vicinity of Manchester and London. Figure 10 shows the geographical distribution of respondents, with the colour of the dots indicating when the location of the respondent business was different from the location of its principal office and when the same location was specified by more than one respondent business.

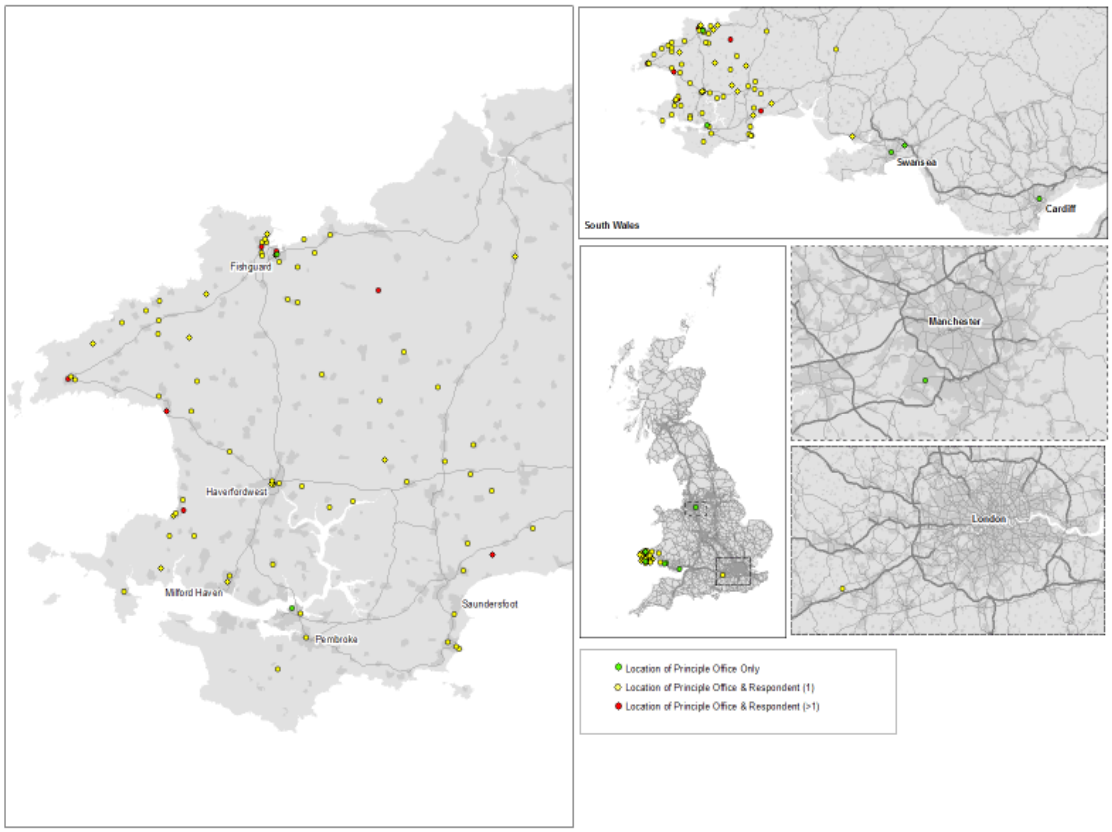

Fig 10 – Survey Respondent Information

4.4.5 A significant proportion of respondents (65% or 60 businesses) have been at their current location for more than 10 years. The main reasons for choosing this location by businesses that have been at the specified location for 1 to 3 years or less than 1 year (% or 8 businesses) were:

- being able to find available / appropriate office space ("Ideal building for my business", "We moved from smaller premises in Milford Haven"); and
- the area's tourism potential ("Excellent tourism attraction", "The idea that property is more affordable here (more value for money), being close to Stena Line and the environment being largely unspoilt and a unique "getaway" for potential increase in tourism through coastal path walkers, retirement and family visits and gateway to Southern Ireland and Europe").

4.4.6 For the purpose of the analysis, the principal sectors were split into Freight Intensive (FI) and Non-Freight Intensive (NFI). The FI sectors were Agriculture, Forestry & Fishing, Manufacturing and Retail. The NFI sectors were Accommodation & Food Services (including tourism), Information & Communication, Finance & Insurance, Property, Professional, Scientific & Technical, Business Administration & Support Services, Health and Public Administration.

4.4.7 The majority of businesses responding to the survey were local in nature, dominated by the SME tourism enterprises (typically accommodation providers). Non-freight intensive businesses therefore dominate the Pembrokeshire economy (in terms of number of businesses although not necessarily number of employees). This finding is in keeping with the conclusions of the baseline analysis.

4.5 A40 - 2+1 Options Design Philosophy

4.5.1 Options 1 and 2 include proposals to improve the A40 with sections of improved 2+1 carriageway following the principles established in the 2004 study. These 2+1 options have been included in the study because of the operational improvements on the A40 provided by the Penblewin to Slebech Park scheme constructed in 2011 and on the A477 St Clears to Red Roses Improvement completed in 2014.

4.5.2 The provision of 2+1 is to provide opportunities for unambiguous overtaking with a view to delivering improvement to journey times, road safety and reduce journey time reliability. Design standards notes that *'a wide single 2+1 carriageway can be a more effective solution than other single carriageway options in promoting journey time reliability on long distance single carriageway roads.'*

4.5.3 The 'Overtaking Value' of the road has been used to inform consideration of the effectiveness of the 2+1 design. For the purposes of this study, overtaking sections of single carriageway road have not been included as they are dependent on the presence or not of oncoming traffic to be considered effective. Only the 2+1 sections providing un-hindered overtaking have been included in establishing the 'Overtaking Value'.

4.5.4 In accordance with design standards, the minimum overtaking provision for a WS2 (Wide Single 10m) is 30% of the link length. For the purposes of this study, the link to be considered is between Haverfordwest and St Clears roundabouts a total length of 32.5km. The target overtaking provision therefore to meet the requirements of design standards would be 10.8km in both the eastbound and westbound direction.

5 OPTION 1 – 2+1 COMMITTED SCHEMES

5.1 Design & Layout

5.1.1 The current committed scheme along the corridor consists of the A40 Llanddewi Velfrey to Penblewin Improvement, as identified in the 2004 study and referenced within the NTFP. Project development has already begun and is currently programmed to commence on site in late 2017. The study has also included for junction improvement works at Redstone Cross, which will be considered as part of the committed scheme for the purpose of the study but has not to date been included to the scheme being taken forward and will be dependent on the findings of design development..

5.1.2 The scheme is approximately 5km long and would consist of a single carriageway, together with 3 elements (approx. 2.1km) of offline 2+1 carriageway to facilitate overtaking. The route bypasses Llanddewi Velfrey to the north before re-joining on-line at Ffynnon Wood. Key features include a new roundabout adjacent to Bethel Chapel, a new bridge carrying the Llanfallteg road, a large embankment and cutting to the offline section.

5.1.3 The improvement works at Redstone Cross would not include any 2+1 carriageway, but would be partly offline. Drawings HHC43696/169 & 170 showing the location and general outline of this option are included in Annex A.

5.1.4 This Option would increase overtaking opportunities by 1.4km in the eastbound direction and 0.7km in the westbound direction. Together with existing provisions, this would equate to overtaking opportunities for around 17% of the total length of the A40 between St Clears and Haverfordwest.

Chainage		Section Group	Option 1: 2+1 Committed Schemes			
			Overtaking Length (km)		Existing/ Proposed	Scheme Description
			e/b	w/b		
Ch.32+500	*Ch.31+500*	*A*		*1.0*	*Existing*	*-*
Ch.28+350	*Ch.27+350*	*A*		*1.0*	*Existing*	*-*
Ch.22+200	*Ch.20+400*	*B*		*1.9*	*Existing*	*-*
Ch.20+300	*Ch.19+400*	*C*	*0.8*		*1C Proposed*	*Llanddewi Velfrey to Penblewin Scheme*
Ch.19+400	*Ch.18+400*	*C*		*0.7*	*1C Proposed*	
Ch.18+400	*Ch.16+350*	*C*	*0.6*		*1C Proposed*	
Ch.16+350	*Ch.15+000*	*D*	*0.0*		*1D Proposed*	*Redstone Cross Improvement*
Ch.13+100	*Ch.11+200*	*E*	*1.9*		*Existing*	*-*
Ch.11+100	*Ch.9+500*	*E*		*1.6*	*Existing*	*-*
Ch.5+200	*Ch.3+900*	*F*	*1.3*		*Existing*	*-*
	Option 1 Total		***4.6(14%)***	***6.2(19%)***		

Table 9 – Option 1 – Overtaking Provision

5.2 Social Impacts

5.2.1 These works would provide relief from the existing community severance issues present within Llanddewi Velfrey and would deliver improvements in terms of traffic noise and air quality within the village as a result of removing the trunk road traffic. A number of Rights of Way would be severed but this impact could be mitigated by appropriate diversions and reinstatements.

5.2.2 Option 1 will contribute a small amount in terms of accessibility to key public services such as healthcare, education, shopping and leisure facilities.

5.3 Environmental Impacts

5.3.1 The offline section north of Llanddewi Velfrey would result in adverse landscape and visual intrusion. The scheme would also intersect a prehistoric burnt mound and post-medieval lodge. There may be an impact on the Slebech Stable Yard Loft SSSI / SAC and Bosherton Lakes SAC.

5.3.2 This off-line section would also result in the loss and severance of some mature hedgerows and a number of protected species, such as badgers, bats, otters and reptiles may be affected.

5.3.3 There would be localised, isolated issues relating to increases in noise and air quality to those to the north of Llanddewi Velfrey, but it is anticipated that these could be at least partially mitigated.

5.4 Cost

5.4.1 The cost for these works is in the region of £56.8m (excluding land, statutory undertaker cost and VAT). Allowance to fund this scheme is currently within the indicative Transport Capital budget, while European structural funds are being set aside to part fund the project and support delivery.

5.5 Traffic Assessment & Benefits

5.5.1 The scheme would deliver small improvements to journey times, journey time reliability and road safety.

5.5.2 Journey time savings are estimated to be up to a maximum of 25 seconds over an existing journey time between St Clears and Haverfordwest. The localised nature of the scheme delivers small improvements in reliability as a result of increased overtaking provision both eastbound and westbound and improved road alignment. Most of the benefit is achieved through the higher speed limit on the new road alignment (60mph) when compared to the existing road speed limit (40-50mph).

5.5.3 There would be localised accident benefits, with an estimated saving of 57 accidents over a 60 year period.

5.6 Likely Support & Objection

5.6.1 The scheme has been in the Public domain for several years and is likely to generally have the support of the local residents.

5.6.2 Overall the Environmental Impact is generally low and is unlikely to attract excessive objection from Environmental Groups.

5.6.3 Pembrokeshire County Council (PCC) previously objected to the A40 Penblewin to Slebech Park scheme, in favour of a dualling option. However, it is acknowledged by PCC (Briefing Paper: TRA40 – St Clears to Haverfordwest Review -August 2014) that dualling is a long term aspiration.

5.7 Risks & Deliverability

5.7.1 Of the options being considered, Option 1 is likely to be the most straightforward to deliver.

5.7.2 It will require completion of the Statutory Process but has been in the public domain for a number of years. There are a number of environmental impacts associated with the scheme but nothing that can't be accommodated via a detailed Environmental Impact Assessment and appropriate package of mitigation.

5.7.3 The scheme has local support but consultation with PCC would be needed to establish whether they would support the scheme or seek the implementation of Special Assembly Procedures as was the case for the Robeston Wathen in 2008.

5.7.4 It would be delivered using the Early Contractor Involvement (ECI) form of procurement which the Welsh Government has a track-record of using for delivery.

5.7.5 At £56.8m, Option 1 is the cheapest of the A40 options considered and is included in the 2015 National Transport Finance Plan. Funding allowance has been made within the current Transport Capital Programme while European structural funds are being set aside to part fund the project.

5.7.6 Project development has already begun and the scheme could be completed within 4 years. The scheme would be developed so as not to preclude any future plans to dual the A40.

6 OPTION 2 - MAXIMISING 2+1 LAYOUT PROVISION ALONG THE ROUTE

6.1 Design & Layout

6.1.1 A number of lengths of existing single carriageway have been identified as having the potential for the introduction of a 2+1 carriageway layout, which provides unambiguous overtaking opportunities in the two lane direction along the length of the A40 between St Clears and Haverfordwest.

6.1.2 These have been split into separate packages for potential future delivery sequence based on their location, ease of delivery, affordability or similarity. These sub-sections could however be delivered as one complete scheme or as a series of discrete separate schemes if required:

- *Package 2C* is the Llanddewi Velfrey Improvement identified in Option 1 and has been included in consideration of Option 2 for completeness.

- *Package 2D* - The Redstone Cross Improvement as identified in Option 1, but with an element of 2+1 layout rather than just a single carriageway improvement as in Option 1. The route taken would be offline and approximately 1.2km in length, giving overtaking opportunities in the eastbound direction.

- *Package 2G* – Comprises four separate elements of 2+1 between Pont Y Fenni and Haulfan all in the vicinity of the Whitland Bypass. These would total approximately 3.9km of overtaking opportunity, three sections in the eastbound direction (3.2km) and one in the westbound (0.7km). The package is all on-line widening of the existing A40 and requires the widening of an existing railway overbridge to accommodate the widened carriageway.

  Package 2G provides a length of eastbound overtaking at the eastern end of this length of the A40 towards St Clears in an area where currently there is none.

- *Package 2H* - Three separate elements of 2+1 from immediately east of Haverfordwest Golf Club to the Redstone Cross Junction. These would give a total of approximately 4km of overtaking opportunity, one section in the eastbound direction (1.5km) and two in the westbound direction (2.5km). The works will involve online widening on one side of the A40. A link to one side road will be constructed north of the A40 at the B4314 roundabout.

  Part of package 2H provides a length of westbound overtaking at the western end of this length of the A40 towards Haverfordwest in an area where currently there is none. The other two sections provide infill

overtaking provision on the A40 either side of the Penblewin to Slebech Improvement completed in 2011.

- *Package 2I* - One element of offline 2+1 between Prickett's Wood and Little Arnold's Hill, bypassing the A40 and Slebech Retail Park to the north. It would be approximately 1.7km of new carriageway through agricultural land with overtaking opportunities in the westbound direction. Access points will be minimised. A new overbridge and two associated link roads will be constructed over the new A40 250m west of Wiston Junction to maintain local road connectivity. One junction would be constructed linking the old and new A40 at Little Arnold's Hill.

6.1.3 Drawings HHC43696/171 & 172 show the location and general outline of these options and are included in Annex A.

6.1.4 A schematic plan showing the overtaking provision provided by the A40 study 2+1 improvement options is included in Annex C.

6.1.5 If all of these identified lengths were constructed (alongside the Llanddewi Velfrey to Penblewin improvement highlighted in Option 1), they would provide an additional 10.5km (32%) overtaking provision in the eastbound direction and 11.1km (34%) in the westbound direction.

6.1.6 The average in both directions would be 33% and is in excess of the typical 30% ratio advised for this type of route. It would deliver noticeable improvements to the journey time, reliability and safety along the A40 and would address the current imbalance of overtaking availability between eastbound and westbound travel. It would also provide discrete and regular overtaking sections along the entire length of the A40 between St Clears and Haverfordwest. The packages would be combined with strategic signing of the location of up-coming overtaking opportunities to minimise driver frustration.

6.1.7 The lengths of overtaking provided by each package and its location are shown in Table 10.

Chainage		Section Group	Option 2 Maximum 2+1			
			Overtaking Length (Km)		Existing/ Proposed	Description
			e/b	w/b		
Ch.32+500	*Ch.31+500*	*A*		*1.0*	*Existing*	*-*
Ch.30+800	*Ch.28+500*	*G*	*1.1*		*2G Proposed*	*Whitland Bypass*
Ch.28+350	*Ch.27+350*	*A*		*1.0*	*Existing*	*-*
Ch.27+200	*Ch.26+200*	*G*	*0.8*		*2G Proposed*	*Whitland Bypass*
Ch.26+200	*Ch.25+250*	*G*		*0.7*	*2G Proposed*	*Whitland Bypass*

Chainage		Section Group	Option 2 Maximum 2+1			
			Overtaking Length (Km)		Existing/ Proposed	Description
Ch.25+250	Ch.23+800	G	1.3		2G Proposed	Whitland Bypass
Ch.22+200	Ch.20+400	B		1.9	Existing	-
Ch.20+300	Ch.19+400	C	0.8		2C Proposed	Llanddewi Velfrey to Penblewin Scheme
Ch.19+400	Ch.18+400	C		0.7	2C Proposed	
Ch.18+400	Ch.16+350	C	0.6		2C Proposed	
Ch.16+350	Ch.15+000	D	1.2		2D Proposed	Redstone Cross 2+1
Ch.15+500	Ch.13+100	H		1.9	2H Proposed	Redstone Cross to Haverfordwest online Improvements
Ch.13+100	Ch.11+200	E	1.9		Existing	-
Ch.11+100	Ch.9+500	E		1.6	Existing	-
Ch.9+100	Ch.7+450	H	1.5		2H Proposed	Redstone Cross to Haverfordwest online Improvements
Ch.7+450	Ch.5+550	I		1.7	2I Proposed	Slebech Bypass (offline)
Ch.5+200	Ch.3+900	F	1.3		Existing	-
Ch.3+750	Ch.1+000	H		0.6	2H Proposed	Redstone Cross to Haverfordwest online Improvements
Option 2 Total			**10.5 (32%)**	**11.1 (34%)**		

Table 10 – Option 2, Increase in overtaking lengths

6.2 Social Impacts

6.2.1 These works would provide relief from existing community severance issues in Llanddewi Velfrey and Slebech and would deliver improvements in terms of traffic noise and air quality to villagers similar to Option 1. A number of Rights of Way would be severed, but these impacts could be mitigated by appropriate diversions and reinstatements.

6.2.2 Each package, when delivered, would contribute a small amount in terms of accessibility to key public services such as healthcare, education, shopping and leisure facilities. When combined together they would provide a moderate benefit in terms of this accessibility.

6.3 Environmental Impacts

6.3.1 The route runs along the boundary of the Milford Haven Waterway historic landscape and Pembrokeshire Coastal National Park between Canaston Bridge Roundabout and Slebech.

6.3.2 There would be a potential impact on two Pembrokeshire bat sites at Bosherton Lakes SAC and Slebech Stable Yard Loft SSSI/SAC. In addition,

there would be extensive hedgerow loss impact on habitats and a potential impact on protected species including badgers, otters and reptiles.

6.3.3 There would be a direct impact on three sites within the Historic Environment Record. There would be localised, isolated issues relating to increases in noise and property air quality reduction, but it is anticipated that these could be partially mitigated.

6.3.4 There would be a small reduction in greenhouse gas emissions as a result of increased traffic speeds, reduced congestion and smoother traffic flows with less stop-start conditions.

6.3.5 There would be instances of local significantly adverse landscape and visual intrusion in particular for improvements within the Pembroke Coast National Park such as packages 2H & I around Slebech.

6.3.6 This option will require extensions and construction of a number of watercourse crossings.

6.4 Cost

6.4.1 The estimated cost for the construction of these additional elements is £48.5m, with the inclusion of the Llanddewi Velfrey to Penblewin scheme giving a total cost of £98.6m (excluding land, statutory undertaker cost and VAT) broken down as follows:

Section	Total £m
Section 2C	*50.1*
Section 2D	*10.5*
Section 2G	*11.2*
Section 2H	*10.0*
Section 2I	*16.8*
TOTAL	***98.6***

Table 11 – Summary of costs for individual Option 2 sections

6.4.2 As is indicated in Table 11, the cost (excluding land, statutory undertaker cost and VAT) of the individual packages would be around £10-11m for packages 2H & 2G and £16.8m for package 2I.

6.5 Traffic Assessment & Benefits

6.5.1 Each package would deliver small improvements to journey times, journey time reliability and road safety which when, combined, deliver moderate impacts on the operation of the trunk road. The improvements are as a result of increased overtaking provision both eastbound and westbound and areas of improved road alignment.

6.5.2 A journey time saving derived from increased speeds and overtaking opportunities is estimated to be up to 93 seconds which will be greater during busy holiday periods when the volume of traffic and number of slow moving vehicles (e.g. caravans & HGVs) is increased.

6.5.3 There will be increased safe overtaking opportunities and a reduced number of side road accesses, which would generate an accident saving of 94 accidents over 60 years. This would include improvements to two of the existing identified accident cluster sites.

6.6 Likely Support & Objection

6.6.1 With the exception of Section 2C (Llanddewi Velfrey as Option 1) these packages would be new proposals for the improvement of the A40. It is anticipated the schemes are likely to receive buy-in from local communities as the direct impact and disruption during construction would be limited in comparison to the more invasive dualling option.

6.6.2 PCC, previously objected to the A40 Penblewin to Slebech Park scheme, in favour of a dualling option However it is acknowledged by PCC (Briefing Paper: TRA40 – St Clears to Haverfordwest Review -August 2014) that dualling is a long term aspiration. As a result they may be receptive to a package of 2+1 options in the short and medium term but early consultation would be needed. During the surveys carried out as part of the EALI part of this study, the businesses within Pembrokeshire were asked about the trade-off between full dualling and targeted stretches of '2+1'. The majority response was that '2+1' represented a lack of commitment and faith in the future of the area although there was a preference to the implementation of this option in the short and medium term against the alternative of making no or very few improvements to the A40.

6.6.3 There would be potential opposition from environmental groups due to the impacts. Overall the Environmental Impact is generally low. Provided environmental mitigation was a core element of the design and there was effective engagement with environmental stakeholders and land owners it is unlikely to attract excessive objection from Environmental Groups.

6.7 Risks & Deliverability

6.7.1 Of the options being considered, Option 2 is likely to be relatively straightforward to deliver, particularly when compared to dualling.

6.7.2 Packages 2G (Whitland Bypass) & 2H (Redstone Cross to Haverfordwest) consist of online sections that could be constructed primarily within the existing highway boundary with minimal additional landtake. As a result there is the potential to reduce the extent of the Statutory Process and Environmental Impact Assessment required. The need to widen a railway overbridge increases the complexity of parts of Package 2G but can be readily overcome.

6.7.3 Packages 2D & 2I are offline sections and would therefore be slightly more difficult to construct, have greater environmental impact and be more costly. They would require the acquisition of additional land away from the existing highway and would likely need to progress through the full Statutory Process.

6.7.4 Aside from the Llanddewi Velfrey scheme which is assumed as being delivered, those packages taken forward first would be those most straightforward to deliver. They will be those co-incident with the most likely route for any future dualling of the A40 and would be designed so as not to preclude the potential for future dualling.

6.7.5 There is a need to deliver overtaking provision in the areas where currently there is none to reduce long lengths without the capacity to pass slower moving vehicles. Currently that is likely to be eastbound in the area around the Whitland bypass, and westbound between Arnolds Hill and Haverfordwest.

6.7.6 Delivery of these packages would be subject to the availability of funding from Transport capital budgets and considered alongside competing priorities within the capital programme. Taking forward first the simplest packages enables potential delivery in the short term and maximises the potential of seeking part-funding through the ERDF from the current round of funding.

6.7.7 In considering the outline ERDF funding package likely to be available for trunk road schemes, and the funds already set aside for other projects (including Option 1 - A40 Llanddewi Velfrey) it is estimated that circa £13m of ERDF funding would be available to part-fund this option. A match-funding commitment of approx. £8-9m from the Transport Capital programme could deliver packages 2G & 2H.

7 OPTION 3 - DUALLING

7.1 Design & layout

7.1.1 Option 3 would provide a dual carriageway for the entire 32.5km route between St Clears and Haverfordwest. The option assessed is based on a standard dual 2 lane all-purpose (D2AP) carriageway cross-section, with no grade separation at the junctions. This option would provide 100% overtaking provision (notwithstanding junctions) in both directions.

7.1.2 The scheme would primarily involve widening to the existing A40 but with approximately 6.5km of off-line sections Llanddewi Velfrey (along the proposed Llanddewi Velfrey bypass – Option 1), Slebech (along the route of Option 2G) and Redstone Cross. Eight new roundabouts or enlargements to the existing roundabouts would be constructed at junctions.

7.1.3 Option 3 requires the stopping up of a number of the side roads and private accesses that currently feed directly onto the A40 with side roads provided to connect these routes onto the A40 at safe discrete locations along the route.

7.1.4 Option 3 includes the construction of a number of new structures including 2 railway bridges, 5 river bridges, 11 side road and accommodation bridges as well as lengths of retaining wall. Demolition of 3 properties is required as well as a number of large cuttings and embankments.

7.1.5 Drawings HHC43696/173 & 174 showing the location and general outline of this option are included in Annex A.

7.2 Social impacts

7.2.1 As with Option 1 these works would provide relief from existing community severance issues in Llanddewi Velfrey and Slebech and would deliver small net improvements in terms of traffic noise and air quality to villagers. A number of Rights of Way would be severed, but these impacts could be mitigated by appropriate diversions and reinstatements.

7.2.2 Rationalising the number of private successes and side roads directly onto the A40 would require a number of the local communities to travel further to access the trunk road network.

7.2.3 Dualling requires the greatest acquisition of land of the options considered for the A40.

7.3 Environmental Impacts

7.3.1 Option 3 would noticeably have the most significant environmental impact of the options considered for the A40, due to the footprint and alignment of the proposals.

7.3.2 The route runs along the boundary of the Milford Haven Waterway historic landscape and Pembrokeshire Coastal National Park between Canaston Bridge Roundabout and Slebech and would likely have a direct impact on the sites.

7.3.3 There would be a potential impact on two Pembrokeshire bat sites at Bosherton Lakes SAC and Slebech Stable Yard Loft SSSI & SAC. In addition, there would be extensive hedgerow loss impact on habitats and a potential impact on protected species including badgers, otters and reptiles.

7.3.4 There would be a direct impact on three sites within the Historic Environment Record, and a potential impact to unknown archaeology on the off-line areas, which would require further investigations.

7.3.5 There would be isolated issues relating to increases in noise and property air quality reduction for the online sections which could be partially mitigated. There may generally be benefit for the offline sections, which move further away from residential areas.

7.3.6 In the short term a reduction in greenhouse gases is expected once the dualling is completed from an improved consistency in vehicle speeds and reduced congestion and this will be the greatest for all of the options. This would increase over time as traffic levels increase. There would be an increase in greenhouse gases generated during the construction phase.

7.3.7 There would be instances of local significantly adverse landscape and visual intrusion in particular for the offline sections and within the Pembroke Coast National Park around Canaston Bridge and Slebech. The on-line length would result in the loss of existing boundary vegetation, which would expose the highway and its traffic to views from outside the road corridor.

7.3.8 This option will require extensions and construction of a number of watercourse crossings.

7.4 Cost

7.4.1 The total estimated costs of dualling the A40 between St. Clears to Haverfordwest is in excess of £400m when land, compensation, statutory undertaker costs and VAT are all included. This is on the assumption that the dualling would be delivered as a single project.

7.4.2 If a phased delivery schedule was adopted similar to that for the A465 Heads of the Valley dualling scheme, this cost would increase as a result of the extended delivery timeframe and inefficiencies in construction as separate projects.

7.5 Traffic Assessment & Benefits

7.5.1 Dualling the route would provide significant benefits in terms of accessibility to key public services such as healthcare, education, shopping and leisure facilities. The benefits are as a result of almost continuous overtaking provision both eastbound and westbound and increased traffic speeds.

7.5.2 A journey time saving derived from increased speeds and overtaking opportunities is estimated to be up to 10-11 minutes which would be slightly greater during busy holiday periods when the volume of traffic and number of slow moving vehicles (e.g. caravans & HGVs) is increased.

7.5.3 This option would remove all oncoming collision accidents and there would be no direct side road access. This would give a large accident benefit along the A40, with a saving of 150 accidents over 60 years.

7.5.4 Based on current future predicted traffic flows, improvement of the A40 between St Clears and Haverfordwest to dual carriageway standard would not be required in the short or medium term. While a full cost benefit analysis has not been completed for the study, the identified costs and anticipated transport economics benefits (e.g. future traffic flows, journey time savings, reliability and accident benefits) suggest that dualling would be unlikely to demonstrate value for money in transportation terms in the short or the medium term.

7.6 Risks & Deliverability

7.6.1 The cost of dualling is not included in current Transport Capital Forecasts. Dualling would take the longest to deliver of the options taking approximately 7 years to complete as a single project with work starting in 2020 at the earliest.

7.6.2 In considering delivery in stages, the earliest date works could start would be 2020 and would take 10 to 15 years to complete depending on the availability of funding. This approach would preclude access to the current round of European structural funds which have been set aside to support the current proposals to improve the A40.

7.7 Likely Support & Objection

7.7.1 The survey exercise held with local businesses suggests that they would generally support a dualling scheme.

7.7.2 PCC's long held preference is to dual the A40 and it is likely this option would be welcomed by them.

7.7.3 Dualling would likely be resisted by environmental groups such as Friends of the Earth, the National Park Authority as well as residents adjacent to the A40 affected more by this option as a result of the increased land-take and reduced ability to gain access directly onto the trunk road.

8 OPTION 4 - HAVERFORDWEST TOWN CENTRE PROPOSALS

8.1 Design & Layout

8.1.1 This Option considers three potential improvements within Haverfordwest Town Centre. These comprise:

- *Option 4a* - Introduction of an elevated 'flyover' at Merlin's Bridge Roundabout to give continuity on the A4076 route.
- *Option 4b* - Amendments to the existing Salutation Square Roundabout with the addition of a dedicated at-grade filter lane, and new signalised junction.
- *Option 4c* - A series of potential traffic management opportunities, including re-working of the existing one-way system.

8.1.2 Drawing HHC43696/175 shows the location and general outline of this option and is included in Annex A.

8.2 Environmental Impacts

8.2.1 There would be a slight adverse impact on both the townscape and landscape from the loss of vegetation and elevated section at Merlin's Bridge. There would potentially be direct impact on three sites within the Historic Environment Record and two listed buildings.

8.2.2 The works at Merlin's Bridge may impact on the watercourse nearby and the Western Cleddau SSSI otter population, although other biodiversity impacts are likely to be minimal.

8.3 Traffic Assessment & Benefits

8.3.1 The study of the potential journey time savings of implementing both Options 4a and 4b identifies that benefits may be achieved in either the eastbound or the westbound direction in each option but delays (disbenefits) are seen in the opposite direction due to the change in traffic patterns introduced by the schemes.

8.3.2 The journey time is calculated between the A40 Scotchwell Roundabout to a point just to the south-east of the A4076 Merlin's Bridge Roundabout. Overall this produced a net benefit to journey time and reliability of 20 seconds during peak times.

8.4 Cost

8.4.1 The estimated cost for Option 4 is £12.9m (excluding land, statutory undertaker cost and VAT). There is no current provision within Transport Capital budgets for this scheme.

8.5 Likely Support & Objection

8.5.1 Works within the Town Centre, although ultimately may provide some minimal benefits to the congestion issues, are not likely to receive a high degree of support from PCC or the residents of Haverfordwest.

9 OPTION 5 - HAVERFORDWEST SOUTH EASTERN BYPASS (A40 TO A477)

9.1 Design & Layout

9.1.1 Option 5 is a new single carriageway road that would link the A40 east of Haverfordwest at Haverfordwest Golf Club with the A477 at Sentry Cross south of Johnston. The route provides an alternative route to the A40 and A4076 trunk roads bypassing the urban congestion of both Haverfordwest and Johnston to the south east of the town.

9.1.2 The route is approximately 9.2km in length crossing primarily over agricultural land, runs through the Haven Waterway and includes a number of substantial cuttings and embankments.

9.1.3 The option requires the construction of 4 new at-grade junctions, 4 new overbridges and a 350m long viaduct to span the Western Cleddau River which is a SSSI and an SAC.

9.1.4 Drawing HHC43696/176 shows the location and general outline of this option and is included in Annex A.

9.2 Social impacts

9.2.1 This is a wholly offline option and there is the potential for severance of land along its entire length.

9.2.2 This option requires the greatest acquisition of land of the options considered for the A4076.

9.2.3 A number of Rights of Way would be severed, but these impacts could be mitigated by appropriate diversions and reinstatements.

9.2.4 Construction of the bypass would provide some benefits in terms of accessibility to key public services such as healthcare, education, shopping and leisure facilities. The benefits are as a result of bypassing an area of known congestion at peak times.

9.2.5 Accessibility will also be improved for those from north and east of Haverfordwest to access key economic and industrial centres such as Milford Haven and Pembroke Dock.

9.3 Environmental Impacts

9.3.1 An offline carriageway through open countryside would be a significant adverse landscape and visual intrusion. The Milford Haven Registered Historic Landscape is crossed by the route, introducing a further sensitive receptor.

9.3.2 The route would create severance of open countryside, affecting a large number of hedgerows and potentially impacting on a number of protected species. There may also be an impact on the Greater Horseshoe Bat population at the Slebech Stable Yard Loft SSSI.

9.3.3 The route crosses the Western Cleddau River which is designated as part of the Pembrokeshire Marine SAC and Milford Haven Waterways SSSI. The Pembrokeshire Coast National Park is also located within 1km.

9.3.4 The route does not intersect any known historic artefacts.

9.3.5 The offline nature of this improvement in open countryside will introduce noise and air quality impacts into areas that do not currently experience the level of traffic noise and air quality associated with a trunk road. This would be offset against the traffic noise reductions and air quality improvements that would be experienced at properties adjacent to the A4076 trunk road which should see a reduction in traffic in favour of the new road. This would benefit the communities in Haverfordwest and Johnston.

9.4 Traffic Assessment & Benefits

9.4.1 To enable a suitable comparison between Options 5 & 6, the journey time savings have been calculated between the A40 Haverfordwest Golf Course and the A4076 at Steyton. This 11.95km route currently takes approximately 9 minutes assuming free flow traffic, travelling at the speed limit. Option 5 would give an estimated journey time saving of nearly 3 minutes.

9.4.2 The scheme would deliver improvements in reliability as a result of reduced instances of congestion and delays at junctions beyond both Haverfordwest and Johnston. Most of the benefit is achieved through the higher speed limit on the new road alignment when compared to the existing road speed limit.

9.4.3 It is anticipated that there would be a reduction in accidents in Haverfordwest and on the A40/A4076 route where traffic flows reduce in favour of the new road.

9.5 Cost

9.5.1 The estimated cost for Option 5 is £50.3m (excluding land, statutory undertaker cost and VAT). No allowance for this project has been made within Welsh Government Transport Capital budget forecasts. The route is not part of the TEN-T and would be ineligible for European Funding.

9.6 Likely Support & Objection

9.6.1 The scheme would likely receive strong support from PCC, the residents within Haverfordwest and Johnston and the businesses located within the

Haven Waterway Enterprise Zone. This option would give the most direct route to the south and relieve congestion along the current route.

9.6.2 This option would likely face opposition from Environmental Groups, Natural Resources Wales due to the environmental impacts, and local landowners whose land would be severed by the new route.

9.7 Risks and Deliverability

9.7.1 The option is not particularly well-developed at this stage and would need further development of options as part of a dedicated study looking at the access problems around Haverfordwest, the A4076 and Milford Haven.

9.7.2 The project is not currently within Welsh Government's Transport Capital Programme such that work could not begin until 2020 at the earliest.

9.7.3 The environmental impacts of this option would be significant and would need careful consideration and mitigation. They would constitute a significant risk to the delivery of the scheme.

10 OPTION 6 - HAVERFORDWEST SOUTH EASTERN BYPASS (A40 TO A4076)

10.1 Design & Layout

10.1.1 Option 6 would be similar to Option 5 as a new single carriageway road that would link the A40 at Haverfordwest Golf Club and would bypass the urban congestion of Haverfordwest, connecting with the A4076 at Dredgeman's Hill to the north of Johnston.

10.1.2 The route is approximately 4.8km in length crossing primarily over agricultural land, runs through the Haven Waterway and includes a number of substantial cuttings and embankments.

10.1.3 The option requires the construction of 3 new at grade junctions, 2 new overbridges and a 350m long viaduct to span the Western Cleddau River which is a SSSI and an SAC.

10.1.4 Drawing HHC43696/177 shows the location and general outline of this option and is included in Annex A.

10.2 Social impacts

10.2.1 This is a wholly offline option and there is the potential for severance of land along its entire length.

10.2.2 This option requires some significant acquisition of land but not to the same extent as Option 5.

10.2.3 A number of Rights of Way would be severed, but these impacts could be mitigated by appropriate diversions and reinstatements.

10.2.4 Construction of the bypass would provide some benefits in terms of accessibility to key public services such as healthcare, education, shopping and leisure facilities. The benefits are as a result of bypassing an area of known congestion at peak times.

10.2.5 Accessibility will also be improved for those from north and east of Haverfordwest to access key economic and industrial centres such as Milford Haven and Pembroke Dock.

10.3 Environmental Impacts

10.3.1 An offline carriageway through open countryside would be a significant adverse landscape and visual intrusion. The Milford Haven Registered Historic Landscape is crossed by the route, introducing a further sensitive receptor.

10.3.2 The route would create severance of open countryside, affecting a large number of hedgerows and potentially impacting on a number of protected

species. There may also be an impact on the Greater Horseshoe Bat population at the Slebech Stable Yard Loft SSSI.

10.3.3 The route crosses the Western Cleddau River which is designated as part of the Pembrokeshire Marine SAC and Milford Haven Waterways SSSI. The Pembrokeshire Coast National Park is also located within 1km.

10.3.4 The route does not intersect any known historic artefacts.

10.3.5 The offline nature of this improvement in open countryside will introduce noise and air quality impacts into areas that do not currently experience the level of traffic noise and air quality associated with a trunk road. This would be offset against the traffic noise reductions and air quality improvements that would be experienced at properties adjacent to the A4076 trunk road which should see a reduction in traffic in favour of the new road. This would benefit the community of Haverfordwest but not Johnston as was also the case for Option 5.

10.4 Traffic Assessment & Benefits

10.4.1 To enable a suitable comparison between Options 5 & 6, the journey time savings have been calculated between the A40 Haverfordwest Golf Course and the A4076 at Steyton. This 11.95km route currently takes approximately 9 minutes assuming free flow traffic, travelling at the speed limit. Option 6 would give an estimated journey time saving of approximately 1.5 minutes.

10.4.2 The scheme would deliver improvements in reliability as a result of reduced instances of congestion and delays at junctions beyond Haverfordwest, but not to the same extent as Option 5 as it does not also bypass Johnston.

10.4.3 It is anticipated that there would be a reduction in accidents in Haverfordwest and on the A40/A4076 route where traffic flows reduce in favour of the new road.

10.5 Cost

10.5.1 The estimated cost for Option 6 is £34.6m (excluding land, statutory undertaker cost and VAT). The route is not part of the TEN-T and would be ineligible for European Funding.

10.6 Likely Support & Objection

10.6.1 Although likely to receive some level of support from PCC and the Haven Waterway Enterprise Zone it would likely be seen as moving the issue of congestion further south to Johnston and would not be favoured in comparison with Option 5.

10.6.2 The scheme is likely to be supported the residents within Haverfordwest as it would give a more direct route to the south and relieve congestion within the town.

10.6.3 This option would likely face opposition from Environmental Groups, Natural Resources Wales due to the environmental impacts, and local landowners whose land would be severed by the new route.

10.7 Risks and Deliverability

10.7.1 The option is not particularly well-developed at this stage and would need further development of options as part of a dedicated study looking at the access problems around Haverfordwest, the A4076 and Milford Haven.

10.7.2 The project is not currently within Welsh Government's Transport Capital Programme such that work could not begin until 2020 at the earliest.

10.7.3 The environmental impacts of this option would be significant and would need careful consideration in the next stage of the study. They would constitute a significant risk and constraint to the consideration of options and the subsequent delivery of the preferred scheme.

11 OPTIONS SUMMARY

11.1.1 The tables below summarise the Options considered.

Option	Maximum travel time benefit (sec)	Safety Benefits (Collisions Saved)	Total Cost – excluding Lands, Stats & VAT (£m)
Option 1 - Committed Scheme	*25*	*57*	*56.8*
Option 2 - Maximising 2+1 Opportunities	*93*	*94*	*98.6*
Option 3 - Dual Carriageway	*666*	*150*	*336.3*

Table 12 - Summary of A40 Improvement Options

Option	Maximum travel time benefit (sec)	Safety Benefits (Collisions Saved)	Total Cost – excluding Lands, Stats & VAT (£m)
Option 4 - Haverfordwest Town Centre Proposals	*20*	*N/A*	*12.9*
Option 5 - Haverfordwest South Eastern Bypass (A40 To A477)	*162*	*N/A**	*50.3*
Option 6 - Haverfordwest South Eastern Bypass (A40 To A4076)	*80*	*N/A**	*34.6*

**quantitative assessment has not been undertaken but positive safety benefits are expected.*

Table 13 - Summary of Southern Access Options

12 ECONOMIC ACTIVITY AND LOCAL IMPACT (EALI)

12.1 Key Findings

12.1.1 The PBA 'A40 St Clears to Haverfordwest Economic Activity & Location Impacts (EALI) Study Report - 33459' report has considered the potential economic activity and location impacts (EALI) of the proposed dualling of the A40 between St Clears and Haverfordwest. It is to be considered alongside the PB 'Design Options Report Volume 1 - 43696/902' study considering existing and future traffic conditions, engineering options and costs for improvements.

12.1.2 The EALI analysis has been based on a combination of secondary data, consultation with key stakeholders and a business survey with Pembrokeshire firms.

12.2 The Pembrokeshire Economy

12.2.1 The study has identified four key economic issues in the Pembrokeshire economy, namely:

- the narrow concentration of economic activity in the energy, tourism, agriculture and public sectors;
- the perception of remoteness, which the evidence suggests is limiting both inward investment and tourism;
- having a 'two-speed economy' with an affluent, well qualified and in many cases in-migrant older population concentrated in coastal areas alongside a less well-off, indigenous and more poorly qualified population in industrial areas like Pembroke Dock and Milford Haven; and
- a slower recovery from the recession compared to equivalent counties and indeed Wales as a whole.

12.2.2 These problems appear to be very closely linked. A combination of lower than average wages; low productivity, an ageing population and lower than average rates of economic activity together with possible under-employment hints at a relatively stagnant local economy, further impacted by recent developments at Milford Haven. There is also a clear reliance on the energy sector for higher value non-public sector employment.

12.2.3 There are a number of ways in which these problems could be addressed, including:

- increased productivity of local businesses;
- expansion of local businesses;

- increased inward investment (one of the purposes of the Enterprise Zone);
- enhanced commuting into and out of Pembrokeshire (implying a more flexible labour market); and
- increased tourism.

12.2.4 The key question in the context of this study was the extent to which current transport connectivity is constraining the productive capacity of the Pembrokeshire economy.

12.3 Geographic Distribution of Benefits

12.3.1 In advance of setting out the potential means through which improvements to the A40 could support improved economic performance, it is worth firstly considering the potential geographic distribution of the benefits.

12.3.2 It is worth noting that any improvement to the Trunk Road network in Pembrokeshire could assist in tackling the overall perception of peripherality from which the area suffers and which the evidence of this study suggests is having a negative impact on both inward investment and tourism. However, outwith the perception related impacts, it is important to note that a dualled A40 would only directly benefit a distinct geographic area of Pembrokeshire. The figure below shows the travel time savings of different areas of Pembrokeshire if the A40 were to be fully dualled and the 'sphere of influence' of the dualled road.

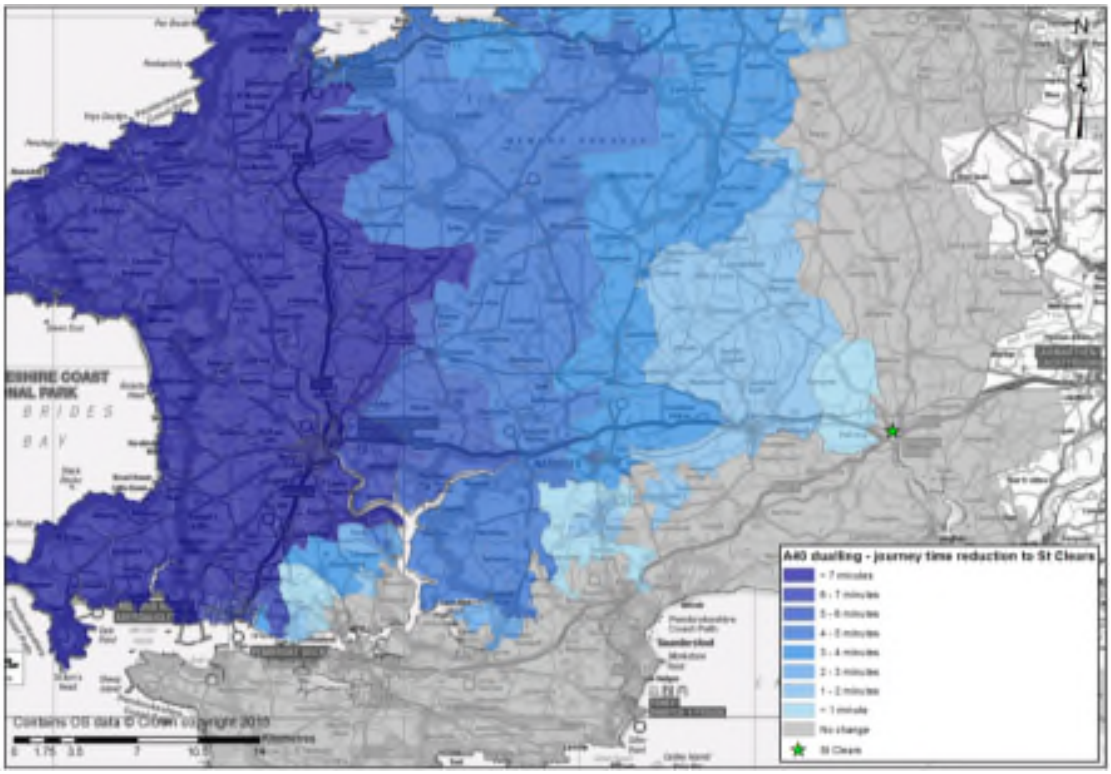

Figure 11 - A40 Dualling – Travel Time Savings and 'Sphere of Influence'

12.3.3 The first point of note from the map is that the travel time savings from the A40 dualling increase the further west a vehicle travels from St Clears. The full benefit accrues to Haverfordwest, Fishguard, Milford Haven and areas to the west, including St David's. The journey time benefit dissipates gradually moving east along the corridor, first to the Narberth junction and then onwards to St Clears.

12.3.4 Of greater significance is the clear difference in benefits between the north and south of the Haven Waterway. Whilst areas to the north such as Haverfordwest and Milford Haven capture the full travel time benefit, Pembroke, Pembroke Dock, Tenby and the remainder of the south coast receive no travel time benefit, as the A477 would remain the route of choice.

12.3.5 Strategic transport connectivity is of greatest importance for freight intensive businesses and the figure below maps the freight intensity of areas (based on the number of employees in 'freight-intensive' sectors) of Pembrokeshire based on the BRES data.

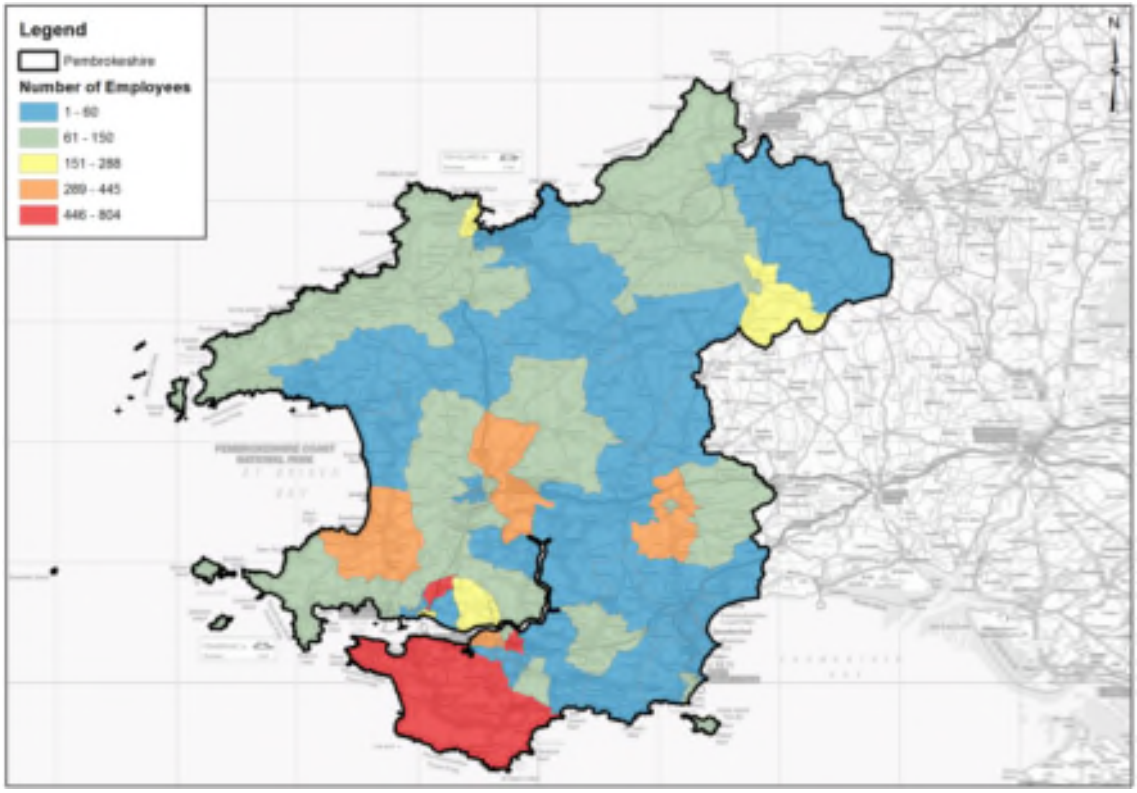

Figure 12 - Freight Intensive[1] Employment in Pembrokeshire by Number of Employees

12.3.6 As a headline figure, 35% of all freight intensive industry is located on the south side of the Haven Waterway and would not receive any travel time

[1] Freight intensive is defined as the sum of employment in the following industries (as classified by BRES): Agriculture, Forestry & Fishing; Mining & Quarrying; Manufacturing; Electricity, Gas, Steam & Air Conditioning Supply; Water Supply, Sewerage, Waste Management & Remediation Activities; Construction; and Transportation & Storage.

benefits from the dualling of the A40. In particular, 47% of Pembrokeshire manufacturing businesses; 34% of construction businesses; and 29% of transportation and storage businesses would draw no benefit from the dualling of the A40.

12.3.7 It is particularly important to note that the most freight intensive area of Pembrokeshire – the area surrounding Pembroke Dock – would receive no direct benefit from dualling the A40. Therefore, when considering the transmission mechanisms set out below, it should be borne in mind that they refer only to areas north of the Haven Waterway, except when considering issues of perception where any improvement may benefit the County as a whole, although there may still be redistribution within the area.

12.4 Transmission Mechanisms

12.4.1 The dualling of the A40 would reduce journey times between St Clears and Haverfordwest by up to eleven minutes for cars. In addition to these direct journey time improvements, journeys times would also be more reliable and the stress / frustration of driving on the single carriageway section would be removed.

12.4.2 The key is to identify potential transmission mechanisms by which the level of improvement to transport conditions delivered by dualling the A40 could impact on the Pembrokeshire economy. These mechanisms are not mutually exclusive; and in some instances may well be complimentary.

12.5 Wider Labour Market

12.5.1 The travel-to-work analysis undertaken demonstrated that Pembrokeshire is a highly self-contained economy from this perspective. There is currently little cross-County boundary movements compared to neighbouring Carmarthenshire. The consultation and business surveys suggest that the A40 is inhibiting a more expansive travel-to-work market. A wider labour pool makes it more likely to find an efficient match between positions and resources, and a better 'match' between roles and staff improves efficiency.

12.5.2 If improvements to the A40 unlocked new commuting opportunities for Pembrokeshire, it would potentially allow local people to take up more productive jobs elsewhere, increasing the 'Gross Value Added per filled job' and reducing, for example, unemployment, underemployment and deprivation. This in turn could provide a more buoyant local consumer market and address the dualism within the local economy.

12.5.3 Given the limited scale of the Pembrokeshire economy, it is more likely that commuting would initially be outbound, although this could change over time if inward investment in Pembrokeshire increased.

12.6 Population Retention & In-Migration

12.6.1 The increased opportunities brought about by improved accessibility could bring about reduced outmigration of working age and more highly educated members of the population. It could also address the current in-migration trends which tend to be dominated by older cohorts, by encouraging in-migration of more highly skilled younger working age adults, perhaps on return from leaving Pembrokeshire for higher education. Any move in this direction would also address the relatively high dependency ratio in Pembrokeshire and the implications in terms of service delivery.

12.7 Business Performance

12.7.1 The low productivity in Pembrokeshire and the recent faster than average decline in the number of active enterprises suggests that south-west Wales is a relatively high cost and uncompetitive business location. Improvements to the A40 may help to tackle this issue by improving journey time reliability thus lowering inventory costs and, increasing the extent of the local labour pool for a given travel time.

12.7.2 Increased productivity may over time allow for high wages and more job creation. However, it is also important to acknowledge that, even in fairly transport intensive companies; the transport element of total costs is relatively small. This, compounded by a small overall time saving on typically long journeys, suggests that any productivity benefits would be small overall.

12.8 Scheduling benefits

12.8.1 A key issue surrounding the current A40 is the uncertainty of journey times. Improving, or in particularly dualling, the A40 would bring greater certainty of journey times and reliability between Haverfordwest and St Clears (and by extension Fishguard & Milford Haven and St Clears). Not having to allow for the current level of uncertainty could bring scheduling benefits to companies (and individuals), which are of greater value than the average time saving would suggest. This saving may also bring about a step change in connectivity, e.g. a vehicle / driver can now do one additional run within their drivers hours, bringing further benefits in excess of the average time saving.

12.9 Perceptions of Remoteness

12.9.1 The consultation and business survey, coupled with other evidence, strongly suggests that stakeholders, businesses and individuals perceive Pembrokeshire to be remote, largely because it is beyond the ‘end’ of the dual carriageway network.

12.9.2 Whilst intangible, the issue of perceptions of remoteness has been raised in many studies of this nature and a similar case could be argued for the A40 in

Pembrokeshire. Whilst the journey time saving would be relatively small overall, the change in perception could be substantial. As such dualling the A40 could remove a key barrier to tourist visits and (inward) investment in west Wales by addressing the (real or perceived) competitive disadvantage of this location. Removing this barrier could have the impact of bringing Pembrokeshire into the 'choice set' of locations being considered during an inward investment decision making process in particular.

12.10 Inward Investment

12.10.1 Improved connections on the A40 may also increase levels of inward investment, particularly if there are indeed improvements to the size and quality of the labour market, perceptions of the area etc., in particular when combined with the creation of an Enterprise Zone, as is the case in Pembrokeshire.

12.10.2 Inward investment would create employment and potentially tackle deprivation and under-employment. In addition, it could also create something of a critical mass effect (particularly in the Enterprise Zone) if enough firms were to move into the area.

12.11 Enhanced Prospects for the Enterprise Zone

12.11.1 The Enterprise Zone is marketed as providing 'a first class business infrastructure and compelling incentives'. Current travel times from St Clears to Milford Haven are around 47 minutes via the A40 and 44 minutes via the A477. Either approach from St Clears involves around 30 miles of travel on single carriageway roads (with limited 2+1 sections) at speeds of around 45mph. Improvements to the A40; in particular dualling would be more in-keeping with the image being projected for the Enterprise Zone, but the same could also be for the A477.

12.12 Residential Development

12.12.1 If improvements to the A40 were to attract inward investment and / or increase the potential for commuting, it may be that housing developers see opportunities to combine improved employment opportunities with new residential developments taking advantage of the high quality of life in the area. This would likely be something of a longer-term impact but would nonetheless be positive providing the demand for new stock existed.

12.13 Increased Trade

12.13.1 Pembrokeshire serves two of Wales' three ferry routes to Ireland (and two of the UK's seven routes) to Ireland. Improvements to the A40 may lead, at the margin, to a very small redistribution of through trade, particularly from Holyhead and Liverpool. There may also be increased direct trade between Pembrokeshire and Ireland.

12.14 Improved Strategic Rail Access

12.14.1 The South-Wales Mainline will be electrified by 2018, bringing new trains, more capacity, faster journey times etc. between Swansea, Cardiff, Bristol and London. Port Talbot Parkway is currently being redeveloped to accommodate large scale car parking and is around an 80 minute drive from Haverfordwest – current rail journey times are longer at 110 minutes. Dualling the A40 would reduce this travel time, allowing improved strategic rail access onwards to Cardiff and London.

12.15 Strength of Transmission Mechanisms

12.15.1 Having identified the means by which dualling the A40 could potentially 'transmit' through to improved economic performance, the strength of each transmission mechanism needs to be considered based on the findings of the consultation, business survey and research.

12.15.2 The table below considers the strength of each transmission mechanism at a high level using a five point scale and comment on each.

Transmission Mechanism	Scale of Impact	Comment
Widening the labour market	✓✓	Dualling the A40 may support increased travel-to-work movements between north & central Pembrokeshire and the wider Swansea Bay City Region.
Population retention and in-migration	✓✓	It is unlikely that dualling the A40 would fundamentally change the balance of the Pembrokeshire economy. The transmission in this regard would be contributing to increased opportunities for commuting.
Improved business performance	✓	Whilst dualling of the A40 may offer small reductions in transport costs, they are unlikely to be transformative.
Scheduling benefits	✓	Whilst dualling of the A40 may offer some benefits in this regard, it is unlikely to be transformative.
Perceptions of remoteness	✓✓✓✓✓	The evidence suggests that the perception of remoteness and the means by which it translates into a reality is an inhibitor to inward investment and tourism in Pembrokeshire. Dualling the A40 could fundamentally change this perception to the benefit of the area.
Inward investment	✓✓✓	By tackling the perceptions of remoteness, dualling the A40 may bring Pembrokeshire into the 'choice set' of locations being considered during an inward investment decision, although the extent to which this translates into actual investment is less clear.
Enhanced prospects for the	✓✓	The current Enterprise Zone is relatively self-

Transmission Mechanism	Scale of Impact	Comment
Enterprise Zone		contained. The dualling of the A40, combined with the other location benefits on offer, may make it a more attractive location for investing. However, improvements to the A40 would not support the larger concentration of economic activity on the south side of the Haven and indeed may even dilute economic activity.
Increased residential development	✓	If the dualling of the A40 were to significantly enhance the economy of the area, it is possible that it would improve the commercial viability of developments. However, this is a very long-term outcome.
Increased trade	✓✓	There is little suggestion that the current A40 is restricting trade. The only exceptions appear to be the competitiveness of agricultural businesses and the loss of tourism to Devon & Cornwall due to perceptions of remoteness.
Improved strategic rail access	✓	Improved access to Port Talbot Parkway from the northern & central areas of the County would be beneficial for business travellers in particular. However, the County has a very self-contained labour market so any impact would be marginal at best.

Table 14 - Comparative Strength of Transmission Mechanisms

Key
✓ Very Small Impact
✓✓ Small Impact
✓✓✓ Medium Impact
✓✓✓✓ Large Impact
✓✓✓✓✓ Very Large Impact

12.16 A40 Dualling - Economic Activity & Location Impacts

12.16.1 The focus of the study was specifically on the proposed dualling of the A40. The table below sets out the sectoral and overall EALI impacts of dualling the A40:

Year of Assessment	Summary of Impacts			
2015	**Local**		**National**	
Sector	*Gains / Gainers*	*Losses / Losers*	*Gains / Gainers*	*Losses Losers*
Manufacturing & Processing	Overall Minor Positive	Minor Negative Dilution of economic activity – disbenefits to firms south of the Haven Waterway	Overall Minor Positive	No Impact

Year of Assessment	Summary of Impacts			
Locally Traded Services	None	Minor Negative – increased external competition	None	No Impact
Externally Traded Services	Overall Minor Positive	Minor Negative – firms south of the Haven Waterway become relatively less competitive	Overall Minor Positive	No Impact, unless economic benefits leak out of Wales
Inward/Mobile Investment	Moderate Positive	No Impact	Minor Positive	No Impact, except potential displacement from elsewhere in Wales
Tourism	Major Positive	No Impact, except perhaps redistribution of tourism activity from south to north	Major Positive	No Impact, except potential displacement from elsewhere in Wales
Day Trips / Shoppers	None	Minor Negative – increased external competition	None	No Impact
Residents	Minor Positive – enhanced employment opportunities & access to services	No Impact	No Impact	No Impact
Sector Interactions / Synergies	Moderate Positive – spin-off spending from increased economic activity	No Impact	Minor Positive – spin-off spending from increased economic activity	No Impact
Total Gross Impacts	Minor Positive	Minor Negative to some firms south of the Haven become relatively less competitive	Minor Positive	No Impact
Net Impact	Overall Impact • Local – Overall positive driven by increased tourism and potential increased inward investment. • National – Small increase in overall net tourism and potential inward investment in Wales.		Summary of Distributional Impacts • Local – Redistribution of economic activity from south of A477 corridor to A40 corridor. Potential dilution of economic activity in the Enterprise Zone. • National – some potential displacement of tourism and inward investment.	

Table 15 – Summary of sectoral and overall EALI impacts of dualling the A40

12.16.2 In summary, the EALI analysis suggests that the main impact of dualling the A40 would be to tackle the perception related issues which are seen to be inhibiting inward investment and tourism. Dualling is unlikely to fundamentally change the cost base of doing business in Pembrokeshire and will only have a minor impact at the local level outwith tourism and potentially making the area more attractive for inward investors. This is also

likely to translate into a small national benefit, although there will be an element of displacement of tourism and potentially inward investment from elsewhere in Wales.

12.16.3 Whilst addressing the perception issue, it should be acknowledged that dualling the A40 would likely tilt the economic gravity of Pembrokeshire northwards. Benefits would accrue to Haverfordwest, Milford Haven and Fishguard but at the expense of the industrial cluster in Pembroke Dock and the south-coast tourism destinations.

12.17 Risks

12.17.1 It is important to note that transport is ultimately a 'two-way street' and impacts of any intervention such as dualling the A40 could be negative as well as positive.

12.17.2 From a local perspective, key risks for potential negative impact include:

- the potential dilution of economic activity within the Haven Waterway by providing an advantage to the less industry-intensive north over the more industry-intensive south (improve A40 over A477);
- wider displacement of economic activity from the south of the County to the central and northern areas;
- the potential opening up of Pembrokeshire to increased outside competition, which could have an impact on the sustainability of local firms;
- increased in-migration amongst the elderly cohort (thus increasing the impact of the two-speed economy), who now see the area as being 'closer' and thus more attractive to settle in; and
- a lack of affordable housing if increased demand to live in the area is not satisfied by the rate of new housing development.

12.17.3 From a Welsh Government perspective, the key risks are:

- 'deadweight' – the investment in the A40 and Haven Waterway Enterprise Zone facilitates investment which would have occurred in any case;
- 'displacement' – improvements to the A40 displace investment from other areas of Wales, resulting in no net gain overall; and
- 'leakage' – benefits from improving the A40 are captured by non-Welsh firms

12.17.4 EALI specifically recognises these issues in that it accepts that displacing investment from one area to another may still be beneficial if that

investment transfers economic activity in a positive way. However, there is no guarantee that this would be the case. It may be that investment is displaced from, for example, deprived areas in the Valleys or even more remote areas of Wales, such as neighbouring Ceredigion. In addition, the analysis suggests that the bulk of the benefits of the dualling the A40 would accrue to the central & northern areas of the County, which appear to be relatively more affluent.

12.18 Wider Infrastructure

12.18.1 The scope for this study was focussed on transport connectivity and the A40 in particular. Whilst a series of transport constraints were identified, consultees in particular stressed that wider non-transport infrastructures were at least as important if not more important than transport issues. These issues included poor broadband connectivity (soon to be addressed) and mobile phone coverage; constraints on the electricity, water and gas pipeline network; and limited land-use development.

13 CONCLUSION

13.1 Key Findings of the Study - Dualling the A40

13.1.1 The data analysis, consultation and business survey clearly identified a series of issues with transport connectivity in Pembrokeshire. The principal focus is on the current standard of the road network, principally the A40, A4076 and A477.

13.1.2 Consideration of the Economic Activity and Location Impacts (EALI) of dualling the A40 highlighted that its main impact would be to tackle the 'perception' of the area as being difficult to access. Whilst the County will always be distant from the majority of large centres of population and markets, there is evidence that this remoteness is perceived to be greater than it actually is, particularly for tourists. This in turn is likely to be deterring inward investment, the development of the travel-to-work market within the Swansea Bay City Region, tourism and population retention.

13.1.3 Dualling the A40 is unlikely to fundamentally change the cost base of doing business in Pembrokeshire and would only have a minor impact at the local level outwith tourism, although it would potentially make the area more attractive for inward investors. This is also likely to translate into a small national benefit, although there will be an associated element of displacement of tourism and potentially inward investment from elsewhere in Wales.

13.1.4 The A40 and the A477 are both critically important transport links in Pembrokeshire - but their divergence at a central point (St Clears) also means that they are 'competitors' to some extent. The study found that, there is a difference in the potential benefits of dualling the A40 between the north and south of the Haven Waterway. Whilst areas to the north such as Haverfordwest and Milford Haven would capture the full travel time benefit, Pembroke, Pembroke Dock, Tenby and the remainder of the south coast receive no travel time benefit, as the A477 would remain the route of choice. It is therefore particularly important to note that the most freight intensive area of Pembrokeshire, the area surrounding Pembroke Dock, would receive no benefit from dualling the A40.

13.1.5 It can therefore be concluded that dualling the A40 would likely tilt the economic gravity of Pembrokeshire northwards. Benefits would accrue to Haverfordwest, Milford Haven and Fishguard but at the expense of the industrial cluster in Pembroke Dock and the south-coast tourism destinations which currently use the A477.

13.1.6 Dualling the A40 provides the greatest improvements to journey times, journey time reliability and road safety between St Clears and Haverfordwest. Journey time savings of up to 11 minutes would be achieved

for the 20 mile stretch which would increase during busy holiday periods when the volume of traffic and number of slow moving vehicles (e.g. caravans & HGVs) is increased.

13.1.7 Current and projected future traffic flows, journey time savings, reliability and accident benefits are not sufficient to support the Value for Money case case for dualling the A40 between St Clears and Haverfordwest in the short or medium term.

13.1.8 Dualling would be supported by local businesses and Pembrokeshire CC whose long held preference is to dual the A40. Dualling would likely be resisted by environmental groups such as Friends of the Earth, the National Park Authority as well as residents adjacent to the A40.

13.1.9 The cost of dualling at over £400m is not included in current Transport Capital Forecasts. Of the Options considered, dualling would take the longest to deliver taking approximately 7 years to complete as a single project with design work starting in 2018 at the earliest.

13.1.10 Dualling the A40 could be delivered in 4 separate sections to enable a phased delivery similar to that adopted for the A465 Heads of the Valley Dualling project. The earliest date that work could start on site would be 2020 and take 10 to 15 years to complete. This approach would preclude access to the current round of European structural funds which have been set aside to support the current proposals to improve the A40.

13.2 Improvement Options for the A40

13.2.1 There remains a good case for proceeding with the A40 Llanddewi Velfrey to Penblewin Improvement scheme, using the 2+1 configuration which is currently included in the National Transport Schedule (ref R15).

13.2.2 The scheme includes unambiguous lengths for overtaking, would address community severance in the village of Llanddewi Velfrey and deliver small improvements to journey times, journey reliability and road safety on the A40.

13.2.3 The cost for these works is in the region of £56.8m. Allowance to fund this scheme is currently within the indicative Transport Capital budget, while European structural funds are being set aside to part fund the project and support delivery.

13.2.4 The scheme has been in the Public domain for several years and is likely to generally have the support of the local residents.

13.2.5 Scheme development has already begun and the scheme could be completed within 4 years. The scheme would be developed so as not to preclude any future plans to dual the A40.

13.2.6 The finding of the study also identified that there is a strong case for further improvements to the A40, in addition to the A40 Llanddewi Velfrey to Penblewin scheme to improve traffic conditions between St Clears and Haverfordwest, using lengths of 2+1 along the route.

13.2.7 Maximising the lengths of 2+1 along the route would improve the operation of the trunk road in delivering additional lengths of overtaking to provide further improvements to journey time, reliability and safety.

13.2.8 Each package would deliver small improvements to journey times, journey time reliability and road safety which when, combined, deliver moderate impacts on the operation of the trunk road - but less than the dualling option.

13.2.9 The majority of these lengths are online to the A40 and would involve widening the existing road and could be delivered in packages. Those taken forward first would be those of low complexity and cost with reduced numbers of adjacent landowners. The phasing would also consider areas where currently there are long lengths of carriageway without provision for drivers to pass slower moving vehicles.

13.2.10 Each scheme could be developed so as not to preclude any future plans to dual the A40.

13.2.11 Taking forward first the simplest packages minimises the likely extent of statutory process needed, thus enabling potential delivery in the short term and the likelihood of obtaining part-funding through the ERDF from the current round of funding.

13.2.12 The remaining packages could be fed into the Capital programme for consideration alongside competing priorities within the capital programme and delivery when resources allowed.

13.2.13 Consultees of the Economic Activity and Location Impacts survey who supported improvements to the current road network were asked about the trade-off between full dualling of the A40 and targeted stretches of '2+1'. The majority response was that '2+1' represented a lack of commitment and faith in the future of the area.

13.3 Access to Haverfordwest and the South

13.3.1 The study found that improvements to the A40 alone would exacerbate the existing congestion issues around Haverfordwest and therefore not fully

address current access problems along the A4076 trunk road to parts of the Haven Waterway Enterprise Zone and the Murco Refinery site – a key consideration of the study.

13.3.2 The option for work within Haverfordwest itself indicated that potential journey time savings of implementing these works may be achieved in either the eastbound or the westbound direction, but delays (dis-benefits) are seen in the opposite direction due to the change in traffic patterns introduced by the schemes. It is therefore concluded that pursuing this option would not be viable.

13.3.3 As a result, initial consideration of solutions to these problems has identified two feasible options for improving journey times and reliability in improving access. Both are bypasses of varying length, including a number of substantial cuttings and embankments, to the south of Haverfordwest. These would cross primarily over agricultural land and run through the Haven Waterway.

13.3.4 Both options require construction of new junctions, overbridges and a 350m long viaduct to span the Western Cleddau River which is a SSSI and an SAC.

13.3.5 Both bypass options deliver journey time and reliability benefits, improving accessibility around Haverfordwest but have key environmental impacts to be considered.

13.3.6 No detailed route selection work has been done on these options within the scope of this study and there is no project currently within Welsh Government's Transport Capital Programme such that work could not begin before 2020 at the earliest.

13.3.7 These options are not particularly well-developed at this stage and would need further consideration as part of a dedicated study, including a public consultation, looking at the access problems around Haverfordwest, the A4076 and Milford Haven. The study should also consider options to improve the local road network in the area

13.4 Wider Issues

13.4.1 The study highlighted other issues, beyond improvements to the A40 & A4076, which were identified as potentially constraining the economy of the region. These included Transport related issues in terms of the role played by the A477 as an alternative to the A40, the Cleddau Bridge Toll, future proposals to potentially combine the ferry ports at Fishguard and Pembroke Dock, air travel and the quality of the existing rolling train stock (which is due to be renewed).

13.4.2 In terms of non-transport related matters, consultees also raised issues with broadband and phone connectivity, lack of Higher Education facilities in Pembrokeshire, access to finance and constraints around the availability of utilities.

14 RECOMMENDATIONS

- That the A40 Llanddewi Velfrey to Penblewin scheme is progressed as soon as possible in line with the timeline outlined in the National transport Plan.

- That an Employer's Agent is appointed to develop an additional package of improvements for the A40 and that these are fed into the Transport Capital Programme for delivery when resources allow.

- That discussion begins with WEFO to explore the feasibility of additional ERDF contributions to support delivery of the additional package of measures.

- That a detailed route options study is progressed looking at the access problems around Haverfordwest, the A4076 and Milford Haven.

- That the economic and traffic conditions within Pembrokeshire are kept under review along with an evaluation of the benefits delivered by each improvement to the A40 as they are completed. Any further requirements to improve the trunk road network as a result of a change to baseline conditions is assessed against the relative merits of improving the A40, A477 and A4076 in order to best support connectivity within the region.

Annex A – Engineering Layout Drawings Options 1-6

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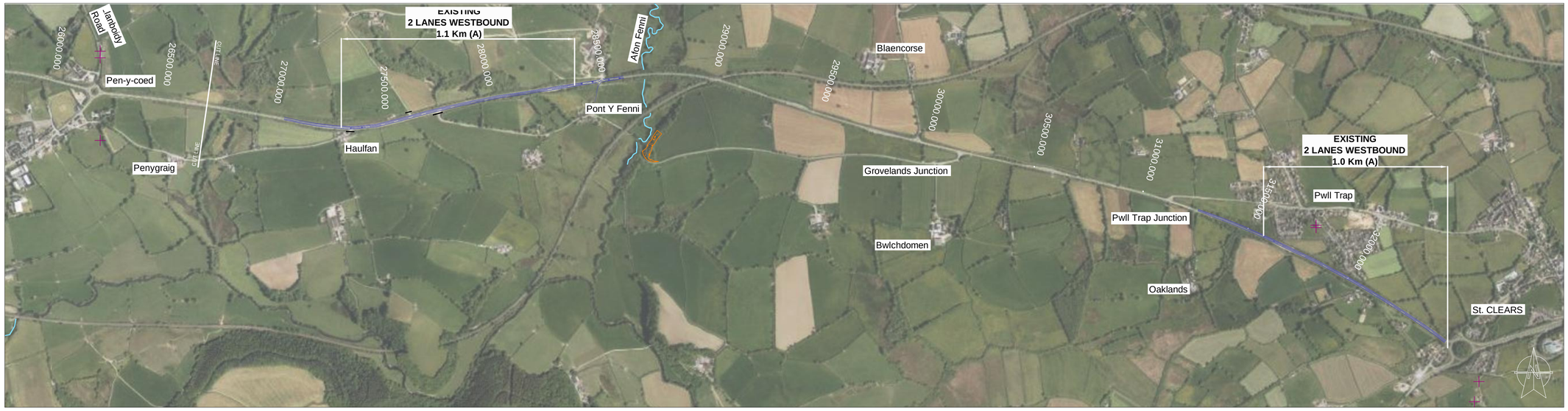
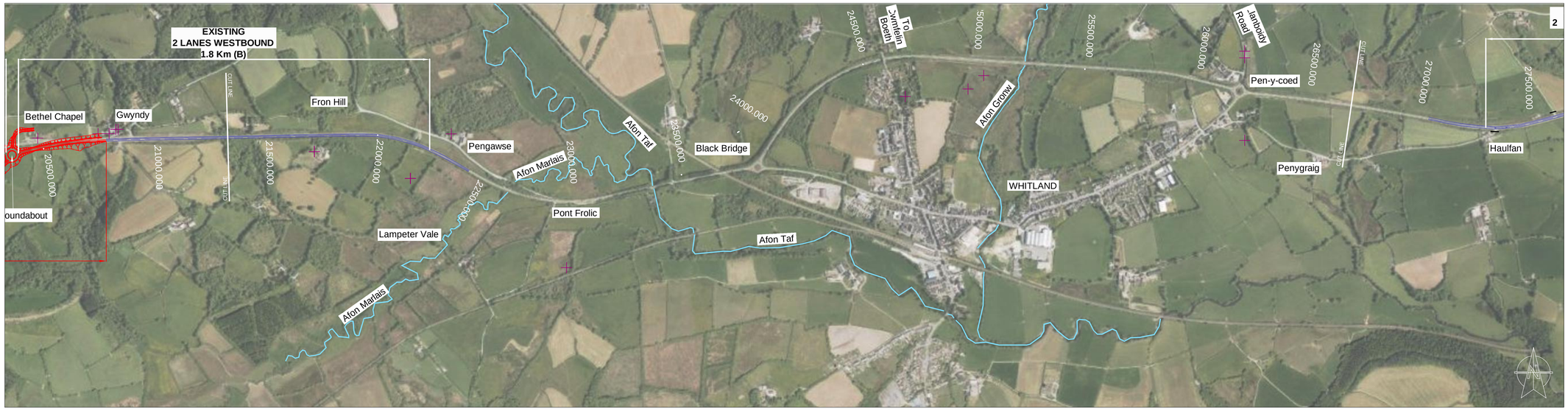
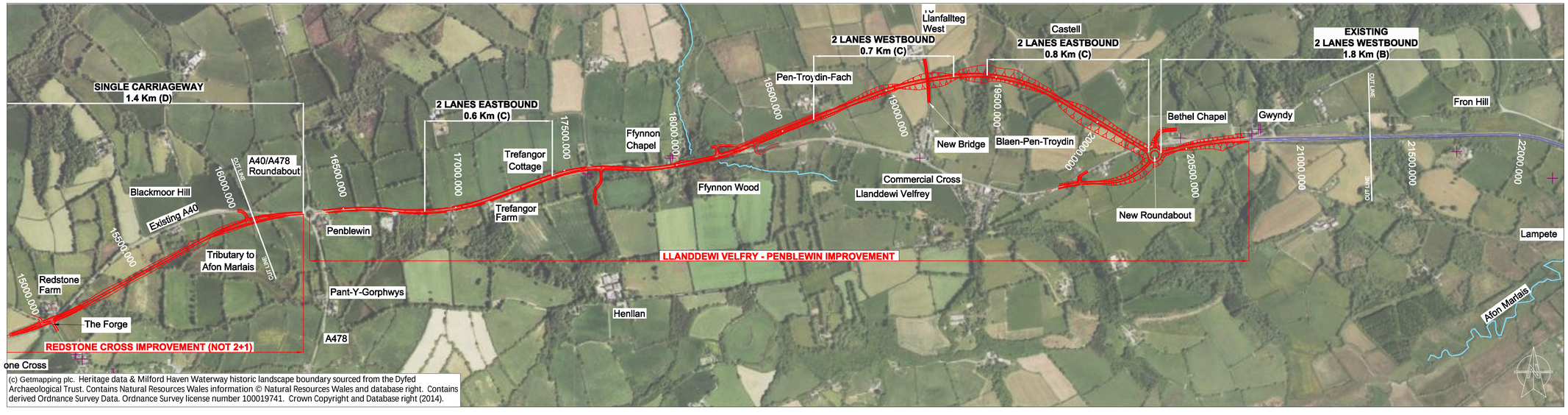
Drawing Number: 169
Revision: 7







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Rev	Date	Description	By	Chk	App
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6	01/05/15	AERIAL PHOTOGRAPHY AMENDED	RB	AH	AH
5	20/04/15	AERIAL PHOTOGRAPHY AND CONSTRAINTS ADDED	RB	AH	AH
4	13/04/15	ANNOTATIONS AMENDED	RB	AH	AH
3	10/04/15	ANNOTATIONS AMENDED	RB	AH	AH
2	02/03/15	LABELS AMENDED	RB	MG	MG
1	18/02/15	NEW OS	GH	MG	MG

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Client: WELSH GOVERNMENT

Site/Project: ST.CLEARS TO HAVERFORDWEST STUDY

Title: OPTION 1
SINGLE CARRIAGEWAY
COMMITTED SCHEMES
SHEET 1 OF 2

Drawn:	RB		Checked:	MG	
Designed:	26.01.15		Approved:	MG	
Date:	09/04/2015	Scale: 1:10,000	A1	Sheet:	1 OF 2

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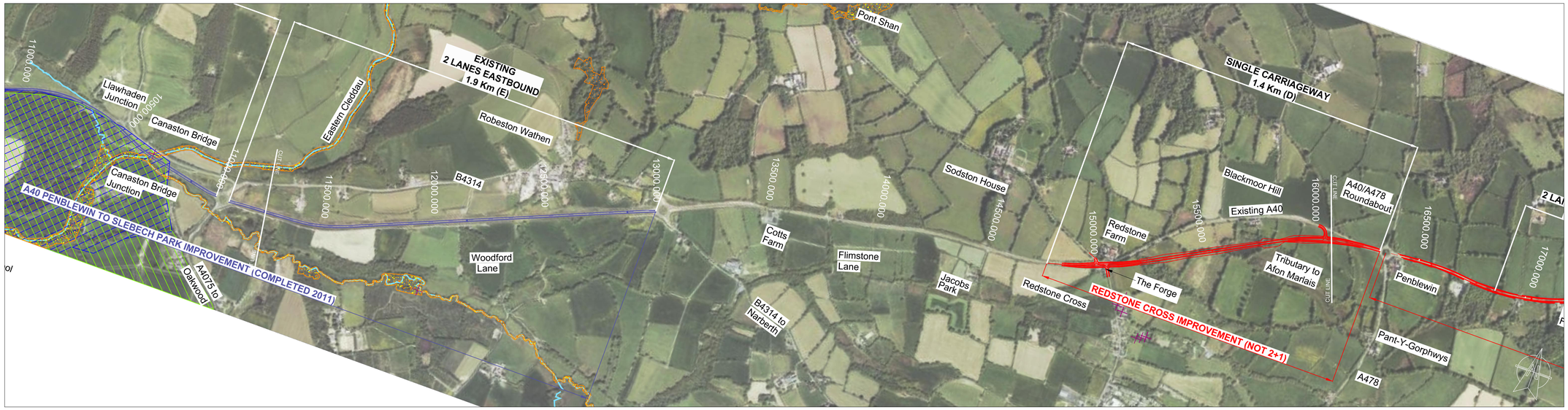

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Rev	Date	Description	By	Chk	App
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2	02/03/15	LABELS AMENDED	RB	MG	MG
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Title: OPTION 1
SINGLE CARRIAGEWAY
COMMITTED SCHEMES
SHEET 2 OF 2

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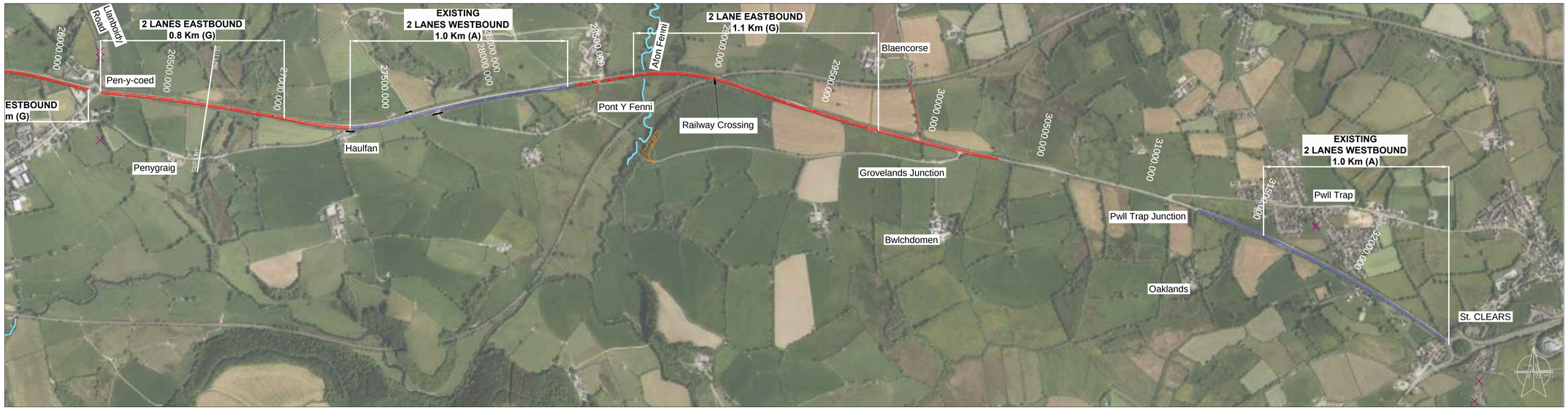

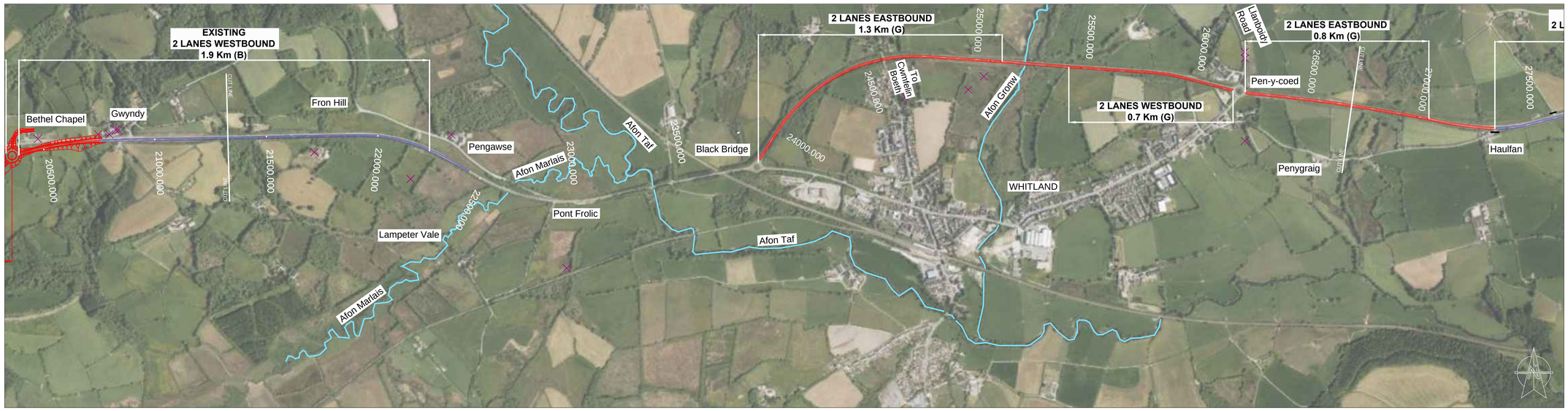

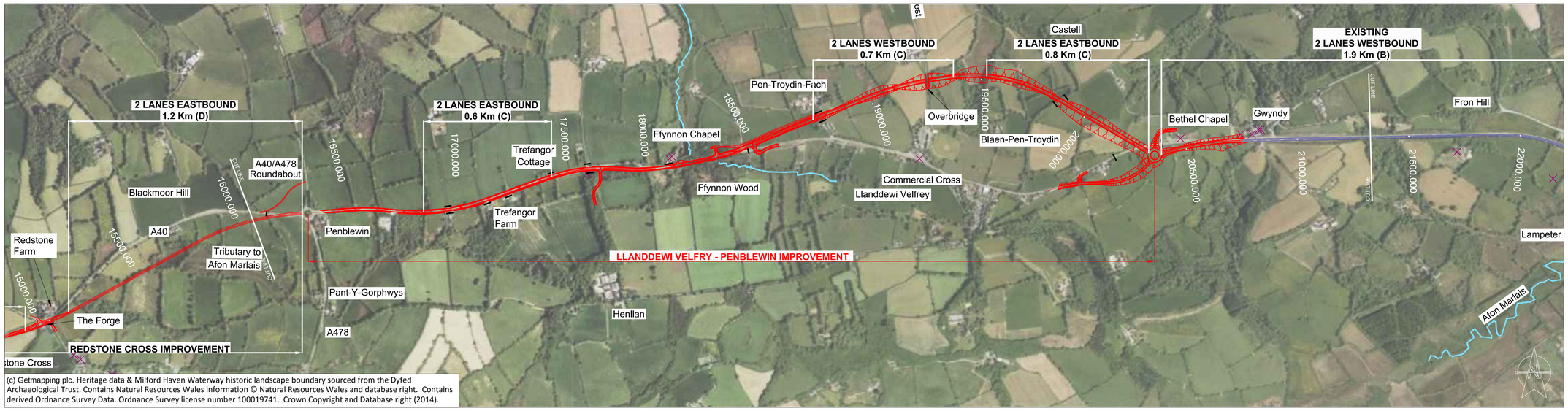

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Site/Project: ST.CLEARS TO HAVERFORDWEST STUDY

Title: OPTION 2
SINGLE CARRIAGEWAY
MAXIMUM '2+1'
SHEET 1 OF 2

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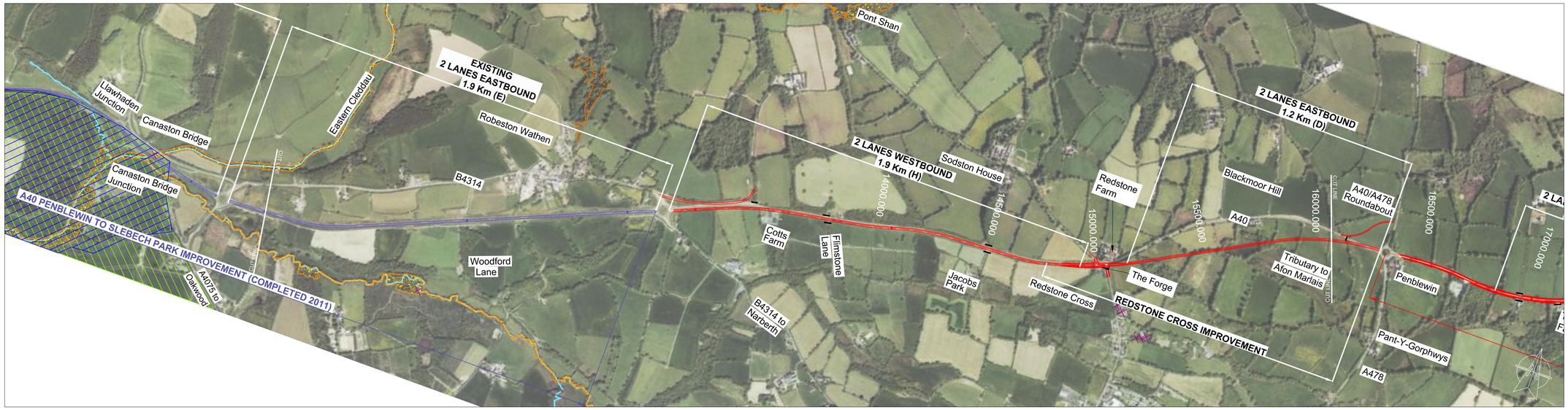

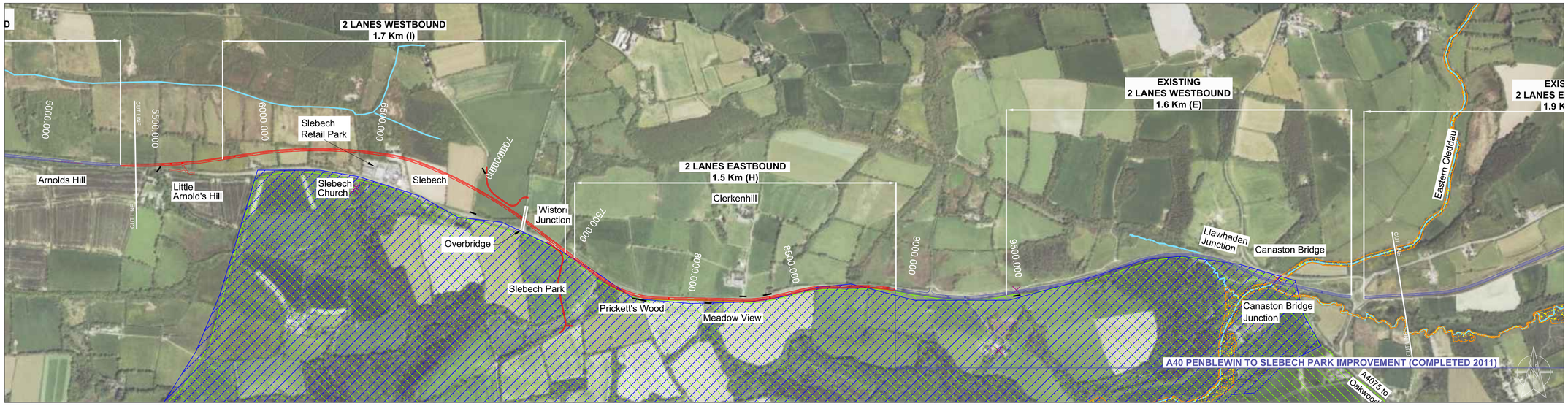

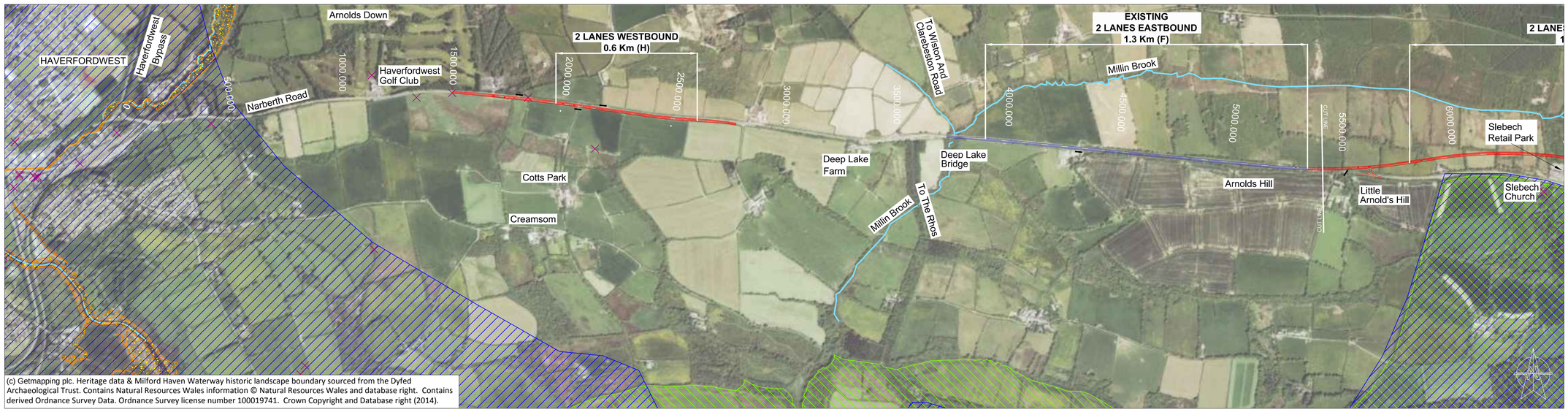

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Site/Project: ST.CLEARS TO HAVERFORDWEST STUDY

Title: OPTION 2
SINGLE CARRIAGEWAY
MAXIMUM '2+1'
SHEET 2 OF 2

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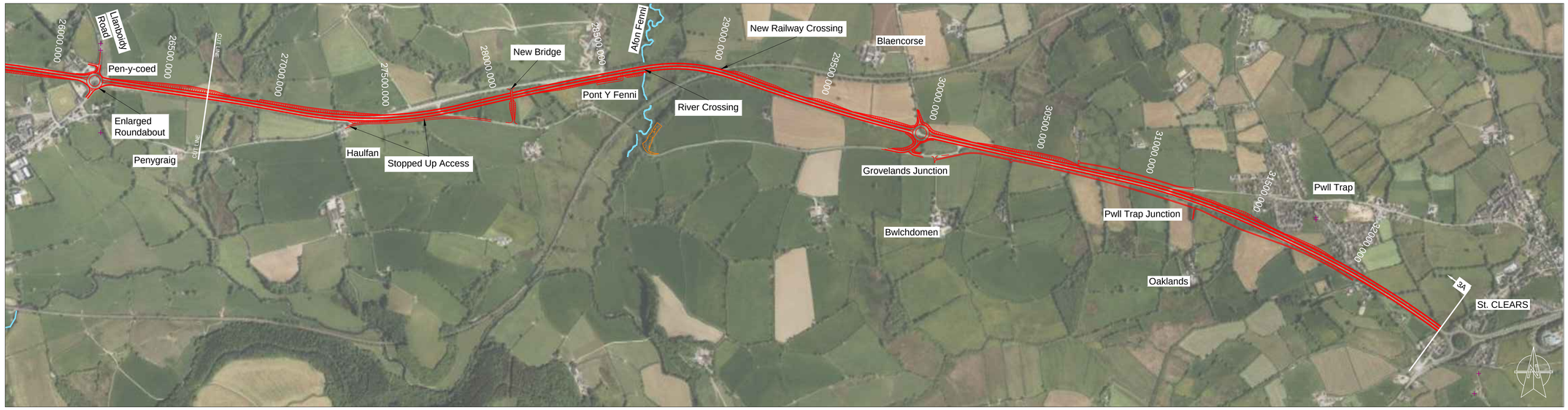

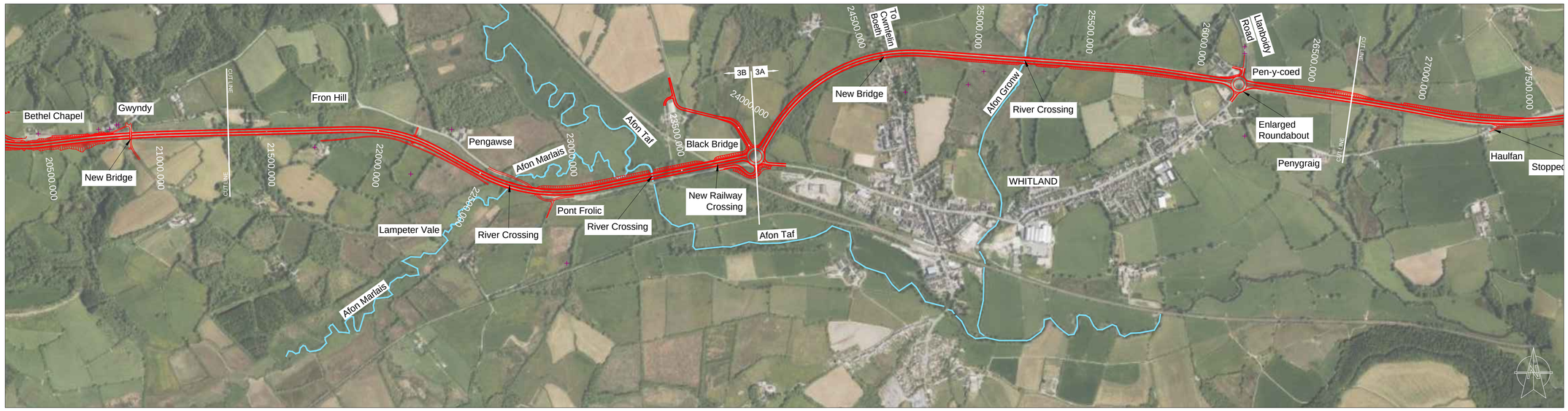

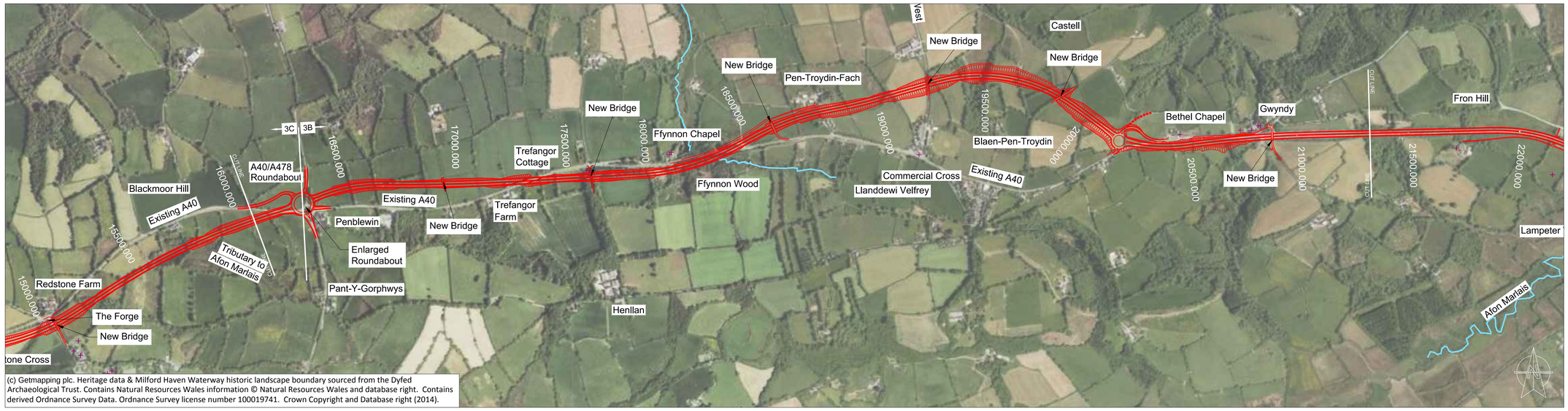

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Site/Project:

ST.CLEARS TO HAVERFORDWEST STUDY

Title:

OPTION 3
DUAL CARRIAGEWAY
DUAL CARRIAGEWAY
SHEET 1 OF 2

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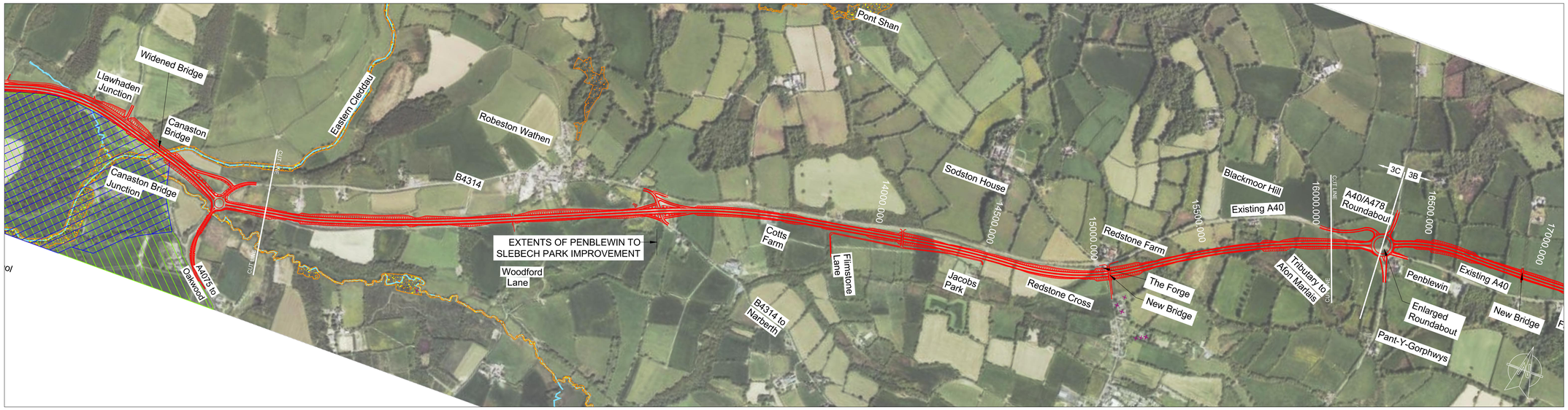
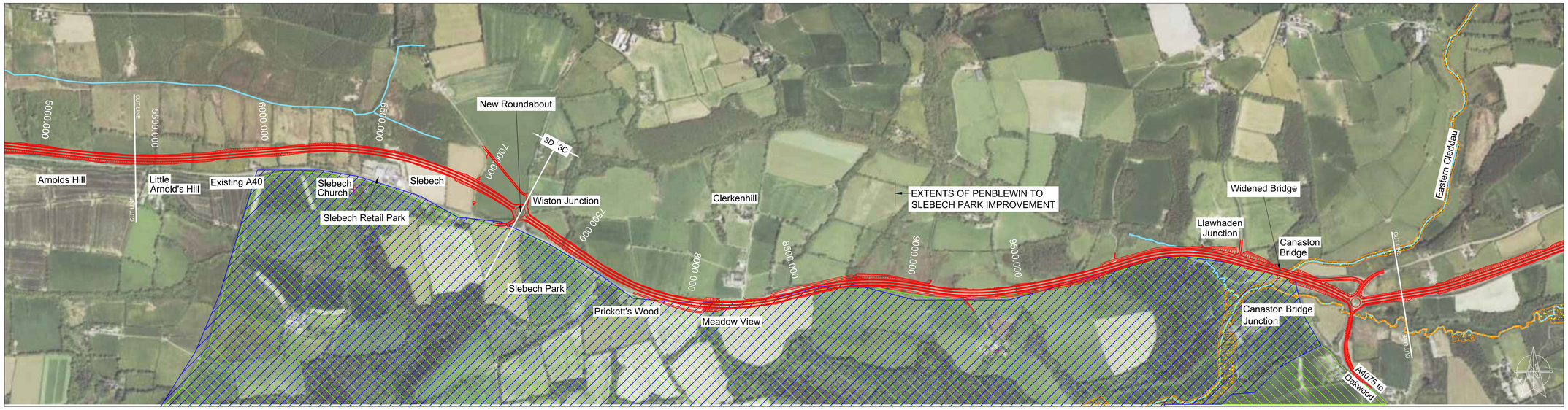
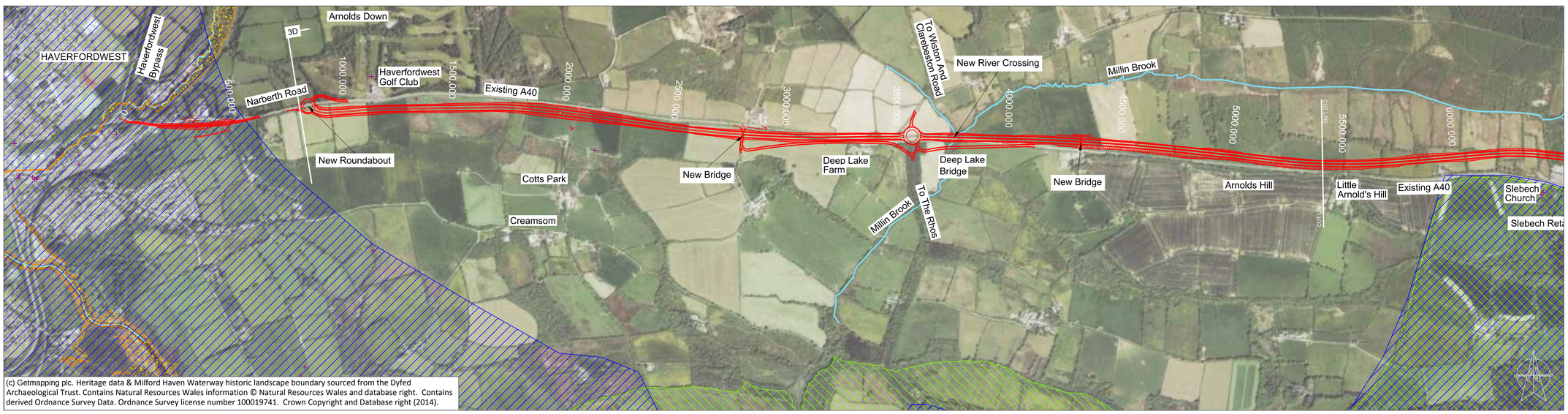
Job Number HHC43696 | Issue Number 174 | Issue 4







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2	20/04/15	AERIAL PHOTOGRAPHY AND CONSTRAINTS ADDED	RB	AH	AH
1	13/04/15	ANNOTATIONS AMENDED	RB	AH	AH

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Client: WELSH GOVERNMENT

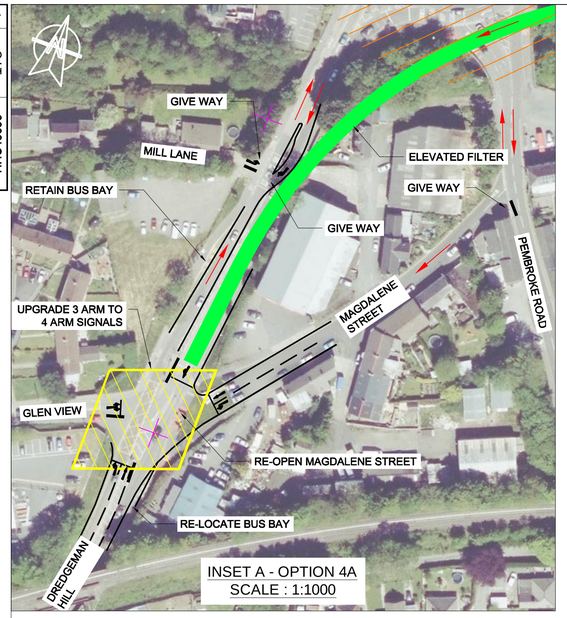
Site/Project: ST.CLEARS TO HAVERFORDWEST STUDY

Title: OPTION 3 DUAL CARRIAGEWAY ROUTE OPTION SHEET 2 OF 2

Drawn: RB		Checked: MG	
Designed: 23.01.15		Approved: 23.01.15	
Date: 22/01/2015	Scale: 1:10,000 A1	Sheet: 2 OF 2	
Project Number: HHC43696		Drawing Number: 174	Revision: 4

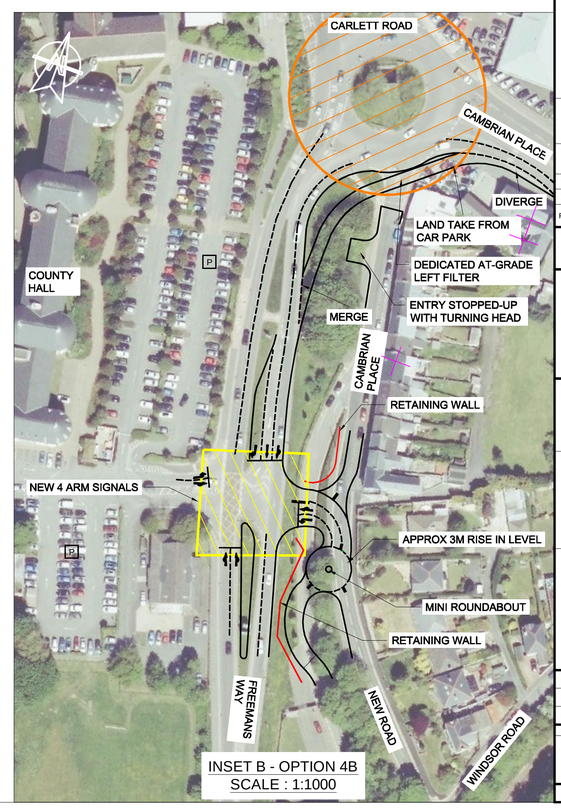
File Name: H:\HH\JOBS\43696 A40 St Clears to FishguardVACAD\Drawings\173 - 174.dwg
Login: Boyle, Richard
Plot Date: 05/06/2015 10:18:01

Project Number: HHC43696
Drawing Number: 175
Revision: 4



INSET A - OPTION 4A
SCALE : 1:1000

SCALE : 1:2500



INSET B - OPTION 4B
SCALE : 1:1000

NOTES

A1

1. THIS IS A C.A.D. DRAWING AND SHOULD NOT BE AMENDED BY HAND.
2. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.

KEY

- EXISTING SIGNAL OPTIMISATION
- ROUNDABOUT PERFORMANCE REVIEW
- REPRIORITISE ONE-WAY SYSTEM
- EXISTING ONE-WAY SYSTEM
- EXISTING CAR PARKING
- GRADE SEPARATION FILTER
- MILFORD HAVEN WATERWAY (COVERS EXTENTS OF DRAWING BUT OMITTED FOR CLARITY)
- NATIONAL PARK
- SAC
- SSSI
- WATERCOURSES
- HERITAGE POINT (POINTS OUTSIDE LIMITS OF SCHEME INTEREST HAVE BEEN OMITTED FOR CLARITY)
- AVAILABLE CAR PARKING

Rev	Date	Description	By	Chk	App
4	08/05/15	NEW AERIAL PHOTOGRAPHY ADDED AND HERRITAGE DATA AMENDED	RB	AH	AH
3	20/04/15	AERIAL PHOTOGRAPHY AND CONSTRAINTS ADDED	RB	AH	AH
2	10/04/15	ANNOTATIONS AMENDED	RB	AH	AH
1	19/03/15	INSET A AND B ADDED	RB	MG	MG

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Client:
WELSH GOVERNMENT

Site/Project:
ST.CLEARS TO HAVERFORDWEST STUDY

Title:
OPTION 4
HAVERFORDWEST
TOWN CENTRE TRAFFIC IMPROVEMENTS

Drawn: RB		Checked: MG	
Designed: RB		Approved: MG	
Date: 26/01/2015	Scale: AS SHOWN	A1	Sheet: 1 OF 1

Project Number:	Drawing Number:	Revision:
HHC43696	175	4

File Name: H:\HHIJOBS\43696 A40 St Clears to Fishguard\ACAD\Drawings\175.dwg
Login: Boyle, Richard
Plot Date: 05/06/2015 15:10:32

Revision: 5
Drawing Number: 176
Job Number: HHC43696

HAVERFORDWEST GOLF CLUB
A40
CARLETT ROAD
CAMBRIAN PLACE
SALUTATION SQUARE ROUNDABOUT
CREAMSTON ROAD
COUNTY HALL
HAVERFORDWEST
NEW AT-GRADE JUNCTION
A4076 FREEMANS WAY
UZMASTON ROAD
MERLIN'S BRIDGE ROUNDABOUT
A4076
NEW OVERBRIDGE
NEW VIADUCT (350 METRES)
GLEN VIEW
PEMBROKE ROAD
AVALLENAU DRIVE
A4076 DREDGEMAN HILL
NEW OVERBRIDGE
A4076
LOWER FREYSTROP
NEW ROUNDABOUT
A4076 VINE ROAD
MOORLAND ROAD
FREYSTROP CROSS
CUT LINE
CUT LINE
JOHNSTON

A40
A4076 VINE
CUT LINE
CUT LINE
JOHNSTON
LANGFORD ROAD
OVERBRIDGE
A477
CHURCH ROAD
OVERBRIDGE
A477
SENTRY CROSS ROUNDABOUT
A477

File Name: H:\HHI\JOBS\43696 A40 St Clears to Fishguard\ACAD\Drawings\176.dwg
Login: Boyle, Richard
Plot date: 05/06/2015 10:54:21

NOTES

A1

1. THIS IS A C.A.D. DRAWING AND SHOULD NOT BE AMENDED BY HAND.
2. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.

KEY

- BYPASS ROUTE AS PER CAPITA SYMONDS HAVERFORDWEST SOUTH EASTERN BYPASS PRE-FEASIBILITY STUDY REPORT JULY 2009
- MILFORD HAVEN WATERWAY
- NATIONAL PARK
- SAC
- SSSI
- WATERCOURSES
- \+ HERITAGE POINT

Rev	Date	Description	By	Chk	App
5	02/06/15	AMENDED AS PER WELSH GOVERNMENT COMMENTS	RB	AH	AH
4	07/05/15	IMAGERY AMENDED	RB	AH	AH
3	20/04/15	AERIAL PHOTOGRAPHY AND CONSTRAINTS ADDED	RB	AH	AH
2	13/04/15	ANNOTATIONS ADDED	RB	AH	AH
1	19/03/15	ANNOTATIONS ADDED	RB	AH	AH

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Client:
WELSH GOVERNMENT

Site/Project:
ST. CLEARS TO HAVERFORDWEST STUDY

Title:
OPTION 5
HAVERFORDWEST SOUTH EAST BYPASS
A40 GOLF COURSE TO A477

Drawn: RB		Checked: MG	
Designed: RB		Approved: MG	
Date: 26/01/2015	Scale: 1:10,000	A1	Sheet: 1 OF 1

Project Number:	Drawing Number:	Revision:
HHC43696	176	5

Project Number: HHC43696
Drawing Number: 177
Revision: 3

HAVERFORDWEST GOLF CLUB
A40
CARLETT ROAD
CAMBRIAN PLACE
SALUTATION SQUARE ROUNDABOUT
CREAMSTON ROAD
COUNTY HALL
HAVERFORDWEST
A4076 FREEMANS WAY
NEW AT-GRADE JUNCTION
UZMASTON ROAD
MERLIN'S BRIDGE ROUNDABOUT
A4076
NEW OVERBRIDGE
NEW VIADUCT (350 METRES)
GLEN VIEW
AVALLENAU DRIVE
PEMBROKE ROAD
A4076 DREDGEMAN HILL
NEW OVERBRIDGE
A4076
LOWER FREYSTROP
NEW ROUNDABOUT
A4076 VINE ROAD
MOORLAND ROAD
FREYSTROP CROSS
JOHNSTON

File Name: H:\HHI\JOBS\43696 A40 St Clears to Fishguard\ACAD\Drawings\177.dwg
Login: Boyle, Richard
Plot Date: 05/06/2015 10:50:41

NOTES

A1

1. THIS IS A C.A.D. DRAWING AND SHOULD NOT BE AMENDED BY HAND.
2. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.

KEY

- PROPOSED ROUTE
- MILFORD HAVEN WATERWAY
- NATIONAL PARK
- SAC
- SSSI
- WATERCOURSES
- + HERITAGE POINT

Rev	Date	Description	By	Chk	App
3	02/06/15	AMENDMENTS AS PER WELSH GOVERNMENT COMMENTS	RB	AH	AH
2	07/05/15	LAYOUT AND IMAGERY AMENDED	RB	AH	AH
1	28/04/15	TEXT AMENDMENT	RB	AH	AH

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Site/Project:
ST. CLEARS TO HAVERFORDWEST STUDY

Title:
OPTION 6
HAVERFORDWEST
SOUTH EAST BYPASS
A40 GOLF COURSE TO A4076

Drawn: RB		Checked: MG	
Designed: RB		Approved: MG	
Date: 23/04/2015	Scale: 1:10,000	A1	Sheet: 1 OF 1

Project Number:	Drawing Number:	Revision:
HHC43696	177	3

Annex B – WelTAG Appraisal Summary Table

Option 1	**Description**	St.Clears to Haverfordwest Single Carriageway 2+1 Committed Schemes Existing 2+1 provision plus 1C Scheme published off-line Llanddewi Velfrey (2.1Km) and 1D Scheme off-line Redstone Cross (Junction safety, no 2+1)

Economy	**Assessment / Comment**	**Significance**
Transport Economic Efficiency -TEE	£56.8M (no land or stats) (1C £50.1M, 1D £6.7M) Localised journey time and variability benefits (1%) only and limited increase in overtaking opportunities. Journey time benefit of up to 25 seconds.	+
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	0

Environment		
Noise	Some isolated property noise increase but generally route moves away from residential area of Llanddewi Velfrey with overall noise reduction	+
Local Air Quality	Some isolated property air quality reduction but generally route moves away from residential area of Llanddewi Velfrey with overall air quality improvement	+
Greenhouse Gas Emissions	Road user reduction in greenhouse gasses from increased vehicle speed and reduced congestion. Greenhouse gas increase from construction activities & materials.	+
Landscape and Townscape	In Llanddewi Velfrey area adverse landscape effects and beneficial townscape. Overall route slight adverse	-
Biodiversity	Potential impact on 2 protected sites; Pembrokeshire bat sites and Bosherston Lakes SAC and Slebech stable yard loft & cellars SSSI. Potential impact protected species including; bats, badgers, otters and reptiles. Potential impact to hedgerow habitats.	-
Heritage	Potential impact to unknown archaeology on off-line area. Direct impact on 2 HER site. Within 250m of 5 listed buildings.	-
Water Environment	Potential construction stage pollution. Highway run-off treatment attenuation and pollution prevention incorporated into design.	+
Soils	Slight adverse impact agricultural landtake.	-

Society		
Transport Safety	Localised accident benefits, saving 56.6 accidents over 60 years. No impact at recognised accident cluster sites.	+
Personal security	No adverse or beneficial impacts identified	0
Permeability	Provides relief from existing community severance in Llanddewi Velfrey. Severs 4 PoW and effects further 7 PoW. Impacts to RoW can be mitigated. Slight beneficial overall	+
Physical Fitness	Travel by active modes is not expected to significantly increase or decrease as a result of the option. There may be some limited local benefits where traffic is removed through Llandewi Velfrey.	0
Social Inclusion	The option may provide a slight benefit in terms of accessibility to health care, education, shopping and leisure facilities via road based public and private transport.	+
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	0

Transport Planning Objectives		
Improve journey time and reliability	Localised improvement expected from inclusion of 2+1 sections of carriageway designed to national speed limit, 1% saving in journey time variability and 25 seconds in journey time benefit..	+
Enhance network resilience	Offline sections of new carriageway provide only slight improvement to network resilience by providing alternative route.	+
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	0
Avoid adverse environmental impact	Slight adverse impact	-
Provide environmental benefit	Balance of slight beneficial and slight adverse impacts on environments result in a neutral impact overall	0
Reduce personal injury accidents	56.6 accidents saved over 60 years with improved road standard and overtaking opportunities.	+
Improve permeability and opportunities for active travel	Slight benefits in terms of permeability in Llandewi Velfrey. Limited opportunity to improve active travel.	+

Other Issues	
Health impact	Neutral
Stakeholder acceptability	Scheme buy-in from Llanddewi Velfrey residents, PCC reservation 'needs dual'
Technical and operational feasibility	No issues
Affordability and deliverability	In current forward programme
Risk	Qualified risk register, managed risk
Comment	

Option 2	**Description**	St.Clears to Haverfordwest Single Carriageway Maximum 2+1 Existing 2+1 provision plus 1C Scheme published off-line Llanddewi Velfrey, 2D Scheme off-line Redstone Cross (1.2Km), 2G Scheme on-line Whitland bypass (3No.=3.2km), 2H Scheme on-line Penblewin to Haverfordwest (3No.=4.0Km) and 2I Scheme off-line Slebech bypass (1.7Km)

Economy	**Assessment / Comment**	**Significance**
Transport Economic Efficiency -TEE	£98.6M (no land or stats) (1C £50.1M, 2D £10.5M, 2G £11.2M, 2H £10.0M, 2I £16.8M) Journey time savings along A40 between St Clears and Haverfordwest due to increased speed, and up to 4% savings in journey time variability. Journey time benefit of up to 1 minute 10 seconds.	**+ +**
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	**+**

Environment		
Noise	Some isolated property noise increase for on-line, off-line sections move away from residential areas with overall noise reduction	**+**
Local Air Quality	Some isolated property air quality reduction for on-line, off-line sections move away from residential areas with overall improvement in air quality	**+**
Greenhouse Gas Emissions	Road user reduction in greenhouse gasses from increased vehicle speed and reduced congestion. Greenhouse gas increase from construction activities & materials.	**+**
Landscape and Townscape	Llanddewi Velfrey & Slebech adverse landscape effects and beneficial townscape. More extensive loss of hedgerow screening vegetation but can mitigate. Potential slight impact on PCNP boundary. Overall route slight adverse	**-**
Bio-diversity	Potential impact on 2 protected sites; Pembrokeshire bat sites and Bosherston Lakes SAC, Slebech stable yard loft & cellars SSSI. Potential impact protected species including; bats, badgers, otters and reptiles. Extensive hedgerow loss impact on habitats.	**- -**
Heritage	Potential impact to unknown archaeology on off-line area. Direct impact on 3 HER site. Within 250m of 10 listed buildings and 1 Scheduled ancient monument. The proposed route runs along the boundary of the Milford Haven Waterway historic landscape boundary between Canaston Bridge Roundabout and Slebech.	**- -**
Water Environment	Potential construction stage pollution. Highway run-off treatment attenuation and pollution prevention incorporated into design. Water Framework Directive issues	**+**
Soils	Slight adverse impact agricultural landtake.	**-**

Society		
Transport Safety	Increased safe overtaking opportunity and reduces side road accesses. Accident benefits along the A40, with savings of 94 accidents over 60 years. Improvements to accident cluster sites at West of Kings Park Farm access and Slebech.	**+ +**
Personal security	No adverse or beneficial impacts identified	**0**
Permeability	Provides relief from existing community severance in Llanddewi Velfrey & Slebech. Severs 9 RoW and effects further 13 RoW. Impacts to RoW can be mitigated. Slight beneficial overall	**+**

Physical Fitness	Travel by active modes is not expected to significantly increase or decrease as a result of the option. There may be some limited local benefits where traffic is removed through Llandewi Velfrey and Slebech.	**0**
Social Inclusion	The option may provide a moderate benefit in terms of accessibility to health care, education, shopping and leisure facilities via road based public and private transport.	**+ +**
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	**0**

Transport Planning Objectives		
Improve journey time and reliability	Improved journey times along the A40 expected from inclusion of 2+1 sections of carriageway designed to national speed limit, up to 4% saving in journey time variability and 1 minute 10 seconds of journey time benefit..	**+ +**
Enhance network resilience	Construction disruption, whole life improvement	**+ +**
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	
Avoid adverse environmental impact	Hedgerow clearance & off-line works	**- -**
Provide environmental benefit	Additional opportunity over committed schemes	**+**
Reduce personal injury accidents	94 accidents saved over 60 years with improved road standard and overtaking opportunities.	**+ +**
Improve permeability and opportunities for active travel	Slight benefits in terms of permeability in Llandewi Velfrey and Slebech. Limited opportunity to improve active travel.	**+**

Other Issues	
Health impact	Neutral
Stakeholder acceptability	Scheme buy-in from A40 communities, PCC reservation 'needs dual', potential environmental group opposition due to scale
Technical and operational feasibility	No issues, more work needed on PMA connections
Affordability and deliverability	Only part in current forward programme, could be delivered in discrete schemes, significant construction disruption
Risk	Qualified risk register, managed risk
Comment	

Option 3	Description	St.Clears to Haverfordwest Single Dual Carriageway TAR Schemes (31.7 km)

Economy	Assessment / Comment	Significance
Transport Economic Efficiency -TEE	£336.3M (no land or stats) Large journey time savings along entire A40 route due to increased speed, and up to 14% savings in journey time variability and over 9 minutes in journey time benefit. Demonstrates poor VFM as result of traffic flows insufficient for dual c/way capacity in short/medium term	- -
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	+ +

Environment		
Noise	Some isolated property noise increase for on-line sections, off-line sections move away from residential areas so noise reductions expected. Potential junction/speed noise increase.	0
Local Air Quality	Some isolated property air quality reduction for on-line, off-line sections move away from residential areas with overall improvement in air quality.	0
Greenhouse Gas Emissions	Road user reduction in greenhouse gasses from increased vehicle speed and reduced congestion. Greenhouse gas increase from construction activities & materials.	+
Landscape and Townscape	Llanddewi Velfrey & Slebech adverse landscape effects and beneficial townscape. Loss of hedgerow screening increased by alignment footprint expansion. Potential moderate impact on PCNP boundary. Overall route moderate adverse	- -
Bio-diversity	Potential impact on 4 protected sites; Pembrokeshire bat sites and Bosherston Lakes SAC, Slebech stable yard loft & cellars SSSI, Cleddau Rivers SAC, Eastern Cleddau SSSI. Potential impact protected species including; bats, badgers, otters and reptiles. Extensive hedgerow loss impact on habitats.	- -
Heritage	Potential impact to unknown archaeology on off-line areas. Direct impact on 35 HER sites and 1 listed structure. Within 250m of an additional 13 listed buildings and 3 Scheduled ancient monuments. The proposed route runs along the boundary of the Milford Haven Waterway historic landscape between Canaston Bridge Roundabout and Slebech and then enters the designation for the final ~0.5 km at the western end.	- - -
Water Environment	Potential construction stage pollution. Highway run-off treatment attenuation and pollution prevention incorporated into design. Water Framework Directive issues. Additional c/way surface run-off	+
Soils	Large adverse impact on agricultural landtake, greatest of all the options.	- - -

Society		
Transport Safety	Removes oncoming collision accidents and no side road accesses. Large accident benefits along the A40, with savings of 150 accidents over 60 years. Significant improvements to accident cluster sites at West of Kings Park Farm access, Canaston Bridge and Slebech. Increased severity potential due to speed.	+ + +
Personal security	No adverse or beneficial impacts identified	0
Permeability	Provides relief from existing community severance in Llanddewi Velfrey & Slebech. Severs 9 RoW and effects further 22 RoW. Impacts to RoW can be mitigated. Slight beneficial overall	+

Physical Fitness	Travel by active modes is not expected to significantly increase or decrease as a result of the option. There may be some limited local benefits where traffic is removed through Llandewi Velfrey and Slebech.	**0**
Social Inclusion	The option may provide a moderate benefit in terms of accessibility to health care, education, shopping and leisure facilities via road based public and private transport.	**+ +**
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	**0**

Transport Planning Objectives		
Improve journey time and reliability	Significant improvement to journey times along the A40 expected from 100% overtaking opportunities and carriageway designed to national speed limit with benefit in peak holiday season. Up to 14% saving in journey time variability and over 9 minutes of journey time benefit.	**+ + +**
Enhance network resilience	Construction disruption, whole life improvement	**+ +**
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	**+ +**
Avoid adverse environmental impact	Hedgerow clearance & off-line works	**- -**
Provide environmental benefit	Additional opportunity over Max 2+1 scheme	**+**
Reduce personal injury accidents	150 accidents saved over 60 years with improved road standard and 100% overtaking opportunities.	**+ + +**
Improve permeability and opportunities for active travel	Slight benefits in terms of permeability in Llandewi Velfrey and Slebech. Limited opportunity to improve active travel.	**+**

Other Issues	
Health impact	Neutral
Stakeholder acceptability	Reduced scheme buy-in from A40 communities, PCC preferred option, environmental group opposition to be expected. Could be seen to be contrary to WG previously stated position
Technical and operational feasibility	No issues, more work needed on PMA connections
Affordability and deliverability	Doesn't demonstrate VFM, not in current WG future budgets, likely to be unaffordable, phased delivery possible
Risk	Qualified risk register, managed risk
Comment	

Option 4	Description	Haverfordwest Town Centre Traffic Proposals (combined option) Option 4A Merlins Bridge Flyover & Option 4B Salutation Square Roundabout/County Hall Traffic Signals *(scores exclude Option 4C Traffic Management Opportunities which require further study)*

Economy	Assessment / Comment	Significance
Transport Economic Efficiency -TEE	£12.9M (no land or stats) (Option 4A £11.3M, Option 4B £1.1M, *Option 4C £0.5M)* Localised journey time benefits within Haverfordwest, but offset with disbenefit caused by additional traffic signals.	-
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	0

Environment		
Noise	The change in the traffic layouts for the two junction improvements 4A and 4B result in a slight change in noise envelope however the urban nature of the sites means some properties are adversely affected and some experience a benefit. On balance the impact is neutral.	0
Local Air Quality	As with the impact on noise, the minor change in traffic positions results in a neutral impact.	0
Greenhouse Gas Emissions	Primarily relates to C02 (carbon dioxide). Whilst improved highway standards and junction performance compared to the existing route giving improved traffic flow and fuel consumption for some movements. It is unlikely that there will be any real changes in overall traffic flow as a result of the Options 4A and 4B improvement works.	0
Landscape and Townscape	Slight adverse impacts on both townscape and landscape from the loss of vegetation and introduction of an elevated structure at Merlins Bridge, with minimal effects on properties. Salutation Square works cause minor townscape effects but within an area already characterised by modern highway infrastructure.	-
Bio-diversity	Flyover will cross a watercourse that passes to the immediate south of Merlin's Bridge Roundabout. Although not part of the Cleddau Rivers SAC or Western Cleddau SSSI otters could use the water course. Due to the urban nature of the area there is unlikely to be any other impacts on biodiversity and the impacts are considered neutral overall.	0
Heritage	Potential impact to unknown archaeology. Potential direct impact to 3 HER sites and 2 listed buildings/structures. There are a further 108 HER, 56 listed buildings, 75 ancient and historical monuments and five portable antiques within 250 m of the proposed option. All proposals are within the Milford Haven Waterway historic landscape.	- -
Water Environment	The proposed watercourse crossing of Option 4A may have the potential to impact on water quality, hydrology and the potential for flooding however the structure does not impact the river directly. Pollution of watercourses receiving highway drainage may be affected during construction and operation but this will be mitigated with Construction Environmental Management Plans and through design.	0
Soils	A small amount of urban land take is required for the Option 4A and 4B works compared to the other options. The impact is therefore neutral.	0

Society		
Transport Safety	Limited reduction in accidents at Salutation Rbt and Merlins Bridge. No impact upon identified cluster sites,	0
Personal security	No change expected from existing situation.	0
Permeability	Reduction of traffic flows might provide some localised benefit to NMUs crossing the roundabout. But overall is unlikely to increase or reduce community severance.	0
Physical Fitness	Travel by active modes is not expected to significantly increase or decrease as a result of the option.	0
Social Inclusion	The option is likely to have a neutral effect in terms of accessibility to health care, education, shopping and leisure facilities via road based public and private transport.	0
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	0

Transport Planning Objectives		
Improve journey time and reliability	Limited improvements to journey time benefits offset by additional delay caused by additional traffic signals and traffic re-distribution.	0
Enhance network resilience	Additional highway assets but minor increased maintenance liabilities.	0
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	0
Avoid adverse environmental impact	Minimal environmental impact so avoidance of environmental impact better than other options	++
Provide environmental benefit	Little improvement expected due to small scale and localised nature of works.	0
Reduce personal injury accidents	Little improvement expected due to small scale and localised nature of works.	0
Improve permeability and opportunities for active travel	Permeability of Option 4A slightly impaired by elevated structure and traffic re-routing and little change for Option 4B. Overall impact considered neutral.	0

Other Issues	
Health impact	Marginal improvement to access to Withybush Hospital may be experienced from Option 4A.
Stakeholder acceptability	No stakeholder consultation undertaken however Pembrokeshire CC support the progression of Option 4A Merlins Bridge Flyover. Loss of some green space and increased traffic control/congestion outside County Hall for Option 4B not expected to be favoured by Pembrokeshire CC. Some small amount of private land take required,
Technical and operational feasibility	Very feasible to construct and maintain, well established traffic signal technology.
Affordability and deliverability	The cost estimate is undertaken on very preliminary designs only and does not account for land or statutory undertakers' diversion costs. Technically feasible to design and construct and maintain.
Risk	Difficulties may be experienced achieving technical approval by Pembrokeshire CC of the non-standard traffic layout on a county road for Option 4B (departures from standard). Stakeholder consultation required and not yet undertaken e.g. with Option 4B with Pembrokeshire CC regarding interface with county road network and with NRW regarding watercourse crossing. Availability of funding not known at present.
Comment	

Option 4A	Description	Haverfordwest Town Centre Traffic Proposals Merlin's Bridge Flyover (PCC Option 5)

Economy	Assessment / Comment	Significance
Transport Economic Efficiency -TEE	£11.3M (no land or stats) Localised journey time benefits within Haverfordwest, but offset with disbenefit caused by additional traffic congestion E/B.	-
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	0

Environment		
Noise	New elevated link will move traffic closer to properties on Magdalen Street and Haroldston Terrace causing additional traffic noise. Other properties fronting the roundabout will experience less traffic noise due to a reduction in circulatory traffic. Changes in noise will be very local to the Merlin's Bridge Roundabout area.	0
Local Air Quality	New elevated link will move traffic closer to properties on Magdalen Street and Haroldston Terrace causing worsening air quality. Other properties fronting the roundabout will experience improved conditions due to a reduction in circulatory traffic. Changes in air quality noise will be very local to the Merlin's Bridge Roundabout area.	0
Greenhouse Gas Emissions	Primarily relates to CO2 (Carbon dioxide). Improved highway standards and junction performance compared to the existing route giving improved traffic flow and fuel consumption for some movements. It is unlikely that there will be any real changes in overall traffic flow as a result of this option.	0
Landscape and Townscape	Slight adverse impacts on both townscape and landscape from the loss of vegetation and introduction of an elevated structure. Minimal effect on properties.	-
Bio-diversity	Will cross a watercourse that passes to the immediate south of Merlin's Bridge Roundabout. Although not part of the Cleddau Rivers SAC or Western Cleddau SSSI otters could be present in the area. Due to the urban nature of the area there is unlikely to be any other impacts on biodiversity and the impacts are considered neutral overall.	0
Heritage	Potential impact to unknown archaeology. Potential direct impact to 3 HER sites and 2 listed buildings/structures. There are a further 11 HER sites, 2 listed buildings and 4 ancient and historical monuments within 250 m of the proposed option. The proposed option is within the Milford Haven Waterway historic landscape.	- -
Water Environment	It is likely that the crossing of the watercourse will be a viaduct although details of its construction are unknown. No piers will be located in the watercourse itself. Any watercourse crossing has the potential to impact upon water quality, hydrology, and the potential for flooding. NRW will have to be consulted and hydrological modelling possibly carried out.	0
Soils	Although no ground investigation along the proposed alignment of this option has been carried out, it is likely that all structures will be piled.	0

Society		
Transport Safety	Limited reduction in accidents at Merlins Bridge. No impact upon identified cluster sites,	0
Personal security	No personal security impacts have been identified.	0

Permeability	Reduction of traffic flows might provide some localised benefit to NMUs crossing the roundabout However, the effect is considered neutral overall.	**0**
Physical Fitness	Travel by active modes is not expected to significantly increase or decrease as a result of the option.	**0**
Social Inclusion	The option is likely to have a neutral effect in terms of accessibility to health care, education, shopping and leisure facilities.	**0**
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	**0**

Transport Planning Objectives		
Improve journey time and reliability	Limited improvements to journey time benefits W/B offset by additional delay caused by additional congestion E/B.	**0**
Enhance network resilience	Additional highway assets but increased maintenance liabilities	**0**
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	**0**
Avoid adverse environmental impact	Minimal environmental impact so avoidance of environmental impact better than other options.	**++**
Provide environmental benefit	Limited opportunity for environmental enhancement	**0**
Reduce personal injury accidents	Grade separation advantage off-set by junction complexity.	**0**
Improve permeability and opportunities for active travel	Permeability slightly impaired by elevated structure and traffic re-routing	**0**

Other Issues	
Health impact	Marginal improvement to access to Withybush Hospital may be experienced.
Stakeholder acceptability	No public or stakeholder consultation has been undertaken
Technical and operational feasibility	Option will have 50kph design standards horizontally with 30kph Design Speed due to vertical alignment constraints. This complies with recognised lower standards in the Design Manual for Roads and Bridges (DMRB) although a combination of the two may not be acceptable. Due to the urban nature of the area there will be a considerable amount of disruption when this option is constructed.
Affordability and deliverability	The cost estimate is very preliminary and does not take into account any land or statutory undertaker's costs
Risk	Funding – the availability of funding is unknown at present. General acceptability – no consultation has been carried out. Process - PI may be needed due to impact on local area Ecology – Environmental Groups may object to this option
Comment	

Option 4B	**Description**	Haverfordwest Town Centre Traffic Proposals Salutation Square roundabout stopping up of New Road arm, dedicated at-grade left filter for Cambrian Place and new 4 arm signalised junction on Freeman's Way at County Hall. Freeman's Way widening at signalisation; 3 lane storage s/b, 2 lanes n/b

Economy	**Assessment / Comment**	**Significance**
Transport Economic Efficiency -TEE	£1.1M (no land or stats) Localised journey time benefits within Haverfordwest, but offset with disbenefit caused by additional traffic signals.	**-**
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	**0**

Environment		
Noise	Marginal change in vehicle positions and noise envelope may affect some receptors.	**0**
Local Air Quality	Marginal change in vehicle positions and air quality envelope may affect some receptors.	**0**
Greenhouse Gas Emissions	Little change on balance as reduced congestion at Salutation roundabout offset by increased congestion at County Hall traffic signalis.	**0**
Landscape and Townscape	Minor townscape effects but within an area already characterised by modern highway infrastructure.	**0**
Bio-diversity	Within an urban built-up environment. Impacts to biodiversity are considered neutral.	**0**
Heritage	Potential impact to unknown archaeology. There are 100 historic artefacts, 54 listed buildings, 71 ancient and historical monuments and 5 portable antiques within 250 m of the proposed option. The proposed option is within the Milford Haven Waterway historic landscape.	**-**
Water Environment	Increased hard paved area but mitigated by drainage design.	**0**
Soils	Small amount of urban land take.	**0**

Society		
Transport Safety	Limited reduction in accidents at Merlins Bridge. No impact upon identified cluster sites,	**0**
Personal security	Illuminated footways will be maintained, little change.	**0**
Permeability	Unlikely to increase or reduce community severance for NMUs.	**0**
Physical Fitness	Travel by active modes is not expected to significantly increase or decrease as a result of the option.	**0**
Social Inclusion	The option is likely to have a neutral effect in terms of accessibility to health care, education, shopping and leisure facilities via road based public and private transport.	**0**
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	**0**

Transport Planning Objectives		
Improve journey time and reliability	Limited improvements to journey time benefits W/B offset by additional delay caused by additional set of traffic signals.	**0**
Enhance network resilience	Similar assets, little extra maintenance.	**0**
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	**0**
Avoid adverse environmental impact	Minimal environmental impact so avoidance of environmental impact better than other options.	**++**

Provide environmental benefit	Little improvement expected due to small scale and localised nature of works.	**0**
Reduce personal injury accidents	Little improvement expected due to small scale and localised nature of works.	**0**
Improve permeability and opportunities for active travel	Neutral	**0**

Other Issues	
Health impact	Neutral impact on journey time to Withybush Hospital, reduced congestion at roundabout offset by increased congestion at traffic signals.
Stakeholder acceptability	Loss of some green space and increased traffic control/congestion outside County Hall not expected to be favoured by Pembrokeshire CC. Some small amount of private land take required,
Technical and operational feasibility	Very feasible to construct and maintain, well established traffic signal technology.
Affordability and deliverability	Low cost and easy to construct. Some traffic disruption during construction in town centre.
Risk	Difficulties may be experienced achieving technical approval by Pembrokeshire CC of the non-standard traffic layout on a county road (departures from standard).
Comment	

Option 4C	Description	Haverfordwest Town Centre Traffic Proposals (Study) Various traffic performance assessments and minor layout/timing/signage works incorporating 4 roundabouts, 2 signalised junctions and one-way system in St.Mary's area. ***REQUIRES FURTHER STUDY TO POPULATE AST***

Economy	Assessment / Comment	Significance
Transport Economic Efficiency -TEE	£0.5M (proposed budget allocation)	
Wider Economic Impacts - EALI		

Environment		
Noise		
Local Air Quality		
Greenhouse Gas Emissions		
Landscape and Townscape		
Bio-diversity		
Heritage		
Water Environment		
Soils		

Society		
Transport Safety		
Personal security		
Permeability		
Physical Fitness		
Social Inclusion		
Equality, Diversity & Human Rights		

Transport Planning Objectives		
Improve journey time and reliability		
Enhance network resilience		
Aid regeneration & support regional economy		
Avoid adverse environmental impact		
Provide environmental benefit		
Reduce personal injury accidents		
Improve permeability and opportunities for active travel		

Other Issues	
Health impact	
Stakeholder acceptability	
Technical and operational feasibility	
Affordability and deliverability	
Risk	
Comment	

Option 5	Description	Haverfordwest South East Bypass A40 Golf Course to A477 Sentry Cross Proposed off-line bypass to Haverfordwest & Johnston 9.2Km no 2+1 (PCC Option 3)

Economy	Assessment / Comment	Significance
Transport Economic Efficiency -TEE	£50.3M (no land or stats) Journey time savings for existing traffic along the A4076 due to increased speed, shorter distance and up to 34% savings in journey time variability. Journey time benefit of just over 2 minutes.	+ +
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	+ +

Environment		
Noise	As this option passes through open countryside there will be noise impacts in areas that are currently not subject to any of a direct nature. A reduction in traffic flows on existing roads that currently carry through traffic will result in reductions in traffic noise in adjacent communities.	0
Local Air Quality	Option passing through open countryside there will be a worsening of air quality in areas that are currently not subject to any air pollution of a direct nature. A reduction in traffic flows on existing roads that currently carry through traffic will result in improvements in air quality in adjacent communities, and for pedestrians and cyclists who use local roads.	0
Greenhouse Gas Emissions	Improved highway standards compared to the existing route will result in improvements in fuel consumption as flow conditions will be more constant. However, this will be offset through the construction of an entirely new road. A reduction in traffic flows on some other existing roads will also have a role to play in improving fuel consumption due to less congestion. Compared to the other options, a slight improvement in greenhouse gas emissions similar to that experienced for Options 1 to 3 is expected.	+
Landscape and Townscape	Scheme proposals cut across open countryside, including crossing the Western Cleddau valley. Potential adverse impacts on landscape character and visual receptors, both on the urban fringe and individual rural settlements. The Western Cleddau is evaluated as Outstanding in the Landmap Visual & Sensory aspect and the proposed crossing is close to the Pembrokeshire Coast National Park boundary. Rural field pattern, boundaries and prevailing topography will be disrupted by the scheme proposals.	- - -
Bio-diversity	Potential impacts to protected sites including the Pembrokeshire Marine SAC, Milford Haven Waterways SSSI, Pembrokeshire Bat Sites and Bosherston Lakes SAC and Slebech Stable Yard Loft and Cellars SSSI. Potential impact to protected species including a number of bat species (Greater horseshoe of particular note), otters, badgers, reptiles and Atlantic Salmon. Potential impacts to habitats such as hedgerows.	- - -

Heritage	Potential impact to unknown archaeology on off-line areas. No direct impacts to any known HER sites, listed buildings/ structures or Scheduled ancient monuments. Within 250m of 1 listed building and 1 Scheduled Ancient Monument. Intersects with Milford Haven Waterway historic landscape. The proposed option intersects the Milford Haven Waterway historic landscape as its travels around the SE quadrant of Haverfordwest and over the River Cleddau. It leaves the designation before then re-entering it for a short distance to the west of Rosemarket. Its tie-in point at Sentry Cross Roundabout is on the boundary of the designation.	- -
Water Environment	It is likely that the Western Cleddau river crossing will be a multi-span structure. Piers are likely to be positioned in the floodplain rather than the river itself. Any river crossing has the potential to impact upon water quality, hydrology, and the potential for flooding. The EA will have to be consulted and hydrological modelling carried out. The proposal passes within 500 metres of at least seven bodies of water, including a large one at Johnston Kilns. Two of these are likely to be directly affected.	- -
Soils	Moderate adverse impact due to large land take required and completely offline nature of scheme. Severance of land needs to be considered.	- -

Society		
Transport Safety	Increased safe overtaking opportunity and reduces side road accesses. Reduction in collisions at Merlins Bridge, Salutation and Scotchwell Roundabouts with reductions expected along the route due to designed to modern standards with less junctions No impact at identified accident cluster sites.	+ +
Personal security	No personal security impacts have been identified. Consideration needs to be given to the design of underpasses to accommodate cycle routes that cross the alignment.	0
Permeability	Provides relief from community severance through Haverfordwest and Johnston. Severs eight public rights of way. As the impacts to public rights of way can be mitigated the impact is considered moderate beneficial overall.	++
Physical Fitness	No NMU facilities are proposed as part of the option. Removal of traffic from the existing A4076 may help facilitate traffic by active modes.	+
Social Inclusion	The option may provide a slight benefit in terms of accessibility to health care, education, shopping and leisure facilities via road based public and private transport.	+
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	0

Transport Planning Objectives		
Improve journey time and reliability	Significant improvement to journey times along the route expected from shorter distance travelled and designed to national speed limit. Up to 34% saving in journey time variability.	+ +
Enhance network resilience	Wholly offline so provides good alternative route to the A40, A4076 and A477 around Haverfordwest and Johnston. Limited construction disruption to motorists due to offline nature except for crossings of local roads and Eastern Cleddau. Increased maintenance liability of 9.2km of new single carriageway including new structures.	+
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	+ +

Avoid adverse environmental impact	Overall moderate adverse impact expected as scheme cuts across greenfield site and Western Cleddau with environmentally important designations.	- -
Provide environmental benefit	Limited opportunities to provide benefit other than improvement to greenhouse gas emissions.	+
Reduce personal injury accidents	Accident savings with improved road standard and overtaking opportunities.	+ +
Improve permeability and opportunities for active travel	Provides relief from community severance through Haverfordwest and Johnston. Removal of traffic from the existing A4076 may help facilitate traffic by active modes.	++

Other Issues	
Health impact	Neutral
Stakeholder acceptability	No public or stakeholder consultation has been undertaken on this option.
Technical and operational feasibility	No technical issues have been identified to date - standard highway and bridge construction and routine maintenance. A significant bridge is required to cross the Western Cleddau (approximately 360m long) which will require flood assessment and consideration of environmental mitigation, Work required to accommodate.protect services including overhead power lines and LNG pipeline.
Affordability and deliverability	Not currently funded in any road improvement programmes. Outline design stage only - further optioneering, WelTAG Stage 1 study and economic assessment work required to justify route option.
Risk	Funding and economic viability risk. Early stage of development so risk register required to identify and manage risks.
Comment	

Option 6	**Description**	Haverfordwest South East Bypass A40 Golf Course to A4076 Dredgeman's Hill Proposed off-line bypass to Haverfordwest & A4076 Dredgeman's Hill north of Johnston 4.8km no 2+1 (Truncated version of PCC Option 3)

Economy	**Assessment / Comment**	**Significance**
Transport Economic Efficiency -TEE	£34.6M (no land or stats) Journey time savings for existing traffic along the A4076 due to increased speed, shorter distance and up to 21% savings in journey time variability. Journey time benefit of just under 1 minute.	**+ +**
Wider Economic Impacts - EALI	Please refer to PBA Wider Economic Study	**+ +**

Environment		
Noise	As this option passes through open countryside there will be noise impacts in areas that are currently not subject to any of a direct nature. A reduction in traffic flows on existing roads that currently carry through traffic will result in reductions in traffic noise in adjacent communities.	**0**
Local Air Quality	Option passing through open countryside there will be a worsening of air quality in areas that are currently not subject to any air pollution of a direct nature. A reduction in traffic flows on existing roads that currently carry through traffic will result in improvements in air quality in adjacent communities, and for pedestrians and cyclists who use local roads.	**0**
Greenhouse Gas Emissions	Improved highway standards compared to the existing route will result in improvements in fuel consumption as flow conditions will be more constant. However, this will be offset through the construction of an entirely new road. A reduction in traffic flows on some other existing roads will also have a role to play in improving fuel consumption due to less congestion. Compared to the other options, a slight improvement in greenhouse gas emissions similar to that experienced for Options 1 to 3 is expected.	**+**
Landscape and Townscape	Scheme proposals cut across open countryside, including crossing the Western Cleddau valley. Potential adverse impacts on landscape character and visual receptors, both on the urban fringe and individual rural settlements. The Western Cleddau is evaluated as Outstanding in the Landmap Visual & Sensory aspect and the proposed crossing is close to the Pembrokeshire Coast National Park boundary. Rural field pattern, boundaries and prevailing topography will be disrupted by the scheme proposals. Area of visual influence and landscape effects less extensive than Option 5, but still includes the most sensitive landscape receptors and significant impacts.	**- -**
Bio-diversity	Potential impacts to protected sites including the Pembrokeshire Marine SAC, Milford Haven Waterways SSSI, Pembrokeshire Bat Sites and Bosherston Lakes SAC and Slebech Stable Yard Loft and Cellars SSSI. Potential impact to protected species including a number of bat species (Greater horseshoe of particular note), otters, badgers, reptiles and Atlantic Salmon. Potential impacts to habitats such as hedgerows.	**- -**

Heritage	Potential impact to unknown archaeology on off-line areas. No direct impacts to any known HER sites, listed buildings/ structures or Scheduled ancient monuments. Within 250m of 1 listed building and 1 Scheduled Ancient Monument. Intersects with Milford Haven Waterway historic landscape. Despite the route being shorter than option 5 the potential impact on known listed buildings and scheduled ancient monuments remains the same.	- -
Water Environment	It is likely that the Western Cleddau river crossing will be a multi-span structure. Piers are likely to be positioned in the floodplain rather than the river itself. Any river crossing has the potential to impact upon water quality, hydrology, and the potential for flooding. The EA will have to be consulted and hydrological modelling carried out.	- -
Soils	Slight adverse impact due to large land take required and completely offline nature of scheme.	-

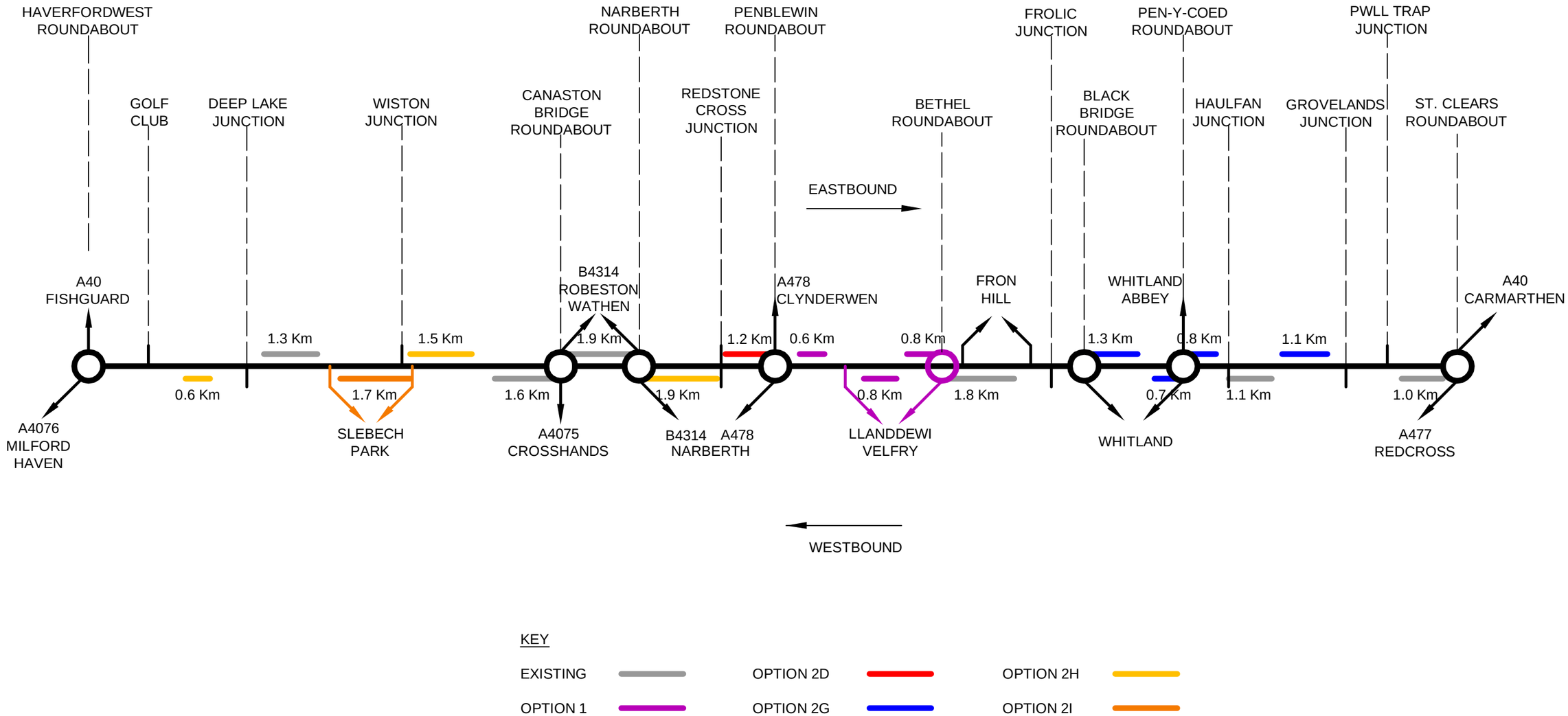
Society		
Transport Safety	Increased safe overtaking opportunity and reduces side road accesses. Reduction in collisions at Merlins Bridge, Salutation and Scotchwell Roundabouts with reductions expected along the route due to designed to modern standards with less junctions No impact at identified accident cluster sites.	+ +
Personal security	No personal security impacts have been identified.	0
Permeability	Provides relief from community severance through Haverfordwest. Severs eight public rights of way. As the impacts to public rights of way can be mitigated the impact is considered slight beneficial overall.	+
Physical Fitness	No NMU facilities are proposed as part of the option. Removal of traffic from the existing A4076 may help facilitate travel by active modes.	+
Social Inclusion	The option may provide a slight benefit in terms of accessibility to health care, education, shopping and leisure facilities via road based public and private transport.	+
Equality, Diversity & Human Rights	The option is likely to have a neutral effect in terms of the WelTAG equality impact groups and unlikely to be relevant in terms of human rights legislation.	0

Transport Planning Objectives		
Improve journey time and reliability	Significant improvement to journey times along the route expected from shorter distance travelled and designed to national speed limit. Up to 21% saving in journey time variability.	+ +
Enhance network resilience	Wholly offline so provides good alternative route to the A40 and A4076 around Haverfordwest. Limited construction disruption to motorists due to offline nature except for crossings of local roads and Eastern Cleddau. Increased maintenance liability of 4.8km of new single carriageway including new structures.	+
Aid regeneration & support regional economy	Please refer to PBA Wider Economic Study	+ +
Avoid adverse environmental impact	Overall moderate adverse impact expected as scheme cuts across greenfield site and Western Cleddau with environmentally important designations.	- -
Provide environmental benefit	Limited opportunities to provide benefit other than improvement to greenhouse gas emissions.	+
Reduce personal injury accidents	Accident savings with improved road standard and overtaking opportunities.	+ +

Improve permeability and opportunities for active travel	Provides relief from community severance through Haverfordwest. Removal of traffic from the existing A4076 through Haverfordwest may help facilitate traffic by active modes.	++

Other Issues	
Health impact	Neutral
Stakeholder acceptability	No public or stakeholder consultation has been undertaken on this option.
Technical and operational feasibility	No technical issues have been identified to date - standard highway and bridge construction and routine maintenance. A significant bridge is required to cross the Western Cleddau (approximately 360m long) which will require flood assessment and consideration of environmental mitigation, Work required to accommodate.protect services including overhead power lines.
Affordability and deliverability	Not currently funded in any road improvement programmes. Outline design stage only - further optioneering, WelTAG Stage 1 study and economic assessment work required to justify route option. Shorter route than Option 5 but involves Western Cleddau bridge design and construction so may not be quicker to deliver.
Risk	Funding and economic viability risk. Early stage of development so risk register required to identify and manage risks.
Comment	

Annex C – A40 Schematic Plan – Overtaking Provision



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Title: OVERTAKING PROVISION

FOR INFORMATION

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Designed: RB	Approved: MG
Date: 11/06/2015	Scale: 1:10,000 | A3 | Sheet: 1 OF 1
Project Number: HHC43696	Drawing Number: 178
	Revision: -

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Revision: MR

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Login: Boyle, Richard
Plot Date: 12/06/2015 16:27:02