Newgale
WelTAG Stage 1 Assessment Report
Pembrokeshire County Council

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ATKINS

Plan Design Enable

Newgale

WelTAG Assessment Report

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Acronyms

AQMA	Air Quality Management Areas
AADT	Annual Average Daily Traffic
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
AST	Appraisal Summary Tables
BMV	Best and Most Versatile
DM	Do Minimum
DMRB	Design Manual for Roads and Bridges
LDP	Local Development Plan
NMU	Non-Motorised User
PCC	Pembrokeshire County Council
PCNPA	Pembrokeshire Coast National Park Authority
PIA	Personal Injury Accident
PRoW	Public Rights of Way
SAC	Special Areas of Conservation
SAM	Scheduled Ancient Monument
SPA	Special Protection Areas
SPG	Supplementary Planning Guidance
SSSI	Site of Special Scientific Interest
TPO	Transport Planning Objective
WebTAG	Transport Analysis Guidance (England)
WelTAG	Welsh Transport Planning and Appraisal Guidance
WIA	Welsh Impact Areas
WTS	Wales Transport Strategy

1 Introduction

The shingle bank at Newgale in the Pembrokeshire Coast National Park, provides coastal protection for the A487 and the village of Newgale, In the winter storms of 2013/14 the shingle bank was overtopped and the A487 flooded. The shingle bank has been overtopped many times resulting in road closure and, with rising sea levels, this is expected to become a more frequent and severe event. When the road is closed, a 6.2km traffic diversion route through single lane rural roads via Roch and Penycwm are used. This route is not capable of carrying high levels of traffic and delivery of a transport solution is therefore required.

In February 2016, Pembrokeshire County Council (PCC) published a Welsh Transport Planning and Appraisal Guidance (WelTAG) Planning Stage Report. The report considered potential transport interventions to overcome the road closure issue. Subsequently an Addendum to the Planning Stage Report was produced to identify a short list of options to take forward for further assessment.

Following on from the Planning Stage Report and Addendum, Atkins has been commissioned by PCC, through the South West Wales Regional Engineering Consultancy Framework, to undertake a WelTAG Stage 1 appraisal of four route options which amend the alignment of the existing A487 through Newgale.

The transport solution will be part of a wider coastal adaptation masterplan strategy for Newgale commissioned by PCC to provide a framework to meet future needs and aspirations of a coastal village in the National Park. The adaptation strategy is being developed in parallel with the WelTAG Stage 1 assessment.

1.1 Aim of Report

In order to compete for public sector resources, transport proposals need to demonstrate that they provide good value for money and overall economic, social and/or environmental benefits to society. Project appraisal is the mechanism providing decision makers with information about all significant impacts from proposals (positive and negative). It enables decision makers to judge the merits of applications for support, and helps resource allocation and reasoned decisions to be made using a consistent approach.

The WelTAG guidance states “Undertaking appraisal in 2 stages enables best use of appraisal resources, as the first stage narrows the list of proposals down to leading options – or option - with only the best options then being subject to a full and detailed appraisal.”

The WelTAG guidance continues by saying “The level of effort, depth and detail required for appraisal has to be in keeping with the cost, risks, appraisal stage (i.e. Stage 1 or 2) and the size of the proposal.” The guidance also states that information in the report should be ‘sufficiently robust to be able to identify and differentiate the most promising options.”

The scope of the assessment reflects the scale of the proposal and the appraisal stage (Stage 1) and recognising the complexity of the context with regards to protecting and enhancing the National Park.

This report describes the results of the WelTAG Stage 1 appraisal undertaken on the four options identified in the Planning Stage Report/Planning Stage Addendum Report. The four route options are shown on Drawing No. 20160152-XX-ZZ-ATK-DR-D-2000/P2 in **Appendix A.1.**The options have been worked up in more detail to make sure that they are deliverable and to understand the likely costs and benefits.

The initial chapters of the report describe the existing conditions within the study area followed by preliminary engineering design considerations in which each option is then briefly described, together with its pros and cons.

The WelTAG Stage 1 appraisal then assesses each option for its impacts under the following key headings:

- Economic Impacts,
- Environmental Impacts,
- Social Impacts.

Following a consultation exercise with the public in February and March 2017, details of the public responses received has been provided.

The report contains the Appraisal Summary Tables (ASTs) for each option followed by a conclusion of the appraisal and recommendations on which option/s should be taken forward for further consideration and assessment.

This report is set out in sections which follow those in the WelTAG guidance notes. At the time of writing The Welsh Government is consulting on proposals to update WelTAG 2008 to reflect current best practice, reduce the length of the guidance and to incorporate the Principles of the Well-being of Future Generations (Wales) Act 2015. The consultation ended on 2 March 2017. As part of this Stage 1 WelTAG assessment a preliminary analysis has been undertaken to assess the extent to which each of the options contribute to the following seven Well-being Goals contained within the 2015 Act:

- A prosperous Wales
- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of cohesive communities
- A Wales of vibrant culture and thriving Welsh Language
- A globally responsible Wales.

Based on the modelling undertaken by Royal HaskoningDHV, the probability of permanent coast road closure, due to increasing flood events arises in 20 years' time (i.e. 2036). For the purpose of this WelTAG Stage 1 Assessment it has been assumed that 2036 is the year that the coast road will cease to be used. The existing coast road will be maintained to the point that it is practical to do so. Consequently, Welsh Road, Newgale Campsite and the Newsurf Café & Shop will be accessed from the southern stub of the A487 (Wood Hill). The remainder of Newgale (including the Duke of Edinburgh Inn, toilets, Sands Café, M.M. Carter Gardens and Leisure Store and The Big Blue Experience) will be accessed from the northern stub of the A487 (Newgale Hill).

However, without any new road scheme in place, from 2037 it is assumed that 'Through traffic' will travel via the C3062 (Roch Hill) and C3010 (Penycwm) route, which is the current 'diversion route' shown later in this report at **Figure 3-10**

Scheme traffic forecasts have been produced for the 'Do Minimum' and 'Do Something' scenarios in the Opening Year (2022) and the Design Year (2037). The Do-Minimum scenario includes retention of the existing road and its current maintenance regime up to 2036 and the diversion route from 2036. The Traffic Economic Efficiency, Local Air Quality, Greenhouse Gas Emissions and Noise assessments are all based on those traffic forecasts. Social impacts are considered against a baseline of 'Do Nothing', which is simply a 'without scheme' scenario.

With respect to the Water Framework Directive (WFD) and the Habitats Regulations Assessment (HRA), preliminary assessments have been undertaken and these can be found in **Appendix E** and **Appendix H** respectively.

1.2 Previous Studies

The 'Do-minimum' scenario whereby the existing defence is likely to be maintainable beyond 2037 is not considered to be an option due to the adverse effects of the increasingly frequent road closures.

In February 2016 Pembrokeshire County Council published a WelTAG Planning Stage report as part of the process of resolving the transportation issues arising from the intermittent failure of the coastal defence at Newgale. The WelTAG Planning Stage Report considered over twenty options to resolve the problem; appraising each of these options against the Transport Planning Objectives (TPOs) and the Welsh Impact Areas: Economic Impacts, Environmental Impacts and Social Impacts.

The Planning Stage Report identified the following ten route options which were deemed suitable for further consideration:

- Option 2b: reinforcing the sea defences;
- Option 2c: putting the existing road on an embankment (either behind the shingle ridge or possibly as a defence);
- Option 2d: putting the existing road on a bridge, viaduct or culverted causeway;
- Option 3b: alignment behind the Duke of Edinburgh Inn by building a bridge, viaduct or culverted causeway;
- Option 4: Newgale Farm to Wood Farm
- Option 5: Newgale Farm to Southwood Farm
- Option 7: partially on existing road and track: 'Penycwm – Llethr – (Site of) Brawdy Mill' – new road including crossing of Brandy Brook;
- Option 8: an embankment or viaduct further inland to the existing A487
- Option 9: from Roch, skirting the marshy land, crossing Brandy Brook at its eastern end, and re-joining the A487 around Penycwm; and
- Option 11: maintain existing route but upgrade Diversion Route (C3062-C3063-C3010) over time for increasing use.

Subsequently the Planning Stage Addendum Report documented Atkins' targeted review of the Planning Stage report to facilitate the preparation of a WelTAG Stage 1 assessment which is both proportionate and can inform future decisions.

The targeted review gave further consideration to the coastal realignment and highway engineering implications of the options recommended in the WelTAG Planning Stage report, specifically the design considerations which are likely to impact on the purposes of the Pembrokeshire Coast National Park. The options were then retested against the following TPO:

'TPO2 - To conserve and enhance the natural beauty, wildlife and cultural heritage of the Pembrokeshire Coast National Park avoiding, or at least minimising, adverse effects on the natural environment caused by traffic and associated infrastructure'.

As part of this process the following two further variants of the Planning Stage options were identified as potentially viable:

- Option 2e: a composite option combining elements of Options 2b and 2c (This option uses a smaller embankment to raise the road plus a sea wall to provide the required level of defence); and
- Option J: a hybrid option of the Planning Stage Middle Corridor options (options 4, 5 and 6) and tying into the A487 to the south of Bay View Farm and east of Wood Farm.

The Planning Stage Addendum Report concluded that the following options should be discounted from further appraisal due to the major adverse impact of those options on landscape character, landscape features, visual amenity and the impacts on biodiversity which are inconsistent with the objectives of the National Park:

- Option 2b: reinforcing the sea defences;
- Option 2c: putting the existing road on an embankment (either behind the shingle ridge or possibly as a defence);
- Option 2d: putting the existing road on a bridge, viaduct or culverted causeway;
- Option 2e: a composite option combining elements of Options 2b and 2c;
- Option 4: Newgale Farm to Wood Farm;
- Option 5: Newgale Farm to Southwood Farm;
- Option 8: an embankment or viaduct further inland to the existing A487; and
- Option 9: from Roch, skirting the marshy land, crossing Brandy Brook at its Eastern end, and re-joining the A487 around Penycwm.

The following options were retained for further assessment as part of this WelTAG Stage 1 assessment:

- Option 3b: alignment behind the Duke of Edinburgh Inn by building a bridge, viaduct or culverted causeway;
- Option 7: partially on existing road and track: 'Penycwm – Llethr – (Site of) Brawdy Mill' – new road including crossing of Brandy Brook;
- Option J: hybrid option tying into the A487 to the south of Bay View Farm at its northern end and east of Wood Farm at its southern end; and
- Option 11: maintain existing route but upgrade Diversion Route (C3062-C3063-C3010) over time for increasing use.

Both public and key stakeholders have been consulted on a strategy to enable Newgale to adapt to the effects of climate change. As part of that consultation stakeholders have been kept informed of the highway options appraisal. The public participation is detailed in Chapter 9 of this report.

2 Transport Planning Objectives

Transport Planning Objectives (TPOs) were identified in the Planning Stage report, based on the review of problems, constraints and opportunities identified by consultees and a review of available data; together with strategic objectives contained in the Wales Transport Strategy (WTS) and the South West Wales Joint Transport Plan (JTP). These TPO's (along with potential options) were presented for public consultation in October and November 2015. As a result of feedback from that consultation the wording of the TPO's were strengthened as follows:

- TPO1: To improve sustainable long term highway connectivity to and within the local community, and between St David's Peninsula, Haverfordwest and the Trunk Road Network in the context of coastal erosion;
- TPO2: To conserve and enhance the natural beauty, wildlife and cultural heritage of the Pembrokeshire Coast National Park avoiding, or at least minimising, adverse effects on the natural environment caused by traffic and associated infrastructure;
- TPO3: To improve the actual and perceived safety of the transport network in the study area for all users and residents;
- TPO4: To make the transport network suitable to facilitate tourism and regeneration in the St David's Peninsula including access to the coast at Newgale; and
- TPO5: To support and facilitate the safe movement of vulnerable road users to their destination.

TPO2 is focussed on the National Park and stems from one of the two statutory purposes for National Parks in England and Wales as set out in The Environment Act 1995: 'Conserve and enhance the natural beauty, wildlife and cultural heritage'.

The other statutory purpose of National Parks is to 'Promote opportunities for the understanding and enjoyment of the special qualities of national parks by the public' and this is captured in TPO4.

Where it appears that there is a conflict between those purposes, greater weight shall be given to the first. National Park Authorities have been set up to pursue these purposes, and other public bodies and other relevant authorities have a statutory duty to have regard to these purposes.

These two statutory purposes are primary considerations for the Pembrokeshire Coast National Park Authority in the evaluation of any proposals coming forward. Furthermore, the Pembrokeshire Coast National Park Landscape Character Assessment Supplementary Planning Guidance (SPG) adopted in June 2011 identifies the 'Special Qualities of the National Park Landscape' which are used to guide the Local Development Plan and the National Park Management Plan.

3 Existing Conditions

3.1 General

Newgale is a village located on the A487 between Haverfordwest and St. David's in the county of Pembrokeshire. It is approximately 12km northwest of Haverfordwest and 10km to the east of St. David's. The village is located within the Pembrokeshire Coast National Park and the Pembrokeshire Coast Path runs through the village.

In addition to Newgale there are several small settlements in the study area (shown in **Figure 3-2**) including:

- Penycwm;
- Brawdy;
- Wood; and
- Roch.

Figure 3-1: The iconic view of Newgale and St Brides Bay from the A487 facing west

Figure 3-2: Map of Study Area

© OpenStreetMap contributors[1]

3.2 Population and Demographic Data

Newgale straddles the Camrose and Solva electoral wards and has a population of 51 (Pembrokeshire Single Needs Assessment - Detailed information & statistics 2012). The population density of the study area is low (below 0.8 person per square kilometre).

The number of households without a car is low being 10.54% for Camrose and 15.49% for Solva districts (Pembrokeshire Profile from 2011 Census Data). The national average for England and Wales is approximately 25% (from 2011 Census Data).

[1] http://www.openstreetmap.org/copyright

3.3 Topography

The topography of the area is characterised by the Brandy Brook Valley which is a low lying flat area which opens out to the west at Newgale Sands beach. Either side of the valley to the north and the south is hillside with undulating landform.

The route options involve crossing the valley, which is flat at 5-6m AOD, joining the existing route of the A487 on higher land to the north and south. Farmsteads of Upper and Lower Eweston and Brawdy to the north are at its highest points at 105m AOD and the A487 at Penycwm descends west towards Newgale Village where there is a steep and twisting descent down Newgale Hill. The northern hillside is incised by some steep narrow wooded valleys up to 30m deep, including Crow Cwm. To the south, the A487 is highest at Roch at 105m AOD and gradually descends towards Southwood at 50m AOD before a steeper descent down Wood Hill to the coast.

3.4 Land Use

The following description of existing land use follows four land use types in accordance with the Design Manual for Roads and Bridges (DMRB):

- Private property
- Land used by the community
- Development land
- Agriculture

The beach at Newgale is a popular destination for the local population and visitors; it hosts a number of leisure activities particularly water sports.

The A487 provides a vehicular link between the northern part of the village, where residential, retail and leisure uses are concentrated, and land uses further south along Welsh Road including several car parks and Newgale Holiday Park.

Figure 3-3: The bridge carrying the A487 over the Brandy Brook with commercial and retail properties in the background

Figure 3-4: View of the shingle bank and of the Duke of Edinburgh Inn looking south

3.4.1 Private Property

There are four residential areas within the study area, Newgale (the largest), Roch, Penycwm and Wood. The rest of the study area is predominantly agricultural land with farmsteads and isolated residential properties.

Newgale's main residential area is in the north of the village off the A487 approach into the village. There are also some residential dwellings to the south east of the main settlement off Wood Hill as it leaves the village towards Roch. Penycwm has residential properties dispersed along Erw Lon and the A487 which passes through the settlement.

Newgale has a number of commercial properties located along the beach road including M.M. Carter Gardens and Leisure store, Big Blue Experience Kite and Water Sports Centre (above the garden and leisure store) and Newsurf surf shop. There is also the Duke of Edinburgh Public House (with accommodation) and Sands Café (adjacent to the garden and leisure store). A small café (Pebbles) is located along Welsh Road adjacent to the large National Trust car park at the south of the settlement. Newgale Camping Site is located directly opposite the beach along the existing beach road and Newgale Coast Holiday Park is located to the south of the settlement along Welsh Road.

There are two private car parks in Newgale; a small private car park opposite Sands Café and a large private area for parking behind Newsurf surf shop.

On the northern edge of Roch there is a pub (Victoria Inn) as well as number of residential properties.

Within the study area there a number of properties providing catered or self-catering holiday accommodation.

Other private property within the study area is as follows:

- Newgale YMCA Outdoor Education Centre to the north of Brawdy;
- Brawdy Church; and
- Chapel House Campsite also to the north of Brawdy.

Figure 3-5: The main cluster of buildings in Newgale

Figure 3-6: A view of the Brandy Brook valley looking west

Figure 3-7: A view of the A487 and Newgale Campsite looking north

Cawdor Barracks Army Base is located at Brawdy in the northern part of the study area. The barracks is home to the 14th Signal Regiment and only generates significant traffic flows on event days. The site is accessed off the A487 just north of Newgale.

3.4.2 Land Used by the Community

There are two large car parks within Newgale. One near the Welsh Road/Wood Hill junction is split into two with an RNLI station located in the most northerly car park. Another car park, owned and operated by the National Park Authority, is located to the south of Newgale near the Holiday Park.

There are a number of public toilets within Newgale; public facilities opposite the Duke of Edinburgh Public House, public facilities located in the Welsh Road junction car park and public facilities adjacent to the car park south of Newgale along Welsh Road.

On the northern edge of Roch there is a primary school.

Open space at Roch School is identified in the National Park Local Development Plan (2010). There are no village greens, allotments or Common Land within the study area.

3.4.3 Development Land

The two relevant development plans in the study area are the Pembrokeshire Coast National Park Local Development Plan (adopted 2010) and the Pembrokeshire Local Development Plan (adopted 2013). No land which is allocated for development in either of these plans is directly affected by any route option.

The Pembrokeshire LDP allocates land for residential and employment use in St David's and for housing in Solva.

Policy GN25 in the adopted Pembrokeshire LDP states that new sensitive development will not normally be permitted within Buffer Zones around mineral working sites, where such uses would potentially have an adverse impact on one another because of their close proximity. One such zone has been designated in Brawdy. A new highway does not fall within the category of sensitive development therefore this policy is not a constraint.

Policy 21 in the Pembrokeshire Coast LDP and Policy GN.22 in the Pembrokeshire LDP safeguard mineral reserves and require development proposals which would otherwise sterilise mineral resources to extract them prior to development. Option 11 passes through, and in close proximity to, a number of sand and gravel and hard rock reserves protected by Policy 21 and Policy GN.22. Parts of Option J and Option 7 are located on sand and gravel resources safeguarded by Policy 21.

The Ministry of Defence (MoD) announced in November 2016 that Cawdor Barracks (located to the north west of the study area) will close in 2024. The site is not allocated for development in either of the Local Development Plans but it is reasonable to assume that it will come forward for development.

It should be noted that an adaptation masterplan is currently being prepared to provide a vision for the future of Newgale irrespective of which highway alignment option is taken forward.

3.4.4 Agriculture

The study area is under grassland for beef cattle and sheep, with occasional fields of arable crops (mainly barley) and fodder crops (mainly beet, hay and silage). Our initial searches should that there are no dairy farms in the area, however a resident has mentioned that there is a dairy farm near Roch Bridge.

Most of the grassland is improved, except on steep banks where there is gorse and bracken and north of Roch Bridge where there are fields of rushy pasture. There are small areas of woodland alongside streams.

Figure 3-8: A view of the Brandy Brook valley looking southwards from Newgale Hill

The floodplain of Brandy Brook has semi-natural bog vegetation and is probably rarely, if ever, grazed.

Option 3b occupies the coastal strip south of Newgale where the land use is recreational and includes a camping site operated by Wood Farm.

3.5 Existing Highway Network

Newgale is a small settlement on the north coast of Pembrokeshire, centred on the A487 (as shown in **Figure 3-9**).

Figure 3-9: Study Area

© OpenStreetMap contributors[2]

3.5.1 A487

The main road leading to and running through Newgale is the A487. This road is an important part of the County Road Network linking Haverfordwest with the St. David's Peninsula providing access to a number of settlements, most notably Newgale, Solva and St. David's. The road helps to fulfill one of the statutory purposes of the National Park by providing the opportunity to access and enjoy the special qualities of the National Park. The road terminates at Fishguard to the north-east.

[2] http://www.openstreetmap.org/copyright

In the vicinity of Newgale, the A487 is a 4km single carriageway road running in a north-westbound direction from Roch to Penycwm. The A487 passes through Newgale on the eastern side of the shingle bank which separates Newgale from its beach and the sea. There is no weight restriction in place on the A487 at this location.

The first 0.5km section of this route (commencing from Roch to the A487 / Roch Hill Junction) has a 40mph speed limit in place. A continuous footway is located adjacent to the south-eastbound carriageway, with residential driveways being accessed via dropped kerbs. The residential road Pilgrims Way is aligned to the north-east (tactile paving present at the junction). Street lighting is located adjacent to the south-eastbound carriageway. The A487 at this location is bordered by agricultural land and hedgerow to the east. No on-street parking restrictions are present.

From the junction with Roch Hill to the A487 / Welsh Road (C3082) Junction (a total of 2.4km), the 40mph speed restriction remains in place for the first 140m (accompanied by a 'Farm Traffic' Warning Road Sign), with the national speed limit (60mph) in place there on. Agricultural land and hedgerow borders both sides off the carriageway. Farm access gates, farms and single residential dwellings are located sporadically along the route. On approach to the junction with Welsh Road (C3082), the A487 has a gradient of 12% with three parking laybys present (two adjacent to the westbound carriageway and one adjacent to the eastbound carriageway). No street lighting or footways are present on this section of the route.

From the junction with Welsh Road (C3082), the A487 (Wood Hill) runs parallel to the shingle bank at Newgale and the 'Newgale Camping Site'. The speed limit is reduced to 30mph. This 0.5km section provides access to the 'Newgale Camping Site', toilets, Duke of Edinburgh Public House, Newsurf Surf Shop and Café, Sands Café, M.M. Carter Gardens and Leisure store and Big Blue Experience Kite and Water Sports Centre. Proceeding Newsurf Surf Shop and Café, the road has no road markings and is formed of a bridge over the Brandy Brook, with a restricted width. The road markings re-commence in the vicinity of Sands Café. A footway is located adjacent to the 'Newgale Camping Site', with double yellow lines present on both sides of the carriageway. No street lighting is present.

Continuing in a north-westbound direction (past Brandy Brook), the A487 turns sharply to the right before proceeding north towards Penycwm. This steep (16% gradient) 0.6km section of road (up to 'Newgale Farm Cottage') provides access to residential dwellings located adjacent to both sides of the carriageway. Parking restrictions (double yellow lines) and street lighting are present along this stretch of the A487 although no footpath provision is in place. The speed limit increases from 30mph to 40mph c.200m north of 'Newgale Farm Cottage'. The A487 becomes more 'rural' in nature from this point, with agricultural land and hedgerow bordering both sides off the carriageway, with sporadically located farm access gates and single residential dwellings.

From Penycwm, the A487 continues to the north-west towards St David's (via Solva).

3.5.2 Welsh Road (C3082)

Welsh Road (C3082) is a single carriageway road located to the south of Newgale; running parallel to the shingle bank / seafront. The road provides a link between Newgale and Nolton Haven (terminating at Haroldston West). In the vicinity of the priority junction with A487 (Wood Hill), Welsh Road (C3082) has footways on both sides of the carriageway up to the first (of two) public car parks, accompanied by double yellow lines. From then on, Welsh Road (C3082) becomes a 'rural' single lane road with no road markings and no supporting infrastructure. The road is bordered by hedgerow to the east and the shingle bank and sea front to the west. A sole residential dwelling and 'Newgale Coast Holiday Park' are accessed to the east where the road continues to Nolton Haven.

3.5.3 Minor Roads (C3062 / C3010)

Two minor roads are aligned off the A487 around Newgale; the C3062 (Roch Hill) and the C3010 (Penycwm). When the A487 through Newgale is closed, these minor roads combine to form the 6.2km diversion route for through traffic.

The national speed limit (60mph) is in place along the majority of the diversion route (with the exception of its extremities where it is 20mph leading into Roch and 40mph leading to the Penycwm Junction).

The C3062 and C3010 are 'rural' single lane roads without road markings or supporting infrastructure.

Extreme whether events in January and February 2014 caused the A487 through Newgale to be closed for periods on a number of different days as it was flooded and blocked by shingle. The coastal water level, based on tide records from Fishguard and Milford Haven, reached a level estimated to be in the order of a 1:20 to 1:25 year extreme water level event. However, the road is also closed during less extreme conditions more frequently either as a result of flooding from the Brandy Brook when the outfall blocks or shingle being washed from the back face of the bank by moderate overtopping that does not result in complete failure.

The minor road (C3062-C3063-C3010) route, used as a diversion when the A487 through Newgale is closed (see **Figure 3-10** below), is a single lane road through much of its length. This route passes to the east and north of the Brandy Brook Flood Plain. From Roch it consists of Roch Hill, Roch Bridge, Bramble Hill, via Eweston, Silver Hill, Rhydygele, to Penycwm. It is lightly trafficked being mainly used for access to the properties on its route. However, at Roch it serves Roch Community (Primary) School; and the two vehicle width C3010 through Penycwm serves communities to the north and east accessing the A487 to and from Solva and St David's. It is heavily over capacity when it has to serve as a diversion route for the approximately 4,700 vehicle a day which normally use the A487 through Newgale.

Figure 3-10: The existing A487 Newgale Diversion Route

3.6 Bus

The scheduled bus routes that currently serve Newgale are the 411 service (running between Haverfordwest and St David's) and the 'Puffin Shuttle' coastal service No. 400 (running between St David's and Marloes). Both these services are currently operated by Richard Bros.

Monday to Saturday, there are approximately eleven 411 services a day, running in each direction between 0800 and 1900hrs (at differing minutes past the hour). In addition to servicing the general public, this service provides school transport for children attending primary and secondary schools in St David's.

From May to September the 400 service runs three times each day in each direction through Newgale Monday to Saturday. From October to April the 400 service only operates 2 days/week.

These services can be caught from one bus stop in each direction in Newgale or by 'hail & ride'.

3.7 Existing Traffic Conditions

The majority of traffic exhibited on the A487 in Newgale is through traffic heading to St David's (and Solva) in the north-west and to Haverfordwest in the south-east. The A487 is also the only diversion route for Heavy Goods Vehicles (HGVs) in the event of a major accident closing the A40 at Treffgarne Bends.

When the A487 through Newgale is closed, as a result of extreme weather events or flooding of Brandy Brook, through traffic is diverted along the alternative C3062 and C3010 route (passing through Roch and Penycwm).

3.7.1 Traffic Flows

The Annual Average Daily Traffic (AADT) flow for the A487 through Newgale (along the seafront) is currently 4,177, comprising of 3% HGVs.

The AADT currently travelling along Welsh Road (C3082) is 1,256 (1% HGVs).

Along the minor roads C3010 (Penycwm) and C3062 (Roch Hill), the AADT is 488 (3% HGVs) and 82 (3% HGVs) respectively. However, flows along these roads can increase to circa 4,700 vehicles a day when the A487 through Newgale is closed. Due to the rural nature of these roads, with certain sections restricted to single lane working, both the C3010 and C3062 can become significantly congested when the A487 diversions are in place.

3.7.2 Average Speeds

The average speed of traffic currently travelling through Newgale (along the seafront with an associated 30mph speed limit in place) is approximately 22mph / 35kph.

On approach to Newgale from the south-east, the average speed of the A487 (between the junctions with Roch Hill and Welsh Road (C3082)) is c.40mph / 64kph (with the national 60mph speed limit in place for the majority). Exiting Newgale to the north, the average speed is c.34mph / 55kph (with a 40mph speed limit in place). On site observations indicate that vehicle speeds on the A487 around Newgale are dictated by the characteristics of the road (i.e. carriageway width, alignment and gradient)

Along the minor roads formed by the C3010 (Penycwm) and C3062 (Roch Hill), the average speeds are c.34mph / 54kph and c.21mph / 34kph respectively (with the majority of both these roads subject to the national 60mph speed limit).

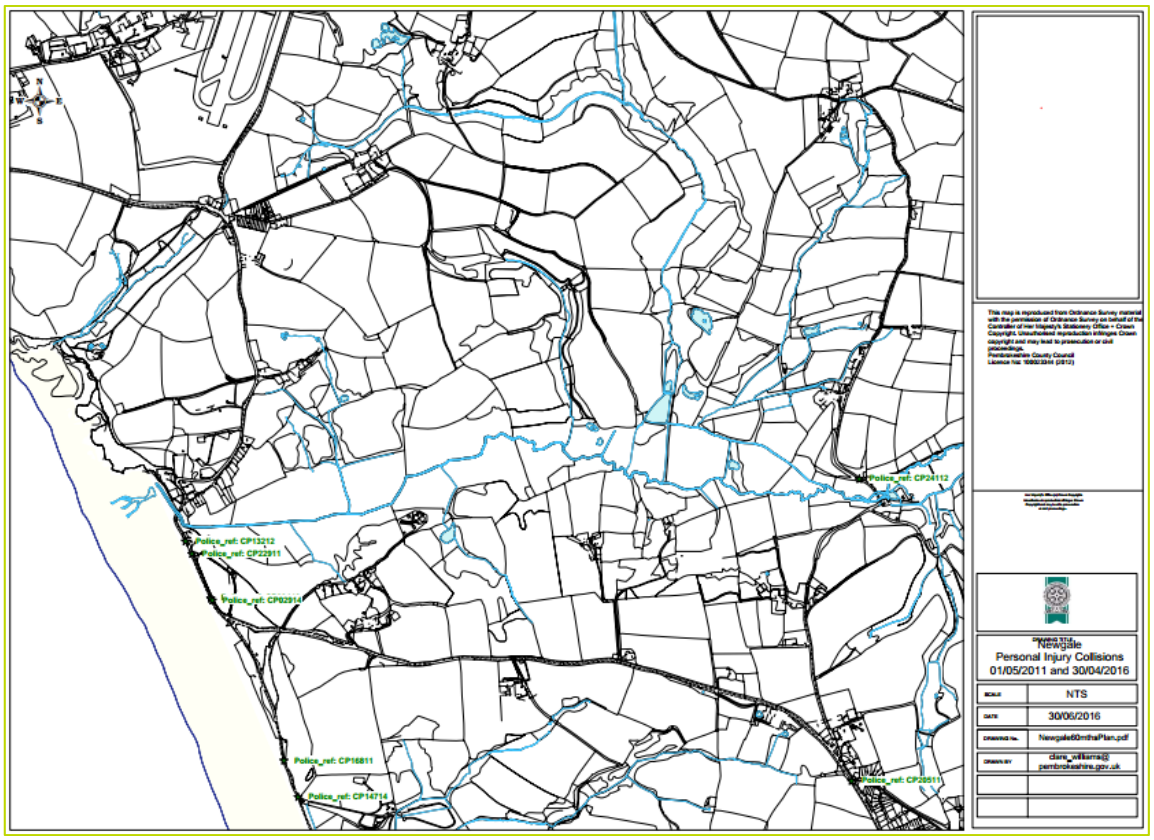
The average speed recorded along Welsh Road was 23mph / 37kph.

3.7.3 Road Accidents

Personal Injury Accident (PIA) data for the study area was provided by Pembrokeshire County Council (PCC) for the most recent five-year period available, covering 01/05/2011 to 30/04/2016 inclusive .

During this period a total of nine accidents were reported. None were classified as 'fatal' whilst one was 'serious' and eight were 'slight'. Eight of the PIAs are as shown in **Figure 3-11** and an additional PIA is just north-west of the study area. The full PIA data has been included in **Appendix B**.

Figure 3-11: Study Area PIA



The accidents resulted in 16 casualties; none were classified as 'fatal', six were 'serious' (comprising of two vehicle drivers and four passengers) and 10 were 'slight' (comprising of two vehicle drivers, four passengers, one motorcyclist, two cyclists and one pedestrian).

A487 (Wood Hill) Newgale

During the five year study period, four collisions were recorded on the c.385m section of A487 (Wood Hill) that runs parallel to the shingle bank at Newgale. All of these collisions were classified as 'slight' with a single collision occurring each year from 2011 to 2014. A summary of these four incidents is provided below;

- 15/08/11: A Goods Vehicle (<3.5t) 'travelling too close' went into the rear of a Car 'indicating to turn right' that had travelled down 'Newgale Hill' towards Newgale. Two slight casualties were reported, the Car river and passenger;
- 04/06/12: The front wheel of a Pedal Cyclist, whilst looking behind them before turning right, struck an object on the road causing them to fall off, categorised as a 'slight' casualty;
- 12/02/13: A Motor Cyclist (<50cc) travelling 'along the sea front…..ridden over a pebble in road causing the rider to lose balance and fall off', categorised as a 'slight' casualty; and

- 01/02/14: A Bus driver drove through 'clearly signed on several locations' diversion signs resulting in the bus (accommodating approximately 10 passengers) being 'hit by a large wave', resulting the bus being 'thrown towards the camping site…..partially underwater'. One 'slight' casualty was reported, a 17 year old male bus passenger.

It is noted that three of these collisions involved a vehicle and one involved a Pedal Cyclist. None of the collisions involved pedestrians.

Other Study Area Accidents

In addition to the four collisions discussed above, a further five collisions were reported in the study area.

Two 'slight' collisions were reported on Welsh Road (C3082), approximately 580m and 715m south-east of the junction with the A487 (Wood Hill).

- The first collision reported in 2011 involved a Car travelling south-east to Nolton, which skidded and collided with the nearside hedge. The 'very likely' reason for the accident was attributed to a 'slippery road (due to the weather)'. The single casualty reported was a 16 year old female passenger, classified as 'slight'.
- The second accident was reported at the junction to 'Newgale Coast Holiday Park' in 2014. A Car hit the rear tyre of a Pedal Cyclist whilst 'attempting an overtake manoeuvre', resulting in the 25 year old female Pedal Cyclist falling off her bike, categorised as a 'slight' casualty.

The only 'serious' collision reported in the study area occurred in 2012 on the A487 towards Solva, c.1.2km north-west of the A487 / Penycwm / Erw Lon junction. It was reported that a Car traveling from St David's 'may have been distracted by events taking place with his 3 passengers'. The car veered across the centre white line causing a Car travelling in the opposite direction to swerve. Six casualties were reported, all categorised as 'serious', including the 17 year old male Car driver and his three passengers (two 17 year old female passengers and a 16 year old male passenger) travelling from St David's and the 53 year old male Car driver and his 49 year old female passenger travelling in the opposite direction.

The only collision which involved a pedestrian occurred in 2011 at the junction of the A487 / Pilgrims Way, classified as 'slight'. It was reported that a 20 year old female pedestrian alighted from a Bus and crossed the A487 in front of the Bus and into the path of an oncoming Car, colliding with the front nearside bonnet. The single 'slight' casualty reported was the pedestrian with it stated that it was 'very likely' that the pedestrian 'crossed the road masked by a stationary vehicle' and 'failed to look properly'.

The remaining 'slight' collision occurred in 2012 on 'Bramble Hill', c.1.2km north of the A487 / Roch Hill junction. It was reported that two Cars travelling in opposite directions collided head on whilst driving around the 'double bend'. Two 'slight' casualties were reported, the driver and passenger of the Car that 'stated they had managed to stop and Vehicle 1 had collided with them head on at slow speeds.

Summary

Overall the accident rate is in keeping with what would be expected from a transport network of this type. However, 2 of the 4 collisions recorded along the A487 (Wood Hill) in Newgale were caused by objects on the road (assumed to be pebbles from the shingle back) whilst one was due to the road being flooded. The proposed scheme will therefore provide an opportunity to improve highway safety along the A487 in Newgale.

3.8 Structures

The following road structures are present in the study area. A brief description is given below:

- **Roch Bridge** – A multiple span masonry arch bridge crosses the Brandy Brook near Roch Mill. The road over the bridge is single track.
- **Newgale Bridge** – A single span masonry arch bridge crosses the Brandy Brook at the bottom of Newgale Hill. The road over the bridge is single track.

3.9 Statutory Undertakers Apparatus

The following statutory undertakers have apparatus in the study area. A brief description of the apparatus is given below:

- **British Telecom** has underground (U/G) cables along the A487 throughout the study area. It also has overhead (O/H) cables alongside the C3062-C3063-C3010 diversion route. Residential and commercial properties are generally supplied by overhead connections.
- **Dwr Cymru Welsh Water** have underground potable water mains in the A487 in the south supplying the properties are far as Wood. They also have water mains and sewers in the A487 to the north serving Newgale and Penycwm. A water main also runs west-east across fields to the north of Penycwm which crosses Erw Lon. Newgale Sewage Treatment Works discharges treated sewage effluent into Brandy Brook. A small sewerage pumping station also exists behind the Duke of Edinburgh Public House.
- **Western Power Distribution** have several sets of high voltage overhead cables (11kV and 33kV) and overhead service cables within the study area.

It should be noted that there might be services which do not show up on standard searches serving the Cawdor Barracks Army Base to the north of Penycwm.

3.10 Geology

3.10.1 Superficial Geology

The British Geological Survey (BGS) 1:50,000 sheet 209 and 226 &227 show the study area comprises Alluvium deposits local to Brandy Brook. Some localised pockets of Glacial Sand and Gravel are present. At the coast in the vicinity of the base of Wood Hill, blown sand deposits exist.

3.10.2 Bedrock Geology

The BGS 1:50,000 sheet 209 and 226 &227 show the study area is predominantly underlain by Carboniferous Middle and Lower Coal Measures that typically comprise interbedded sandstone, mudstone, siltstone and coal seams. The north and east of the study area is underlain by Cambrian mudstones and sandstones.

3.10.3 Structural Geology

Faults pass across the site area; some trending north northeast to south southwest with the downthrow to the west and others trending east to west with the downthrow to the south.

3.10.4 Mining

The study area is underlain by the Lower and Middle Coal Measures and coal seams are shown to be present. Mine shafts are shown in the study area on the BGS 1:50,000 sheet 209 and 226 & 227. It known that coal mining has been taking place since the late mediaeval period and more extensively since the middle of the 19th century.

3.11 Traffic Noise and Vibration

Existing noise within the Scheme locality is predominantly associated with traffic noise from the existing road network. Noise from the farms and other local businesses may affect particular properties at particular times, these however are excluded from this assessment.

Based on our experiences in this type of area noise levels are not expected to fall below 40dB, and the calculations of impact take this into account.

From the baseline traffic data provided it is possible to obtain the roadside noise levels for the existing road network. The roadside noise level in the study area is generally between 63 and 66dB, except for Roch Hill and Welsh Road where traffic flows are too low to make a reliable estimate of noise levels.

The majority of noise sensitive receptors are residential properties located near to the roads in Roch with some properties in Penycwm and on Newgale Hill near the seafront. There are also a number of isolated properties in the study area, some of which are more than 300m away from the existing roads but are within 300m from some of the proposed options.

The total number of noise sensitive receptors in the study area has been estimated as 264 utilizing OS Open Data, satellite imagery (Google and Bing maps) and Google Street View.

3.12 Air Quality

Pembrokeshire County Council (PCC) has declared two Air Quality Management Areas (AQMA), which are in Haverfordwest and Pembroke, approximately 12 and 20 kilometres to the south-east of the study area respectively. These AQMAs are not considered to be of relevance to this study area.

Statutory ecological designations also help to define the sensitivity of the receiving environment of the impact of changes in air pollution. In addition to being within the National Park, there are three statutory ecological designation within 200 m of the roads included in the study area. This includes St. David's Peninsula Coast Site of Special Scientific Interest (SSSI) which is located approximately 40 metres north of the A487 Newgale Hill and the Pembrokeshire Marine SAC

Most receptors are residential properties located near to the roads in Roch, Newgale and Penycwm. There are several isolated properties in the study area.

3.13 Landscape and Townscape

3.13.1 Local Landscape Character

The route options (and study area) are located on the west coast of Pembrokeshire within the Pembrokeshire Coast National Park and Pembrokeshire County. The study area incorporates the farmsteads of Upper and Lower Eweston to the north at its highest point at 105m AOD gradually descending south to Roch and west to Newgale and Penycwm. In between the main settlements are scattered farms and dwellings surrounded by undulating wooded landscape gradually sloping down to Brandy Brook and its valley which form the spine of the study area and eventually reaching the low lying flat area of Newgale and its beach. Refer to Landscape Constraints Plan **Figure 3-12** for existing features, land uses and designations.

The A487 is the main road connecting Newgale with Haverfordwest and St David's, and the B4330 linking up with this and bounding the study area to the north east. Dramatic views are experienced along the A487 as it descends towards Newgale beach which would be characterised as being an unspoilt coastal and rural landscape. This *'Coastal Splendour'* has been identified along with eleven other characteristics as Special Qualities of the National Park Landscape.

The coastal landscape provides drama to the west of the study area, with the unusual relationship of high coast and lowland valley. This provides a high degree of exposure, a wide expanse of sea and influences the landscape character of the area, through sight and sound, the existing shingle bank screening the existing road.

The beach at Newgale is a popular surfing location with associated holiday accommodation, with low rolling pastoral hills forming the hinterland to the east. Large ships at anchor deeper in the bay will be visible from the shore. In season, tranquillity is limited on the busy beach, where the A487 runs along the rear of the shingle bank which sits at the back of the beach. The presence of development, buildings and visitor activity at Newgale affects the scenic quality of the seascape.

To the east of the beach, the area is largely agricultural with undulating landform. Small irregular fields are bounded by high overgrown hedgerows, hedgebanks and hedgerow trees. To the east of the study area, the fields are often poor grazing with improved and semi improved grassland mixed with blocks of woodland clustered around the watercourses that link with Brandy Brook. To the north and south, fields open up as landform rises and flattens offering wide views across the landscape and towards the coast.

Farmsteads, small settlements scattered around the valley combined with tourist facilities such as cafes, shops and camping grounds at Newgale make up the built landscape within the study area. The Wales Coast Path and other public rights of way criss-cross through the valley offering recreational experiences. These are only intermittently visible from surrounding ground where it becomes well wooded within the valley slopes and network of hedgerows.

Views in places are open and long distant especially towards the coast, particularly to the settlements of Penycwm and Roch as the ground rises up from the beach to the north and south-east. At the north-eastern section of the study area where the landscape becomes more wooded at Upper and Lower Eweston farmsteads, views are more contained by undulating ground and high hedgerows and trees. As this landscape opens up and the ground falls away to the west these views become more prominent especially looking down across the Brandy Brook valley towards the coast.

3.13.2 Broad Landscape Character

The route options fall within three character areas identified by LANDMAP (Refer to Landscape Constraints Plan **Figure 3-13**), with a further four adjacent character areas which may experience impacts as a result of one or more of the route options. **Table 3-1** identifies the character areas that the route options fall within.

Table 3-1: LANDMAP: Visual & Sensory Landscape Aspect Areas

Aspect Area Code	Aspect Area Name	Route Option	Summary Description	Evaluation
PMBRKVS072	Druidston	3b, J, 7	The agricultural landscape overlies a gently undulating landform on the coastal hinterland of this area on the west coast of Pembrokeshire. The landscape contains small wooded valleys and some overgrown hedges and areas of scrub and has some small villages and farmsteads with tourism developments including caravan parks. The strong coastal association adds to sense of place.	High value in fair condition. The area of coastal farmland is enhanced by frequent views of adjacent cliffs and beaches and a strong coastal influence giving areas of rough grazing and coastal scrub
PMBRKVS112	St. Brawdy Airfield	7, 11	The area relates to the military landscape associated to the currently mothballed St Brawdy airfield and ancillary buildings lights and towers. Set within a wider attractive landscape it forms a distinct detractive landscape element.	Low value in fair condition. Incongruous mixture of buildings runways etc. in a rural landscape. Agricultural areas are of mixed use with some intensively managed and large sized fields.

				Hedgerows are over-neglected in some areas.
PMBRKVS031	Skyfog	7, 11	The landscape in this area is characterised by a gently rolling farmland traversed by network of hedges/hedgebanks bordered lanes with occasional small clumps of woodland and small scrub belts. Development is typically in the form of farmsteads and occasional hamlets scattered through the farmland landscape with larger settlements including the village of Roch.	Moderate value in fair condition. The agricultural landscape with small wooded copses and tree belts as well as some larger wooded areas are of local value. The area is of mixed condition. Agricultural areas are of mixed use with some intensively managed and large sized fields. Hedgerows are over-neglected in some areas.

These Visual and Sensory Landscape Character Areas from LANDMAP, form the baseline data for the Pembrokeshire Coast National Park Landscape Character Assessment Supplementary Planning Guidance (SPG) adopted in June 2011. As identified in the Executive Summary of this SPG document, further detailed descriptions of the main attributes of the landscape character are included under the topics of Visual and Sensory Landscape, Geological Landscape, Landscape Habitats and Historical and Cultural Landscape. Representative photographs have been taken. This assessment refers to the LANDMAP baseline data above for the current strategic stage of route option review.

In addition to the additional layer of character assessment undertaken for this SPG; the Study and the steering group managing it defined special qualities of the landscape, drawing upon information from visitors and residents' surveys undertaken during 2006 and from desk study and field assessment work carried out for the Study. These special qualities have then been used to guide the Local Development Plan and National Park Management Plan going forward.

The following special qualities have been identified as distinct topics:

- Coastal Splendour
- Diverse Geology
- Diversity of Landscape
- Distinctive Settlement Character
- Rich Archaeology
- Cultural Heritage
- Richness of Habitats and Biodiversity
- Islands
- Accessing the Park
- Space to Breathe
- Remoteness, Tranquillity and Wilderness
- Diversity and Combination of Special Qualities

It is noted and has been highlighted in our assessment that the panoramic views afforded to visitors in Newgale and our study area are frequent and panoramic, the 'Coastal Splendour' whilst not directly identified in our assessment relating to this SPG is present and has been an important consideration in our assessment and the work that is being undertaken in parallel to this assessment – the Coastal Adaptation Masterplan Strategy.

The diversity of the landscape and the interface between landscape and ecology has been recognised during the assessment process and the work being undertaken for the Coastal Adaptation Masterplan Strategy, with a recently commissioned Habitat Creation Study

undertaken by Royal Haskoning DHV. As ongoing design work continues and options are refined a more exacting understanding of impacts will continue to be assessed.

The special qualities of the landscape are all interrelated, as the strategic options are developed they will continue to be a focus of inter-related assessments moving forward.

3.13.3 Landscape Designations

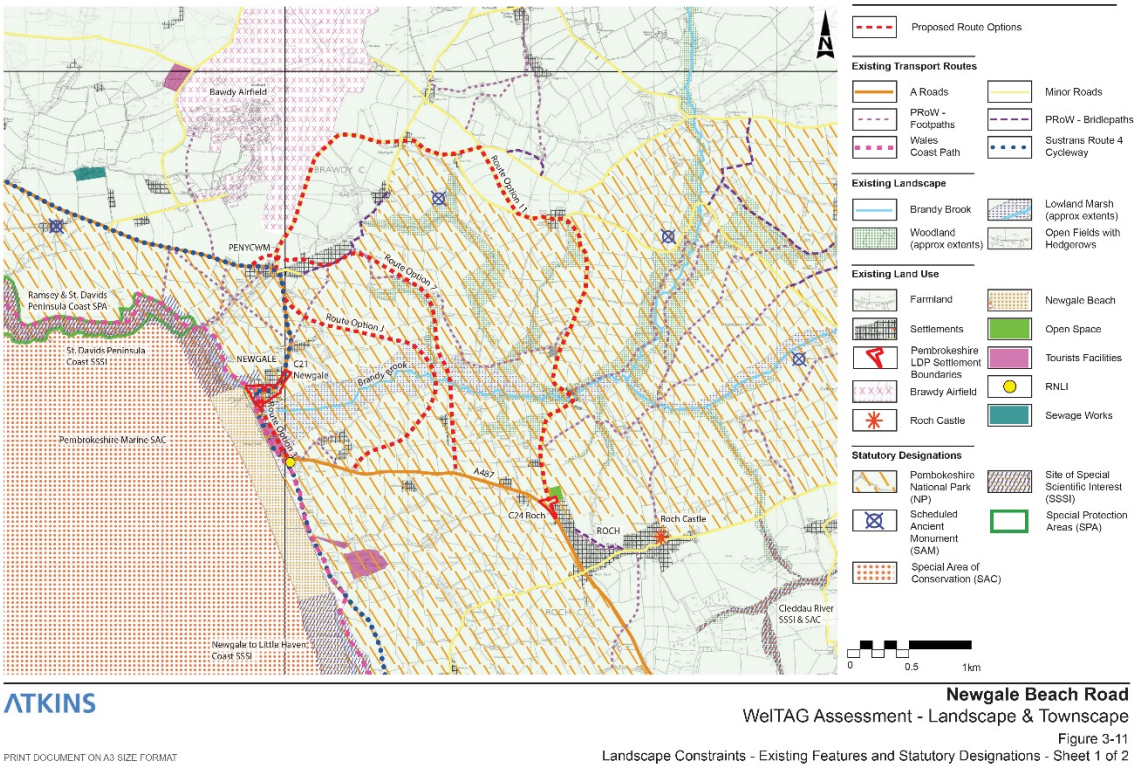
Landscape Designations include National Parks (NP), Areas of Outstanding Natural Beauty (AONB), Sites of Special Scientific Interest (SSSI and Special Areas of Conservation (SAC) together with other areas of conservation and recreational networks of local, regional, national or European importance. (Refer to Landscape Constraints Plan **Figure 3-11**). The study area including all route options falls within the following statutory landscape designations:

- Pembrokeshire Coast NP (all route options);
- Potential designated SSSI to Brandy Brook Valley / Newgale Marsh (options 3b, J & 7). NRW advise that Newgale Marsh meets the criteria for SSSI selection as set out in the published guidelines for the selection of biological SSSIs . The site has however not yet been designated as an SSSI. . Therefore for this assessment, it is assumed that the assemblage of habitats are of SSSI quality and they have been valued as of High importance; and
- National Cycle Route 4 (all route options).

Statutory designations within 2km of the route options are identified below:

- St David's Peninsula Coast SSSI; approximately 0.8km from Option 3b, J, 7 & 11;
- St David's/Ty Dewi SAC; approximately 0.8km from Option 3b, J, 7 & 11
- Newgale to Little Haven Coast SSSI; approximately 1km from Option 3b & J, 1.5km from option 7 & 2km Option 11;
- Western Cleddau River SSSI; approximately 2km from Option J & 7 and 1.5km from Option 11;
- Pembrokeshire Marine SAC; approximately 0.2km from Option 3b, J, 7 & 11;
- Cleddau Rivers SAC; approximately 2km from Option J & 7 and 1.5km from Option 11;
- Scheduled Ancient Monuments; approximately 2km from Option 3b, 1.5km from Option J, 0.5km from Option 7 and 0.25km from Option 11; and
- Wales Coast Path; approximately 0.2km from Option 3b, 0.7km from Option J, 7 & 11.

Figure 3-12**: Landscape Constraints – Existing Features and Statutory Designations**



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Newgale Beach Road
WelTAG Assessment - Landscape & Townscape
Figure 3-11
Landscape Constraints - Existing Features and Statutory Designations - Sheet 1 of 2

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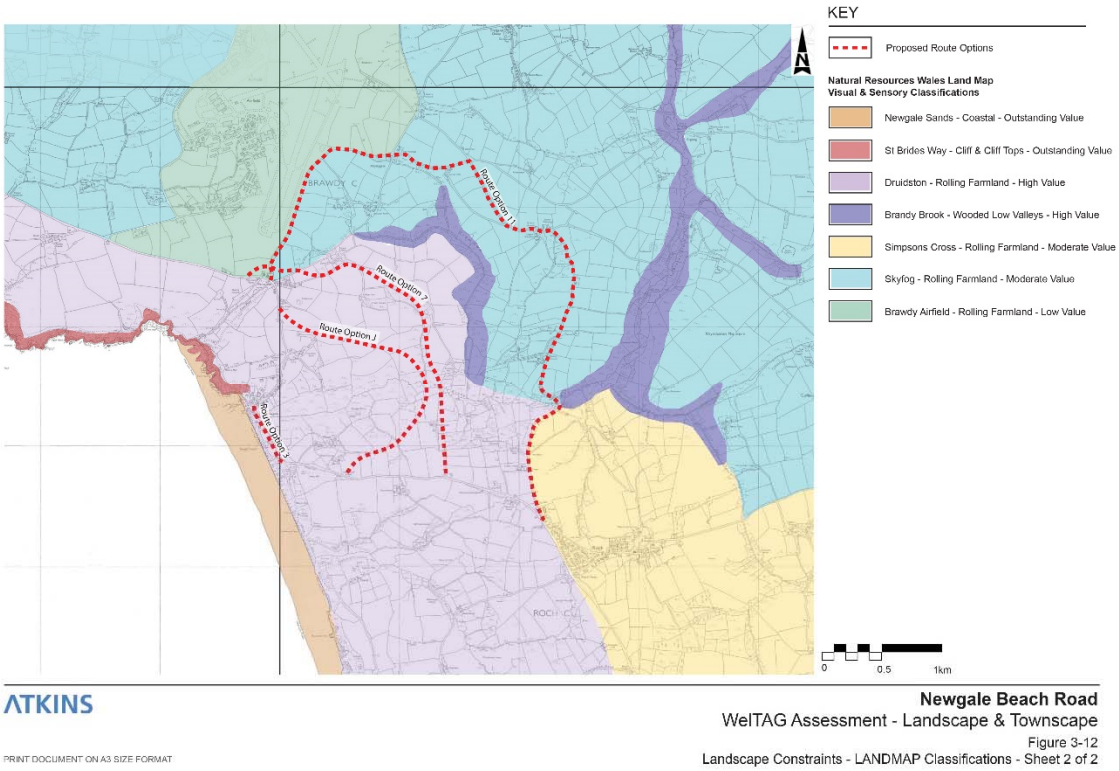
Figure 3-13: Landscape Constraints: LANDMAP Classifications



3.14 Biodiversity

The 'Richness of Habitats and Biodiversity' is acknowledged to be one of the special qualities of the Pembrokeshire National Park landscape. The Landscape Character Assessment of the National Park which was adopted as Supplementary Planning Guidance to the Local Development Plan in June 2011 states: 'The abundance of wildlife – and the ability to get close to it – is one of the great attractions of the National Park'.

3.14.1 Statutory Designated Sites

Information on statutory designated sites for biodiversity and earth heritage[3] located within 2 km of each of the Option study area (a linear search along the route with a 2 km buffer zone) was obtained from the Multi-Agency Geographical Information for the Countryside (MAGIC[4]) website in November 2016 and May 2017. In line with guidance from the Design Manual for Roads and Bridges, the search area was extended to 30 km for European designated sites with bats as a qualifying feature[5]. The search was also extended to include European designated sites where other pathways for impacts may occur, e.g. where hydrological links via waterways are present.

All Scheme options are wholly or partly within the Pembrokeshire Coast National Park. An overview of the statutory designated sites located within the search area is provided in **Table 3-2.**

[3] Including: Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR).
[4] www.magic.defra.gov.uk
[5] Highways Agency (2009). *HD44/09 - Design Manual for Roads and Bridges Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment)*.
*Site with hydrological connection to option.

Table 3-2: Overview of biodiversity and earth heritage statutory designated sites within the Option study areas

Road route options	Statutory designated site	Distance/direction from study area
Option 3b	Pembrokeshire Bat Sites and Bosherston Lakes/Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston, SAC	27km NE
	North Pembrokeshire Woodlands SAC	19km NE
	St David's/Ty Ddewi SAC	0.8km NW
	Pembrokeshire Marine/Sir Benfro Forol SAC	0.2km W
	Ramsey and St David's Peninsula Coast SPA	0.8km NW
	West Wales Marine cSAC	0.2km W
	St David's Peninsula Coast SSSI	0.07km NW
	Newgale to Little Haven Coast SSSI	1km S
	Pembrokeshire Coast National Park (NP)	Option wholly within NP
Option J	Pembrokeshire Bat Sites and Bosherston Lakes/Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston, SAC	25km NE
	North Pembrokeshire Woodlands SAC	17km NE
	St David's/ Ty Ddewi SAC	0.8km NW
	Pembrokeshire Marine/Sir Benfro Forol SAC	0.8km W
	West Wales Marine cSAC	1.2km W
	Ramsey and St David's Peninsula Coast SPA	0.6km NW
	St David's Peninsula Coast SSSI	0.6km SW
	Newgale to Little Haven Coast SSSI	1km S
	Pembrokeshire Coast National Park	Option wholly within NP
Option 7	Pembrokeshire Bat Sites and Bosherston Lakes/Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston, SAC	24 km NE
	North Pembrokeshire Woodlands SAC	17 km NE
	St David's/ Ty Ddewi SAC	0.6km SW
	Pembrokeshire Marine/Sir Benfro Forol SAC	0.7km W
	West Wales Marine cSAC	1.2km W
	Ramsey and St David's Peninsula SPA	0.8km SW
	St David's Peninsula Coast SSSI	0.6km SW
	Newgale to Little Haven Coast SSSI	1 km S
	Pembrokeshire Coast National Park	Option wholly within NP
Option 11	Pembrokeshire Bat Sites and Bosherston Lakes/Safleoedd Ystlum Sir Benfro a Llynnoedd Bosherston, SAC	20 km NE
	North Pembrokeshire Woodlands SAC	16km NE
	Cleddau Rivers SAC	1.5km SE
	Western Cleddau River SSSI	1.5km SE

	Ramsey and St David's Peninsula Coast SPA	0.7km SW
	St David's Peninsula Coast SSSI	0.7km SW
	St David's/Ty Ddewi SAC	0.7km SW
	Pembrokeshire Marine/Sir Benfro Forol SAC	0.8km SW
	West Wales Marine cSAC	0.8km SW
	Pembrokeshire Coast National Park	Option partly within NP

Newgale Marsh[6] meets the criteria for SSSI selection as set out in the published guidelines for the selection of biological SSSIs[7]. The site has however not yet been designated as an SSSI and it is understood this is unlikely to happen prior to the completion of this Scheme. The area includes a mosaic of wetland habitats including: fen, marshy grassland, semi-improved grassland, swamp, inundation grassland, base-rich flushes, tall-herb vegetation, sand-dune vegetation, and dry neutral and acid grassland. Options 7 & J pass through this site, whereas Options 3b and 11 pass around the margins. Historic survey data indicates the western part of the site (unaffected by any of the Scheme options) includes most of the higher value habitats[8].

3.14.2 Non-statutory Designated Sites

West Wales Biodiversity Information Centre (WWBIC) was contacted to obtain records of non-statutory designated sites[9] within 1 km of each option in November 2016. There were no records of any non-designated sites within the data provided by WWBIC.

3.14.3 Habitats

Ordnance Survey map data and aerial imagery of the study areas was investigated in order to identify the broad habitat types present within the footprint of each option and to enable an initial assessment of potential impacts to habitats. Phase 1 habitat mapping of the area was obtained from Lle[10], and Phase 2 botanical survey information for Newgale Marsh was received from NRW. No site visit has been undertaken by an ecologist to inform this work.

The study area is located in coastal West Wales near Newgale, Pembrokeshire. All options are situated around a valley containing the Brandy Brook. An area of floodplain marsh known as Newgale Marsh is present at the valley bottom and contains a mosaic of habitats (described above). This is surrounded by more elevated land consisting of undulating agricultural habitats typically comprising small, hedgerow bordered improved grassland fields (some marshy), patches of broadleaved and mixed woodlands (including ancient woodland) and scrub. A summary of the habitat features potentially affected by each option is provided in **Table 3-3.**

[6] The area of floodplain extending east from Newgale to Roch Bridge.
[7] NRW (no date). *Newgale Marsh: Managing a coastal valley wetland in the face of sea level rise*
[8] CCW (2003). Wales Lowland Grassland Survey: Newgale Marsh.
[9] e.g. Locally designated Sites of Importance for Nature Conservation (SINC).
[10] Lle.gov.wales

Table 3-3: Summary of habitats affected by each option (all values are approximate). Habitats of negligible ecological value (e.g improved grassland) have been omitted.

Option	Identified from OS mapping/aerial photography				Identified from Phase 1 mapping					
	Waterbodies within 500 m	Watercourse crossings	Lengths of Hedgerow affected (m)	Number of woodlands potentially affected by option	Swamp (ha)	Marshy grassland (ha)	Tall herb and fern (ha)	Neutral semi-improved grassland (ha)	Scrub (ha)	Bracken (ha)
Option 3b	1	1	81	0	0.6	-	-	-	-	-
Option 7	4	2	318	10	-	1.1	0.3	5.9	6.2	1.7
Option J	5	3	1100	8	0.8	1.6	-	-	5.8	0.2
Option 11	0	1	6200	4	-	-	-	-	-	-

Heart Covert, an area of ancient woodland on the Ancient Woodland Inventory lies adjacent to Option 7 and, depending on the method of construction, may be affected by the Scheme. However, it would be the intention to avoid any impacts to this habitat through minor realignment and protection of habitat during construction, where necessary. No other woodlands within the footprint of the Options are included on the ancient woodland inventory.

3.14.4 Species

WWBIC was contacted to obtain records of notable species[11] within the study area, incorporating all options and a further 1 km buffer around the area (extended to 5 km for bat records) in November 2016. Information was also provided by NRW. Partly as a result of the degree of geographical overlap between the different options, the same protected species have been recorded within the search area. **Table 3-4** below states the number of species records in each Taxon group split into total and protected species within that total:

Table 3-4: Notable/legally protected species records within study area

Taxon group	Total number of records of notable/legally protected species	Detail
Birds	1832/177	Records of 39 bird species were received. An assessment of habitat requirements would

[11] Notable species are taken as principal species for the conservation of biodiversity listed under Section 42 of the Natural Environment and Rural Communities Act 2006; any species listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended); any species listed under Annex II or Annex IV of the Habitats Directive (1992); any species listed in an IUCN Red Data Book.
As all wild birds are protected under the Wildlife and Countryside Act 1981 (as amended), only specially protected bird species listed on Schedule 1 of the Act have were included in the protected species search. Other notable bird species are covered in Section 3.4.5.

		indicate the following are thought to possibly breed within the study area: bullfinch, dunnock, song thrush, starling, skylark, bittern, Cetti's warbler, chough, curlew, Dartford warbler, grasshopper warbler, house sparrow, lapwing, linnet, marsh tit, quail, reed bunting, spotted flycatcher, tree pipet, willow tit, stonechat, green woodpecker, water rail, and yellowhammer. Other species records relate to overwintering species, or birds on passage. Although birds are likely to nest across the study area, the highest concentrations of notable species are likely to be within the assemblage of wetland habitats within the floodplain marsh.
Amphibians	4/4	Records of palmate newt and common frog were received. These species are likely to be associated with the ponds and other wetlands, although they are likely to be present across terrestrial habitats within the study area. It is understood that there are no known populations of great crested newt in Pembrokeshire.
Invertebrates	118/0	The majority of records relate to moths, including white ermine, cinnabar, and small square-spot. Three species of butterfly were recorded: small heath, grayling, and wall brown. The north of the study area supports a population of the nationally scarce hornet robberfly.
Bats	28/28 (incl. Greater & Lesser Horseshoe bats)	Records of eight species of bat have been received: greater horseshoe bat, lesser horseshoe bat, whiskered bat, common pipistrelle, soprano pipistrelle, brown long-eared bat, Natterer's bat, and Noctule. Pembrokeshire and the local area are known to be of importance for bats, and bats are qualifying species of SACs within the study area. Wetland habitats within the floodplain marsh are likely to provide optimum foraging habitats for many species of bat. Areas of woodland, scrub and hedgerow will provide foraging habitat, as well as providing habitat connectivity to the wider landscape. Greater and lesser horseshoe bats found in the vicinity of all options could indicate connectivity with the Pembrokeshire Bat and Bosherton Lakes SACs.
Terrestrial mammals (not incl. bats)	63/19	Records of otter and badger were received. Otter will utilise the Brandy Brook and wetland habitats for foraging, and the scrub and woodland habitats are likely to provide suitable breeding sites and connectivity.

		Badger are likely to be widespread and may utilise all the habitats within the study area.
Reptiles	9/9	Records for slow worm adder and grass snake have been received. These species could be present in most habitats across the study area.

Other protected species for which there are no existing WWBIC records but which could be present in the habitats identified in the study area and could potentially pose a constraint to development if present include:

- Dormouse;
- Water vole;
- Common lizard, and;
- Great crested newt (although very unlikely as no previous records in Pembrokeshire).

3.15 Soils

The only published soil map of Newgale is the 1;250,000 scale National Soil Map, Sheet 4, Wales (Soil Survey of England and Wales, 1983)[12] and the accompanying book, 'Soils and Their use in Wales' (Soil Survey of England and Wales 1984)[13]. This map shows three soil associations in the study area.

On the floodplain of the Brandy Brook there are waterlogged alluvial silty clay soils of the Conway association.

Most of the land has the Neath association of well drained, loamy soils over the country rock of interbedded sandstone, siltstones and mudstones.

West of the road north of Roch Bridge, between Bramble and Upper Ewiston, there is the Brickfield association of slowly permeable, medium and heavy clay loams in glacial drift (mainly Till). These soils are generally wet for long periods from early autumn through to early summer, but drier soils occur on raised ground where the drift is thinner.

A study of aerial imagery found additional areas of Brickfield soils, identified by the uneven tone of the grassy vegetation, on the lower slopes of the southern valley side of the Bramble Brook.

There are disused colliery workings to the west of Roch Bridge and extending close to Option 7.

3.15.1 Agricultural Land Classification

The MAFF 1:250,000 Provisional ALC Map of Wales[14] shows the study area as being a mixture of Grade 3 (land with moderate limitation to agriculture) and Grade 4 (land with severe limitations). However, this map does not subdivide Grade 3 into 3a and 3b.

The 1988 Revision of the ALC system[15] classifies land into six grades, Grade 3 being additionally subdivided into Subgrades 3a and 3b. Best and most versatile (BMV) land is defined as Grades 1, 2 and Subgrade 3a.

Available information on soils, climate and topography allows a preliminary assessment to be made of the land quality in the study area, according to the 1988 revised ALC system.

[12] Soil Survey of England and Wales (1983). Soils of England and Wales, Sheet 2, Wales. Harpenden.
[13] Soil Survey of England and Wales (1984). Soils and their Use in Wales. Harpenden.
[14] Ministry of Agriculture, Fisheries and Food. Agricultural Land Classification. Wales. 1:250,000. 1982.
[15] Agricultural Land Classification of England and Wales. Revised Guidelines and Criteria for Grading the Quality of Agricultural Land. MAFF, 1988.

Climate, in combination with soil type and gradient is the main determinant of land quality in the Newgale area. Climatic data in Soils and their Use in Wales shows that average annual rainfall is around 1100mm, and the number of Field Capacity Days (FCDs), when the soils are fully charged with water is around 225.

Neath soils, being well drained, are in Wetness Class I and are in Subgrade 3a (i.e. BMV) where gradients are 7 degrees or less (1 in 8). Where gradients exceed 7 degrees the land is in 3b or 4 (non BMV).

Most Brickfield soils are in Wetness Class IV (waterlogged for long periods) which means that in this climate they cannot be better than Grade 4. This supports the grading on the earlier MAFF Provisional ALC Map. Patches of better drained soils on raised ground (Wetness Class II – III) are in Subgrade 3b.

The floodplain of the Bramble Brook is in Grade 5 because of continuous waterlogging.

The plan drawing in **Appendix D** shows the occurrence of non-BMV land along each route option, based on this preliminary assessment of the ALC. Landtake and loss of BMV land is summarised in **Table 3.5.** Option 3b is non-agricultural

As a proportion of length of the routes, BMV land is estimated to comprise around 55% of Option J and Option 7 and 69% of Option 11.

Table 3-5: Total Landtake and Loss of BMV Land

Option	Total landtake ha	Loss of BMV land ha	BMV land as %
3	0.73	n/a	n/a
J	9.3	5	55
7	11.1	6	55
11	16.6	11	69

3.16 Contamination

A review of freely available historical and statutory information has identified potential contamination sources in the study areas. The study areas for the purposes of this assessment comprise a 500m zone either side of each route alignments. Sources of information include freely available online historical maps, current online OS maps, online aerial photography, the airfields of Britain Conservation Trust (ABCT) database[16] and details of permitted waste sites from Natural Resources Wales' (NRW) online data viewer[17].

A summary of the principal potentially contaminative land uses within the study area is provided below and their locations and extents are shown on **Figure I.1** in **Appendix I**:

- Potentially infilled coal pits, sand pits and quarries with fill material of unknown provenance which is a potential source of contaminated leachate and ground gas;
- Former RAF Brawdy comprising a disused airfield (operational between 1944 and 1996) and now an army barracks. Activities which may have taken place include bulk storage and use of chemicals and fuels, engineering and maintenance of aircraft and other infrastructure, storage and use of ammunition and/or explosives, and burial or burning of waste materials, redundant aircraft and aircraft parts. As such, a wide range of potential

[16] http://abct.org.uk/airfields/airfield-finder/brawdy/ (accessed December 2016)
[17] https://naturalresources.wales/our-evidence-and-reports/maps/find-details-of-permitted-waste-sites-in-wales-1/?lang=en (accessed December 2016)

contaminants may be present in this area in soil, groundwater and as vapours. Unexploded Ordnance (UXO), radioactive materials and asbestos may also be present;
- Numerous farms in the study areas which may store and use fuels and oils and pesticides and herbicides which can lead to build up of persistent organic pollutants;
- Former Southwood Colliery (including infrastructure such as railway lines and engine sheds) and Made Ground derived from colliery spoil heaps which are potential sources of metals, petroleum hydrocarbons and polycyclic aromatic hydrocarbons;
- Former sewage works which are potential sources of metals and other inorganics, acids and alkalis, a range of organic compounds and micro-organisms in soil and groundwater as well as gases such as methane, carbon dioxide and hydrogen sulphide;
- Former petrol filling station which is a potential source of petroleum hydrocarbons if leakages and spillages have occurred during operation and/or decommissioning;
- Existing highway infrastructure which is a potential source of a range of organic and inorganic contaminants in Made Ground used in carriageway construction and associated with surface run off.

3.17 Cultural Heritage

The National Park landscape surrounding the current A487 at Newgale largely comprises of agricultural fields with small areas of woodland at Penycwm, Roch Bridge and Llethr, and a settlement pattern of small villages and farmsteads linked by rural roads. Newgale and Penycwm are the largest settlements in the wider study area. The proposed options largely run through pastoral agricultural land. The undulating landscape gradually slopes down towards Brandy Brook and its valley until reaching the low lying flat area at Newgale Sands. The study area largely comprises of Alluvium deposits local to Brandy Brook with some localised pockets of Glacial Sand and Gravel (see Section 3.10).

Appendix C provides a list of heritage assets present within the study area.

3.18 Water Quality

Baseline conditions in respect of the quality of surface water and groundwater can be found in the Preliminary Water Framework Directive (WFD) assessment in **Appendix E.**

3.19 Flood risk

The 1% (1 in 100 year) floodplain of the Brandy Brook is likely to be crossed by the scheme leading to fluvial flood risk. This asset is considered to be of High Value. The route is also shown to cross a number of surface water floodplain areas associated with smaller watercourses and ditches. These assets are listed in **Table 3-6**.

Table 3-6: Water features adjacent to the scheme

Water Feature description	Location
Brandy Brook	Upstream: SM 87339, 22357 Downstream: SM 84768, 22284
Pond and un-named watercourse/ditch approximately 250m north east of Wood	SM 85761, 22207
Small Pond and un-named watercourse/ditch approximately 300m south of Penycwm	SM 85293, 22908
Two ponds with small un-named watercourses/ditches approximately 350m west of Bramble	SM 86547, 22669

Watercourse from Rhydygele to the Brandy Brook	Upstream: SM 85741, 24405 Downstream: SM 86403 ,22428
Pond 350m north west of Bramble	SM 86696, 23003

3.20 Pedestrians, Cyclists, Equestrians and Community Effects

'Accessing the Park' is recognised as one of the 'Special Qualities of the National Park Landscape'. The landscape is easily accessed by visitors and residents due to the Pembrokeshire Coast Path National Trail, stretching along some of the most spectacular coastal scenery in Britain, but also over 500 miles (800kms) of public rights of way which pass through the Park.

Traversing through the study area is The Pembrokeshire Coast Path . It is a 186 mile route along the coast of Pembrokeshire from St Dogmaels to Amroth. The route follows Welsh Road (C3082) and the A487 (Wood Hill) before continuing along the coast.

The National Cycle Network (NCN) Route 4, a long distance route between London and Fishguard, via Reading, Bath, Bristol, Newport, Swansea, Carmarthen, Tenby, Haverfordwest and St David's also passes through the study area. The route is designated along Welsh Road (C3082) and the A487 (Wood Hill) through to west of Penycwm junction. This section of NCN Route 4 in Wales is part of the Celtic Trail.

There are a number of PRoWs and bridleways within the study area predominantly crossing open fields; including PRoWs PP5 1/1, PP5 37/1, PP5 36/1, PP5 42/2, PP80 32/1, PP80 32/2, PP80 31/1, PP80 20/1, PP5 2/2 and bridleway PP5 2/2. There are few roads within the village of Newgale, of which very few have footpaths.

The public rights of way and the cycle route identified above make a key contribution to fulfilling one of the statutory purposes of the National Park which is to promote opportunities for the public to understand and enjoy the special qualities of the park.

The nearest hospital with an A&E department is Withybush General Hospital in Haverfordwest, which is accessed by the A487 from Newgale. There is a surgery (St. David's Surgery) in St. David's and a doctor's surgery in Solva, however Withybush Hospital is also the nearest hospital to St. David's and Solva.

Pembrokeshire College has a campus at Haverfordwest, which is accessed by the A487 from Newgale. Ysgol Dewi Sant (St. David's School) is the closest secondary school to Newgale.

St. David's is the closest city to Newgale, albeit a Cathedral City, offering limited shopping and leisure facilities. Haverfordwest offers more substantial shopping and leisure facilities for the settlements of Newgale, St. David's and Solva.

4 Preliminary Engineering Design of Route Options

4.1 Introduction

Eight route options were identified in the Planning Stage Newgale WelTAG Study, February 2016, as possible solutions. These were then subject to further development and a sifting process to identify the options most likely to achieve the TPOs.

Four route options were brought forward into this WelTAG Stage 1 Appraisal. A brief description of each of these is given below with their routes shown on Drawing No. 20160152-XX-ZZ-ATK-DR-D-2000/P2 in **Appendix A.1**.

In the case of all options the following assumptions have been made:

- The road needs to be designed for 120 years in order to provide a sustainable and value for money solution;
- The Pembrokeshire Coastal Path and National Cycle Route 4 would be retained although would be set back outside of the active zone of coastal retreat ;
- Access to Welsh Road from the north would be maintained;
- That it is practical to maintain the existing beach road until 2036;
- The toilets, campsite, Newsurf and Duke of Edinburgh pub businesses on the seafront would be anticipated to last until 2036 but after that point they would be expected to decline over time.

4.1.1 Option 3b

Option 3b is a development of the Planning Stage Inner Route Corridor – 3b alignment behind the Duke of Edinburgh public house. This option would be approximately 520m in length. It would be carried across the flood plain of the Brandy Brook on a long viaduct. At its southern end, this route would tie in to the existing A487 approximately 50m south east of the existing junction with the C3082 towards Nolton Haven. To the north, the route would tie in with the existing A487 approximately 50m north east of the existing bridge over Brandy Brook.

4.1.2 Option J

Option J is a development and hybrid of the Planning Stage Middle Route Corridor options 4, 5 and 6. This option would be approximately 2.5km in length. At its southern end, it would tie in to the existing A487 to the south of Wood Farm. It would then head in a north easterly direction before turning to north, passing to the east of the property Pontpren, and crossing the Brandy Brook. It would then turn toward the north-west, passing to the north of Newgale Farm, before turning to the north and tying in with the existing A487 at Bay View Farm.

4.1.3 Option 7

Option 7 is a development of the Planning Stage Middle Route Corridor option 7. This option would be approximately 3.25km in length. At its southern end, it would tie in to the existing A487 at the existing junction with the access track to Pontpren and Gouts. It would then head in a northerly direction along the line of the access track before crossing the Brandy Brook following the line of a small stream valley. It would then turn to the north-west toward Lower Llethr and turning to the west to follow the line of Erw Lon towards Penycwm. Before reaching the properties on Erw Lon, it would divert and pass to the north of Penycwm, before tying in to the existing A487 approximately 60m to the west of the settlement.

4.1.4 Option 11

Option 11 is a development of the Planning Stage Outer Route Corridor Option 11. This option would be approximately 6.2km in length. It would follow and widen the existing diversion route of the C3062-C3063-C3010. At the south it would tie in to the existing A487 at the existing junction with the C3062 at Roch. It would cross Brandy Brook at Roch Bridge, and continue via Bramble Hill, Eweston, Silver Hill, Rhydygele to Penycwm where it reaches the existing junction with the A487.

4.2 Engineering Standards

The four route options were developed in accordance with the standards in TD 9/93 Highway Link Design. Taking into account the existing speed limits and the sensitivity of the landscape within the Pembrokeshire Coast National Park, a design speed of 70kph for a rural all-purpose single carriageways has generally been used, which correlates to a speed limit of 40mph (64kph). The National Speed Limit may be used on the proposed route alignments providing a number of Departures from Standard from a 100kph design speed are agreed. A 60kph design speed, which correlates to a 30mph (48Kph) speed limit, has been used where the options tie into existing 30mph zones.

The key design parameters for horizontal and vertical alignments in accordance with TD 9/93 Section 1 are as follows:

Table 4-1: Design Parameters

Design Speed	70Kph	60Kph
Desirable minimum horizontal radius	360m	255m
Desirable minimum crest K value	30	17
One step below desirable minimum crest K value	17	10
Absolute minimum sag K value	20	13
Desirable maximum gradient	6%	6%
Desirable minimum stopping sight distance	120m	90m
Full overtaking sight distance FOSD	410m	345m

4.3 Highway Cross Section

The recommended opening year economic traffic flow ranges for new rural roads are given in Table 2.1 of TA 46/97 Traffic Flow Ranges for Use in the Assessment of New Rural Roads. For a single (S2) and wide single (WS2) carriageway road, the recommended opening year flows are given in **Table 4.2**

Table 4-2: Recommended Opening Year Economic Flow Ranges

Carriageway Standard	Opening Year AADT	
	Minimum	Maximum
S2	Up to 13,000	
WS2	6,000	21,000

The opening year AADT flows (shown at Table 6-1) for each route option are below 6,000 and thus an S2 carriageway standard has been applied to the preliminary designs for each option.

Although the routes might benefit from climbing lanes on steep uphill sections, to remain consistent with the locations at which the options tie in with existing carriageways an S2 standard has been applied across all the route options. This provides consistency across all the route options and should be reviewed in later assessment stages.

The cross sections of the route options would be in accordance with Welsh Assembly Government design Standard TD 27/05 – Cross-Sections and Headrooms. This would consist of 2 x 3.65m lanes (7.3m total width), with 1m hardstrips and 2.5m verges.

4.4 Option 3b - Preliminary Engineering Design

Alignment

The conceptual general arrangement and horizontal and vertical alignments of this option are shown on Drawing No. 20160152-XX-ZZ-ATK-DR-D-2001/P1.1 in **Appendix A.2.**

The horizontal alignment generally replicates the existing alignment of the A487 where it travels alongside the beach, except that it has been shifted approximately 60m in land. Horizontal curves at the tie-ins either end are 92m and 90m radii. They are substantially below the desirable minimum for the 70kph design speed in this area, but are greater than the existing radii and are necessary to allow the intention of this route to be achieved.

Vertically, the road is on a very slight gradient, with a sag curve with k=26 at the northern end to tie in with the rising A487. The level of the road would be between 7m and 7.7m as it crosses the Brandy Brook flood plain, is approximately 3 metres higher than the existing ground level.

Junctions

A priority junction would be required at its southern end to retain access to C3082 and to the existing A487 for access to the Duke of Edinburgh and neighbouring property.

Major structures

Most of this route would be carried on a viaduct approximately 400m long above the Brandy Brook flood plain. The height of the road surface is generally 3m above the existing ground (the same elevation as the current shingle bank). Handrailing would normally extend 1.2-1.5m above the level of the road. The elevated structure would consist of a bridge deck structure set below the proposed road, but the design of the structural elements cannot be confirmed at this outline design stage. Although the viaduct is in an exposed location, wind barriers would not be utilised as they are only used exceptionally in the UK on major long span bridge crossings to protect the bridge itself or high sided vehicles from the effects of exceptional wind turbulence, generated by the unique wind effect / dynamic forces generated by long span bridges.

Earthworks

Embankments approximately 2 to 2.5 metres high and 50m long would be required at either end of the viaduct to tie in with the existing A487.

Advantages

The advantages of this option would be:

- It would be the shortest route.
- It would replicate the existing route corridor.
- It maximises the use of the existing A487.
- It is set far enough in land to not be affected by wave overtopping.
- The new road is above the flood level and would remain open at all times.

Disadvantages

The disadvantages of this option would be:

- It would require a major structure to carry the road above the Brandy Brook flood plain.
- It would require the demolition of the commercial/residential properties at the northern end of the route.
- It would be located through the popular Newgale Camping Site.
- The elevated viaduct would not be afforded wind protection from the shingle bank.

4.5 Option J - Preliminary Engineering Design

Alignment

The conceptual general arrangement and horizontal and vertical alignments of this option are shown on the Drawing No. 20160152-XX-ZZ-ATK-DR-D-2004/P1.6 in **Appendix A.3.**

The horizontal alignment contains radii of 360m and 510m which comply with the Desirable Minimum for the 70kph design speed.

The vertical alignment is made up of crest curves with k values of 50 and 175 and a sag curve with k=20, which all comply with the Desirable Minimum for the 70kph design speed. It also contains gradients of 5.2% and 8.6%. The 8.6% is greater than the desirable maximum of 6%, but TD9/93 acknowledges that “in hilly terrain steeper gradients will frequently be required, particularly where traffic volumes are at the lower end of the scale”.

Junctions

A roundabout would be required at the southern tie in with the existing A487 because of the sharp change of direction traffic would need to negotiate. The visibility to this junction from all arms would need to be carefully considered if this option is taken further, with the possibility that the existing A487 might need to be realigned slightly, speed limits put in place (currently National Speed Limit in this location) and land purchased for advanced signing on its approaches. It is also likely that this junction would need street lighting to ensure it is visible to drivers at night.

A priority junction would probably be required at the northern tie in, to allow access to the existing section of the A487 north of Newgale.

Major structures

A culvert would be required to carry the Brandy Brook under the road.

Earthworks

The route would negotiate the side slopes of the Brandy Brook valley, requiring a mixture of cuttings and embankments, in some locations on sidelong ground. Embankments would be up 8-9m high and up to 1km long. Cuttings would be up to 14.5m deep and up to 1km long.

Advantages

The advantages of this option would be:

- It is the shortest of the routes that wouldn’t require a viaduct
- It would retain the view of Newgale beach from the viewpoint at Wood
- It would not require the demolition of any properties, although it might affect the grounds of Southwood Lodge

Disadvantages

The disadvantages of this option would be:

- It would require a change in direction of approximately 140 degrees for through traffic at the southern tie in, which would give the appearance of an unnatural/disjointed route

- A roundabout would be required to facilitate this movement, but this type of junction would not be in keeping with its surroundings. Lighting and large signs would be required on the approaches to the roundabout
- The roundabout would be located on the top of inclines from both the new route and from the existing A487 western approach, which is not a preferred siting, as it is difficult for drivers to appreciate the layout when approaching uphill

4.6 Option 7 – Preliminary Engineering Design

Alignment

The conceptual general arrangement and horizontal and vertical alignments of this option are shown on Drawing No. 20160152-XX-ZZ-ATK-DR-D-2002/P1.1 in **Appendix A.4.**

The horizontal alignment contains radii between 200m to 360m, which would be up to 2 steps below Desirable Minimum radii. In certain circumstances, this can be an allowable relaxation. However, at the northern end, there are a number of relaxations in horizontal curvature (and therefore corresponding less than standard stopping site distance) in the vicinity of the junctions with the C3010 and the existing A487. Relaxations in stopping site distances on the immediate approaches to junction are not permitted, therefore it is likely that departures from standards would occur in this location.

The straight alignment on the approach to the southern tie in with the existing A487 would create a sharp bend at the tie in point. It is likely that this alignment would need to be developed in future stages to smooth out this sharp bend and create a more acceptable tie in.

The vertical alignment is made up of crest curves with minimum k values of 30 and a sag curve with k=20, which complies with the Desirable Minimum for the 70kph design speed. It also contains gradients of 10% over length of up to 650m. The 10% is greater than the desirable maximum of 6%. Although TD9/93 acknowledges that “in hilly terrain steeper gradients will frequently be required, particularly where traffic volumes are at the lower end of the scale”, on a single carriageway with no overtaking sections or climbing lanes, a gradient this steep could lead to delay and driver frustration.

Junctions

A priority junction would probably be required at the northern end, to allow access to the existing section of the A487 at Penycwm. A priority junction would also be required for the C3010 at Penycwm. There are also a number of lanes and tracks that would require approximately 6 accesses onto the road.

If the alignment remains as shown at the southern tie in, a roundabout would probably be required to facilitate the almost 90 degree change in direction on the A487. However, if the angle of the tie in is subsequently smoothed out with a suitable curve, a priority junction with the existing A487 would probably be sufficient.

Major structures

A culvert would be required to carry the Brandy Brook under the road.

Earthworks

The route would negotiate the side slopes of the Brandy Brook valley, requiring a mixture of cuttings and embankments, in some locations on sidelong ground. Embankments would be up 23m high and up to 500m long. Cuttings would be up to 14m deep and up to 1km long.

Advantages

The advantages of this option would be:

- It is the most direct of the routes linking the A487 between Roch in the south and Penycwm in the north
- It would not require the demolition of any properties

Disadvantages

The disadvantages of this option would be:

- It would contain a number of departures from standards, especially on the approaches to junctions at Penycwm
- It contains gradients of 10% over distances of up to 650m which on a single carriageway with no overtaking sections or climbing lanes could lead to delay and driver frustration.
- It would require a change in direction of approximately 90 degrees for through traffic at the southern tie in, which would require either a roundabout, or a larger radius curve to be developed during later stages
- A roundabout would not be in keeping with its surroundings. Lighting and large signs would be required on the approaches to the roundabout
- A roundabout would be located on the top of a steep incline from the new route, which is not a preferred siting, as it is difficult for drivers to appreciate the layout when approaching uphill

4.7 Option 11 – Preliminary Engineering Design

Alignment

The conceptual general arrangement and horizontal and vertical alignments of this option are shown on Drawing No. 20160152-XX-ZZ-ATK-DR-D-2003/P1.1 in **Appendix A.5.**

The concept of this route is to follow and upgrade the existing diversion route along the C3062, C3063 and C3010 to an S2 single carriageway cross section.

In order to follow the existing roads, the horizontal alignment would contain numerous locations where the radii would be significantly below Desirable Minimum – radii of 200m, 100m and even down to 40 and 50m, which would be more than 5 steps below Desirable Minimum. Multiple departures from standards would therefore be required. In order to overcome this and provide radii that would be allowable relaxations, the route would probably need to deviate from the existing roads in many locations over potentially significant lengths, but especially at Roch Bridge and Eweston.

The vertical alignment is made up of crest curves with minimum k values of 55 and a sag curves with k=20, which comply with the Desirable Minimum for the 70kph design speed. It also contains gradients generally below 6%, except towards the southern end where it reaches 9% on the approach to the tie in with the existing A487. The 9% is greater than the desirable maximum of 6%. Although TD9/93 acknowledges that “in hilly terrain steeper gradients will frequently be required, particularly where traffic volumes are at the lower end of the scale”, on a single carriageway with no overtaking sections or climbing lanes, a gradient this steep could lead to delay and driver frustration.

Junctions

Priority junctions would probably be required at the southern and northern tie-ins to allow access to the existing section of the A487 at Roch and Penycwm. Priority junctions would also be required to link the existing road network at Eweston, Silver Hill and Rhydygele. There are also numerous lanes, tracks and accesses that would require connection onto the road.

Major structures

A bridge would be required to carry the road over Brandy Brook, replacing the single track Roch Bridge.

Earthworks

Since the vertical alignment of the existing road is so variable, imposing standard k values onto it would mean that the levels would differ in many locations. This would lead to a mixture of small cuttings and embankments up to approximately 5m deep/high along the route. However, to achieve an acceptable sag curve at Roch Bridge, the road would be approximately 12m higher than existing ground, requiring embankments of this height on the approaches to the new high level bridge.

Advantages

The advantages of this option would be:

- It would mostly follow the line of existing roads
- Cuttings and embankments would generally be less extensive than on other routes

Disadvantages

The disadvantages of this option would be:

- The horizontal alignment would be significantly sub-standard in numerous locations and unlikely to be acceptable without significant deviations from the existing roads in many locations.
- It is the longest route of all the options.
- A new bridge would be required approximately 12m high at Roch Bridge
- The existing vertical alignment cannot be replicated with standard vertical curves, meaning that the road level would need to be raised or lowered along virtually the whole length.

4.8 Drainage

The design of surface and subsurface drainage has not been considered in this assessment.

The drainage proposals would normally consist of a combination of carrier drains, filter drains and combined carrier/filter drains. Toe ditches would be provided at the bottom of embankments and interceptor ditches at the top of the cutting slopes on the uphill sides. Sustainable urban drainage systems (SUDS) could be utilised wherever possible.

Highways Standards require that drainage systems provide a degree of control over the risk of pollution of the receiving watercourse or flooding elsewhere in the catchment. HD45/09 (DMRB) requires that discharges from roads must not lead to a deterioration in the classification status of the receiving waters under the Water Framework Directive (WFD) 2000/60/EC. HD 45/09 also requires that roads remain safe and operational in times of flood, result in no net loss of floodplain storage, do not impede water flows or increase flood risk elsewhere.

Systems for the control of flooding or pollution are detailed in HA 33/06 (DMRB):

Spillage control: Oil Separators, Lined Ditches, Penstocks, Baffles, Kerbs and Gullies, Surface Water Channels, Filter Drains;
• **Other pollution control**: Filter Drains, Unlined Ditches, Oil Separators, Sediment Traps;
• **Flow control**: Filter Drains, Carrier drains (oversize), Ditches, Combined Kerb and Drainage, Permeable Pavements;
• **Vegetated systems**: Ponds, Infiltration basins, Wetlands, Grassed channels, Swales, oil interceptors or pollution traps to be incorporated at high risk areas such as the roundabouts.

Some minor watercourse and field ditches would be culverted under the road with some adjustments and rationalising of their layout. Locations of the outfalls for the highway drainage

runoff will be generally at the low spots of the alignment and coincide with a nearby watercourse. It is likely that the highway drainage run off would require attenuation and/or treatment in the form of storage ponds at each of the outfall locations. These storage ponds would be required to be designed in consultation with NRW to determine the restrictions on outflows.

A permit to discharge water or effluent may be required from Natural Resources Wales as part of the new road construction.

4.9 Road Lighting

There is existing road lighting on the A487 at Roch, Newgale and Penycwm.

PCC acknowledges the environmental concerns over light pollution and light spill particularly in the National Park context. Therefore PCC is committed to considering either a Departure from Standard TD 16/07 to avoid the need for lighting at junctions and roundabouts, or using best practice measures such as low level bollard lighting that have been used across other highway networks in sensitive environmental locations. This methodology will be adopted as one of the parameters to be considered with the wider road safety and engineering requirements at detail design stage.

4.10 Road Restraint System

A detailed Road Restraint Risk Assessment Process (RRRAP) has not been undertaken as part of the preliminary design. Road Restraint systems would be required to be provided in the verges, on the approaches to, across, and beyond structures, signs, embankments and for any other hazards considered to need protection as determined by the RRRAP.

4.11 Statutory Undertakers

All options would be likely to affect British Telecom underground apparatus at the tie in points to the existing A487. Option 11 would affect their overhead lines which run alongside the existing C3062-C3063-C3010 route.

Options J, 7 and 11 would be likely to affect Dwr Cymru Welsh Water's underground mains at the tie in points to the existing A487. Option 7 and Option 11 could also affect the existing water main which runs to the north of Penycwm.

Options J, 7 and 11 could affect Western Power Distribution's high voltage overhead (11kV) at various points where they cross along the routes. Option 11 might also affect the 33kV overhead line.

All options, but especially Options 7 and 11 might affect services to the Cawdor Barracks Army Base which do not show up on the searches.

4.12 Burial Records

A search for cemeteries and graves sites has not been carried out at this stage, but we have been made aware of a single grave north of Penycwm, close to the route of Option 7.

4.13 Scheme Cost Estimates

The estimated scheme cost of each option is given in

Table 4-3, below, and cost estimate breakdowns are contained in **Appendix F.**

The construction costs of each option have been estimated using unit rates calculated from a recently completed scheme of similar size. A 20% allowance for preliminaries, 10% allowance for Employer's Risk and a 5% allowance for payments to Statutory Undertakes by the Employer has been applied to the construction cost to determine the Works Cost.

A 15% allowance for professional fees, an allowance of £7 per square metre for land purchase and compensation and estimate for property purchase and compensation has been applied to the works cost to determine the employers cost.

A 44% optimism bias has been applied to the total of the Works Cost and Employers Cost to give the Total Scheme Forecast Cost, in accordance with the Supplementary Green Book Guidance.

Non-recoverable VAT has been included in the estimates as separate items.

The estimates were based upon 2016 prices.

Table 4-3: Scheme Cost Estimates

Route Option	Works Cost	Employers Cost	Optimism Bias	Total Scheme Forecast Cost
Option 3b	£12,535,396	£2,431,612	£6,585,483	£21,552,491
Option J	£9,036,751	£2,006,485	£4,859,023	£15,902,259
Option 7	£11,865,384	£2,556,794	£6,345,177	£20,767,935
Option 11	£15,550,482	£4,244,859	£8,709,950	£28,505,291

5 Stage 1 WelTAG Appraisal

5.1 Scope

WelTAG advises that, at Stage 1, it might be necessary to appraise individual schemes both qualitatively and quantitatively. It suggests that, where quantitative information is already available, it should be used to help highlight distinctions between options. Where quantitative information is not readily available, WelTAG advises that professional judgement will be required. WelTAG also advises that time and resources should not be wasted on assessing criteria where differences between options or on areas where the impacts are likely to be negligible.

Taken the above into account, the following scope of the Stage 1 WelTAG Appraisal was produced.

Table 5-1: Scope of Works

Newgale Beach Road: WelTAG Stage 1 Appraisal Scope	
Welsh Impact Area	**Scope of Work for Stage 1**
Economy	
Transport Economic Efficiency	The level of detail at Stage 1 will be appropriate to the data available and the stage of development of the proposals. The following will be **broadly estimated**: • Capital and operating costs; • Vehicle operating costs; • Travel time savings; • Revenues and user charges; • Reliability; and • Grant, subsidy and any developer contributions. Available information will be used as much as possible. If a particular item cannot be estimated quantitatively, then a qualitative assessment of the implications of the proposal will be made. When possible, broad BCRs will be derived based on DfT value for money guidance (poor = BCR<1, low = BCR 1-1.5, medium = BCR 1.5-2, high = BCR >2).
Environment	
Noise	For Stage 1, a qualitative assessment of the potential noise impacts will be sufficient, highlighting the key issues, expected impacts and geographic locations most affected. The likely magnitude of the effects on the environment (in terms of the differences between the Do-Minimum and Do-Something scenarios), and the number of people likely to benefit or disbenefit from the implementation of the proposal will be described qualitatively. The calculation method described in Calculation of Road Traffic Noise will be used to predict the roadside LA10,18hr noise level based on the traffic data supplied. Changes in noise will be described using the advice in the Design Manual for Roads and Bridges.
Local Air Quality	A WelTAG stage 1 assessment will be undertaken to estimate the exhaust emissions at the source to be removed from or added to the network as a result of implementing the proposed options. This approach provides the overall changes in network-wide emissions due to the option compared to the 'Do-Minimum' (DM). Local air pollution impacts will be assessed in terms of the changes in annual exhaust emissions of oxides of nitrogen (NOx) and particles (PM10). Vehicle emissions will be calculated using the DMRB18 method for the calculation of road traffic emissions, for the opening year (2022).
Greenhouse Gas Emissions	The assessment will follow the WelTAG stage 1 guidance. The assessment will consider the changes in emissions of CO2 over a 60 year appraisal period from the opening year (2022 to 2081) and the calculation of a Net Present Value (NPV) for this period. The Emission Factor Toolkit v5.2c19 will be used to estimate the total emissions of CO2 in 2015 and 2025 for each scenario. The NPV will be calculated in accordance with the methodology described in WebTAG Unit 3.3.5 to enable a comparison of options. The links included in the calculation will be the main links within the model for which reliable speed and flow information is available.

[18] Design Manual for Roads and Bridges, Highways Agency, 2007, Vol11 Sect3 Part 1 – HA 207/07 Air Quality
[19] Emission Factor Toolkit v 5.2c, Defra and the Devolved Administrations, January 2013

Landscape and townscape	Any new highway infrastructure could have landscape/townscape impacts, particularly in a National Park context. An assessment will be carried out consisting of the following: • Identifying key landscape and townscape features and their sensitivity, including their ability to accommodate change; • An assessment of how the proposed options would affect the key characteristics and whether these options would be likely to have significant or long term effects. • Identification of the key visual receptors within the study area including users of roads, public rights of way and residential properties; • A description of the quality of the existing views from these receptors, their sensitivity and whether the proposed scheme is likely to have a significant temporary or long term effect on those views.
Bio-diversity	To provide a desk-based qualitative appraisal of the potential impacts of each option on biodiversity and earth heritage features during the construction and operational phases. Where appropriate the assessment will refer to DMRB, Volume 11, Section 3, Part 4, Chapter 5, and will be undertaken in accordance with the methods described in Web TAG Unit 3.3.10 and WelTAG.
Heritage	Any new highway infrastructure could have built heritage impacts. A Stage 1 WelTAG will be undertaken. To begin with this involves gaining an understanding of the known heritage resources along and in the area surrounding the alignments. Heritage will be taken to comprise: buildings of architectural or historic importance; areas (such as parks, gardens, other designed landscapes); sites (e.g. ancient monuments); individual artefacts; and the sense of identity and place which the combination of these features provides. The impact of the different options on the identified heritage resources would be assessed using a seven-point scale to assign significance.
Water environment	There could be an impact from the options on the water environment either during construction or operation. Following the WelTAG unit 3.3.11 method worksheets will be produced to assess the significance of effect on the water environment for each of the 4 options. Where no information is available professional judgement will be used to consider the likely value of the water feature. The value of the feature and the likely magnitude of impact will be combined to determine an overall significance of effect for each attribute of the water environment.
Soils	An assessment of the land quality in the study area will be undertaken with reference to the Agricultural Land Classification. Agricultural land use within the study area will be described. An assessment of the impact of the options on soils and agriculture will be undertaken following guidance provided in WelTAG and DMRB. The impact on agriculture will be considered in terms of loss of land and fragmentation or severance of agricultural holdings. An assessment of the impact of the route options on non-agricultural land will be undertaken following the guidance set out in Volume 11 Section 3 Part 6 of the DMRB. Accordingly the assessment will consider the impact of the options with respect to the following: • Demolition of Private Property; • Loss of Land Used by the Community; and • Effects on Development Land
Society	
Transport safety	An **informed statement** about whether the options are likely to have a material effect on accident frequencies or their severity, whether positive or negative, will be made.
Personal security	Impacts unlikely to be significant and would not be a differentiator between options, therefore no further assessment necessary.
Permeability	An assessment will identify the degree to which people in the affected area can travel by non-motorised modes thereby encouraging healthier lifestyles and promoting enjoyment of the National Park. A qualitative assessment of all people likely to be affected by changes in severance and how permeability will be affected will be undertaken for the proposed options, with a textual summary of these impacts. This assessment will take into account both freedom of movement (the capacity to travel in any given direction without being obstructed by a transport corridor) and the capacity to reach key services.
Physical fitness	Physical fitness seeks to assess the likelihood of any increase in the use of active travel modes following implementation of the stand-alone options. At this stage the impact on the number of trips by cycling or walking mode will not have been estimated. Therefore a qualitative assessment of whether travel by active modes can be expected to increase or decrease as a result of the options will be undertaken.
Social inclusion	For the purposes of WelTAG, social inclusion is effectively synonymous with accessibility. The impact assessment will consider potential impacts on those people / social groups whose options in life are limited by not having the available transport they would wish. This includes people on low incomes who have access to a car but may not be able to afford fuel to drive to where they

	want or need to go but primarily people without access to cars who rely on walking, cycling and public transport. A qualitative assessment will be made of the impacts of options on access to healthcare, education, training, life-long learning, shopping and leisure facilities.
Equality, Diversity & Human Rights	All positive and negative impacts arising from the options will be qualitatively assessed with regard to their impact on people with disabilities, specifically travel time to hospital. The potential for discrimination against members of society who do not have access to a car is considered in the Social Inclusion assessment The options do not discriminate on any of the following grounds: • Race, ethnicity, colour or nationality; • Sex or marital status; • Religion or belief; • Sexual orientation; • Welsh language; and • Age; • Other: Lone parent, economic inactivity, social and multiple deprivation.

For this Stage 1 WelTAG assessment an EALI has not been undertaken. Land use covers socio-economics in terms of income and employment.

6 Economic Impacts

6.1 Transport Economic Efficiency (TEE)

6.1.1 Introduction

This section describes the Transport Economic Efficiency (TEE) Assessments undertaken for the four route options. The outcomes of these assessments have been used to inform the TEE related inputs to the WelTAG AST Tables in **Chapter 10.**

The TEE part of the WelTAG appraisal is designed to measure the impact of the proposals on the economic efficiency of the transport system. It requires analysis of the costs and benefits of the proposal under consideration and covers the impact areas ordinarily captured by standard cost-benefit analysis.

Utilising the forecasts presented within this section of the report and an analysis on transport safety provided in Section 8.4, a high level assessment has also been undertaken as to the extent the four route options would meet the Scheme Transport Planning Objectives.

6.1.2 Methodology

The purpose of a Stage 1 WelTAG appraisal is to screen and test options, which were developed during the planning stage, against both the Scheme TPO's and the Welsh Impact Areas; Economy, Environment and Society.

The appraisal of transport schemes, such as Newgale Beach Road, takes into account changes in the characteristics of travel as a result of the scheme. These include variations in journey times, journey distances and road safety between the 'without scheme' situation and the 'with scheme' position. The journey time and distance elements of the appraisal forms part of the Transport Economic Efficiency criteria in WelTAG (which falls within the Economy criteria of the Welsh Impact Areas), whilst safety forms part of both the Transport Economic Efficiency criteria and the Transport Safety criteria (which falls separately within the Social criteria of the Welsh Impact Areas). The Scheme Transport Safety assessment is documented in **Section 8.4** in this report.

Transport Economic Efficiency

Using the traffic forecasts presented in the following section and adopting principles from the Department for Transport TUBA programme and WebTAG (in particular ***Unit A1.1: Cost-Benefit Analysis***), all four route options have been ranked in terms of their likely Benefit to Cost Ratio (BCR). A BCR is calculated by dividing the Present Value of Benefits (PVB) by the Present Values of Costs (PVC). The PVB is calculated from changes in journey time, distances, carbon emissions and collisions whilst the PVC takes into account the cost of constructing, operating, maintaining and renewing the Scheme.

6.1.3 Key Findings

Scheme Traffic Forecasts

Traffic related forecasts for Newgale and the surrounding road network have been produced using traffic survey data (ATC, MCC, Turning Count and Speed Survey data) obtained from PCC. Forecasts have been produced to represent conditions on an average weekday (18 hour AAWT) and average day (24 hour AADT) covering both the 'with scheme' (Do Something) and 'without scheme' (Do Minimum) scenarios.

2022 Opening Year Forecasts (Do Minimum and Do Something 1)

For forecasting purposes it has been assumed that the A487 through Newgale will remain open until 2036 albeit that 'through traffic' will be directed along the new road (i.e. the Scheme) in the 'with scheme' scenario.

2037 Design Year Forecasts (Do Minimum and Do Something 2)

From 2037 onwards it has been assumed that the A487 will be severed at Newgale. Consequently, Welsh Road, Newgale Campsite and the Newsurf Café & Shop will be accessed from the southern stub of the A487 (Wood Hill). The remainder of Newgale (including the Duke of Edinburgh Inn, toilets, Sands Café, M.M. Carter Garden and Leisure Store and The Big Blue Experience) will be accessed from the northern stub of the A487 (Wood Hill).

'Through traffic' has been assigned to the C3062 (Roch Hill) and C3010 (Penycwm) route in the 'without scheme' scenario and to the new road (i.e. the Scheme) in the 'with scheme' scenario.

2022 Opening Year

Table 6-1 below presents the 2022 Opening Year Traffic Forecasts for the Do Minimum and Do Something 1 Scenarios. A study area Node-Link Diagram is provided in **Appendix G**.

Table 6-1: 2022 AADT Opening Year Traffic Forecasts

Link No.	Link Description	Do Min	Option 3b	Option 11	Option 7	Option J
1	A487 / Church Road Crossroads (Simpson Cross) to Option 11	5371	5371	5371	5371	5371
2	Option 11 to Option 7	4710	4710	1063	4710	4710
3	Option 7 to Option J	4710	4710	1063	1063	4710
4	Option J to New Welsh Road Link	4710	4710	1063	1063	1063
5	New Welsh Road Link to Option 3b	4710	4574	1063	1063	1063
6	Option 3b to A487 / Welsh Road Junction	4710		1063	1063	1063
7	Southern Cluster Stub (Newgale Seafront)	4574		1205	1205	1205
8	Northern Cluster Stub (Newgale Seafront)	4574		1205	1205	1205
9	Option 3b		4574			
10	Option 3b to A487 / Newgale Farm Junction	4604	4604	1234	1234	1234
11	A487 / Newgale Farm Junction to Option J	4604	4604	1234	1234	1234
12	Option J to Option 11	4604	4604	1234	1234	4604
13	Option 11 to Option 7	4494	4494	4494	1204	4494
14	Solva	4494	4494	4494	4494	4494
15	Penycwm to Trefgarn Junction – (Option 11)	534	534	3904	534	534

Link No.	Link Description	Do Min	Option 3b	Option 11	Option 7	Option J
16	Trefgarn Junction to A487 / Roch Hill Junction (Option 11)	90	90	3460	90	90
17	Option 7				3370	
18	Option J					3370
19	Welsh Road	1376		1376	1376	1376
20	New Welsh Road Link		1376			

2037 Design Year

Table 6-2 below presents the 2037 Design Year Traffic Forecasts for the Do Minimum and Do Something 2 Scenarios.

Table 6-2: 2037 AADT Design Year Traffic Forecasts

Link No.	Link Description	Do Min	Option 3b	Option 11	Option 7	Option J
1	A487 / Church Road Crossroads (Simpson Cross) to Option 11	5934	5934	5934	5934	5934
2	Option 11 to Option 7	1711	5204	1711	5204	5204
3	Option 7 to Option J	1711	5204	1711	1711	5204
4	Option J to New Welsh Road Link	1711	5204	1711	1711	1711
5	New Welsh Road Link to Option 3b	191	5204	191	191	191
6	Option 3b to A487 / Welsh Road Junction	191		191	191	191
7	Southern Cluster Stub (Newgale Seafront)	191		191	191	191
8	Northern Cluster Stub (Newgale Seafront)	826		826	826	826
9	Option 3b		5054			
10	Option 3b to A487 / Newgale Farm Junction	826	5086	826	826	826
11	A487 / Newgale Farm Junction to Option J	826	5086	826	826	826
12	Option J to Option 11	826	5086	826	826	5087
13	Option 11 to Option 7	4965	4965	4965	1188	4965
14	Solva	4965	4965	4965	4965	4965
15	Penycwm to Trefgarn Junction – (Option 11)	5651	590	5651	590	590
16	Trefgarn Junction to A487 / Roch Hill Junction (Option 11)	5159	99	5159	99	99

Link No.	Link Description	Do Min	Option 3b	Option 11	Option 7	Option J
17	Option 7				5060	
18	Option J					5060
19	Welsh Road					
20	New Welsh Road Link	1520	1520	1520	1520	1520

6.1.4 Scheme Costs

A cost breakdown for the four route options is provided in **Appendix F** of this report. The total scheme costs, against which the benefits of the scheme are measured, are presented below (most expensive to least expensive);

- Option 11 – £28,505,291;
- Option 3b – £21,552,491;
- Option 7 – £20,767,935; and
- Option J – £15,902,259.

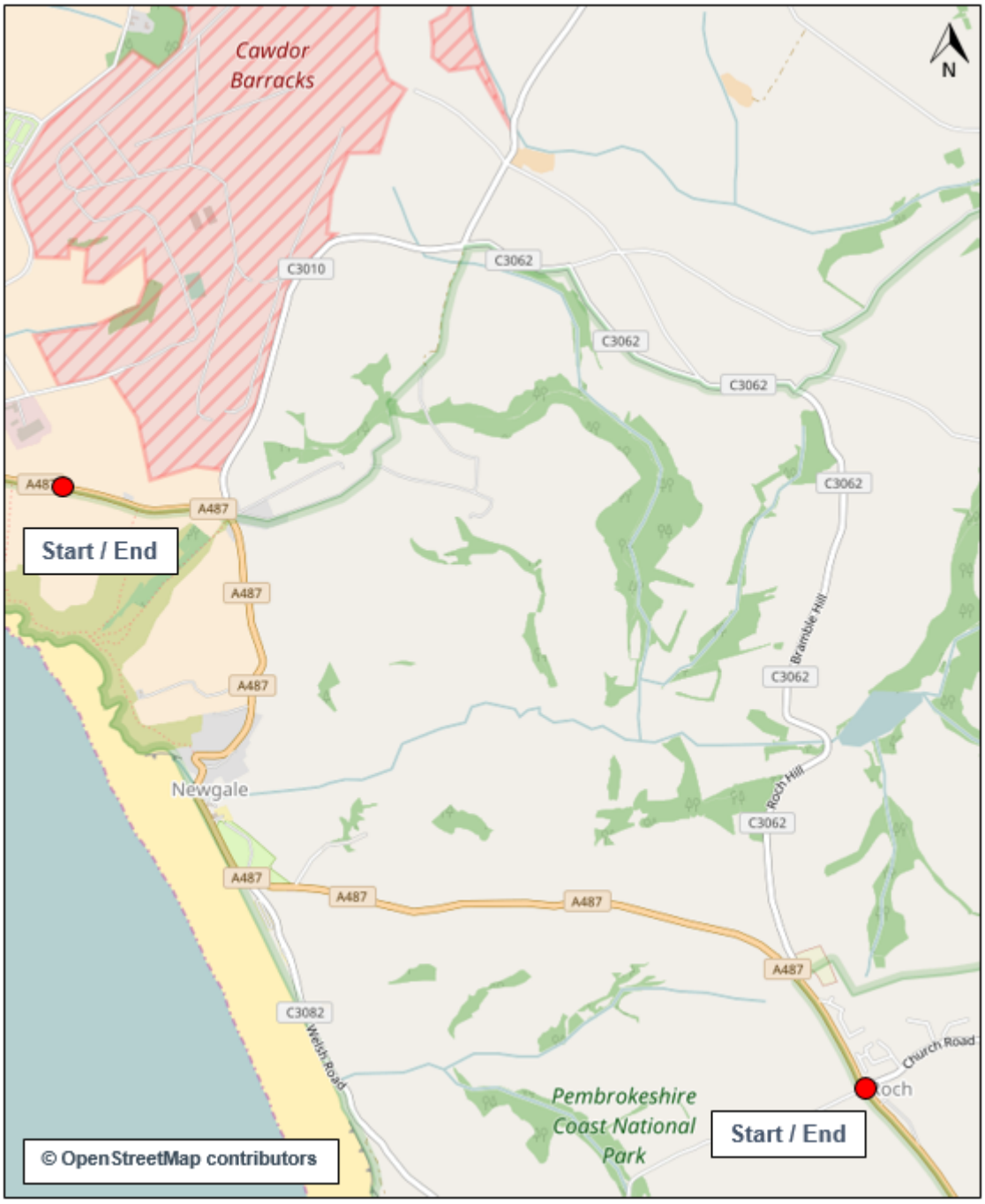
The above scheme costs have been calculated using a 2016 Q3 price base. However, in accordance with WebTAG guidance, the stream of costs and benefits forecast for the Scheme (over a 60 year appraisal period) have been discounted to 2010 prices / levels.

6.1.5 Scheme Benefits

Distance and Journey Times

All four options for the Newgale Scheme would provide an alternative route avoiding the shingle bank at Newgale. **Tables 6-3** to **6-6** below provide route length and journey time comparisons between the 'with scheme' and 'without scheme' scenarios. The comparisons are based on route distances and travel times for 'through traffic' travelling between the existing A487 Church Road Crossroads (Roch) in the south east and a point 0.5km west of the Option 7 tie in point in the north west (as illustrated in **Figure 6-1**).

Figure 6-1: Route Comparison Measurement Points



2022 Opening Year

Table 6-3: Opening Year Route Length Comparison

Option	Total Route Length (km)	Change (km)	Rank
Existing	5.322	-	
Option 3b	5.326	+0.004	2
Option 11	7.431	+2.109	4

Option	Total Route Length (km)	Change (km)	Rank
Option 7	5.159	-0.163	1
Option J	5.729	+0.407	3

Option 7 provides the greatest distance saving compared to the existing situation (a reduction in distance travelled of 163 metres). Option 3b shows a negligible increase of approximately 4 metres compared to the existing route, as it follows almost an identical alignment. The remaining two options provide no distance savings, with Option J and Option 11 constituting increases of 0.4km and 2.1 km's respectively.

Table 6-4: Opening Year Journey Time Comparison

Option	Total Route – Journey Time (secs)	Change (secs)	Rank
Existing	352	-	-
Option 3b	340	-12	4
Option 11	299	-53	3
Option 7	228	-124	1
Option J	276	-76	2

Option 7 provides the shortest travel time of all route options under consideration; a reduction of 124 seconds compared to the existing route. Options 7, J and 11 have a higher design speed than Option 3b, so despite being longer routes Options J and 11 would still provide significant journey time savings of 76 seconds and 53 seconds respectively. Option 3b is shown to provide a negligible 12 seconds time saving.

2037 Design Year

As outlined earlier, from 2037 onwards it has been assumed that the A487 will be severed at Newgale requiring 'through traffic' to reassign to the C3062 (Roch Hill) and C3010 (Penycwm) without the Scheme in place. The 2037 Design Year route length and journey time comparisons have been undertaken on this basis. The comparisons are provided in **Tables 6-5** and **6-6**.

Table 6-5: Design Year Route Length Comparison

Option	Total Route Length (km)	Change (km)	Rank
Do Minimum	7.431	-	
Option 3b	5.326	-2.105	2
Option 11	7.431	+/- 0	4
Option 7	5.159	-2.272	1
Option J	5.729	-1.702	3

Option 7 is again shown to provide the largest distance saving in the 2037 Design Year; a reduction of approximately 2.3km compared to the Do Minimum. Option 3b shows a similar reduction of approximately 2.1km, Option J a reduction of 1.7km whilst the distance of Option 11 is identical to the Do Minimum.

Table 6-6: Design Year Journey Time Comparison

Option	Total Route – Journey Time (secs)	Change (secs)	Rank
Do Minimum	657	-	-
Option 3b	340	-317	4
Option 11	299	-358	3
Option 7	228	-429	1
Option J	276	-381	2

Option 7 is again shown to provide the shortest travel time of all route options under consideration; a reduction of 429 seconds compared to the Do Minimum. Options J, 11 and 3b would also provide significant journey time savings of 381 seconds, 358 seconds and 317 seconds respectively. Option 3b is subject to a lower design speed than the other options.

6.1.6 Scheme BCR Estimates

As outlined earlier, this part of the WelTAG appraisal is designed to measure the impact of the proposals on the economic efficiency of the transport system. The costs and benefits of the proposals, outlined within this section of the report, have been quantified (in line with WebTAG guidance) and input to a spreadsheet model to provide high level BCR estimates for the four route options. The BCR results for each options is provided in **Table 6-7**.

Table 6-7: BCR Results

Route	Total Discounted Scheme Costs (2010 Prices)	Discounted Scheme Benefits (2010 Prices)	BCR Estimate	Value for Money Category	Rank
Option J	£12.94m	£39.2m	3.0	High	1
Option 7	£16.89m	£42.6m	2.5	High	2
Option 3b	£17.53m	£34.5m	1.97	Medium	3
Option 11	£23.19m	£35.2m	1.5	Medium	4

Whilst Option 7 is forecast to provide the highest level of scheme benefits out of all four options, Option J would provide the highest value for money. Option J has a BCR of 3 and is categorised as providing 'High' Value for Money.

6.1.7 Conclusions

Newgale is a small settlement on the north coast of Pembrokeshire, centred on the A487. The majority of traffic exhibited on the A487 is through traffic heading to St David's (and Solva) to the north-west and Haverfordwest to the south-east. The A487 also provides the only diversion route for Heavy Goods Vehicles (HGVs) in the event of a major accident closing the A40 at Treffgarne Bends. As outlined earlier in this report, extreme weather events and flooding have necessitated temporary closure of the A487 through Newgale in recent years. When the A487 through Newgale is closed, traffic is diverted along the C3062 (Roch Hill) and C3010 (Penycwm). Nevertheless, this route is a single track rural road and cannot carry high levels of traffic and delivery of a transport solution is therefore required.

The transport related analysis undertaken indicates that all four route options would contribute towards reducing travel times for traffic travelling between St David's Peninsula and Haverfordwest. All options other than Option 11 would also contribute towards a reduction in vehicle / km (i.e distances travelled by each vehicle) within the study area compared to the Design Year Do Minimum Scenario; providing environmental benefits to the natural environment within the National Park.

From a transport safety perspective, all options would improve highway safety (for all road users) along the A487 through Newgale as follows:

- Options J, 7, and 11 would divert through traffic away from Newgale (more specifically away from sections of the A487 currently at risk from shingle bank debris and flooding); whilst
- Option 3b provides a new route within Newgale albeit along an alignment proposed to mitigate against existing shingle and flooding constraints i.e. approximately 60m in land and 3 meters higher than the existing ground level.

7 Environmental Impacts

7.1 Noise

7.1.1 Introduction

This section describes a Welsh Transport Planning and Appraisal Guidance (WelTAG) stage 1 assessment of the expected noise impacts of four different Newgale A487 scheme options. The noise assessment is based on the likely changes in noise along roads in the area of the scheme options, considering the geographic extent of those impacts.

All noise data given in this report is expressed in terms of $L_{A10, 18hr}$ index as specified in Calculation of Road Traffic Noise (Department of Transport, 1988) (CRTN) which is the standard index for noise assessment in the UK. The $L_{A10, 18hr}$ index represents the A-weighted noise level exceeded for 10% of the time between the hours of 06:00 and 00:00 and has been shown to have a reasonable correlation with community response. In this report, the term Roadside Noise Level indicates the expected noise level at a distance 10m from the kerb of the road.

7.1.2 Method

The Proposed Scheme options have been assessed following the guidance in the Design Manual for Roads and Bridges Volume 11 Section 3 Part7, 2011 (DMRB 11:3:7, referred to as DMRB) which incorporates the calculation and prediction methodology from CRTN, and in general accordance with the process described in WelTAG.

For a DMRB assessment, the Design Year is normally taken to be 15 years after the Opening Year of the proposed scheme. Traffic flows, speeds and the proportion of heavy vehicles have been supplied for the base year 2016, expected opening year of 2022 and a design year of 2037 for a do-minimum scenario and the four options assessed.

The DMRB provides threshold values against which changes in noise due to the project should be compared, and assessed, in both the short-term (on scheme opening) and in the long-term (over the design period, typically 15 years after scheme opening). The threshold criteria are either a change of at least 1dB $L_{A10, 18hr}$ in the short-term, or at least 3dB $L_{A10,18hr}$ in the long-term.

The CRTN method has been used to predict the roadside $L_{A10,18hr}$ noise level based on the traffic data. Changes in traffic between the options would give rise to changes in noise affecting the properties near to the section of road in question.

The changes in roadside noise level would be experienced at the facades of properties which face the road. The changes in noise would be smaller at properties further from the road as the noise level at these locations would be influenced by noise from other roads and other sources which would not change as a result of the option. A qualitative assessment of the population affected has been made.

Tables 7.1 and **7.2** in the DMRB provide the following classification for the magnitude of noise impacts, recognizing that it may not be applicable in all circumstances:

Table 7-1: Classification of Magnitude of Noise Impacts

Noise Change, $L_{A10,18h}$	Magnitude of impact (short term)	Magnitude of impact (long term)
0	No change	No change
0.1-0.9	Negligible	Negligible
1-2.9	Minor	Negligible
3-4.9	Moderate	Minor
5-9.9	Major	Moderate
10+	Major	Major

From this classification, 'minor', 'moderate' and 'major' changes in noise are perceptible. 'Negligible' changes in noise are not perceptible. For this assessment changes in noise that are 'moderate' or 'major' are regarded as significant.

The usual practice for road scheme is to investigate mitigation options for significant impacts. However, in this area the existing noise levels at some receptors are understood to be well below the level at which community annoyance starts, and mitigation would only be planned where moderate adverse impacts or worse are shown and where noise levels are above the thresholds for community annoyance.

For guidance on onset of community annoyance effects, reference is made to the World Health Organisation (WHO) document 'Community Noise' (WHO, 1999). This document provides guideline values based on the precautionary principle. It states: 'To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50dB L_{Aeq}.'

This stage of the WelTAG assessment includes:

- an assessment of the predicted change in noise for each option in the opening year, compared with the Do Minimum situation;
- an assessment of the predicted change in noise in the design year for each option and the do minimum situation, compared with the do minimum situation; and
- estimates of the number of receptors experiencing those changes in noise.

The study area is defined within 300m of the route of the physical works associated with the road project, as well as any roads being bypassed or improved by the schemes. For the purposes of this assessment, the wider area was not considered. The assessment does not account for individual screening measures, topography, structures or soft ground corrections, and therefore the noise levels are indicative.

7.1.3 Impact

It is understood that the local traffic will continue to use the existing A487 and the long distance traffic would use the scheme route. Around year 2036 it is anticipated that the existing A487 will be closed at Newgale and all traffic, including local, will be directed on to the scheme route. Local traffic will still be able to access Newgale via southern and northern stubs.

Additionally, access along Welsh Road will be implemented with each option.

Do Minimum

If the scheme is not built there would be no significant changes in noise expected. Traffic growth over the design period is expected to increase noise on certain roads by the design year, giving rise to negligible increases in noise. Decreases in noise are not expected.

Option 3b

Scheme Opening
When the scheme opens, noise levels would rise by 1.4dB on the new section of the A487 when compared to the levels on the existing levels seafront road. Properties nearby would receive minor or moderate increases in noise. On all other roads the changes in noise would be negligible.

It is unlikely that mitigation would be needed for this option as significant impacts are limited.

By the Design Year
It is likely that noise increases by the design year would be negligible, due to the way that changes in noise are perceived in the long term. On most of the roads in the study area no change would be expected although there are some negligible decreases in noise.

Option 7

Scheme Opening
When the scheme opens, noise levels would be expected to increase near the proposed road, particularly at the closest properties to the route on and near Penycwm and Erw Lon road. Increases in noise are expected to be moderate or major, potentially resulting in a significant impact.

Noise levels would decrease by 6dB on the existing A487 between the Church Road and Penycwm which is regarded as a moderate reduction in noise. On all other roads changes in noise would be negligible.

As the scheme has the potential to introduce significant effects, noise mitigation may need to be considered, particularly near Penycwm.

By the Design Year
It is likely that the situation in the design year would be similar to the opening year. Noise levels near the proposed scheme are likely to be higher than baseline levels resulting in long term adverse noise impacts, potentially significant. The noise levels on the existing A487 between the scheme south junction and Penycwm would remain lower than the do-minimum levels, resulting in moderate to major reductions in noise. On all other roads changes in noise are expected to be negligible.

Option J

Scheme Opening
Similarly to Option 7, when the scheme opens noise levels would increase near the proposed road at the properties on A487 Newgale Hill close to Penycwm and on Wood hill where the southern part of the scheme will merge with the A487. The change in noise levels would be moderate to major, resulting in potentially significant impacts at these properties.

Noise levels would decrease by 6dB on the existing A487, west of the scheme resulting in a major reduction in noise.

On all other roads changes in noise would be negligible.

As the scheme has the potential to introduce significant effects, noise mitigation may need to be considered, particularly near Penycwm.

By the design year
It is likely that the situation in the design year would be similar to the opening year. Noise levels near the proposed scheme would be higher than baseline, resulting in moderate increase in noise at the properties affected during the scheme opening. A further decrease in noise would be expected on the existing A487 resulting in moderate to major reduction in noise. The remaining roads would have a negligible change in noise.

Option 11

Scheme Opening
When the scheme opens noise levels would increase significantly on Roch Hill between the A487 and Penycwm, resulting in major increases in noise which have the potential to be significant. Decreases would be expected on the existing A487 resulting in major reduction noise between the Church road junction and Penycwm.

On all other roads changes in noise would be negligible.

As the proposed scheme is a part of the existing road network, most of the significant impacts would be expected to occur at the properties near the existing roads, with vehicular access to these properties giving limitations on potential mitigation options.

By the design year
It is likely that the situation in the design year would be similar to the opening year. The noise levels on the proposed scheme are likely to be much higher than baseline levels resulting in long term adverse noise impacts, potentially significant. Similarly to the opening year, the decreases would be expected on the existing A487 resulting in moderate to major reduction in noise levels.

On all other roads change in noise would be negligible.

Impacts at the noise sensitive receptors

Due to the traffic changes on existing links, as well as introducing new option routes for the A487, traffic redirection in the opening and design year, there is potential for increases in noise levels within the study area. The summary of the noise assessment is shown in the following tables, which give estimates of the potential impacts for each option.

Table 7-2: Change in noise levels at noise sensitive receptors, Opening Year

Change in noise level (dB) (Short term)		Option 3b	Option 7	Option J	Option 11
Increase:	>5	0	16	2	59
	3-5	4	6	11	0
	1-3	14	6	28	0
	<1	12	4	11	0
No change:	0	233	162	176	114
Decrease:	<1	0	1	1	0
	1-3	0	6	1	0
	3-5	0	3	0	0
	>5	1	60	34	91

Table 7-3: Change in noise levels at noise sensitive receptors, Design Year

Change in noise level (dB) (Long term)		Do Minimum	Option 3b	Option 7	Option J	Option 11
Increase:	>10	0	0	10	0	59
	5-10	0	0	10	6	0
	3-5	0	6	6	27	0
	<3	236	229	149	167	113
No change:	0	28	28	20	28	0
Decrease:	<3	0	0	5	1	0
	3-5	0	0	24	3	30
	5-10	0	0	38	30	60
	>10	0	1	2	2	2

Summary

The impacts are summarised in the following tables;

Table 7-4: Number of perceptible and significant change in noise levels on opening

Change in noise levels	Option 3b	Option 7	Option J	Option 11
Short Term Increase	18	28	41	59
of which Significant	4	22	13	59
Short term Decrease	1	69	35	91
of which Significant	1	63	34	91

Table 7-5: Number of perceptible and significant change in noise levels by the design year

Change in noise levels	Option 3b	Option 7	Option J	Option 11
Long Term Increase	6	26	33	59
of which Significant	0	20	6	59
Long term Decrease	1	64	35	92
of which Significant	1	40	32	62

If the scheme were built, there would be a range of increases and decreases in noise. People living near the existing A487 and other roads would experience potentially significant decreases in noise. People living close to the proposed scheme alignments would experience potentially significant increases in noise.

The impacts vary with the options. For options 3b and J it is likely that the number of properties receiving a decrease in noise would generally be smaller than the number of properties receiving an increase in noise, whereas for option 7 and 11 the number of properties receiving a decrease in noise would generally be greater than the number of properties receiving an increase in noise.

For options J and 7, it is considered likely that the number of properties experiencing the most significant adverse impacts would be able to be minimised through the introduction of noise mitigation measures. Mitigation is unlikely to be required for Option 3b and is likely to be difficult for the significant impacts shown in Option 11.

Overall, the noise results show that Option 3b would result in the noise climate most similar to existing. Options J and 7 result in more noise benefits than dis-benefits and it is considered likely

that the number of adverse impacts could be reduced through the use of noise mitigation for these options.

The overall significance for each option has been assessed by comparing the number of potentially significant increases and decreases in noise by the design year. A benefit is shown when there are more decreases in noise than increase in noise and a disbenefit is shown when there are more increases in noise than decreases in in noise. The scheme is neutral when the numbers are similar.

Table 7-6: Ranking

Option	Significant Decreases	Significant Increases	Significance
Option 3b	1	0	Neutral
Option 7	40	20	Minor benefit
Option J	32	6	Minor benefit
Option 11	62	59	Neutral

7.1.4 Conclusions

The noise results show that Option 3b would result in the noise climate most similar to existing. Options J and 7 result in more noise benefits than dis-benefits and it is considered likely that the number of adverse impacts for these options could be reduced through the use of noise mitigation. Option 11 introduces the greatest number of impacts and is most difficult to provide mitigation for.

7.2 Local Air Quality

7.2.1 Introduction

This section describes the WelTAG stage 1 strategic local air quality assessment.

7.2.2 Method

The assessment followed the WelTAG guidance (June 2008)[20]. This requires the estimation of exhaust emissions at the source (i.e. not considering the effects of dispersion) to be removed from or added to the network as a result of implementing the proposed options. This approach provides the overall changes in network-wide emissions due to the option compared to the 'Do-Minimum' (DM).

Local air pollution impacts have been assessed in terms of the changes in annual exhaust emissions of oxides of nitrogen (NO_x) and particles (PM_{10}).

Vehicle emissions for the DM and each option have been calculated using a more sophisticated method than that described in the WelTAG guidance. As per the DMRB[21] method for the calculation of road traffic emissions, detailed emission functions for different vehicle types and pollutants dependent on average traffic speed, road type and composition (percentage heavy duty vehicles [HDV]) were utilised. Traffic data was provided for the proposed options and surrounding local road network, a list of the roads included in this assessment is presented in **Table 7-7**. The data included 24 hour annual average daily traffic (AADT) flows, average daily speed, and percentage HDV for four options (Option 3b, Option 7, Option 11, Option J) for the opening year (2022).

The Emission Factor Toolkit v7.0[22] was used to estimate the total emissions of NO_x and PM_{10} in the opening year for each scenario based on the measured link length and the traffic data provided. The total emissions for each option were compared with the DM value.

[20] Welsh Transport Planning and Appraisal Guidance – WelTAG, June 2008, Welsh Assembly Government
[21] Design Manual for Roads and Bridges, Highways Agency, 2007, Vol11 Sect3 Part 1 – HA 207/07 Air Quality
[22] Emission Factor Toolkit v 7.0, Defra and the Devolved Administrations, July 2016, available at: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

The change in annual vehicle kilometres across the study area is estimated based on link length (in kilometres) multiplied by the daily traffic flow (AADT). The result is then multiplied by 365 to estimate total flow on each link over a period of a year. The total annual vehicle kilometres were summed for each scenario and the estimated change as a result of implementing the proposed options in the **opening year** analysed. The comparisons are based on route distances for 'through traffic' travelling between the existing A487 Church Road Crossroads (Roch) in the south east and a point 0.5km west of the Option 7 tie in point in the north west (as illustrated in **Figure 6-1**).

Table 7-7 details the roads included in the emissions calculations. No change criteria have been applied to determine which roads could be affected by the proposed options. The comparison of change in emissions is indicative and for comparative purposes and the values of the change in emissions may change at later stages of the assessment process. A study area Node-Link Diagram is provided in **Appendix G**.

Table 7-7: Roads included in study area

Link No.	Name
1	A487/ Church Road Crossroads to Option 11
2	Option 11 to Option 7
3	Option 7 to Option J
4	Option J to New Welsh Road Link
5	New Welsh Road Link to Option 3b
6	Option 3b to A487/ Welsh Road Junction
7	Southern Cluster Stub
8	Northern Cluster Stub
9	Option 3b
10	Option 3b to A487/Newgale Farm Junction
11	A487/Newgale Farm Junction to Option J
12	Option J to Option 11
13	Option 11 to Option 7
14	Solva
15	Penycwm to Trefgarn Junction Option 11
16	Trefgarn Junction to A487/ Roch Hill Junction
17	Option 7
18	Option J
19	Welsh Road
20	New Welsh Road Link

7.2.3 Impact

The total NO_x and PM_{10} emissions for the various options are presented in **Table 7-8** and the change in emissions relative to the DM option are presented in **Table 7-9**.

The changes in emissions relate to the difference between the option and the DM option for the opening year (2022) with the results in **Table 7-9** presented in rank order from most beneficial down to least beneficial. Option 3b results in an overall reduction of NO_x emissions of 1% and no change in PM_{10} emissions. Conversely Option 7 results in an overall reduction in PM_{10} emissions of 3% and no change in NO_x emissions. Both Option 11 and Option J result in an overall increase for both pollutants, with the largest increases occurring with Option 11 with a 31% increase in NO_x emissions and 24% in PM_{10} emissions, in line with the change in vehicle kilometres travelled.

Table 7-8: Total emissions of NO_x and PM_{10} (kg/yr) 2022

Option	NO_x	PM_{10}
DM	2,136	249
Option 3b	2,114	248
Option 7	2,136	241
Option 11	2,808	307
Option J	2,266	259

Table 7-9: Change in emissions of NO_x and PM_{10} (kg/yr) in rank order

Option	**NO_x**	**Option**	**PM_{10}**
Option 3b	-22	Option 7	-8
Option 7	0	Option 3b	0
Option J	+130	Option J	+11
Option 11	+672	Option 11	+58

7.3 Greenhouse Gas Emissions

7.3.1 Introduction

This section describes the assessment for greenhouse gas emissions. Carbon dioxide (CO_2) is used as the key indicator for the purposes of assessing the impacts of transport options on climate change.

7.3.2 Method

The assessment followed the WelTAG guidance (June 2008)[20]. Assessment of changes in emissions of CO_2 over a 60 year appraisal period from the opening year (2022 to 2081) and the calculation of a Net Present Value (NPV) for this period are required. Traffic data for four different options (Option 3b, Option 7, Option 11, Option J) and a 'Do Minimum', (DM) scenario were provided for 2022 and 2037.

The method as described in **section 7.2** above for local air quality was followed to calculate emissions of CO_2 for the **opening year and a future year (2025)**. The traffic data were used with the Emission Factor Toolkit v7.0[23] to estimate the total emissions of CO_2 in 2022 and 2037 for each scenario.

[23] Emission Factor Toolkit v 7.0, Defra and the Devolved Administrations, July 2016, available at: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html

Calculation of emissions for each year in the 60 year appraisal period was undertaken as follows; for the years between 2022 and 2037 linear interpolation between these years was used to calculate an emission for each year in this period; post 2037, emissions were assumed to remain unchanged.

The NPV was calculated in accordance with the methodology and using the worksheets described in WebTAG Unit A3 (December 2015)[24].

This assessment considers the change in road vehicle exhaust emissions as a result of operating each option, which are considered non traded emissions. The costs per tonne of CO_2 in the non traded fuel sector are based on the estimated marginal abatement costs per tonne of CO_2 equivalent to achieve the Government's emissions targets provided by DECC. The costs are discounted at standard HM Treasury rates and summated to give a net present value (NPV) of the change in CO_2 emissions over the appraisal period. A positive NPV indicates an overall reduction in carbon and a negative NPV indicates an overall increase in carbon.

7.3.3 Impact

The emissions for the various options are presented in **Table 7-10** and the change in emissions relative to DM option are presented in **Table 7-11**.

The change in emissions relates to the difference between the option and the DM option for 2022 and 2037. Option 3b is the only option that leads to a reduction in CO2 emissions in both modelled years of 1%. All other options are expected to have an increase in CO2 emissions in both years, with the largest increase in both years with Option 11.

Table 7-10: Emissions of CO_2 (t/yr)

Option	2022	2037
DM	1,435	1,555
Option 3b	1,421	1,542
Option 7	1,443	1,788
Option 11	1,886	2,535
Option J	1,530	1,811

Table 7-11: Change in emissions of CO_2 (t/yr) in rank order

Option	2022	Option	2037
Option 3b	-14	Option 3b	-13
Option 7	+8	Option 7	+233
Option J	+95	Option J	+256
Option 11	+451	Option 11	+980

[24] TAG UNIT A3 Environmental Impact Appraisal, DfT, December 2015, available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/487684/TAG_unit_a3_envir_imp_app_dec_15.pdf

The change in CO_2 emissions over the 60 year appraisal period, the change in annual vehicle kilometre and the NPV for each option are provided in **Table 7-12**. The only positive NPV which represents a benefit is for Option 3b as this option results in a reduction in CO_2 emissions. All other options have a negative NPV as there is an increase in CO_2 emissions with the options. The ranking order in terms of NPV from most beneficial to least beneficial is Option 3b, Option 7, Option J, Option 11, the same as for 2022 and 2037 CO2 results.

Table 7-12: NPV and Change in carbon emissions and annual vehicle km

Option	Change in CO2 Emissions in Opening Year (t)	Change in CO2 Emissions with scheme over 60 year appraisal period (t)	Change in Annual Vehicle km over 60 year appraisal period	NPV (£)
Option 3b	-14	-788	+566	+36,048
Option 7	+8	+12,180	+131,354	-568,589
Option J	+95	+14,072	+205,170	-652,224
Option 11	+451	+54,568	+848,544	-2,524,657

7.4 Landscape and Townscape

7.4.1 Introduction

This Stage 1 Landscape and Townscape assessment has been undertaken to provide sufficient information to identify the likely effects and constraints on the landscape and townscape by the proposed route options for the Newgale bypass, in order to inform the decision making process for determining the preferred route option.

The landscape is an important national resource and, though subject to natural evolution and change, it must be considered in its current condition as a valuable resource for future generations. To ascertain the potential and likely impacts of the proposals on the landscape and the visual amenity of the area, it is important to consider the site in its present landscape context. This is referred to as its 'baseline condition'.

The existing situation or baseline conditions of the site and surrounding area, including the presence of existing land use and protected landscape designations are taken into account in assessing the landscape quality, character and views.

A detailed assessment of the baseline condition should be undertaken in due course as part of the detailed LVIA with a particular focus on the existing natural and built environments, including settlement patterns, architectural styles and materials, infrastructure and means of access to the site as well as the natural topography and characteristic land cover including agricultural and vegetation patterns.

7.4.2 Methodology

The landscape and townscape assessment has been carried out in accordance with the following guidance:

- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 5, Landscape Effects;
- Interim Advice Note 135/10 (W) – referenced in conjunction with DMRB;
- Welsh Transport Planning and Appraisal Guidance: WelTAG: June 2008;
- Guidelines for Landscape and Visual Impact Assessment by the Institute of Environmental Assessment and the Landscape Institute 3rd Edition, 2013 (GLVIA) published by the Landscape Institute and the Institute of Environmental Management and Assessment;
- Landscape guidance issued by the Countryside Council for Wales (CCW).

Data has also been obtained from the following sources:

- Landmap: http://landmap-maps.naturalresources.wales;
- Magic: Multi-Agency Geographic Information for the Countryside, Defra: (http://magic.defra.gov.uk);
- Sustrans National Cycle Routes: (http://www.sustrans.org.uk);
- Pembrokeshire County Council: (http://Pembrokeshire.gov.uk);
- Natural Resources Wales (NRW); and
- Ordnance Survey Mapping: (https://osmaps.ordnancesurvey.co.uk).

For the purpose of this assessment, the study area is defined by the extent of visibility which is generally defined by the local topography, between approximately 0m and 105m AOD, falling within approximately 2km of the proposed scheme options.

The landscape character is described with reference to the broader landscape character units identified by LANDMAP, a landscape evaluation resource provided by NRW. This was supported by a site visit carried out by Atkins Landscape Architects in May 2016.

Key landscape and townscape features were identified and their sensitivity, including their ability to accommodate change were considered. An assessment was then made of how the proposed scheme options would affect the key characteristics and whether these options would be likely to have significant or long term effects.

Table 7-13 identifies landscape sensitivity criteria:

Table 7-13: Landscape Sensitivity

Criteria	Definition
Low	A landscape capable of accommodating considerable proposed change without significant effects on the landscape character, features or elements
Medium	A landscape capable of accepting limited proposed change with some effects on landscape character, features or elements.
High	A landscape particularly sensitive to the proposed change, which would result in significant effects on landscape character, features or elements.

The visual assessment identifies the key visual receptors within the study area including users of roads, public rights of way and residential properties of the proposed scheme based on changes to views from these receptors. It describes the quality of the existing views from these receptors, their sensitivity and whether the proposed scheme is likely to have a significant temporary or long term effect.

The sensitivity of visual receptors is an important issue in the assessment of the significance of an impact. This sensitivity is based on the type of receptor, as well as the special nature or the rarity of the view. Residential properties are considered to have a high sensitivity due to their nature. Additional factors to consider in the classification of sensitivity of visual receptors include:

- The period of exposure to view (short, medium or long term)
- The degree of exposure to view
- The function of the receptor
- The nature of the view and scope for mitigation.

Table 7-14 identifies visual receptor sensitivity criteria:

Table 7-14: Sensitivity of Visual Receptors

Sensitivity of visual receptor to change	Visual Receptors
High	Residential properties Farms / Farmhouses Users of Public Rights of Way (PRoW), footpaths, cycleways and bridlepaths
Medium	Road users Industrial Units Other work places including supermarkets and offices
Medium – Low	Recreational Facilities where the aim is not the enjoyment of the landscape (e.g. sports pitches)

7.4.3 Impacts

In order to establish the level of significance of effects, it is necessary to identify the environmental value of the resource and/or the level of sensitivity of the receptor and the magnitude of the impact. At this early stage of route options mitigation will be loosely defined and can only be based on standard practice.

DMRB Vol 11, Section 2, sets out the criteria for Environmental Value and Magnitude of Impact, showing the Significance of Effect as a function of these. The following tables set out the criteria for each of the stages in determining this.

Assigning Environmental Value: Typical descriptors and criteria for the value of an environmental resource are listed in **Table 7-15.**

Table 7-15: Environmental Value and Typical Descriptors

Value (sensitivity)	Typical Descriptors
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale and limited potential for substitution.
Low	Low or medium importance and rarity, local scale
Negligible	Very low importance and rarity, local scale.

Assigning Magnitude of Impact: Typical descriptors and criteria for the magnitude or impacts are listed in **Table 7-16.**

Table 7-16: Magnitude of Impact and Typical Descriptors

Magnitude of Impact	Typical Descriptors
Major adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements
Major beneficial	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality
Moderate adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements
Moderate beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality
Minor adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements
Minor beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring
Negligible adverse	Very minor loss or detrimental alteration to one or more characteristics, features or elements
Negligible beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Assigning Significance of Effect: Typical descriptors for Significance of Effect are given in **Table 7-17.**

Table 7-17: Descriptors of the Significance of Effect Categories

Significance category	Typical descriptors of effect
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Significance of Effect: This should be assigned after consideration of the effectiveness of design and mitigation measures. At the early design stages or route options, mitigation will be poorly

defined and can only be based on standard practice. Where specific mitigation may be feasible or desirable, it should be noted but should not influence the significance score assigned at this early stage. Arriving at the Significance of Effect Categories are given in **Table 7-18**.

Table 7-18: Arriving at the Significance of Effect Categories

Environmental Value (Sensitivity)	Magnitude of Impact (degree of change)					
		No Change	**Negligible**	**Minor**	**Moderate**	**Major**
	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

7.4.4 Landscape and Visual Impacts

Potential Temporary Impacts

Impacts resulting from construction of any of the options would have a moderate to major adverse temporary impact on the landscape and the townscape of the settlements.

There will be loss of existing hedgerows, hedgebanks, trees and sections of woodland blocks associated with options 7, J and 11 which would impact on the landform, field pattern and character of the rural setting. Option 3b would most significantly result in loss and disturbance of tourist and recreational facilities at Newgale beachfront in addition to adjacent residential properties with major adverse visual impacts on nearby receptors. Access to these land uses along the beachfront will be adversely impacted after 2036 when it is assumed that it will no longer be practical for the existing road to be defended by a maintained coastal defence. For existing features and land uses refer to Landscape Constraints Plan **Figure 3-11**. All route options will have a major short term effect on visual and landscape impacts at a local level.

There will be large areas of cut and fill associated with the construction of options J, 7 and 11, with J and 7 cutting through undulating rural landscape and 11 utilising and widening the existing road. This, combined with the removal of mature vegetation, will result in a major initial change in local landscape character following its construction.

Potential Permanent Impacts

All the proposed route options will detract from the rural nature of the surrounding landscape by introducing a new or widened road with associated earthworks and structures which will cut across the existing field pattern and landform thereby creating visible alien features in the landscape.

Option 3b will result in significant impacts on visual amenity due to the nature of the engineering works with a viaduct, 3m above existing ground level in an exposed seafront location. This will also result in the loss of tourist facilities in Newgale.

Options J and 7 will impact predominantly on landform and landscape resource with engineering works including new road networks and associated earthworks, potential roundabouts at A487 junctions and associated lighting proposals and culverts at Brandy Brook. Option 11 will have most significant impacts on landform and landscape resources with engineering works including widening, earthworks, lighting and a bridge 12m above the existing valley floor in the vicinity of the existing bridge at Roch Bridge.

Options J, 7 and 11 would cut through or impinge on unspoilt landscape with important landscape features therefore impacting at a more significant level on landscape resources and character. Proposed roundabouts and lighting will be uncharacteristic elements in highly visible locations at junctions where the routes intersect with the A487 which will impact on the intrinsic landscape character and visual amenity of the area.

Where feasible, translocation of existing hedgerows, should be considered. In addition, further hedgerow and tree planting should be introduced to aid the integration of the new or existing widened road and structures into the landscape by softening engineered slopes on cuttings and embankments and provide visual screening for local residents and other features of importance.

The impacts on properties within the settlements as a result of the road widening associated with option 11 will result in some loss of property land. With regards to options 3, it would result in a loss of a proportion of Newgale Camping Ground and land associated with Sands Café, New Surf and the Duke of Edinburgh Inn. Options J and 7 would have minor impacts on isolated properties adjacent to the scheme as these would cut through only rural landscape.

In the long term future all route options would result in permanent alterations to the user experience and residential and commercial properties within Newgale. Potential future land uses and activities along the beachfront after the existing road and facilities along here have been removed will be considered as part of the adaptation masterplan proposals.

Comparison of Landscape & Townscape Impacts associated with Route Options

In assessing how the route options would affect the existing landscape, the following factors have been taken into account:

- The extent to which the road will be visible in the landscape.
- The character of the landscape and its capacity to accept change of the type and scale proposed.
- The extent to which impacts can be mitigated and the road can be integrated into the landscape.

The impacts on the following aspects of the landscape have also been taken into account:

- Landform – how does the route affect the underlying structure of the landscape?
- Seasonal differences: how does the seasonal change in vegetation affect the visibility of the route?
- Pattern of settlement: will the route detract from existing man-made features?
- Noteworthy landscape elements and features: will the route affect the settings of any natural features or buildings, structures, earthworks etc?

Tables 7-19 to 7-22 on the following pages indicate the main landscape and townscape features identified in the area, and are divided into the three Aspect Areas the proposed routes fall within. It also considers the four character areas within 2km of each route, which are close enough to experience indirect visual impacts.

Table 7-19: Option 3b – New road as Viaduct set back from existing beach road

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
Route falls within Aspect Area:						
PMBRKVS072: Druidston – High Value	High (dwellings)	Residential properties at Newgale and scattered properties/farmsteads off A487 looking northwest	New road as viaduct (3m level difference); increased traffic & noise, parking associated with the Duke of Edinburgh Inn would be partially lost. Road on embankment increases visibility to surrounding properties and will directly impact on properties through impingement and some loss of land.	Moderate adverse	Moderate adverse	Moderate adverse
	Medium	Leisure facilities: Newgale camping park, Sands Café, New Surf store	New road as viaduct (3m level difference); loss of field pattern, increase in traffic & noise. Newgale camping ground will be permanently severed and altered. Parking associated with New Surf would be partially lost. The garden of the leisure store and Sands Café would need to be relocated. There would be major impact on the settlement pattern due to alterations and relocation of facilities.	Moderate adverse	Moderate adverse	Moderate adverse
	Medium	Amenity grassland as part of the camping park and marshland to the northern section	New road as viaduct (3m level difference); partial loss of habitat, loss of field pattern and alteration to landform.	Minor adverse	Slight adverse	Slight adverse
	Medium	Brandy Brook watercourse & valley (pending formal SSSI designation)	New road as viaduct over Brandy Brook watercourse (3m level difference); disturbance to habitat, earthworks associated with embankment and alteration to Landform	Moderate adverse	Moderate adverse	Moderate adverse
	High (PRoW)	Wales Coast Path	New road as viaduct (3m level difference); no direct impact, increases visibility for public right of way users and impacts on character of setting.	Minor adverse	Slight adverse	Slight adverse

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
	High (Cycleway)	National Cycle Route 4	New road as viaduct (3m level difference); very minor impact as cycle route passes along Newgale beachfront on existing road disrupting user experience both visually and on character of setting.	Negligible adverse	Negligible adverse	Negligible adverse
	Medium	Views in & out of area	New road as viaduct (3m level difference); Prominent elevated element with increased visibility to surrounding properties most specifically in Newgale and scattered farmstead/properties in close vicinity such as Curlew Cottage, Wood Farm and Southwood Farm B&B. Road users, PRoW users and more distant viewpoints are also impacted on as a result of a new element in the landscape. Visual impact of new road and viaduct in an area with a strong coastal character would need to be considered as a result of the exposed location within the lowland area.	Major adverse	Large adverse	Large adverse
Route within 2km of Aspect Area:						
PMBRKVS029: St Brides Bay – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there is potential for occasional views of proposed road from the Wales Coast Path due to the lack of intervening vegetation and its close proximity to route. However, this will be seen in context with existing road which will be replaced.	Major adverse	Large adverse	Large adverse
PMBRKVS031: Skyfog – High Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there will be occasional glimpsed views of the proposed road through gaps in vegetation for road users and PRoW users.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS031 Newgale Sands – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although impact on coastal setting would need to be considered.	Minor adverse	Slight adverse	Slight adverse

Table 7-20: Option J – New road and associated earthworks through existing landscape

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
Route falls within Aspect Area:						
MBRKVS072: Druidston – High Value	High	Residential properties at Penycwm and Newgale Farm to the northern end of the route and Pontpren, Wood Farm and Gouts Farm to the southern end of the route	New road, roundabout, lighting and associated earthworks; disturbance to properties adjacent to the route specifically to southern end in the form of increased disturbance, traffic and noise. No impact on settlement pattern.	Minor adverse	Slight adverse	Slight adverse
	Medium	Fields and farmland between Penycwm and Wood Farm	New road, roundabout, lighting and associated earthworks; disturbance and loss of habitats, agricultural land and field pattern in a strong rural setting	Major adverse	Moderate adverse	Large adverse
	Medium	Mature hedgerows/hedgebanks, woodland and individual trees	New road, roundabout, lighting and associated earthworks; route would traverse through existing vegetation which contribute to the areas strong rural setting. Permanent loss and alteration of natural resource and field pattern.	Major adverse	Moderate adverse	Large adverse
	Medium	Brandy Brook watercourse & valley (pending formal SSSI designation)	New road, roundabout, lighting and associated earthworks; disturbance and alteration of existing habitat and landform with road crossing over Brandy Brook with proposed culvert forming part of the works.	Moderate adverse	Moderate adverse	Moderate adverse
	High (PRoW)	Public Rights of Way across open fields	New road, roundabout, lighting and associated earthworks; 1 PRoW severed and altered due to realignment or loss of vegetation.	Minor adverse	Slight adverse	Slight adverse
	High (Cycleway)	National Cycle Route 4	New road, roundabout, lighting and associated earthworks; direct impact as northern end of road intersects with small section of cycle route on the A487 disrupting user experience both visually and on character of setting.	Minor adverse	Slight adverse	Slight adverse
	Medium	Views in & out of area	New road, roundabout, lighting and associated earthworks; visibility to surrounding receptors including Penuel Baptist Church, properties at Penycwm, Newgale and scattered farmsteads within vicinity. In addition to this, road users, PRoW users, Penuel Baptist Church and more distant receptors will experience visual impacts. Severance of habitat, vegetation and loss of field pattern as a result. Visual impact of new road, roundabout and lighting would need to be considered in respect to the strong rural setting and character of the area and the impact on this due to the uncharacteristic nature of the associated works. Taking into account the contained area of which the roundabout and lighting will be located to the southern junction and with appropriate mitigation measures this adverse impact could be reduced over time.	Moderate adverse	Moderate adverse	Moderate adverse

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
Route within 2km of Aspect Area:						
PMBRKVS029: St Brides Bay – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there is potential for occasional views from Cycle Route 4 and the Wales Coast Path due to the lack of intervening vegetation and its close proximity to route.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS036: Brandy Brook – High Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there is potential for occasional intermittent views to the south west due to proximity to the route. Intervening vegetation and undulating landform will provide some screening measure.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS031: Skyfog – High Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there will be occasional glimpsed views of the proposed road through gaps in vegetation.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS071 Simpson Cross – Moderate Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there will be partial, glimpsed views of the proposed road to the west.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS031 Newgale Sands – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although impact on coastal setting would need to be considered.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS112 St. Bawdy Airfield – Low Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, with little to no visual impact on aspect area due to intervening landform and vegetation cover.	Negligible adverse	Neutral	Slight adverse

Table 7-21: Option 7 – New road and associated earthworks through existing landscape

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
Route falls within Aspect Area:						
PMBRKVS072: Druidston – High Value	High	Residential properties at Penycwm, Llethr and Lower Llethr to the northern section of the route; Pontpren at the southern section	New road, roundabout, lighting and associated earthworks; increased disturbance, traffic and noise in close proximity to properties. No impact on settlement pattern.	Minor adverse	Slight adverse	Slight adverse
	Medium	Fields and farmland between Penycwm and Pontpren.	New road, roundabout, lighting and associated earthworks; disturbance and loss of habitats, agricultural land and field pattern in a strong rural setting.	Major adverse	Moderate adverse	Large adverse
	Medium	Mature hedgerows/hedgebanks, trees and woodland blocks	New road, roundabout, lighting and associated earthworks; route would traverse through existing vegetation which contribute to the areas strong rural landscape setting. Permanent loss and alteration of natural resource and landform.	Major adverse	Moderate adverse	Large adverse
	Medium	Brandy Brook watercourse & valley (pending formal SSSI designation)	New road, roundabout, lighting and associated earthworks; disturbance and alteration of existing habitat and landform.	Moderate adverse	Moderate adverse	Moderate adverse
	High (PRoW)	Public Rights of Way across open fields	2 PRoW severed and altered due to realignment or loss of vegetation.	Minor adverse	Slight adverse	Slight adverse
	High (Cycleway)	National Cycle Route 4	New road, roundabout, lighting and associated earthworks; direct impact as northern end of road intersects with small section of cycle route on the A487 disrupting user experience both visually and on character of setting.	Minor adverse	Slight adverse	Slight adverse
	Medium	Views in & out of area	New road, roundabout, lighting and associated earthworks; visibility to surrounding receptors including Penuel Baptist Church, properties at Penycwm, Newgale and scattered farmsteads within vicinity. In addition to this, road users, PRoW users, Penuel Baptist Church and more distant receptors will experience visual impacts. Severance of habitat, vegetation and loss of field pattern as a result. Visual impact of new road, roundabout and lighting would need to be considered in respect to the strong rural setting and character of the area and the impact on this due to the uncharacteristic nature of the associated works. Taking into account the contained area of which the lighting and roundabout will be located to the southern junction and with appropriate mitigation measures this adverse impact could be reduced over time.	Moderate adverse	Moderate adverse	Moderate adverse

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
PMBRKVS112 St. Bawdy Airfield (small section of route) – Low Value	Medium	Fields and farmland at Penycwm	New road and upgrade to existing road with associated earthworks; small section of route within Aspect Area to the western end of the route cutting through existing fields, creating disturbance and loss of habitats.	Minor adverse	Slight adverse	Slight adverse
	Medium	Mature Hedgebanks/hedgerows at Penycwm	New road and upgrade to existing road with associated earthworks; route traverses through existing vegetation which contribute to the areas strong rural landscape setting. Permanent loss of natural resource.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS031: Skyfog (small section of route) – High Value	Medium	Fields and farmland at Penycwm	New road and upgrade to existing road with associated earthworks; small section of route to the western end cutting through existing fields, creating disturbance and loss of habitats.	Minor adverse	Slight adverse	Slight adverse
	Medium	Mature Hedgebanks/hedgerows at Penycwm	New road and upgrade to existing road with associated earthworks; route would cut through existing vegetation which contribute to the areas strong rural landscape setting. Permanent loss of natural resource.	Minor adverse	Minor adverse	Slight adverse
Route within 2km of Aspect Area:						
PMBRKVS029: St Brides Bay – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there is potential for occasional views of proposed road from the cycle route and the Wales Coast Path due to the lack of intervening vegetation and its close proximity to route.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS036: Brandy Brook – High Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there is potential for occasional views of proposed road to the south west due to the close proximity to the route. Intervening vegetation and undulating landform will provide some screening measure.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS071 Simpson Cross – Moderate Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there will be partial, glimpsed views of the proposed road to the west.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS031 Newgale Sands – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although impact on coastal setting would need to be considered.	Minor adverse	Slight adverse	Slight adverse

Table 7-22: Option 11 – Widening of existing road and associated earthworks

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
Route falls within Aspect Area:						
PMBRKVS031: Skyfog – High Value	High	Residential properties at Penycwm, Rhydygele, Upper and Lower Eweston, Roch Bridge and Roch located along the existing road, including The Granary self-catering accommodation at Roch Mill and other scattered properties and farmsteads along the route.	Widening of existing road, associated earthworks, lighting and replacement bridge; increased disruption of traffic, noise and lighting in close proximity to properties in addition to impingement on land.	Moderate adverse	Moderate adverse	Moderate adverse
	High	Public Rights of Way across open fields	Widening of existing road, associated earthworks, lighting and replacement bridge; 3 PRoW temporarily disturbed due to widening of existing road including replacement bridge.	Negligible adverse	Negligible adverse	Negligible adverse
	Medium	Penuel Baptist Church	Widening of existing road, associated earthworks, lighting and replacement bridge; increase of traffic and noise in close proximity church in addition to impingement on land.	Moderate adverse	Moderate adverse	Moderate adverse
	Medium	Fields and farmland adjacent to the road	Widening of existing road, associated earthworks, lighting and replacement bridge; disturbance and partial loss of habitats, agricultural land and field pattern in a strong rural setting.	Minor adverse	Slight adverse	Slight adverse
	Medium	Mature hedgerows/hedgebanks, trees and woodland blocks	Widening of existing road, associated earthworks, lighting and replacement bridge; loss of vegetation as a result of widening, which contribute to the areas strong rural landscape setting. Permanent loss of natural resource.	Major adverse	Moderate adverse	Large adverse
	Medium	Brandy Brook watercourse & valley (pending formal SSSI designation)	Widening of existing road, associated earthworks, lighting and replacement bridge; disturbance of existing habitat.	Minor adverse	Slight adverse	Slight adverse
	Medium	Views in & out of area	Widening of existing road, associated earthworks, lighting and replacement bridge; visibility limited to adjacent receptors including properties, PRoW and road users with the occasional more distant receptor. Once complete, road will be seen in context with existing road network. Visual impact of upgrade to existing road and its associated earthworks would need to be considered in respect to the strong rural setting and character of the area and the impact on this.	Minor adverse	Slight adverse	Slight adverse

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
PMBRKVS112 St. Bawdy Airfield (border of Aspect Area) – Low Value	High	Residential properties at Penycwm and Rhydygele located along the existing road	Widening of existing road and associated earthworks; increase of traffic and noise in close proximity to properties in addition to impingement on land.	Minor adverse	Slight adverse	Slight adverse
	High (PRoW)	Public Rights of Way across open fields	Widening of existing road and associated earthworks; 1 PRoW at Penycwm indirectly disturbed through increased noise due to widening of existing road.	Minor adverse	Slight adverse	Slight adverse
	High (Cycleway)	National Cycle Route 4	Widening of existing road and associated earthworks; direct impact as north eastern end of road intersects with small section of cycle route on the A487 disrupting user experience both visually and on character of setting.	Minor adverse	Slight adverse	Slight adverse
	Medium	Fields and farmland adjacent to the road	Widening of existing road and associated earthworks; disturbance and partial loss of habitats, agricultural land and field pattern in a strong rural setting.	Minor adverse	Slight adverse	Slight adverse
	Medium	Mature hedgerows/hedgebanks and trees	Widening of existing road and associated earthworks; loss of vegetation as a result of widening, which contribute to the areas strong rural landscape setting. Permanent loss of natural resource.	Moderate adverse	Moderate adverse	Moderate adverse
	Medium	Views in & out of area	Widening of existing road and associated earthworks; visibility limited to adjacent receptors including few properties at Penycwm and Cawdor Barracks adjacent to the route. Once complete, road will be seen in context with existing road network. Visual impact of upgrade to existing road and its associated earthworks would need to be considered in respect to the strong rural setting and character of the area and the impact on this.	Minor adverse	Slight adverse	Slight adverse
Route within 2km of Aspect Area						
PMBRKVS029: St Brides Bay – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there is potential for occasional views of proposed road from the cycle route and the Wales Coast Path on high ground due to the lack of intervening vegetation and its close proximity to the route.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS036: Brandy Brook – High Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there is potential for occasional views of proposed road as it cross adjacent to the Aspect Area at Silver Hill. Intervening vegetation and undulating landform will provide some screening measure.	Minor adverse	Slight adverse	Slight adverse
PMBRKVS031 Newgale Sands – Outstanding Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although there will be partial, glimpsed views of the proposed road to the west.	Minor adverse	Slight adverse	Slight adverse

Aspect Area Code	Sensitivity / Value	Feature affected	Nature of impact	Magnitude of impact	Significance of Impact	Summary Impact
PMBRKVS071 Simpson Cross – Moderate Value	Medium	Views in & out of area	No direct impacts on this Aspect Area, although impact on coastal setting would need to be considered.	Minor adverse	Slight adverse	Slight adverse

7.4.5 Conclusion

This Stage 1 WelTAG has considered proposed route options 3b, J, 7 and 11 and their impact on the landscape resource, character and visual amenity within a sensitive rural landscape, using the information available at the time of writing.

In regards to option 3b, this route will have an overall moderate impact on landscape resource and is the shortest of the four options. It is has been considered to have a moderate impact on residential properties and on disturbance, permanent removal and relocation of local amenities and tourist facilities along the beachfront in Newgale. Views in and out will also be adversely impacted on with a new prominent feature in an exposed seafront location which encompasses a 3m high viaduct in the landscape, especially effecting those in Newgale, surrounding properties, users of the A487 and PRoW users which experience striking views towards the coast. Though, once the new road is in place set back from the seafront there is potential for some improvement and upgrade through new public realm proposals along the seafront benefitting user experience. Based on all aspects considered and being set within a high value aspect area with a strong coastal setting it has been assessed to have an overall **moderate adverse** impact on the landscape and townscape most specifically when taking into account impacts on views towards and on the beachfront itself.

Route options J and 7 would be detracting features in a strong rural setting cutting through important and sensitive landscape features including hedgerows, woodland and trees in a high value aspect area. There will be large areas of cut and fill as they pass through undulating landscape permanently altering the landform and ultimately the landscape character in addition to the impingement on adjacent properties. In addition to this, where the routes intersect with the A487, roundabouts and lighting are proposed which create uncharacteristic elements in this landscape setting. Mitigation in the form of translocation and new planting would help to counteract this impact and offer screening measures with regards to visual amenity. Overall, in respect to the permanent impact these will have on the landform, character and landscape resources in a sensitive rural setting they have been assessed as having an overall **moderate adverse** impact on the landscape and townscape.

Option 11 will involve proposed earthworks, lighting at A487 junction, a 12m high bridge in the vicinity of Roch Bridge and widening of the existing Roch Hill and Bramble Hill Lanes which intersect with the A487. The route will have major impacts on landscape features such as hedgerows, woodland and trees resulting in a permanent loss of resources and alteration to landform. It will also have moderate impacts on adjacent properties where widening will impinge on land and any disruption that is caused. However, translocation and new planting will help mitigate this through screening and replacement of important resources and will also be considered in context with utilising the existing road in place therefore impacts on setting and visual amenity will be minor and for this reason when taking in account mitigation measures it will have an overall **minor adverse** impact on the landscape and townscape.

7.5 Biodiversity

7.5.1 Introduction

This section provides a qualitative appraisal of the potential construction and operation impacts of each of the four options on biodiversity features. This report does not include a full detailed ecological impact assessment of each of the Scheme options. This will be undertaken at the next stages of the Scheme development.. The options can be viewed on Drawing No. 20160152-XX-22-ATK-DR-D-2000/P2 in **Appendix A.1.**

7.5.2 Method

A desk-based study has been undertaken to collect information on the biodiversity and earth heritage features which could potentially be affected by each option.

With reference to the potential impacts of road schemes described in the DMRB, Volume 11, Section 1.2.3, 3, Part 4, Chapter 5, and in accordance with the methods described in TAG UNIT A3 Environmental Impact Appraisal[25], a qualitative appraisal has been undertaken of the potential impacts of each option on the biodiversity and earth heritage features identified during the desk study. For the purposes of the appraisal, the identified biodiversity and earth heritage features have been grouped into the four receptors described and evaluated[26] in **Table 7-24**. The valuation is based on the criteria in **Table 7-23.**

Table 7-23: Guidance on Describing the Biodiversity and Earth Heritage Value of Features

Value	Criteria	Examples
Very High	High importance and rarity, international scale and limited potential for substitution	Internationally designated sites
High	High importance and rarity, national scale, or regional scale with limited potential for substitution	Nationally designated sites Regionally important sites with limited potential for substitution
Medium	High or medium importance and rarity, local or regional scale, and limited potential for substitution	Regionally important sites with potential for substitution Locally designated sites
Low	Low or medium importance and rarity, local scale	Undesignated sites of some local biodiversity and earth heritage interest
Negligible	Very low importance and rarity, local scale	Other sites with little or no local biodiversity and earth heritage interest

Table 7-24: Relevant ecological receptors

Receptor	Description	Value
European designated sites	Pembrokeshire Bat Sites and Bosherston Lakes/Saf leoedd Ystlum Sir Benfro a Llynnoedd Bosherston, SAC. North Pembrokeshire Woodlands SAC. St David's/Ty Ddewi SAC. Cleddau Rivers SAC. West Wales Marine cSAC. Pembrokeshire Marine/Sir Benfro Forol SAC and Ramsey and St David's Peninsula Coast SPA together comprise a number of internationally important coastal habitat features including maritime vegetation communities within reefs, sandbanks, mud flats and Atlantic salt meadows. These habitats ultimately help to support internationally important bird, seal and lamprey populations.	Very high
SSSIs and National Parks within 2 km	St David's Peninsula Coast SSSI (part of the St David's Peninsula Coast SPA) comprises of important geological and biological features, namely lichens, invertebrates, Choughs and Peregrines and nationally important for grey seals. Newgale to Little Haven Coast SSSI is nationally important for its intertidal habitats and species. Pembrokeshire Coast National Park contains an assemblage of important coastal and terrestrial habitats supporting a range of notable and protected species. Western Cleddau Rivers SSSI is of special interest for otter, a range of fish species, as well as a variety of associated riverside habitats.	High

[25] TAG UNIT A3 Environmental Impact Appraisal, Dec 2015, Department for Transport, Transport Analysis Guidance (TAG)
[26] Values are based on Table 1 of Web TAG Unit 3.3.10 – *The Biodiversity Sub-Objective* (http://www.dft.gov.uk/webtag/documents/expert/pdf/unit3.3.10.pdf).

Receptor	Description	Value
Floodplain marsh	Newgale Marsh[27] meets the criteria for SSSI selection as set out in the published guidelines for the selection of biological SSSIs[28]. The site has however not yet been designated as an SSSI, but for the purpose of this assessment this assemblage of habitats has been valued as of High importance.	High
Farmland habitats and notable species	Farmland habitats include grasslands, hedgerows, woodland, rivers and streams. These habitats have the potential to support a range of protected and notable species, which may include (but are not necessarily limited to): bats; badger; birds; slow worm; and a range of moths and butterflies.	Low

Table 7-25: Estimating the Overall Assessment Score

Magnitude of Impact	Biodiversity and earth heritage value				
	Very High	High	Medium	Low	Negligible
Major negative	Very Large Adverse	Very Large Adverse	Moderate Adverse	Slight adverse	Neutral
Intermediate negative	Large Adverse	Large Adverse	Moderate Adverse	Slight adverse	Neutral
Minor negative	Slight adverse	Slight adverse	Slight adverse	Slight adverse	Neutral
Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Positive	Large beneficial	Large beneficial	Moderate beneficial	Slight beneficial	Neutral

For each option, the overall assessment has been qualitatively assessed for each receptor using the following eight-point scale to determine their importance:

- Large beneficial;
- Moderate beneficial;
- Slight beneficial;
- Neutral;
- Slight adverse;
- Moderate adverse;
- Large adverse; and;
- Very large adverse.

The overall assessment score combines the appraisal of biodiversity and earth heritage value of the features, with the appraisal of the magnitude of the impacts, to determine the consequence of those impacts, it is a function of the magnitude of the impact (assessment of the impact of the scheme on the significance of the features identified)[29] and the biodiversity and earth heritage value of the receptor. An overall impact has been determined for each option, based on the most significant adverse impact in each case.

Potential hedgerow loss length has been approximately calculated by marking the locations of hedgerows on general arrangement plans of each option and measuring the lengths of hedgerow that are due to be impacted by the new road option footprint.

[27] The area of floodplain extending east from Newgale to Roch Bridge.
[28] NRW (no date). *Newgale Marsh: Managing a coastal valley wetland in the face of sea level rise*
[29] TAG UNIT A3 Environmental Impact Appraisal, Dec 2015, Department for Transport, Transport Analysis Guidance (TAG)

7.5.3 Impact

The qualitative impact appraisals are provided for each option in **Table 7-26** to **7-29** below. The overall assessment score has been calculated using the criteria in **Table 7-25**.

Table 7-26: Option 3b

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
European designated sites (Very high)	Assuming standard pollution prevention measures no impacts are anticipated on; • Pembrokeshire Marine SAC • St David's/Ty Ddewi SAC • West Wales Marine cSAC • Ramsey and St David's Peninsula Coast SPA Abandonment of the existing road and sea defences may allow creation of saline lagoons and establishment of natural coastal processes, possibly of benefit to Pembrokeshire Marine SAC. North Pembrokeshire Woodlands SAC is approximately 19km northeast, and a compartment of Pembrokeshire Bat Sites and Bosherton Lakes SAC is located 27 km NE from this option. Barbastelle bats, and greater and lesser horseshoe bats are the reason for the designations, respectively. Records of greater and lesser horseshoe bats have been found within the vicinity of this option. It is unlikely that at this distance away from the SACs, the option would have an impact on the roosting bats. However, if hedgerows are lost foraging and commuting bats could be impacted.	Minor negative	Slight adverse
SSSIs and NPs within 2 km (High)	Potential impacts on St David's Peninsula Coast SSSI through any noise/artificial light disturbance made around the bird nesting seasons for Choughs and Peregrines. Assuming standard pollution prevention measures are carried out during construction no negative impacts are anticipated on Newgale to Littlehaven Coast SSSI. The option is located within Pembrokeshire Coast National Park, although impacts to semi-natural habitats will be limited.	Minor negative	Slight adverse
Floodplain marsh (High)	Minor loss of marsh wetland habitat. Route close to Brandy Brook and tributaries carries risk of pollution into Brandy Brook during construction and operation affecting temporary disturbance	Minor negative	Slight adverse

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
	of sediments during construction and also affect hydrological features such as flow of water across the habitat with the ability to alter the habitats. This has the potential to cause indirect impacts on Pembrokeshire Marine/Sir Benfro Forol SAC. Standard forms of mitigation should be in place to prevent these risks. Abandonment of the existing road and sea defences at Newgale will result in some tidal inundation at the west of the floodplain, allowing more natural coastal process to establish and allowing creation of habitats such as saline lagoons and wet woodland[30].		
Farmland habitats and notable species (Low)	• Loss of amenity campsite and some arable farmland. • Indirect loss/degradation of adjacent habitats as a result of noise and light generated during construction and operation. • Potential loss of 81 metres of hedgerow. • 1 watercourse crossing over Brandy Brook. • Killing/injury of protected and notable species during construction and operation	Minor negative	Slight adverse
Overall: Slight adverse			

Table 7-27: Option J

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
European designated sites with hydrological connections (Very high)	Assuming standard pollution prevention measures no impacts are anticipated on: • Pembrokeshire Marine SAC • St David's/Ty Ddewi SAC • West Wales Marine cSAC • Ramsey and St David's Peninsula Coast SPA Abandonment of the existing road and sea defences may allow creation of saline lagoons and establishment of natural coastal	Minor negative	Slight adverse

[30] Haskoning DHV UK LTD (2017). *Newgale Habitat Creation Study: Environmental Appraisal*

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
	processes, possibly of benefit to Pembrokeshire Marine SAC. North Pembrokeshire Woodlands SAC is approximately 17km northeast, and a compartment of Pembrokeshire Bat Sites and Bosherton Lakes SAC is located 25 km NE from the option. Barbastelle bats, and greater and lesser horseshoe bats are the reason for the designations, respectively. Records of greater and lesser horseshoe bats have been found within the vicinity of this option. It is unlikely that at this distance away from the SACs, the option would have an impact on the roosting bats. The loss of hedgerows, scrub and wetland habitats may impact foraging and commuting bats.		
SSSIs and NPs within 2 km (High)	Potential impacts on St David's Peninsula Coast SSSI through any noise/artificial light disturbance made around the bird nesting seasons for Choughs and Peregrines. Assuming standard pollution prevention measures are carried out during construction no negative impacts are anticipated on Newgale to Littlehaven Coast SSSI. The option is located within Pembrokeshire Coast National Park, and will result in loss of semi-natural habitats. Losses will be greater than Option 3b or Option 11.	Intermediate negative	Large adverse
Floodplain marsh (High)	Significant loss of marsh wetland habitat from construction of a crossing over the flood plain and habitat fragmentation. Direct route over Brandy Brook and tributaries carries risk of pollution into Brandy Brook during construction and operation affecting temporary disturbance of sediments during construction and also affect hydrological features such as flow of water across the habitat with the ability to alter the habitats. This has the potential to cause indirect impacts on Pembrokeshire Marine/Sir Benfro Forol SAC. Standard forms of mitigation should be in place to prevent these risks. Abandonment of the existing road and sea defences at Newgale will result in some tidal inundation at the west of the floodplain, allowing more natural coastal process to establish and allowing creation of habitats such as saline lagoons and wet woodland[31].	Major negative	Very large adverse

[31] Haskoning DHV UK LTD (2017). *Newgale Habitat Creation Study: Environmental Appraisal*

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
Farmland habitats and notable species (Low)	• Direct loss of arable farmland. Predominantly grassland pasture and hedgerows. • Indirect loss/degradation of adjacent habitats as a result of noise and light generated during construction and operation • Loss/fragmentation of broadleaved woodland pockets (10 in total either on direct route course or within 1 km from site area). • Potential for loss of 318 meters of hedgerow. • Potential impact on 4 ponds within 500m from site area and 3 watercourse crossings over Brandy Brook. • Severance of habitats used by otter, foraging bats, reptiles and breeding birds. • Killing/injury of protected and notable species during construction and operation	Intermediate negative	Slight adverse
Overall: Very large adverse			

Table 7-28: Option 7

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
European designated sites with hydrological connections (Very high)	Assuming standard pollution prevention measures no impacts are anticipated on; • Pembrokeshire Marine SAC • St David's/Ty Ddewi SAC • West Wales Marine cSAC • Ramsey and St David's Peninsula Coast SPA Abandonment of the existing road and sea defences may allow creation of saline lagoons and establishment of natural coastal processes, possibly of benefit to Pembrokeshire Marine SAC**.** North Pembrokeshire Woodlands SAC is approximately 17km northeast, and a compartment of Pembrokeshire Bat Sites and Bosherton Lakes SAC is located 24 km NE from the option. Barbastelle bats, and greater and lesser horseshoe bats are the reason for the designations, respectively. Records of greater and lesser horseshoe bats have been	Minor negative	Slight adverse

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
	found within the vicinity of this option. It is unlikely that at this distance away from the SACs, the Scheme would have an impact on the roosting bats. The loss of hedgerows, scrub and wetland habitats may impact foraging and commuting bats.		
SSSIs and NPs within 2 km (High)	Potential impacts on St David's Peninsula Coast SSSI through any noise/artificial light disturbance made around the bird nesting seasons for Choughs and Peregrines. Assuming standard pollution prevention measures are carried out during construction no negative impacts are anticipated on Newgale to Littlehaven Coast SSSI. The option is located within Pembrokeshire Coast National Park, and will result in loss of semi-natural habitats. Losses will be greater than Option 3b or Option 11.	Intermediate negative	Large adverse
Floodplain marsh (High)	Significant loss of marsh wetland habitat from construction of a crossing over the flood plain and habitat fragmentation. Direct route over Brandy Brook and tributaries carries risk of pollution into Brandy Brook during construction and operation affecting temporary disturbance of sediments during construction and also affect hydrological features such as flow of water across the habitat with the ability to alter the habitats. This has the potential to cause indirect impacts on Pembrokeshire Marine/Sir Benfro Forol SAC**.** Standard forms of mitigation should be in place to prevent these risks. Abandonment of the existing road and sea defences at Newgale will result in some tidal inundation at the west of the floodplain, allowing more natural coastal process to establish and allowing creation of habitats such as saline lagoons and wet woodland[32].	Major negative	Very large adverse

[32] Haskoning DHV UK LTD (2017). *Newgale Habitat Creation Study: Environmental Appraisal*

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
Farmland habitats and notable species (Low)	• Direct loss of arable farmland. Predominantly grassland pasture and hedgerows. • Indirect loss/degradation of adjacent habitats as a result of noise and light generated during construction and operation • Loss/fragmentation of broadleaved woodland pockets (8 in total either on direct route course or within 1 km from site area). • Potential impact on 5 ponds within 500m from the site area and 2 watercourse crossings over Brandy Brook. • Potential for loss of 1100 meters of hedgerow. • Severance of habitats used by otter, foraging bats, reptiles and breeding birds. • Killing/injury of protected and notable species during construction and operation	Intermediate negative	Slight adverse
Overall: Very large adverse			

Table 7-29: Option 11- Based on proposed widening of the road

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
European designated sites with hydrological connections (Very high)	Assuming standard pollution prevention measures no impacts are anticipated on: • Pembrokeshire Marine SAC • St David's/Ty Ddewi SAC • West Wales Marine cSAC • Ramsey and St David's Peninsula Coast SPA • Cleddau Rivers SAC / Western Cleddau Rivers SSSI Abandonment of the existing road and sea defences may allow creation of saline lagoons and establishment of natural coastal processes, possibly of benefit to Pembrokeshire Marine SAC. North Pembrokeshire Woodlands SAC is approximately 16km northeast, and a compartment of Pembrokeshire Bat Sites and Bosherton Lakes SAC is located 20 km NE of the option. Barbastelle bats, and greater and lesser horseshoe bats are the reason for the designations, respectively. Records of greater and lesser horseshoe bats have been found	Minor negative	Slight adverse

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
	within the vicinity of this option. It is unlikely that at this distance away from the SACs, the Scheme would have an impact on roosting bats. The loss of hedgerows and scrub may impact foraging and commuting bats.		
SSSIs and NPs within 2 km (High)	Potential impacts on St David's Peninsula Coast SSSI through any noise/artificial light disturbance made around the bird nesting seasons for Choughs and Peregrines. Option partly with the Pembrokeshire Coast National Park, although impacts to semi-natural habitats will be limited and adjacent to an existing road.	Minor negative	Slight adverse
Floodplain marsh (High)	Widening of route over Brandy Brook and tributaries could cause loss of marsh wetland habitat and habitat fragmentation. Considering that the floodplain is narrower at this location, this loss is less than both Option J & 7. Direct route over Brandy Brook and tributaries carries risk of pollution into Brandy Brook during construction and operation affecting temporary disturbance of sediments during construction and also affect hydrological features such as flow of water across the habitat with the ability to alter the habitats. This has the potential to cause indirect impacts on Pembrokeshire Marine/Sir Benfro Forol SAC**.** Standard forms of mitigation should be in place to prevent these risks. Abandonment of the existing road and sea defences at Newgale will result in some tidal inundation at the west of the floodplain, allowing more natural coastal process to establish and allowing creation of habitats such as saline lagoons and wet woodland[33].	Intermediate negative	Large adverse

[33] Haskoning DHV UK LTD (2017). *Newgale Habitat Creation Study: Environmental Appraisal*

Receptor (and value)	Impact	Magnitude	Overall Appraisal (value x magnitude)
Farmland habitats and notable species (Low)	• Direct loss of arable farmland. Predominantly grassland pasture and hedgerows. • Indirect loss/degradation of adjacent habitats as a result of noise and light generated during construction and operation. • Loss/fragmentation of broadleaved woodland pockets (4 in total either on direct route course or within 1 km from site area). • Potential loss of 6200 meters of hedgerow (unless translocated) • Potential impact on 2 ponds within 500m from the site area and 1 watercourse crossing over Brandy Brook. • Killing/injury of protected and notable species during construction and operation	Intermediate negative	Moderate adverse
Overall: Large adverse			

7.5.4 Conclusions

Table 7-30 below displays the overall scores of each option and provides an appraisal summary of each in consideration of Scheme preference.

Table 7-30: Scheme Options Appraisal summary

Option	Overall score	Appraisal Summary
Option 3b	Slight adverse	In light of this biodiversity assessment, from an ecological perspective, this option is considered overall the most preferred option as it has an overall score of **slight adverse.** However, this option would still result in the loss of high importance lowland marsh habitat. Out of the four options, this option is likely to result in fewer impacts to Newgale Marsh, hedgerows (lowest length of hedgerow due to be lost (81 m)) and it is unlikely that any woodlands are to be affected.
Option J	Very large adverse	With an overall assessment score of **very large adverse** assigned to this option, in light of this biodiversity assessment and from an ecological perspective, this option is considered the second least favourable compared to Option 7 which also has an overall assessment score of very large adverse. This is due to significant loss of priority habitats (lowland marsh habitat) and associated biodiversity. A large length of hedgerow (318 m) is due to be lost as a result, this is however considerably less than Option 7. 10 woodland areas will also be affected.

Option 7	Very large adverse	With an overall assessment score of **very large adverse** assigned to this option, in light of this biodiversity assessment and from an ecological perspective, this option is considered the least favourable. This option would result in a significant loss of priority habitats (lowland marsh habitat) and associated biodiversity. The second greatest linear length of hedgerow (1100 m) has the potential to be lost along with eight woodland areas that are due to be affected also as well as the two river/stream crossings being required.
Option 11	Large adverse	In light of this biodiversity assessment, from an ecological perspective, this option is considered third least-favourable after Options 7 & J as it has an overall assessment score of **Large adverse.** Even though widening the pre-existing road will result in minimal impacts on the nearby lowland marsh habitat, it has the greatest length (6200m) of linear hedgerows affected along with impacts to 4 woodlands. This is the highest loss of hedgerows of all of the options.

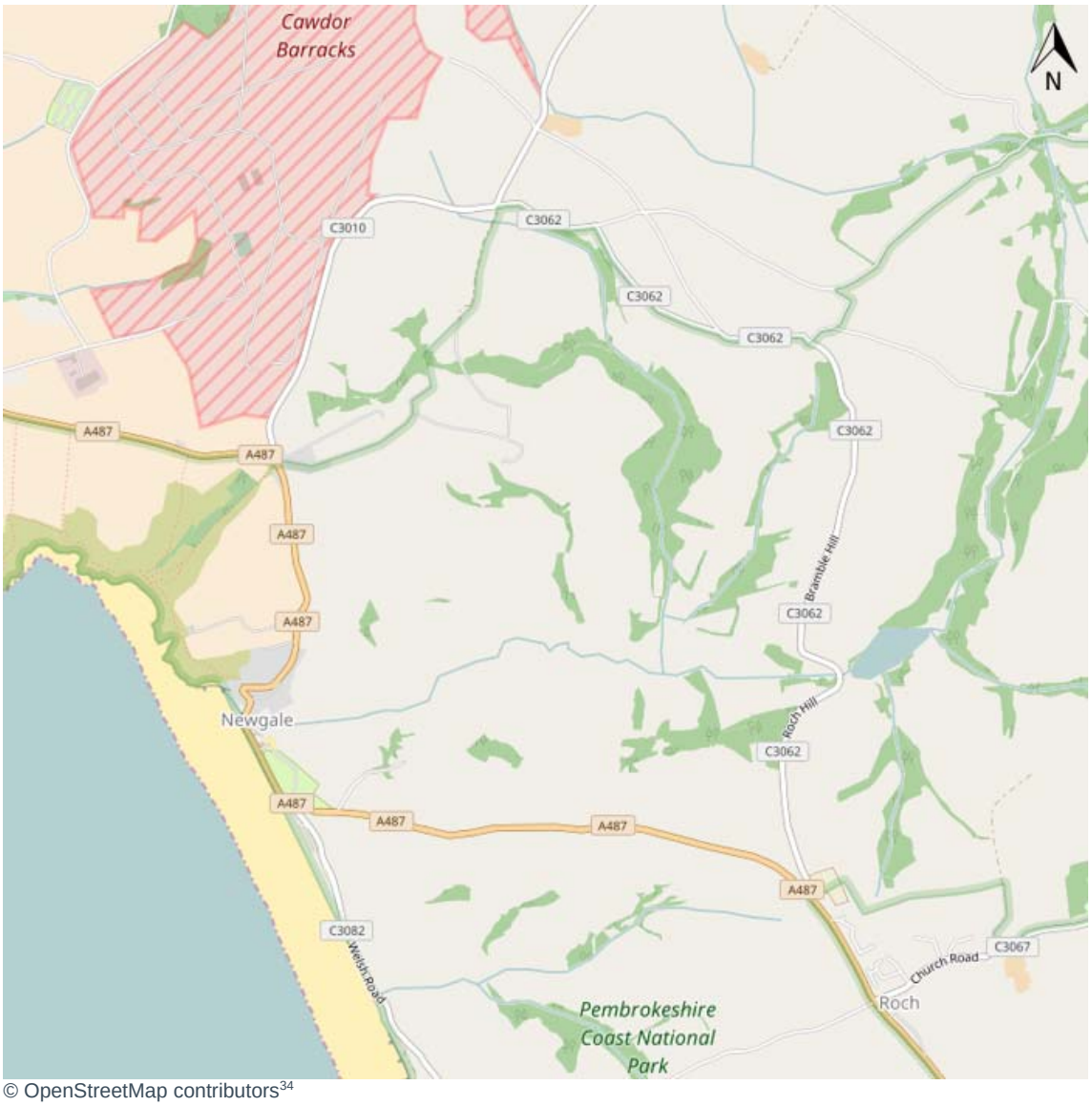
7.6 Heritage

7.6.1 Introduction

Conserving the cultural heritage of the Pembrokeshire coast is one of the statutory purposes of the National Park. This section provides an appraisal of the potential construction and operation impacts of each of the four options on heritage assets within and on the edge of the National Park

The study area is shown in **Figure 7-1**. For the purpose of this report the study area has been broadly defined by a 500m wide buffer extending outwards from each of the four alignment options for the possible road; that is 250m from either side of the proposed route alignments.

Figure 7-1: Study Area



© OpenStreetMap contributors[34]

7.6.2 Method

The Stage 1 assessment presented has been prepared in accordance with Welsh Transport Planning and Appraisal Guidance (WelTAG, 2008). A summary of the results and the significance of each options' (Options 3b, J, 7 and 11) impacts to heritage assets are summarised in the appraisal tables in **Appendix C**. These tables provide an early indication of any key heritage constraints and establishes the potential significance of impact on the historic environment from each option.

A corridor of 250m either side of each option has been assessed to gain an understanding of the known designated and non-designated heritage assets along and in the area surrounding the alignments. This also provides information to create an early understanding on the surrounding archaeological and historic context in which the options are located.

[34] http://www.openstreetmap.org/copyright

In accordance with WelTAG guidance (2008), heritage assets are taken to comprise:

- Buildings (singly or in groups) of architectural or historic importance;
- Areas, such as parks, gardens, other designed landscapes or public spaces, remnant historic landscapes, archaeological complexes and heritage coasts;
- Sites (e.g. ancient monuments, places with cultural or historical associations such as battlefields, preserved evidence of human effects on the landscape, etc.);
- Individual artefacts that form part of the overall archaeological resource; and
- The sense of identity and place which the combination of these features provides.

Following the above guidance, the designated and non-designated heritage assets recorded by the Archaeological Trusts of Wales and in particular Dyfed Archaeological Trust are set out below and are used in this report to assess the importance of assets, likely impacts, effects from these impacts on their quality and a summary of the significance of these impacts on the historic environment.

- Scheduled Monuments
- Listed Buildings
- Parks and Gardens of Special Historic Interest in Wales
- Conservation Areas
- World Heritage Sites.

Notes regarding planning guidance for this historic environment is shown at **Appendix C.5.**

Impact Significance Description

Following WelTAG guidance (2008), the results of the assessment of the impact significance is summarised using a seven-point scale, as follows:

- Large beneficial (+3);
- Moderate beneficial (+2);
- Slight beneficial (+1);
- Neutral (0);
- Slight adverse (-1);
- Moderate adverse (-2); and
- Large adverse (-3).

Heritage Sources

The assessment of impacts on heritage assets has been undertaken through the analysis of data obtained from Dyfed Archaeological Trust Historic Environment Record[35] (DATHER), as well as its online database Archwilio[36]. The Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) online portal Coflein was also consulted. Where assets are recorded on the DATHER and Coflein[37] both of their individual reference numbers for an asset have been noted, but only one entry per asset has been created on the tables (see **Appendix C**).

[35] Dyfed Archaeological Trust: http://www.dyfedarchaeology.org.uk/ Accessed 5th January 2017

[36] Archwillo: http://www.cofiadurcahcymru.org.uk/arch/dyfed/english/dyfed_interface.html. Accessed 5th January 2017

[37] RCHAMW Coflein online portal: http://www.coflein.gov.uk Accessed 5th January 2017

The heritage asset data presented in the assessment tables in **Appendix C** has been directly sourced from the relevant databases, such as the DATHER, Coflein and CADW, and no site visits have been undertaken to assess the current conditions of heritage assets discussed below.

7.6.3 Impact

Alignment Option 3b

The proposed route departs from the existing alignment of the A487 directly east of the Welsh Road junction. The route runs through the Newgale Camping Site in a northwest orientation before re-joining the existing A487 directly north of the Newgale Bridge. Within the study area of Option 3b there are:

- Grade II listed Limekiln at south end of Newgale Sands [CADW 19081/DAT59636];
- Post-medieval lime kiln [DAT23755];
- Post-medieval anti invasion defence site [Coflein 270735];
- Cottages north of Newgale Bridge [Coflein 22423];
- Newgale Bridge [Coflein 24263];
- The remains of a submerged forest [DAT12991];
- Landing place [Coflein 544151];
- Post-medieval sand pit [DAT32624];
- St Caradoc's Chapel [DAT2799];
- Site of former post-medieval Bridge Inn [DAT23751];
- Post-medieval cottage (no trace remains) [DAT32636];
- Single arched stone post-medieval bridge [DAT15138];
- Modern tank trap [DAT33295];
- Bronze Age find spot [DAT14279];
- Archaeological remains associated with The Prince (wreck) [Coflein 273360];
- Archaeological remains associated with The Pride of Wales (wreck) [Coflein 273361];
- Archaeological remains associated with The Cossack (wreck) [Coflein 273361];
- Archaeological remains associated with The Blende (wreck) [Coflein272953]; and
- Post-medieval coal workings (site of) [DAT17964].

There are no Parks and Gardens of Special Historic Interest in Wales, Scheduled Monuments, Conservation Areas or World Heritage Sites within the study area.

Appendix C provides a list of heritage assets present within the study area and the impact assessment scores relating to each asset.

Option 3b has the potential to affect the setting of the Limekiln, a Grade II listed building at the south end of Newgale Sands [CADW 19081/DAT59636] situated approximately 170m to the south of the proposed option. The remaining heritage assets with potential to be affected by this route option are largely archaeological remains associated with wrecks, archaeological sites or buildings of post-medieval date situated to the west of the proposed alignment. A number of these are sites of former assets of which no above ground evidence remains. The post-medieval bridge and cottages in Newgale [Coflein 24263, 22423 & DAT 32636] and a sand pit [DAT 32624] are at particular risk of being affected by Option 3b as construction impacts are likely to physically impact these assets. In the case of the sand pit [DAT 32624], the proposed alignment would lead to the loss of this asset, however, it is likely that the sand pit has already previously been destroyed due to the land currently being used as a campsite.

The impact on the remaining assets will be restricted to their setting. As the setting will not greatly differ from the current conditions, due to alignment option 3b only moving the existing A487 approximately 60m to the east, the adverse impacts are not anticipated to be significant.

The wreck sites along Newgale Sands [Coflein 272953, 273361, 273153 and 273360] are indicative sites only and their exact locations are not confirmed at this stage. It is likely that the impact on their setting would be neutral.

Alignment Option J

This option departs from the A487 Wood Hill to the southeast of Wood Farm and extends through agricultural fields in a north-eastern direction. The proposed alignment crosses Brandy Brook and turns westward through fields, passing directly north of Newgale Farm and re-joining the A487 to the south of Bay View Farmstead.

Within the study area of Option J there are:

- Bay View Farm Defended Enclosure Scheduled Monument [PE540/DAT2816/DAT3053];
- Medieval/post-medieval beacon [DAT2817];
- Medieval/post-medieval mansion [DAT11838];
- Post-medieval lodge [DAT17965];
- Bronze Age Standing Stone (site of) [DAT4619];
- Medieval manor house [Coflein 2825];
- Medieval settlement [DAT12351];
- Find spot of stone axe [DAT2811];
- Post-medeival chapel [DAT15091];
- Medieval quarry [DAT23750];
- Earthwork (undated) [Coflein 400077];
- Find spot of stone axe [DAT2813]; and
- Medieval manor house [DAT2825].

There are no Parks and Gardens of Special Historic Interest in Wales, Listed Buildings, Conservation Areas or World Heritage Sites within the study area. **Appendix C** provides a list of heritage assets present within the study area and the impact assessment scores relating to each asset.

In comparison to Option 3b, Option J will not have a direct physical impact on any of the heritage assets, meaning that impacts will relate to setting only. However, potential embankment cuttings and the creation of a new road across agricultural fields has the potential to disturb as yet unrecorded archaeological remains of any period. The setting of the Scheduled Monument enclosure of Bay View Farm [PE540/DAT2816/DAT3053] will be adversely affected. Although it is already impacted by the A487 (to the west) and Erw Lon (to the north), a new road to its east will further damage the setting of this asset. The non-designated heritage assets which might experience setting impacts are largely located within the agricultural fields and already shielded by existing areas of woodland.

Alignment Option 7

Route Option 7 diverges from the A487 east of Southwood Farm and follows the alignment of an existing track northwards into agricultural fields. The alignment passes to the east of Gouts Farmstead, crossing Brandy Brook and continuing northwards. In a north-west orientation the proposed alignment passes directly south of a farm building before following the alignment of Erw Lon for a short section before passing to the north of Penycwm and meeting the A487. Within the study area of Option 7 there are:

- Bay View Farm Defended Enclosure Scheduled Monument [PE540/DAT2816/DAT3053];
- Grade II listed 19th century gentry house [CADW 14405/DAT2814];
- Grade II listed late 18th century or early 19th century stable block [CADW 14406/DAT59288];
- Medieval/post-medieval beacon [DAT2816];
- Brawdy 14th century water mill (site off) [DAT12477];

- Possible location of medieval mill [DAT17961];
- Bronze Age Standing Stone (site of) [DAT4619];
- Coal working site (part of) [DAT17960];
- Burnt mound (Bronze Age) [Coflein 414090];
- Medieval cemetery (site of, unproved) [DAT2868];
- Southwood Colliery (Coflein 17963];
- Bronze Age Standing Stone (site of) [DAT4621];
- Find spot of hollow-based arrowheads (Bronze Age) [DAT2812];
- Medieval chapel (site of) [DAT23750];
- Penycwm post-medieval quarry [DAT23750];
- Post-medieval Blacksmith's workshop [DAT15037]; adn
- Linear parchmarks indicating position of pipeline or Roman Road [Coflein 413847].

There are no Parks and Gardens of Special Historic Interest in Wales, Conservation Areas of World Heritage Sites within the study area.

Whilst Option 7 will not lead to physical impacts to any of the heritage assets listed in the assessment table (see **Appendix C),** this alignment will affect the setting of all the heritage assets. Similarly to Option J, this option also crosses multiple agricultural fields meaning that it will impact on buried unknown archaeological remains, especially where cuttings are being proposed. The setting of the Listed Buildings in Penycwm [CADW 14405/DAT2814 and CADW 14406/DAT59288] and the non-designated buildings associated with the Sunday School [DAT15091 and DAT10953] will be adversely affected by the introduction of the new road.

Alignment Option 11

Option 11 is the longest of the four options and is proposed largely to follow the alignment of existing roads. Commencing in Roch Gate the alignment departs the A487 close to Roch Community School and follows Roch Hill through Roch Bridge where the road becomes Bramble Hill. Continuing northwards along Bramble Hill, Option 11 passes a number of farmsteads before heading westwards at Eweston Farm and then northwest towards to a four-way junction where the proposed alignment heads west. The alignment heads south immediately east of Cawdor Barracks before re-joining the A487 in Penycwm. The existing roads to be used for this option are currently largely single track roads and would need upgrading to a two-lane single carriageway. Within the study area there are:

- Brawdy Promontory Fort Scheduled Monuments [PE422];
- Bay View Farm Defended Enclosure [PE540/DAT2816/DAT3053];
- Penuel Baptist chapel of early 19th century foundation [DAT17966/Coflein 11031];
- Bramble Hill post-medieval cottage (site of) [DAT15830];
- Farmers Arms post-medieval Public House [DAT23764];
- Roch Mill post-medieval corn mill [DAT4637];
- Roch Mill [Coflein 40258];
- Brandy Brook Water Mill [DAT12475];
- Roch post-medieval road bridge over Brandy Brook [DAT17972];
- Site of former post-medieval cottage [DAT15889];
- Site of Old Mill post-medieval Gorse Mill [DAT17957];
- Water mill (site of) [DAT12476];
- Find spot of piece of pottery [DAT33675];
- Oweynston Eweston medieval shrunken village [DAT12353];
- Earthwork [Coflein 416861];
- Tyrmeibion Owen medieval settlement [DAT12345];
- Roch Community School [Coflein 413032];
- Silver Hill post-medieval mining feature [DAT25486];
- Post-medieval vicarage [DAT17956];
- Medieval settlement [DAT12352];

- Chapel (post-medieval) [DAT7853/Coflein 10955];
- Chapel cottages (post-medieval) [DAT7853/Coflein 21748];
- Mutton Hill, post-medieval mansion [DAT23753];
- Broadway post-medieval cottage (remains of) [DAT23754]; and
- Post-medieval chapel [DAT15091/Coflein 10953].

There are no Parks and Gardens of Special Historic Interest in Wales, Listed Buildings, Conservation Areas or World Heritage Sites within the study area.

Option 11 would have no physical impacts on any designated heritage assets but, due to embankments and construction impacts of upgrading the lanes, this option could partially affect or lead to the removal of the following non-designated heritage assets:

- Penuel Baptist chapel of early 19th century foundation [DAT17966/Coflein 11031];
- Roch Mill post-medieval corn mill [DAT4637];
- Farmers Arms post-medieval Public House [DAT23764];
- Site of former post-medieval cottage [DAT15889];
- Oweynston Eweston medieval shrunken village [DAT12353];
- Broadway post-medieval cottage (remains of) [DAT23754]; and
- Post-medieval chapel [DAT15091/Coflein 10953].

In comparison to the other alignment options, Option 11 would therefore physically affect the largest proportion of non-designated assets in comparison to any other routes. Additionally, Option 11 would also adversely impact the setting of the remaining heritage assets.

7.6.4 Conclusions

This report constitutes a Stage 1 WelTAG appraisal of four options associated with the development of a new section of the A487 at Newgale. In accordance with WelTAG, the appraisal is of a scale that is appropriate to the value of the scheme. Again, in accordance with WelTAG, the appraisal focuses on those areas which are of concern and areas that differentiate options.

As part of this Stage 1 assessment of the A487 route options Historic Environment Record information supplied by the Dyfed Archaeological Trust (DATHER has been collated alongside readily accessible online historic sources, including Archwilio (part of the DATHER), Coflein and CADW.

The Stage 1 WelTAG assessment found that various heritage assets are distributed throughout the various study areas, although the main concentrations are to be found near Newgale Sands, Penycwm and Roch. These heritage assets largely relate to the medieval and post-medieval periods, although some assets, such as Scheduled Monuments at Bay View Farm [PE540] and the fort at Brawdy Farm [PE422] suggest earlier prehistoric activity. A Mesolithic submerged forest [DAT12991], and find spots ranging from the Neolithic to the Bronze Age would further indicate prehistoric activity in the area.

In terms of types of impacts, these have been divided into setting and physical impacts. Physical impacts would lead to partial or complete destruction of heritage assets. Direct visual impact or visual impact on the landscape in which an asset is located would usually constitute a settings impact.

There will be no physical impacts to any designated heritage assets, but Option 11 would lead to such impacts on at least seven non-designated heritage assets.

This Stage 1 assessment concluded that:

- Route Option 3b has the potential to affect the setting of a single Grade II Listed Building [CADW 19081/DAT59636] and a number of non-designated assets, which is likely to result in an overall **slight adverse** effect on the historic environment.
- Route Option J has the potential to affect the setting of a single Scheduled Monument [PE540/DAT2816/DAT3053] and a number of non-designated assets, which is likely to result in an overall **moderate to slight adverse** effect on the historic environment;
- Route Option 7 has the potential to affect the setting of a single Scheduled Monument [PE540/DAT2816/DAT3053], 2 Grade II listed buildings [CADW 14405/DAT2814 and CADW 14406/DAT59288] and a number of non-designated assets, which is likely to result in an overall **moderate to slight adverse** effect on the historic environment;
- Route Option 11 has the potential to affect the setting of 2 Scheduled Monuments [PE540/DAT2816/DAT3053 and PE422] and a number of non-designated assets. Additionally, this route would lead to physical impacts on at least 7 non-designated heritage assets. Combined, this option is likely to have an overall **moderate to slight adverse** effect on the historic environment.

In general, while it should be noted that none of the proposed four options would result in a direct impact on any designated heritage assets, there is the potential for currently unknown archaeological remains to be encountered during construction works and for non-designated assets to be affected.

It must also be noted that this assessment only considered heritage assets which are within a 250m wide corridor of each option and did not discuss assets which are close to the study area, but may still experience noise impacts due to a proposed alignment.

Taking into account the information known at this time, the early assessment tool has concluded that, out of the four options, Option 3b has the least overall adverse range of effects on individual heritage assets within its study area.

7.7 Water Environment

7.7.1 Introduction

There could be an impact from the scheme options on the water environment either during construction or operation. During construction this could include physical disturbance of water features such as diversions of watercourses, culverting a watercourse, building in floodplains and spillages. During operation there could be an impact on the water environment that could include pollution of the water features through routine runoff, discharge to groundwater, increased flooding, serious spillage risk or potential for enhancement of the existing water environment to meet Water Framework Directive standards.

At this stage of the scheme the assessment has not considered separately the construction stage and operational stage impacts.

7.7.2 Method

Water Quality

Water attributes have been considered if they are considered to have possible connectivity with the options.

Welsh Transport Planning and Appraisal Guidance (WelTAG) (Welsh Assembly Government, June 2008) has been used for the assessment of impacts. Guidance on importance has been sourced from WEBTAG (Department for Transport, December 2015) as this provides guidance on the

criterion to judge the importance of water features identified using Natural Resource Wales' (NRW) website.

A summary table (**Table 7-31**) has recorded the likely significance of effects on water quality for each option.

Fluvial Flood Risk

Following the WelTAG assessment guidance, 4 worksheets have been produced in one spreadsheet to assess the significance of effect in terms of flood risk for each of the 4 options. The Value of the water features within 500m of the Scheme have been identified using Natural Resource Wales' (NRW) website and the method from WelTAG unit 3.3.11. Where no information is available professional judgement has been used to consider the likely value of the water feature or other comments have been provided.

The value of the feature and the likely magnitude of impact have been combined to determine an overall significance of effect for each attribute of the water environment. The resultant significance of effects of each feature during construction and operation is then summarised in one overall assessment score for the option and justification for the assessment score given at the bottom of each spreadsheet.

A summary table has recorded the likely significance of effects for each option.

7.7.3 Impact

Table 7-31 sets out a summary of the appraisal results. They are shown in order of potential damage for the water environment, with the most potentially damaging option shown first.

The 'rating score' is driven by the number of new river/drain watercourse crossings (principal criteria).

The majority of likely impacts from construction activities are temporary and would be mitigated through good engineering practice and appropriate mitigation.

During operation there are potential impacts to water quality and flow volumes owing to the increase in impermeable area and additional risks associated with road runoff and pollution. The risk of spills from accidents also needs to be considered, and may affect other features such as biodiversity or public water supply.

Cuttings, earthworks and piling presents a potential mechanism for impacts on groundwater level and quality. Works could potentially affect the flow of groundwater in indirectly affecting surface water features and abstractions which are dependent upon groundwater inputs and may introduce new pollutant pathways to groundwater.

Table 7-31: **Water quality impact assessment**

Rank	Option	No. of water course crossings	Magnitude	Importance	Significance
1	Option J	• Crosses Brandy Brook once and several smaller un-named watercourses/drainage ditches • Total no. of significant watercourse crossings 3	Moderate adverse	Medium – low	Slight adverse
2	Option 7	• Crosses Brandy Brook once and several smaller un-named	Moderate adverse	Medium – low	Slight adverse

Rank	Option	No. of water course crossings	Magnitude	Importance	Significance
		watercourses/drainage ditches • Total no. of significant watercourse crossings 2			
3	Option 3b	• Crosses Brandy Brook once • Total no. of significant watercourse crossings 1	Moderate adverse	Medium – low	Slight adverse
4	Option 11	• Crosses Brandy Brook once and a several smaller un-named watercourse/drainage ditches. • Total no. of significant watercourse crossings 1	Moderate adverse	Medium – low	Slight adverse

Key: 1 - potentially more environmental water risks/impacts; 4 - least environmental water risks/impacts

Fluvial Flood Risk

All scheme options are likely to have a large adverse impact on flood risk without mitigation. This is related to potential construction and operational impacts to flood risk and the likelihood that without mitigation there could be an increase in flood risk to property as indicated by WelTAG methodology. The potential impacts are summarised in **Table 7-32**.

Table 7-32: Flood Risk impact assessment

Option	Key Question(s)	Assessment	Magnitude	Importance	Significance (Impact)
Option 11	• Will the scheme lead to an increase in surface water run-off?	• Yes, as a result of the increase in impermeable area. For the proposed scheme, an impermeable area of 73,367m² for roads and verges is proposed. A surface water drainage strategy will be required. However, as this route utilises existing road network the change may be less compared to the other route options.	• Major adverse. Potentially less compared to other options due to utilising existing road alignment	• High. The scheme crosses through floodplain which has less than 10 properties. These are located mainly in proximity of Roch Bridge, on the Brandy Brook. No river flood zone data is available for smaller watercourses, so NRW Surface Water Flood Zones has been considered.	• Large adverse
	• Is the scheme in close proximity to any watercourses?	• Yes, the proposed development crosses the Brandy Brook and several smaller watercourses/drainage ditches. As above, since this is using an existing road network it could be expected that impacts will be less in comparison to other route alignments.			
	• Will the scheme impact on the effectiveness	• Yes as a result of crossing Brandy Brook and smaller			

Option	Key Question(s)	Assessment	Magnitude	Importance	Significance (Impact)
	of a floodplain?	watercourses/drainage ditches. The scheme may potentially require compensatory flood storage as a result of loss/impact on floodplain. • The site passes through NRW Flood Zone 2 and 3 and lies in a NRW Surface Water Flood Zone.			
Option 7	• Will the scheme lead to an increase in surface water run-off? • Is the scheme in close proximity to any watercourses ? • Will the scheme impact on the effectiveness of a floodplain?	• Yes, as a result of the increase in impermeable area. For the proposed scheme, an impermeable area of 38,385m² for roads and verges is proposed. A surface water drainage strategy will be required. • Yes, the proposed development crosses the Brandy Brook and smaller un-named watercourses/drainage ditches). The scheme is also adjacent to several ponds. The scheme may potentially require compensatory flood storage as a result of loss/impact on floodplain. • The site passes through NRW Flood Zone 2 and 3 and through a Natural Resources Wales Surface Water Flood Zone.	• Major adverse	• Low to medium. The scheme crosses floodplain which is limited to agricultural land with not properties in the floodplain adjacent to the works. s. No river flood zone data is available for smaller watercourses , so NRW Surface Water Flood Zones has been considered. Potential for downstream impacts on flow however, hence rank of medium.	• Large adverse
Option 3b	• Will the scheme lead to an increase in surface water run-off? • Is the scheme in close proximity to any watercourses ?	• Yes, as a result of the increase in impermeable area. For the proposed scheme, an impermeable area of 6,147m² for roads and verges is proposed. A surface water drainage strategy will be required. • Yes, the proposed development crosses the Brandy Brook. The scheme also runs adjacent to the shore line (approximately 200m to the mean high watermark).	• Major adverse	• High. The scheme crosses floodplain which contains around 5 properties. (Duke of Edinburgh pub, 'New Surf' Surf Shop, Sands Cafe, Carter's store and Llanwenydd)	• Large adverse

Option	Key Question(s)	Assessment	Magnitude	Importance	Significance (Impact)
	• Will the scheme impact on the effectiveness of a floodplain?	• The Shoreline Management Plan (Royal Haskoning, 2011) policy is Managed Realignment for this area. The proposed route alignment should ensure it is consistent with the SMP policy. • Yes, as a result of crossing Brandy Brook and being close to the shore line. The scheme may potentially require compensatory flood storage as a result of loss/impact on floodplain. • The site lies in NRW Flood Zone 2 and 3 and through a NRW Surface Water Flood Zone.			
Option J	• Will the scheme lead to an increase in surface water run-off? • Is the scheme in close proximity to any watercourses? • Will the scheme impact on the effectiveness of a floodplain?	• Yes, as a result of the increase in impermeable area. For the proposed scheme, an impermeable area of 29,806m² for roads and verges is proposed. A surface water drainage strategy will be required. • Yes, the proposed development crosses the Brandy Brook and smaller un-named watercourses/drainage ditches). The scheme is also adjacent to several ponds. The scheme may potentially require compensatory flood storage as a result of loss/impact on floodplain. • The site passes through NRW Flood Zone 2 and 3 and through a NRW Surface Water Flood Zone.	• Major adverse	• Low to Medium. Floodplain is limited to agricultural land with no properties in the floodplain adjacent the works. Potential for downstream impacts on flow however, hence rank of medium.	• Large adverse

Although all scheme options have been assessed to have the same significance of impacts it is possible to distinguish relatively between the options based on the comments associated with each one. The ranked options and associated comments are shown in **Table 7-33.**

Table 7-33: Flood Risk Ranked Options and Comments

Relative Rank	Summary of Overall Effects	Route	Comment
1	Large adverse	Option J	Crosses the Brandy Brook and several smaller watercourses. The proposed route is entirely within a greenfield area.
2	Large adverse	Option 11	Crosses the Brandy Brook and several smaller watercourses floodplains. However, although it is the longest of the proposed routes, this route utilises the existing road network, therefore it could be expected that impacts will be less in comparison to other route alignments.
3	Large adverse	Option 7	The longest route to be built with several crossings of the Brandy Brook and smaller un-named watercourses. The scheme is also adjacent to several ponds. It has the greatest potential to contribute to increased surface water runoff since it is largely on greenfield land.
4	Large adverse	Option 3b	Shortest route at only 500m, but lies almost entirely in the Brandy Brook floodplain. This route also runs adjacent to the shore line.

Standard mitigation in the form of flood attenuation and sustainable drainage systems could be employed and will offset some of the adverse impacts identified.

Coastal Flood Risk

Unlike the existing road, which would require significant raised flood defences of up to 3m above the existing shingle bank to reduce overtopping to tolerable discharge levels, Option 3b benefits from being set further inland and is set up the combined fluvial and tidal flood levels.

The Coastal Engineering Reports in **Appendix J**, recommend that Option 3b is set back around 60m from the shingle crest and outside the zone where wave overtopping takes place. It has also been assessed that the shoreline will retreat between 25m to around 47m over the lifetime of the road (120 years) and that the road will remain outside of the area of affected by wave overtopping over this lifetime of direct interaction with the shingle bank. In making this assessment, the future development of the natural shingle bank has been considered, recognising that as the bank is overtopped more regularly in the future; that its height is likely to reduce, forming a wider more natural profile which will then become more stable. While this will result in increased overtopping, the overall integrity of the bank will be more robust. While the analysis undertaken would be revisited if detailed design of route 3b was taken forward, the present assessment has taken account of sea level rise and increased wave heights based on climate change projections for surge conditions. It is recognised within this that the shingle ridge (while potentially lower but also wider) will be overtopped and as such we have made allowance for wave transmission across the ridge.

If the road were taken across the valley on a viaduct, then the viaduct needs to extend across most of the valley floor to be sufficient width to ensure free flow through its open section when the valley is flooded. NRW have provisionally assessed an extreme fluvial flood condition at the T1000 flood event with climate change of 5.5m AOD, which would result in flooding a significant distance up stream.

To assess the viability of the existing road, a joint probability analysis has been undertaken which shows inshore wave heights of approximately 2.5m at T200 with 50 year allowance for climate change. This inshore wave height has been derived from wave modelling covering a range of

different joint probabilities (i.e. the inshore wave height associated with the standard range of extreme water levels, together with higher wave heights associated with lower water levels). This analysis confirms that the extreme offshore wave heights for a 1 in 200 year offshore wave height is 11.95m with a wave period of 12.83 sec. Based on the range of joint probabilities, we have then considered which joint probability combination gives rise to the most severe overtopping condition.

This overtopping analysis has been used to make a preliminary estimate of wave transmission. Typically wave transmission would be below 1m during extreme conditions. This would be immediately to the rear of the shingle bank, with waves dissipating as they progress inland over the wider valley. (Note the inshore wave would break on the shingle bank, running up the shingle and, as such, wave transmission would be generated by the overtopping flow, not directly in the form of the inshore incident wave.) In effect, the transmitted wave would raise the water elevation by around 0.5m at the wave crest. The combined water plus wave level is at its highest at the shingle bank at 5.9m AOD, but would then be lower inland.

The road level proposed for option 3b is set at a level of around 7.1m AOD. This is to allow the road to be set above the extreme flood plain level (and allowing for 50 year climate change in the overtopping analysis) at 5.57m AOD with allowance for residual wave propagation through an overtopped defence and for freeboard underneath a viaduct structure. The viaduct structure would span across the entire valley floor until connecting to the 7.1m level and Newgale Hill (north) and Wood Hill (south). Further detailed modelling would need to be undertaken as part of further stages of the WelTAG study.

7.7.4 Limitations and Assumptions

- Where no information is available through online open sources, professional judgement has been used to consider the likely value of the water feature or other comments have been provided.
- Data quality – desk study, using mainly web-based data has only been reported at this stage and therefore the level of detail, is limited and in some case unknown. For example, the exact number of other surface watercourses is unknown due to inconsistencies between OS base mapping and digital river mapping
- Data quantity – as per quality, only open, freely licensed data has only been reported at this stage and therefore the amount of detail is limited
- No consultation with stakeholders has been undertaken
- Ground-truth – in the absence of site visits and consultation of key stakeholders at the time of reporting, site specific data is limited
- Cumulative impact assessment (CIA) – no data is available at the time of reporting on other schemes, projects, strategies and plans within the study area
- The impact and overall scores are based on the assumption that no mitigation is applied above standard design practice. However, when mitigation is in place, proportional to the scale of adverse impact, it is likely that any impacts can be minimised.
- A Flood Risk Activity Permit would be required for all works within 9m of a watercourse.
- A Flood Consequence Assessment supported by flood modelling would be required to satisfy TAN 15 planning requirements.

7.9 Non Agricultural Land Use

7.9.1 Introduction

The alignment options have the potential to impact on land use in a number of ways during construction and operation. Many of the affected land uses contribute to the one of the statutory purposes of the National Park which is to promote opportunities for the understanding and enjoyment of the park. This section assesses the potential impacts of the four alignment options arising from demolition of private property, loss of existing land use, severance of existing land uses and impact on future development. The options and consequent changes to accessibility will impact on the way Newgale functions as a village and as a tourist/recreational destination. Therefore, this chapter should be read in conjunction with the Social Impact chapters of the report.

7.9.2 Method

The WelTAG guidance does not provide any advice on appraising the impact of transport schemes on land use. In order to cover the impact of the route options on non-agricultural land use a DMRB Stage 2 assessment has been undertaken following the guidance set out in Volume 11 Section 3 Part 6 of the DMRB. Accordingly the assessment of impact on non-agricultural land use has considered the impact of the options with respect to the following:

- Demolition of Private Property;
- Effects on Development Land; and
- Loss of Land used by the Community

In addition, impacts arising from severance of access to land uses have been considered as part of the assessment.

The impact on the amenity of land uses is generally considered in the visual, noise and air quality impact chapters of this report.

Potential development land has been identified by reference to the Pembrokeshire Coast National Park Local Development Plan (adopted 2010) and the Pembrokeshire Local Development Plan (adopted 2013). At this stage a planning history search has not been undertaken.

There is no prescribed means by which impacts on non-agricultural land use can be captured in the Appraisal Summary Tables (ASTs). The impact of the options on land use is therefore captured in the 'Other Factors' section of the AST.

In relation to non-agricultural land uses, the various impacts of each option have been assessed using the following bespoke impact criteria:

- **Beneficial impact** – relief from existing severance or supporting future development
- **Neutral impact** – no demolition/loss of private properties or severance of access routes or no support for future development;
- **Adverse impact** – loss/demolition of private properties or severance of access routes or prejudicing future development.

The impacts identified for each option are then combined to reach an overall assessment of the impact of that option on non-agricultural land use.

7.9.3 Impact

This section identifies the impacts of the options on private property and on development land.

For all four road alignment options, it is assumed that access to land uses along Welsh Road would be maintained.

Option 3b

This option would involve the loss of a number of private properties in Newgale due to the relocation of the existing beach road slightly inland resulting in the existing road not being defended in the future and that the coast will be allowed to adapt naturally to coastal change.

In the short term the potential adverse effects of this option on non-agricultural land uses as a result of realigning the road are as follows:

- Demolition of approximately 2 private properties (M.M. Carter Gardens and Leisure store, Big Blue Experience Kite and Water Sports Centre (one property), and Sands Café);
- Partial loss of car parking associated with the Duke of Edinburgh Public House and Newsurf shop; and
- Partial loss of the campsite.

In the longer term the pub, toilet facilities, Newsurf shop and the campsite would cease to exist due to the effects of coastal change. However, since this change will occur in the longer term, it is possible that all of these properties/buildings/facilities could be relocated beyond the new road alignment in a location with an improved degree of coastal protection. The current adaptation masterplanning exercise for Newgale helps to identify these needs and investigates whether it is possible to relocate properties/facilities within any proposals made for the settlement within the adaptation masterplan being developed separately. Potential future development of Cawdor Barracks could provide a new revenue stream for the relocated businesses. However this option would not make the A487 more suitable for HGVs which is a constraint to redevelopment of the barracks. The residual impact is expected to be **neutral.**

For the commercial properties requiring demolition/loss, there would be no impact on the number of people employed or the business' future providing these businesses can be relocated.

There would be no loss of residential dwellings from this option.

This option would improve access to and from Newgale as the settlement would remain accessible by road without the need to close the route running through the village during storm events.

Options J, 7 and 11.

Options J, 7 and 11 do not provide a coastal route, so there are impacts common the all these options.

In the medium term the existing businesses in Newgale, namely the shops, cafes and public house would potentially suffer in terms of reduction in trade due to the removal of through-traffic from the village. Without mitigation this would be an **adverse impact.**

Severance of the coast road, along with the removal of through-traffic would have an adverse impact on the following businesses: shop, watersports centre and café. At this stage of the assessment it is not possible to predict, with any certainty, what impact the removal of through-traffic and the severance of the existing coast road would have on employment numbers, but it is likely that employment numbers would be reduced. However this adverse impact on local businesses would to some extent be balanced by the potential positive economic impact arising from less traffic noise and pollution and a safer environment. In addition improved access for HGVs along the A487 would support redevelopment of Cawdor Barracks which in turn could provide a new revenue stream for businesses.

There would be no loss of residential dwellings from this option. Eventually, since the existing road does not need to be defended from the sea, natural retreat of the coast would result in the relocation/loss of a number of private properties in Newgale. The potential long term direct effects of this option on non-agricultural land uses are as follows:

- Demolition of the public toilet facilities opposite the Duke of Edinburgh Public House;
- Loss of 2 private properties (Newsurf surf shop and the Duke of Edinburgh Public House); and
- Loss of the Newgale Camping Site.

Although the above mentioned private properties and facilities would eventually cease to exist, the impact could be mitigated whereby all of these properties/buildings/facilities would move to a location with an improved degree of coastal protection and an improvement in local amenity due to the removal of through-traffic. These relocated businesses could benefit from a revenue stream from the improved access for HGVs along the A487 which would support redevelopment of Cawdor Barracks.

Options J, 7 and 11 would involve development of land which contains safeguarded mineral resources however this would not influence selection of a preferred alignment option.

For option 7, both ends of the alignment tie into the A487 without any impact on existing properties. The northern end of the route partly follows Erw Lon before passing north of the residential area, however no impact on these dwellings in terms of land take or access is expected.

The road alignment for option 11 follows minor roads. This alignment would be fine-tuned to ensure the new road would not involve demolition or loss of any private properties, or severance of access from the public highway to existing properties. There would also be no landtake from residential properties with this option. Option 11 would divert the A487 through the northern part of Roch bringing the road closer to the school, playground and community centre. The increase in traffic along this route would have an adverse impact in terms of severance.

Using the bespoke impact criteria formulated for this assessment the impacts of each option identified above are summarised in **Table 7-34**. Each option is allocated an overall impact considering all the various impacts.

Table 7-34: Assessment of Impacts

Option	Residual Impact	Impact	Overall Impact
3b	Improve access to and from Newgale during storms	Beneficial.	Neutral
	Loss of existing properties and facilities could be mitigated through relocation to sites with an improved degree of protection.	Neutral.	
	Retains trade in Newgale from through traffic although commercial properties will be lost in time.	Neutral	
	Retains presence of through traffic.	Neutral	
	Future development of Barracks would provide a new revenue stream for relocated businesses however the A487 would not be made more suitable for HGVs.	Neutral	
J	Improve access to and from Newgale during storms	Beneficial	Beneficial
	Loss of existing properties and facilities could be mitigated through relocation to sites with an improved degree of protection.	Neutral	
	Improvement in local amenity due to removal of through-traffic	Beneficial	
	Reduced trade for businesses in Newgale due to removal of through-traffic. Employment numbers reduced.	Adverse	
	Improved access for HGVs would support redevelopment of Cawdor Barracks which in turn could provide a new revenue stream for the businesses in Newgale.	Beneficial	
7	Improve access to and from Newgale during storms	Beneficial	Beneficial
	Loss of existing properties and facilities could be mitigated through relocation to sites with an improved degree of protection.	Neutral	
	Improvement in local amenity due to removal of through-traffic.	Beneficial	
	Reduced trade for businesses in Newgale due to removal of through-traffic. Employment numbers reduced.	Adverse	
	Improved access for HGVs would support redevelopment of Cawdor Barracks which in turn could provide a new revenue stream for the businesses in Newgale.	Beneficial	
11	Improve access to and from Newgale during storms	Beneficial	Neutral
	Loss of existing properties and facilities could be mitigated through relocation to sites with an improved degree of protection.	Neutral	
	Improvement in local amenity due to removal of through-traffic	Beneficial	
	Reduced trade for businesses in Newgale due to removal of through-traffic. Employment numbers reduced.	Adverse	
	A487 diverted through northern part of Roch bringing road closer to school, playground and community centre. Increase in traffic would have an adverse impact in terms of severance.	Adverse	
	Improved access for HGVs would support redevelopment of Cawdor Barracks which in turn could provide a new revenue stream for the businesses in Newgale.	Beneficial	

7.9.4 Conclusion

All options would improve access to and from Newgale as the settlement would remain accessible by road without the need to use an unsuitable alternative route during storm events.

All options would have an **adverse** impact with the loss of commercial properties due to factors of landtake and/or coastal change. This impact could be mitigated through relocation of those land uses.

For Options J, 7 and 11, in the medium and long term, several commercial properties in Newgale would be likely to experience a reduction in trade due to the removal of through-traffic. However the relocation of three commercial properties, lost as a result of coastal change, along with the removal of through-traffic would create a quieter, safer and less polluted environment in the village.

For all options it is assumed that the potential future development of the Cawdor Barracks would provide a level of trade to the businesses in Newgale. Options J, 7 and 11 would have a more positive benefit in terms of supporting the redevelopment of Cawdor Barracks as they would improve HGV access on the A487 to the site, whereas Option 3b is less suited to HGV traffic which would still need to navigate the steep and twisty section of Newgale Hill.

None of the options would result in the loss of public open space.

Overall on balance, and based on the bespoke land use impact criteria detailed earlier in this chapter, the impact of each option on non-agricultural land use is as follows:

- Option 3b = Neutral
- Option J = Beneficial
- Option 7 = Beneficial
- Option 11 = Neutral

7.10 Agricultural Land Use and Soils

7.10.1 Introduction

The options have the potential to impact on agricultural land use and on soils in a number of ways during construction and operation of the scheme. This section assesses the potential impacts arising from loss, fragmentation or severance of land parcels.

7.10.2 Method

An assessment of the impact of the options on soils and agriculture has been undertaken following guidance provided in WelTAG and Design Manual for Road and Bridge Works (DMRB). The assessment has regard to the impact on existing soil quality with reference to the Agricultural Land Classification provided by DEFRA. The assessment then considers the impact of the options in respect of severance and fragmentation of agricultural land.

The agricultural land use and soils assessment was made by a desk study drawing on published information and aerial imagery.

Planning and Regulatory Framework

The national planning policy framework for Wales is provided by Planning Policy Wales, and the series of Technical Advice Notes (TAN) published by the Welsh Government. TAN 6, covering national planning policy for sustainable rural communities, requires that local government seeks to protect and preserve, where possible, BMV agricultural land[38]. Consultation is required where loss of BMV land will exceed 20ha (Section B2). TAN 6 also requires assessments to take into account the impact of a proposed development on farm size and structure and any buildings and fixed equipment.

[38] http://wales.gov.uk/topics/planning/policy/tans/tan6/?lang=en

Pembrokeshire County Council's Local Development Plan (2013)[39] supports these objectives. Retaining the best quality agricultural land is a Key Environmental Issue (p42). General Policy GN 10 supports the continuing agricultural operation of farms (p91).

Potential development land within the study area has been identified through a review of land allocated for development in the Pembrokeshire Local Development Plan (adopted 2013) and the Pembrokeshire Coast Local Development Plan (2010).

There is no official guidance by which impacts on non-agricultural land use impacts can be captured in the Appraisal Summary Tables (ASTs). The impact of the options on land use is therefore ranked separately from the AST in 'other factors'.

Sensitivity of Environmental Resources and Receptors

On agricultural land the key receptors are soils (considered in terms of loss of BMV land), the farms and fields affected by land take and severance and the associated impacts on items of farm infrastructure such as trackways, hedgerows and water supplies.

Agricultural land in ALC Grades 1, 2 and 3a is considered to be of high sensitivity, agricultural land in ALC Subgrade 3b is considered to be of medium sensitivity, whilst land in ALC Grades 4 and 5 is considered to be of low sensitivity.

Preliminary ALC assessments (See **Appendix D** and **Table 3-5**) indicate that land of high sensitivity occupies around 55% of Options J and 7 and 69% of Option 11. The extent to which each option is underplayed by Best and Most Versatile agricultural land is demonstrated on the drawing in **Appendix D.**

For farms the following sensitivity criteria are applied:

- **High**: farm types in which the operation of the enterprise is dependent on the spatial relationship of land to key infrastructure, and where there is a requirement for frequent and regular access between the two, or dependent on the existence on the infrastructure itself, e.g. dairying; irrigated arable cropping and field scale horticulture; intensive livestock or horticultural production;
- **Medium**: farm types in which there is a degree of flexibility in the normal course of operations, e.g. combinable arable crops; grazing livestock farms (other than dairying);
- **Low**: farm types and land uses undertaken on a non-commercial basis.

Our initial search showed that there is no dairying in the study area or evidence on mapping of the associated slurry tanks and affected farms are assessed as being of medium sensitivity. However, it has been reported by a resident that there is a dairy farm on land adjacent to Roch Bridge which is grazed by cattle all year around. This being the case, option 11 will need to incorporate suitable provision in the design of the road.

Several farms provide camping sites but aerial imagery shows no static facilities along Options J, 7 and 11 are affected. In Option 3b, Newgale Camping Site is of high sensitivity

Assessment of magnitude of impact

The general methodology for assessment of the significance of soil and land use impact includes consideration of the magnitude of impacts on soils, farming practice, access, broad economic impacts and drainage and water supply. The main considerations are:

- Type of impact - direct or indirect;
- Nature of impact - beneficial or adverse or neutral;

[39] https://www.pembrokeshire.gov.uk/content.asp?nav=1626,109,2045&id=28946&language=

- Duration of impact - short or long term, reversible or not;
- Frequency of impact - continuous or intermittent, changing with time or constant;
- Geographical context - international, national, regional or local.

Table 7-35: Magnitude of Impact on Agricultural Land

Magnitude	Criteria
High	The identified impacts are predicted to result in a large loss of BMV land and/or major damage to a farm business
Medium	The identified impacts are predicted to result in the loss of a significant amount BMV land and/or significant damage to a farm business
Low	The identified impacts are predicted to result in a small loss of BMV land and/or a small amount of damage to a farm business
Negligible	The identified impacts are predicted to result in the loss of little or no BMV land and/or little or no damage to a farm business

Assessment of Significance of Effects

The significance of loss of BMV land is assessed as follows, with the Welsh Government's Technical Advice Note (TAN) 6's benchmark of 20ha (section B2) taken as the indicator for a large adverse impact:

- Large adverse (-3) - Potential for loss of >20 ha of BMV land
- Moderate adverse (-2) - Potential for loss of between 5 ha and 20 ha of BMV land
- Slight adverse (-1) - Potential for loss of < 5 ha of BMV land

7.10.3 Impacts

This section identifies the impacts of the options on soils, agriculture, private property, land used by the community and development land.

Loss of BMV land

The potential for loss of BMV land is moderate adverse for all options (see **Figure 3-5**), with the Option 11 taking most (11ha) and Options J and 7 losing 5ha and 6ha respectively. Option 3b contains no BMV land.

Impacts on farm viability

A nationally recognised set of standard assessment criteria for effects on farm and rural businesses does not exist. A bespoke set of criteria has therefore been used for this assessment, reflecting the known impacts and local farming conditions.

Table 7-36: Significance of Effect on Local Farm Businesses

Effect	Criteria
Large Adverse (-3)	Renders a full-time farm business, including any diversification enterprises, unworkable in its current form, such that it could not continue unchanged; the business would have to change the activities undertaken on the remainder of the holding as well as seeking some form of alternative income.
Moderate Adverse (-2)	Changes the workability of a full-time farm business, including any diversification enterprises, but without preventing the business continuing largely as before; there would be reductions in income and changes in day-to-day management, such as longer journeys to access severed land parcels.
Slight Adverse (-1)	Affects the workability of a full-time farm business, including any diversification enterprises, but with little change to the business continuing largely as before; there would be limited change in income and day-to-day management.
Neutral (0)	Very slight or negligible impact on farm business that can often be easily compensated for by modifications to management system.

Loss of agricultural land

Loss of agricultural land, whether or not it is of BMV quality, always has an adverse impact on a farm. However, landtake by each option is less than 12 ha and so the impact on any farm business is likely to be no more than slight adverse (-1).

The only environmental mitigation possible for loss of land is for the engineering design to minimise the footprint of the scheme and for disturbed soils outside the highway boundary to be restored to farming in a condition not worse than their existing state.

Severance of agricultural land

Options J and 7 cross open farmland, severing farms and bisecting fields. Option 11 widens an existing road and so does create new physical severance of land. This new road will be a strategic road and at times traffic will be heavy, particularly in holiday periods. Thus, livestock and large agricultural machinery may have difficulty in crossing the road safely

Mitigation will involve creating (Options J and 7) or restoring (Option 11) field and farm accesses or providing overbridges or underpasses. Where the latter are not provided the mitigation is installation of handling pens in gateways, wide gates set back to allow farm vehicles to pull off the carriageway and adequate turning splays.

No mitigation is possible on Option 3b's Newgale Camping Site which although is not currently in agricultural use provides an opportunity for a farm diversification business. and the impact is large adverse (-3).

For the other options, the impact of severance and road widening on affected farms is assessed as moderate adverse (-2), although this may be reduced where underpasses and overbridges are provided. The longer the option, the greater the overall impact and so the options can be ranked according to length with Option 11 (6229m) being the most affected, Option 7 (3253m) the second, Option J (2557m) third and Option 3b the least.

Farm buildings

No farm buildings would be demolished by any option. Option 7 passes close to a large agricultural building at chainage 1550, but the road would be designed to avoid damage.

Land drainage

It should be assumed that much of the land in the study area contains field drains. Drainage systems would be restored or diverted during scheme construction and monitored for an agreed period of aftercare. Since this impact is only temporary and able to be fully mitigated it is considered to be neutral and no distinction can be made between the options.

Water supply

Most fields will contain troughs or watering points, such as springs, for livestock. All options would likely disrupt some of these necessitating relocation of both troughs and their water supply. Again, since this impact is only temporary and able to be fully mitigated it is considered to be neutral and no distinction can be made between the options.

Summary

The agricultural impacts that allow the options to be compared are loss of BMV land, total loss of farmland and severance. The greater the length, the more land will be lost and more farms and fields will be affected by severance, so that Option 11 has the greatest magnitude of impact, followed by Option 7 and Option J.

For the options J, 7 and 11 the significance of effect of these is moderate adverse for severance and slight adverse for loss of land. Option 3b is different from the other options in that it does not cross farmland and so it has no impact in terms of loss of agricultural land. Severance is restricted to one camping field where the impact on that enterprise is large adverse. Overall, however, it is the option of least impact on soils and farming.

Table 7-37 summarises the scoring and ranking of ranking of the options

Table 7-37: Ranking of Options

Option	Score for loss of BMV land	Score for Severance	Total score	Ranking	Relative adverse impact
11	-2	-2	-4	1	Greatest
7	-2	-2	-4	2	
J	-2	-2	-4	3	
3b	0	-3*	-3	4	Least

*Note: The severance in Option 3b is restricted to one camping field

7.11 Land Contamination

7.11.1 Introduction

This section provides a preliminary appraisal of potentially contaminative land uses with which impacts may be associated during construction and operation of the scheme.

7.11.2 Method

Having identified the potential contaminative sources in the study area, the assessment provides commentary on whether these sources are on the route of the different options or in proximity to them and summarises the further work considered to be required.

7.11.3 Impact

A review of available historical and statutory information has identified potentially contaminative land uses in the study areas of all route options which may have a potential land contamination impact.

The principal potential sources of contamination located in the study areas of one or more route options are summarised below:-

- The former Southwood Colliery and the former RAF Brawdy are located in the study areas of Option 7 and Option 11;
- A former petrol filling station is located in the study area of Option 3b.
- Sewage works were historically present in the study areas of Option J and Option 11.
- A former lime kiln and associated culm pits were historically located in the study area of Option 3b; and
- Numerous former quarries and pits which have potentially been infilled, and operational farms are located in the study areas of all route alignments.

7.11.4 Conclusion

It is recommended that a detailed desk study should be undertaken as part of the Stage 2 assessment making use of a Landmark Envirocheck Report which provides more detailed land quality information and more in depth historical mapping and will enable better characterisation of the land on and around the route options. Depending on the findings of the desk study, a ground investigation may be required, with appropriate environmental sampling and laboratory analysis.

On completion of a detailed desk study and ground investigations a comparative appraisal of the options can be undertaken.

8 Social Impacts

8.1 Permeability

8.1.1 Introduction

Permeability describes the degree to which people in the affected area can travel by non-motorised modes. Improving permeability, or reducing severance, can encourage healthier lifestyles and in this case, can promote enjoyment of the special qualities of the National Park by the public. Each option has the potential to impact upon the movement of pedestrians and cyclists in its vicinity. The assessment identifies the degree to which people can travel by non-motorised modes thereby encouraging healthier lifestyles.

Changes to severance, therefore increased or decreased severance, could occur as a result of the follows potential causes:

- Removal of the beach road (increased severance);
- New highway crossing or alongside a non-motorised users (NMU) route (increased severance); and
- Removal of or reduction in vehicular traffic on a road resulting in a reduction in severance of NMU routes which cross that route.

8.1.2 Methodology

The impact of the options on permeability has been assessed qualitatively through consideration of the degree to which people are likely to be affected by changes in severance and how permeability will be affected. This has been achieved through an assessment of the number of Public Rights of Way (PRoW) and Bridleways that are affected by the options.

The assessment takes into account both freedom of movement (capacity to travel in any given direction without being obstructed by a transport corridor) and capacity to reach key services.

For the permeability assessment, the following significance criterion have been applied;

- Large Adverse (-3): Reduction in permeability through direct severance of >3 PRoW or people are likely to be dissuaded from making trips as result of severance.
- Moderate Adverse (-2): Reduction in permeability through direct severance of 1-3 PRoW or people might be dissuaded from making trips as result of severance.
- Slight Adverse (-1): Reduction in permeability through direct severance of 1-3 PRoW but people are unlikely to be dissuaded from making trips. Trips will be made longer or less attractive.
- Neutral (0): No change to permeability or adverse effects balance by beneficial effects
- Slight Beneficial (+1): Permeability improved by 1-3 instances of removal of traffic and/or new NMU provision.
- Moderate Beneficial (+2): Permeability improved by 1-3 instances of removal of traffic and/or new NMU provision which is likely to result in an increase in usage.
- Large Beneficial (+3): Permeability improved by PRoW created and/or improvements to access to existing PRoWs.

8.1.3 Impacts

The Pembrokeshire Coastal Path and National Cycle Route 4 run along the coastline at Newgale. It is expected that in the case of all options these designated routes would be retained but would be set back outside of the active zone of coastal retreat. This would present the opportunity to improve NMU provision along the coast at Newgale in order to increase permeability.

There are no PRoW or bridleways within the land area for the proposed road alignment in Option 3b. The proposed alignment of Option J cuts across a PRoW (PP5 1/1) to the south of Penycwm and Bay View Farm. Therefore this option would increase severance as NMU will have to cross the proposed road to maintain access to the footpath between Newgale Hill (A487) and Erw Lon which currently reduces the distance that people have to walk/cycle on main roads between Newgale and Penycwm. This option would decrease permeability as the proposed road would cross a PRoW. Although this would hinder non-motorised modes of movement, it would not stop NMU from using the PRoW. It is noted that Option J would improve permeability for NMUs travelling between Roch and Penycwm by providing a more direct route with less severe gradients.

The proposed alignment of Option 7 runs along an existing bridleway (PP5 2/2) for approximately 460m along Erw Lon between Penycwm in the west and Lower Llethr in the east. Therefore, Option 7 would create a need for the existing bridleway to be relocated. Option 7 also intersects a PRoW (PP5 37/1) in two places; approximately 135m to the east of Lower Llethr and 345m to the west of Dolgwm and east of Heart Covert. This option would reduce permeability as the route severs both a bridleway and a PRoW, requiring an alternative route for pedestrians/horse riders/cyclists to be sought. It is noted that Option 7 would improve permeability for NMUs travelling between Roch and Penycwm by providing a more direct route with less severe gradients.

Although Option J and Option 7 sever NMU routes, the removal of vehicular traffic from the existing beach road, along with measures to maintain safe access for NMUs along the coast at Newgale, may result in an increase of NMU activity between the village and amenities and other settlements to the south.

There are no PRoWs or bridleways within the land area for the proposed road alignment in Option 11, therefore this option would not increase severance. As with Option 3b, permeability would be increased due to the removal of vehicular traffic on the existing beach road and establishment of measures to maintain safe access for NMUs along the coast at Newgale.

Table 8-1: PRoW and Bridleways Severed by Each Alignment

Road Option	Public Rights of Way across open fields	Bridleway along Erw Lon	Footpaths along established tracks
3b	x	x	x
J	✓ (1 PRoW)	x	x
7	x	✓	✓ (1 PRoW)
11	x	x	x

Note: As stated in Section 4.1 it is expected that in the case of all options, the Pembrokeshire Coastal Path and National Cycle Route 4 would be retained. The route of the coastal path and the cycle route would be set back outside of the active zone of coastal retreat.

8.1.4 Conclusion

Walking, cycling and bridleway routes would be impacted by the alignments of Options J and 7, however these routes may only be used by a small proportion of residents and visitors. The road alignments of Options 3b and 11 would not impact upon any NMU routes. Options J, 7 and 11, which would include measures to maintain safe access for NMUs along the coast at Newgale, would increase permeability within the settlement of Newgale and between the village and amenities further south along the coast due to the removal of vehicular traffic on the existing beach road. The degree of reduced permeability caused by Options J and 7 depends upon the amount that the PRoW and bridleway are used by NMU. As this is a high level qualitative assessment, due to the lack of available data it is not possible to quantify the degree of reduced permeability at this stage.

The assessment of each proposed road alignment option is given in the Appraisal Summary Tables in **Chapter 10.**

8.2 Physical Fitness

8.2.1 Introduction

There is a strong link between health and transport, and a great contribution to physical fitness and general wellbeing can be made by travelling on foot, by bicycle or on horseback. This criterion reflects the contribution to physical fitness and general well-being that can be made by travelling by these modes. Therefore to what degree the options will either increase, decrease or maintain the current level of active travel modes will be assessed.

8.2.2 Methodology

At this stage the impact on the number of NMU trips has not been estimated therefore a qualitative assessment has been undertaken.

For the physical fitness assessment, the following significance criteria have been applied;

- Large Adverse (-3): Reduction in the use of active travel modes through direct severance of >3 PRoW/bridleways or people are likely to be dissuaded from making trips by active travel modes as result of severance.
- Moderate Adverse (-2): Reduction in the use of active travel modes through direct severance of 1-3 PRoW/bridleways or people might be dissuaded from making trips by active travel modes as result of severance.
- Slight Adverse (-1): Reduction in the use of active travel modes through direct severance of 1-3 PRoW/bridleways but people are unlikely to be dissuaded from making trips by active travel modes. Trips will be made longer or less attractive.
- Neutral (0): No change in the use of active travel modes.

- Slight Beneficial (+1): Active travel modes improved by 1-3 instances of removal of traffic and/or new NMU provision.
- Moderate Beneficial (+2): Active travel modes improved by 1-3 instances of removal of traffic and/or new NMU provision which is likely to result in an increase in usage.
- Large Beneficial (+3): Active travel modes improved by PRoW/bridleway created and/or improvements to access to existing PRoWs/bridleways.

8.2.3 Impacts

All options offer the opportunity to create a segregated cycle path and footways parallel to the new road carriageway to enhance active forms of travel.

As shown in **Table 8.1**, Options J and 7 have a negative impact on a number of walking, cycling and bridleway routes, which could reduce the amount of active travel undertaken by local residents. However when compared to the existing situation Options J and 7 provide a slightly more direct route for NMUs with less severe gradients between Roch and Penycwm.

Options 7, J and 11 may increase the number of journeys made by foot or bicycle due to the reduced level of vehicular traffic in Newgale with the removal of vehicular traffic along the beach road, alongside measures to maintain safe access for NMUs using the Pembrokeshire Coastal Path or National Cycle Route No. 4 along the coast at Newgale. In addition Option 11 does not directly impact upon any PRoWs or bridleways.

Option 3b would have no negative impact upon walking, cycling and bridleway routes. Option 3b would not reduce traffic through the village and thus traffic induced severance would remain however the option may encourage more journeys by foot or cycle by incorporating provision for NMU as part of the realignment of the residual beach road.

8.2.4 Conclusion

Options J and 7 result in severance issues for some local walking, cycling and bridleway routes, but they also reduce traffic flows along the beach front in Newgale, improving the environment for walking and cycling, as does Option 11. In addition Options J and 7 would provide a more attractive route for NMUs between Roch and Penycwm.

Although Option 3b provides a replacement road alignment very close to the existing beach road, it does provide an alternative walking and cycling route along Newgale's beach front, therefore proving the potential to increase active travel by local residents.

The assessment of each route option is given in the Appraisal Summary Tables in **Chapter 10.**

8.3 Social Inclusion

8.3.1 Introduction

For the purpose of WelTAG, social inclusion is effectively synonymous with accessibility. This is because the relative ease with which people can access healthcare, education, shopping and leisure facilities affects the degree to which they are able to lead a full life. Other factors such as deprivation or low educational attainment can often be even more important causes of social exclusion but in the context of WelTAG and transport proposals, the lack of accessibility is the main variable affecting social inclusion.

WelTAG's social inclusion impact assessment places particular emphasis on potential impacts on those people/social groups whose options in life are limited by not having the transport they would wish. This includes people on low incomes who have access to a car but may not be able to afford fuel to drive to where they want or need to go but primarily people without access to cars who rely on walking, cycling and public transport. Therefore, the social inclusion impact assessment is particularly interested in disadvantaged and possibly marginalised social groups and how they will

be affected by the proposals. The key concern is to ensure that disadvantaged or vulnerable groups are not disproportionately adversely affected by the proposals.

WelTAG states that it is possible to expend significant effort on identifying and quantifying the social inclusion impacts of transport proposals. However in each case, a judgment needs to be made balancing the amount of effort spent on such an assessment against its usefulness in making a decision. This is because the social inclusion impacts of some proposals will be negligible.

8.3.2 Methodology

A qualitative assessment of impacts on access to healthcare, education, training, learning, shopping and leisure facilities has been made. Therefore the quality of access to St David's, Solva and Haverfordwest is key.

For the social inclusion assessment, the following significance criteria have been applied;

- Large Adverse (-3): Reduction in accessibility to services in Haverfordwest or St. David's through the removal of the public transport service from the village and people are unable to access important amenities.
- Moderate Adverse (-2): Reduction in accessibility to services in Haverfordwest or St. David's through a re-routed public transport service serving the village and people might be dissuaded from making trips to important amenities. Trips will be made longer or less attractive.
- Slight Adverse (-1): Reduction in accessibility to services in Haverfordwest or St. David's through a re-routed public transport service serving the village but people are unlikely to be dissuaded from making trips to important amenities.
- Neutral (0): No change in accessibility to services.
- Slight Beneficial (+1): Accessibility to services in Haverfordwest or St. David's remains the same but accessibility to amenities in a storm event would be improved.
- Moderate Beneficial (+2): Increase in accessibility to services in Haverfordwest or St. David's through a re-routed public transport service serving the village. Accessibility to amenities in a storm event would be improved.
- Large Beneficial (+3): Increase in accessibility to services in Haverfordwest or St. David's through a re-routed public transport service serving the village and the addition of a new public transport service linking Newgale to important amenities. Accessibility to amenities in a storm event would be improved.

It should be noted that the above criterion for the social inclusion assessment is based on an assumption that the No.400 and No.411 buses will re-route along the alignments of the identified options, continuing to stop at Newgale.

8.3.3 Impact Assessment

Access to Healthcare

The nearest hospital with an A&E department is Withybush General Hospital in Haverfordwest, which is accessed by the A487 from Newgale. There is a surgery (St. David's Surgery) in St. David's and a doctor's surgery in Solva, however Withybush Hospital is also the nearest hospital to St. David's and Solva.

The purpose of all options would be to provide a transport route which remains open during storm events. Therefore, when compared to the do nothing scenario, all the options would improve access to healthcare facilities during storm events.

The realignment of the beach road at Newgale would impact on access to Withybush Hospital from Newgale, St. David's and Solva. Option 3b would provide the closest alternative route to the existing route and would enable a very similar journey to be made by vehicle to the general hospital. Options J and 7 would result in slightly longer journey times from Newgale to reach this hospital,

but the journey from the St. David's Peninsula would be shorter due to an improved alignment and reduced distance. In comparison Option 11 would mean a much longer journey time from Newgale and from the St David's Peninsula therefore significantly reducing accessibility to healthcare facilities.

It is assumed that the local bus service from St. David's to Haverfordwest (No.411 bus) and the coastal bus service from St. David's to Marloes (No.400 bus) will not change their routes to accommodate Option 3b as this option runs parallel to the beach road. It is also assumed that the No.411 and No.400 buses will re-route along Options J, 7 and 11, with a stop in Newgale whereby buses will have to turn around in the village to re-join the main road again, as these routes would by-pass Newgale itself. Accessibility to healthcare facilities by public transport could be slightly reduced with Options J and 7 due to an increase in journey times, whereas Option 11 could significantly reduce this accessibility due to a considerable increase in journey times.

Access to Education, Training and Lifelong Learning

The purpose of all options would be to provide a transport route which remains open during storm events. Therefore, when compared to the do nothing scenario, all the options would improve access to education and training facilities during storm events.

Pembrokeshire College has a campus at Haverfordwest, which is accessed by the A487 from Newgale. The realignment of the beach road at Newgale would impact on access to Pembrokeshire College from Newgale and the St. David's Peninsula. Option 3b would provide the closest alternative route to the existing route and would enable a very similar journey to be made by vehicle to the college. Options J and 7 would result in slightly longer journey times from Newgale, but shorter journey times for people travelling from St. David's and Solva. In comparison Option 11 would mean a much longer journey time from all three settlements, therefore significantly reducing accessibility to education facilities.

Ysgol Dewi Sant (Saint David's School) is the closest secondary school to Newgale. The realignment of the beach road would not affect the settlement of Newgale having access to the school as it is located on the St. David's side of the A487.

Again, it is assumed that the local bus service from St. David's to Haverfordwest (No.411 bus) and the coastal bus service from St. David's to Marloes (No.400 bus) will not change their routes to accommodate Option 3b as this option runs parallel to the beach road. It is also assumed that the No.411 and No.400 buses will re-route along Options J, 7 and 11, with a stop in Newgale whereby buses will have to turn around in the village to re-join the main road again, as these routes would by-pass Newgale itself. Accessibility to education facilities by public transport could be slightly reduced with Options J and 7 due to an increase in journey times, whereas Option 11 could significantly reduce this accessibility due to a considerable increase in journey times.

Access to Shopping and Leisure Facilities

The purpose of all options would be to provide a transport route which remains open during storm events. Therefore, when compared to the do nothing scenario, all the options would improve access to shopping and leisure facilities during storm events.

St. David's is the closest city to Newgale, albeit a small city, offering limited shopping and leisure facilities. The removal of the beach road would not affect the settlement of Newgale having access to shops and leisure facilities in St. David's, as it is located on the St. David's side of the A487.

Haverfordwest offers more substantial shopping and leisure facilities for the settlements of Newgale, St. David's and Solva. The realignment of the beach road at Newgale would impact on access to shopping and leisure facilities in Haverfordwest from all three settlements. Option 3b would provide the closest alternative route to the existing route and would enable people in Newgale to make a very similar journey to these facilities. Options J and 7 would result in slightly longer journey times from Newgale to reach the main shopping and leisure facilities in Haverfordwest, but shorter journeys from St. David's and Solva due to an imporved alignment and

reduced distance. In comparison Option 11 would mean a much longer journey time from all three settlements, therefore significantly reducing accessibility to shopping and leisure facilities.

It is assumed that the local bus service from St. David's to Haverfordwest (No.411 bus) and the coastal bus service from St. David's to Marloes (No.400 bus) will not change their routes to accommodate Option 3b as this option runs parallel to the beach road. It is also assumed that the No.411 and No.400 buses will re-route along Options J, 7 and 11, with a stop in Newgale whereby buses will have to turn around in the village to re-join the main road again, as these routes would by-pass Newgale itself. Accessibility to shopping and leisure facilities by public transport could be slightly reduced with Options J and 7 due to an increase in journey times, whereas Option 11 could significantly reduce this accessibility due to a considerable increase in journey times.

8.3.4 Conclusion

The purpose of all options would be to provide a transport route which remains open during storm events. When compared to the do nothing scenario, all the options would improve access to amenities in Haverfordwest and St. David's. In this regard the impact of changes in accessibility on social inclusion would therefore be positive.

Option 3b would have very minimal impact on the accessibility of services for both car owners on limited incomes and people without access to a car. Options J and 7 would slightly increase travel times to services from Newgale, but reduce journey times for people travelling from St. David's and Solva. Option 11 would significantly increase travel times to services from these settlements. This would impact on the accessibility of services, particularly for car users on limited incomes and people without access to a car, providing reduced accessibility levels.

Although the No.411 and No.400 buses would have to re-route their services for Options J, 7 and 11 as these routes do not pass through Newgale, it is assumed that they will still stop in Newgale whereby buses will have to turn around in the village to re-join the main road again.

The assessment of each proposed scheme option is given in the Appraisal Summary Tables in **Chapter 10** of this report.

8.4 Transport Safety

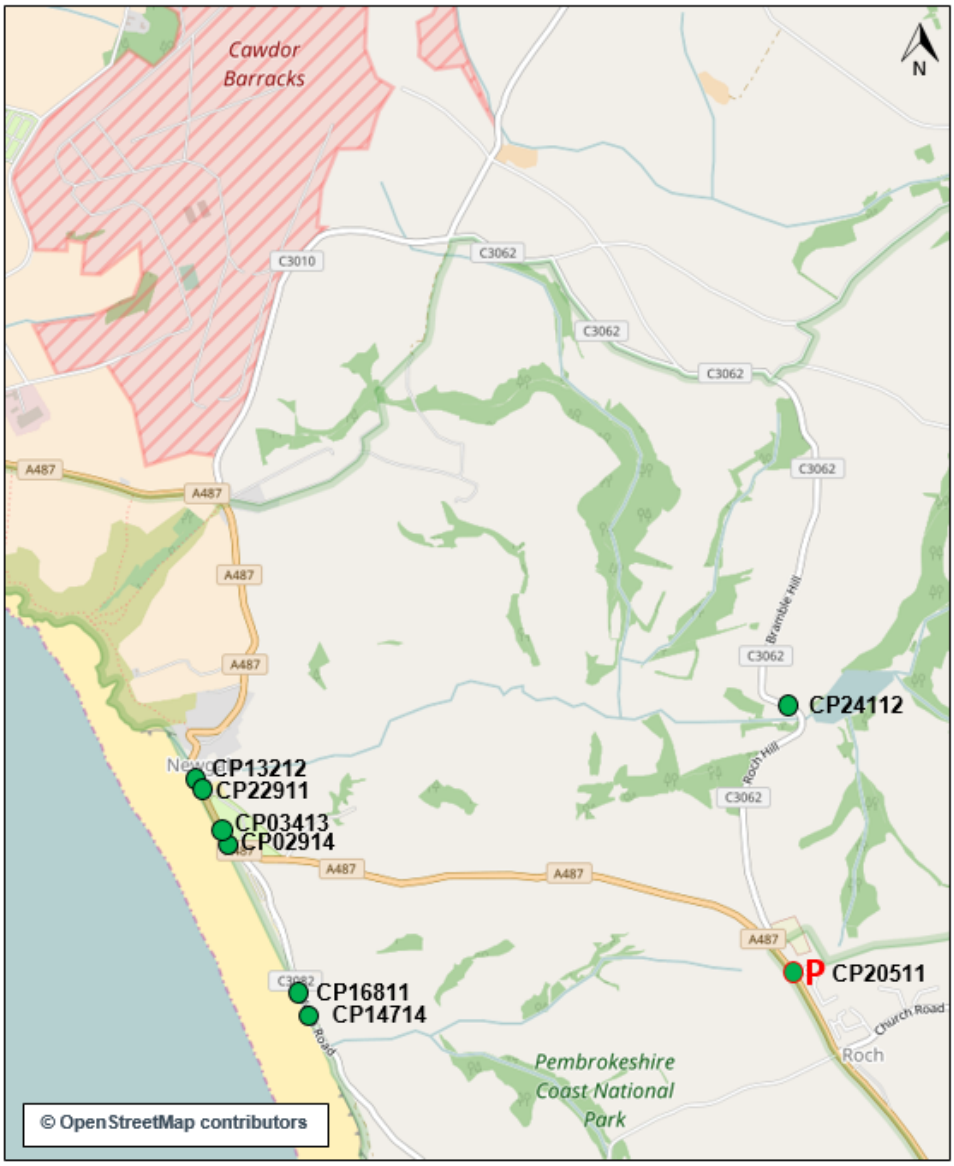
Transport safety aims to assess the extent to which the options will contribute to a reduction in the number and severity of accidents in order to enable a comparison of the relative merits of the stand-alone options.

The basic inputs for the estimation of accident impacts are the changes in vehicle-km, average traffic speeds and junction configuration. Consideration has also been given to the extent to which each option would mitigate existing safety related constraints.

8.4.1 Methodology

STATS19 data for the most recent five year period has been obtained for the study area and plotted to show the location of accidents, demonstrating the locations of slight accidents (green circles), serious accidents (blue squares), and also showing which ones involved pedestrians (red outline with added "P"). This map and associated data has been analysed qualitatively to ascertain what impact the scheme could have on accidents in the area. A copy of this map is provided below and the accident data report can be found in **Appendix B**.

Figure 8-1: Study Area Accident Plot



8.4.2 Impacts

As outlined earlier in this report, four collisions were recorded on the c.385m section of the A487 that runs parallel to the shingle bank at Newgale. All of these collisions were classified as 'slight' with a single collision occurring each year from 2011 to 2014. Two of these collisions were caused by objects in the road (assumed to be pebbles from the shingle bank), one involved a pedal cyclist and one was due to the road being flooded. All four route options under consideration would provide an opportunity to improve highway safety along the A487 through Newgale as outlined below.

- Options J, 7, and 11 would divert through traffic away from Newgale (more specifically away from sections of the A487 currently at risk from shingle bank debris and flooding); whilst
- Option 3b provides a new route within Newgale albeit along an alignment proposed to mitigate against existing shingle and flooding constraints i.e. approximately 60m in land and 2 to 3 meters higher than the existing ground level.

In diverting through traffic away from Newgale (A487 Newgale Hill and Wood Hill), Options J, 7, and 11 would also significantly reduce conflict levels between pedestrians / cyclists and vehicular traffic within Newgale; particularly during the busier summer months when visitor numbers are at their highest. The associated reduction in traffic flows (c.75%) along the A487 through Newgale could potentially make walking and cycling safer and far more desirable for shorter local trips. In the event that Option 3b is taken forward, complimentary improvements to the sustainable transport infrastructure within Newgale should form a key consideration during the design development process. Ideally this would incorporate segregated provision for pedestrian and cyclists (away from vehicular traffic) within Newgale.

For assessment purposes, segregated provision for pedestrians and cyclists (within the village of Newgale itself) was not considered to form part of the Option 3b proposal. Consequently, Option 3b would provide reduced transport safety benefits compared to Options J, 7 and 11. To distinguish between the transport safety credentials of Options J, 7 and 11 (all of which are expected to have a 'Medium Beneficial (+2)' impact), consideration has been given to the following factors:

- Study Area Vehicle Kilometres
  - With an increase in vehicle kilometers constituting an increase in study area accidents
  - Study area vehicle kilometres were calculated by multiplying forecast average day traffic volumes on each road link by the link length.
  - Calculations based on 2037 Design Year Scenario.

- Scheme Design
  - with consideration given to both link and junction designs.
- A brief overview of the key design considerations identified in relation to the above is provided in **Table 8-2**. For completeness, information is also provided for Option 3b.

Table 8-2: Design Year Route Length Comparison

Option	Study Area veh-km (000s)	Scheme Design Considerations
7	32.61	• The southern tie in would be swept in on a smooth bend with a priority junction at the northern end. • Steep gradients would exist along the route with no overtaking sections likely.
J	33.70	• Route would require a roundabout junction at southern tie in and a priority junction at the northern end.
11	45.27	• The horizontal alignment would have radii below the desirable minimums with departures from standards required. • Priority junctions required at northern and southern ends and priority junctions would link to existing road network at Eweston, Silver Hill and Rhydgele and numerous lanes, tracks and accesses that would require connection onto the road.
3b	29.96	• Priority junction horizontal alignment at northern and southern tie-ins fall below the desirable minimum for the 70kph design speed.

Based on the analysis presented within this section of the report, the transport safety credentials of the four route options are ranked as follows:

- Rank 1 – Option 7
- Rank 2 – Option J
- Rank 3 – Option 11
- Rank 4 – Option 3b

Whilst Option 7 is ranked higher than Option J (due to the presence of a roundabout in Option J and a slight increase in the Study Area veh-km forecasts); both are expected to provide almost identical levels of transport safety benefits.

8.5 Equality, Diversity & Human Rights

Any impacts of the options on the following criteria are not considered to be significant and are not differentiating factors at this stage of assessment:

- Race, ethnicity, colour or nationality;
- Sex or marital status;
- Age;
- Religion or belief;
- Sexual orientation;
- Welsh language;
- Other: Lone parent, economic inactivity, social and multiple deprivation; and
- Human rights legislation.

9 Public Participation

The Newgale Coastal Adaptation project has sought at the outset to incorporate regular public participation. Prior to this current assessment, a public consultation took place during the early part of the WelTAG Planning Stage in February 2015. Subsequently, a Newgale Adaptation Plan was developed which was the subject of further stakeholder and community engagement culminating in a period for public responses between October and November 2015.

Following the completion of consultation, the WelTAG Planning Stage report was issued in February 2016 and transport options were shortlisted into ten route corridors (options 2b, 2c, 2d, 3b, 4, 5, 7, 8, 9 and 11) for further consideration. Since publication of the WelTAG Planning Stage report, Atkins has given more consideration to the coastal realignment and highway engineering implications of these ten options, specifically the design considerations which are likely to impact on the purposes of the Pembrokeshire Coast National Park. Atkins Planning Stage Addendum Report recommended that four options (options 3b, J, 7, and 11) would be retained for further assessment as part of this WelTAG Stage 1 assessment.

As part of the ongoing stakeholder and community engagement a mid-project 'Sounding Board' event was facilitated by Atkins on 20 and 21st October 2016 at Solva Memorial Hall, to explain to the public the reasons for the shortlisting of these four options (listed above) for assessment.

On issue of Atkins' draft Stage 1 assessment report at the end of January 2017, a public exhibition was held with key stakeholders on 8 February 2017 and with the public on 9 and 10 February 2017, with the period for public responses opening on 3 February 2017 and closing on 20 March 2017. 243 people were noted as attending. In addition to the exhibition, Atkins draft WelTAG report was provided along with a non-technical summary report. Drawings were also provided which illustrated the four route corridors. The report described the four route corridors as follows:

- **Option 3b:** is a development of the Planning Stage Inner Route Corridor – 3b alignment behind the Duke of Edinburgh public house. This option would be approximately 520m in length. It would be carried across the flood plain of the Brandy Brook on a long viaduct. At its southern end, this route would tie in to the existing A487 approximately 50m south east of the existing junction with the C3082 towards Nolton Haven. To the north, the route would tie in with the existing A487 approximately 50m north east of the existing bridge over Brandy Brook.
- **Option J:** is a development and hybrid of the Planning Stage Middle Route Corridor options 4, 5 and 6. This option would be approximately 2.5km in length. At its southern end, it would tie in to the existing A487 to the south of Wood Farm. It would then head in a north-easterly direction before turning north, passing to the east of the property Pontpren, and crossing the Brandy Brook. It would then turn toward the north-west, passing to the north of Newgale Farm, before turning to the north and tying in with the existing A487 at Bay View Farm.
- **Option 7:** is a development of the Planning Stage Middle Route Corridor option 7. This option would be approximately 3.25km in length. At its southern end, it would tie in to the existing A487 at the existing junction with the access track to Pontpren and Gouts. It would then head in a northerly direction along the line of the access track before crossing the Brandy Brook following the line of a small stream valley. It would then turn to the north-west toward Lower Llethr and turning to the west to follow the line of Erw Lon towards Penycwm. Before reaching the properties on Erw Lon, it would divert and pass to the north of Penycwm, before tying in to the existing A487 approximately 60m to the west of the settlement.
- **Option 11:** is a development of the Planning Stage Outer Route Corridor Option 11. This option would be approximately 6.2km in length. It would follow and widen the existing diversion route of the C3062-C3063-C3010. At the south it would tie in to the existing

A487 at the existing junction with the C3062 at Roch. It would cross Brandy Brook at Roch Bridge, and continue via Bramble Hill, Eweston, Silver Hill, Rhydygele to Penycwm where it reaches the existing junction with the A487.

Atkins recommendation in the Stage 1 report was to carry out further study of Option 3b and J and to seek the public's view of progressing further study of these options.

By the closing date of 20th March 2017 a total of 138 response forms had been received. A summary of findings from the responses to the public consultation, showed:

- In **option 3b**, 62% strongly agreed or agreed that this option be taken forward for further assessment, whilst 28% disagreed or strongly disagreed.
- For **option J**, 66% strongly agreed or agreed that this option be taken forward for further assessment, whilst 22% disagreed or strongly disagreed.
- 62% of respondents strongly agreed or agreed whilst 22% disagree or strongly disagreed that both **options 3b** and **J** should be taken forward for further assessment.
- For the alternative options (**options 7** and **11**) 11% strongly agreed or agreed with an alternative option being short-listed, whilst 68% disagreed or strongly disagreed on alternative options being put forward for further assessment as the preferred route.
- Of those who indicated that an alternative option should be considered for short-listing (and those who indicated that they neither agreed nor disagreed with an alternative option being shortlisted) the largest number (19) felt that **Option 7** should be considered. Only four respondents felt that **Option 11** should be considered.

Full details of the consultation process and the results of the public consultation exercise are provided in the following reports, which are at **Appendix K:**

- Public Exhibition Poster Presentation, 8 February 2017;
- Pembrokeshire County Council, WelTAG Report, Response Report, March 2017 – containing the result of the public response questionnaire, March 2017; and
- Pembrokeshire Coastal Forum, Notes from Stakeholder Meeting of 8 February 2017.
- Other feedback responses received separately to the questionnaire.

9.1 Themes emerging from responses for Option 3b and J

For the options recommended for further study, there was a variety of support in the responses received.

9.1.1 Option 3b

Positive

Views expressed reflected that this option kept an attractive approach to Newgale, potentially enhancing the attraction of driving to Solva and St David's and that it would retain a viewing point for tourists. The elevated road could enhance the view of the beach. It was also felt that it had the least impact on the environment. It maintains a safe route for drivers and for hikers using the bus and still provides access to the coastal path at similar points as it does now.

Mixed reactions

Whilst this route, is the shortest construction and closest to the present route and potentially the least damaging to habitat, the visual impact of an elevated structure is a concern. People would like to see good architectural features and design of the elevated road complementary to the landscape.

It was felt the route could be adjusted, and connection points on the hillside reviewed, the road could be potentially set back further up the valley and further measures taken to avoid properties being knocked down.

Opposition

People were concerned about cross-winds and sea spray. There are concerns that the elevated roadway would look unsightly, obtrusive and this is a concern for tourism. There were concerns about the long-term viability of the road location, give that that the shingle bank will be damaged and retreat in the future. The route does not avoid the steep section of Newgale Hill and the new junction in this location needs to be looked at more closely. There were concerns about the maintenance costs associated with this structure in an exposed location. There were concerns on the effect of local business with the potential loss of café, hardware store, pub and camp site which is not afforded protection by this route.

9.1.2 Option J

Positive

Comments indicated that this option would be future proof (presumably not at risk from coastal retreat) and will leave the village of Newgale peaceful and have the potential from improving the 'beach experience' at Newgale. There were advantages seen in road construction not affecting existing facilities. It was appreciated that over time the impact to the landscape would lessen as the road blended into the maturing landscape. Also, it was felt that avoiding the steep Newgale Hill was an advantage. It was felt that the view of Newgale should be retained on this route as this has a positive impact on tourism.

Mixed reactions

People commented that the route was not as direct as some would like and that improvements to the route could be made by incorporating a viaduct. It was felt improvements to the route could be made by following farm boundaries and allowing it to blend in with the landscape.

Opposition

There was concern about the use of a roundabout junction as being too urban and its proximity to Southwood Lodge. There was concern that this route takes people away from Newgale beach and the village and there were concerns about the effect on tourism and business. Some were concerned at the effect on countryside and the loss of the iconic view of Newgale. Several views were made that they considered Option 3b to be the better route.

9.2 Action to be taken from the feedback received

It is noted that some of the comments raised by the public can be addressed by adjustments to the alignment of the proposed routes, whilst maintaining the route corridors. Further work to study and further optimise the routes could be dealt with in future stages following the WelTAG Stage 1 assessment.

A minor adjustment to the alignment at the northern end of Option 3b, has been developed as shown on Atkins drawing 20160152-XX-ZZ-ATK-DR-D-2005/P1.2 in **Appendix A.6.** This adjusted option has not yet been presented to the public and could be taken into consideration for the next stage of the study.

10 Stage 1 Appraisal Summary Tables

10.1 Introduction

Following the assessment of the four options against the TPOs, a qualitative / quantitative Stage 1 Appraisal of each was carried out. The purpose of this stage 1 appraisal is to test and screen the options considered against the TPOs and Welsh Impact Areas.

This Section of the report documents the appraisal summary tables (ASTs) for all the options.

10.2 Option 3b

Option Description: Option 3b			
Appraisal Criteria	**Assessment**	**Distribution**	**Significance**
Welsh Impact Areas			
Economy			
Transport Economic Efficiency	Cost - £21.55 m Option 3b will contribute towards reducing travel times between St David's Peninsula and Haverfordwest; with a Design Year (2037) journey time saving of 317 seconds compared to the Do Minimum Scenario. Option 3b will also contribute towards a reduction in veh/km within the study area (i.e distances travelled by each vehicle) in the Design Year (2037). Estimated BCR = 1.97 (Medium Value for Money)	All 'through traffic' to benefit from reduced journey times and distances.	Moderate Beneficial (+2)
EALI	N/A	N/A	Neutral (0)
Environment			
Noise	Increases and decreases in noise affect a small number of properties (19 out of 264). There are more increases in noise than decreases in noise. Potentially significant noise effects are shown at 5 properties in the short term and at 1 property in the long term. Mitigation is unlikely to be needed for this option.	N/A	Neutral (0)
Local Air Quality	Slight reduction in vehicle kilometres travelled with this option in the Opening Year (2022) than with the Do Minimum as a result of decreases along the A487 east of the junction with Welsh Road.	No significant changes to distribution of emissions.	Neutral (0)
Greenhouse Gas Emissions	Fewer vehicle kilometres travelled with this option results in a slight reduction in emissions over the 60 year appraisal period than with the Do Minimum as a result of decreases along the A487 east of the junction with Welsh Road.	Not Assessed	Slight beneficial (+1)
Landscape and townscape	PMBRKVS072: Druidston – High Value Large adverse impacts on: views in and out of area. Moderate adverse impacts on: residential dwellings in Newgale including the Duke of Edinburgh Inn; leisure facilities and users in Newgale; and Brandy Brook & Valley (pending formal SSSI designation) Slight adverse impacts on: amenity grassland as part of the camping park and marshland; cycleway and Wales Coast Path.	N/A	Moderate adverse (-2)
Bio-diversity	Loss of high importance lowland marsh habitat, but fewest impacts to Newgale Marsh. Limited impacts to hedgerows and no impacts to woodlands.	N/A	Slight Adverse (-1)
Heritage	Grade II listed building of medium importance [CADW 19081/DAT59636]. Non-designated bridge [Coflein 22423] and cottage [DAT32636] of low importance.	Potential to impact on setting of listed building – Slight Adverse. Potential direct physical impact on assets – Moderate Adverse. Potential to impact on setting of non-designated heritage assets – Slight Adverse.	Slight Adverse (-1)

	16 Non-designated archaeological sites of low importance.	Potential direct physical impact on any surviving below ground remains – Slight Adverse.	
Water environment	Potential for slight adverse impacts to water quality owing to risks associated with additional road runoff and pollution. Potential impacts on groundwater level and quality from cuttings, earthworks and piling. Works could indirectly affect surface water features and abstractions which are dependent upon groundwater inputs and may introduce new pollutant pathways to groundwater. Large adverse impacts in terms of flood risk without mitigation.	N/A	Moderate adverse (-2)
Soils	A former petrol filling station and a former lime kiln with associated culm pits were historically located in the study area. Numerous former quarries/pits and operational farms are located in the study area.	N/A	Neutral (0)
Society			
Transport safety	Option 3b will improve highway safety for all road users along the A487; primarily by diverting through traffic away from the seafront at Newgale	Positive Impact on all road users; particularly vulnerable road users at Newgale Seafront.	Slight Beneficial (+1)
Personal security	N/A	N/A	Neutral (0)
Permeability	No PRoW or bridleways would be severed as a result of this option. The Coastal Path and National Cycle Route No. 4 would be integrated into the revised highway alignment potentially improving NMU provision although NMUs would still encounter vehicular traffic. A positive impact on residents and visitors in the area is predicted.	Positive impacts for all as a result of improvements to NMU routes, particularly for residents/visitors without access to a car.	Slight Beneficial (+1)
Physical fitness	No pedestrian, cycle or horseback routes are severed as a result of this option. This option would incorporate NMU provision to encourage non-motorised modes of travel, however NMUs may still be discouraged due to the presence of vehicular traffic.	No negative or positive impacts on local NMU activity as the option does not sever any walking, cycling or bridleway routes, nor will it specifically encourage more active modes of travel.	Neutral (0)
Social inclusion	Improvements in accessibility during storm events would have a positive impact in respect of social inclusion. Not expected to have a negative impact on the accessibility to services with this road alignment as the route follows a very similar route to the existing alignment. Not expected to have a large impact on public transport users as it is assumed the No.411 and No.400 buses would re-route along a very similar route, therefore current access through Newgale maintained	Accessibility to services for both private car and public transport users will be neither positively nor negatively affected.	Slight beneficial (+1)
Equality, Diversity & Human Rights	Any impacts are not considered to be significant.	N/A	Neutral (0)
Transport Planning Objectives			
TPO1- To improve sustainable long term highway connectivity to and within the local community, and between St David's Peninsula, Haverfordwest and the Trunk Road Network in the context of coastal erosion	The option would improve highway connectivity to shopping, healthcare and education/training facilities during storm events. Significant journey time savings of 317 seconds are forecast, improving connectivity with St David's Peninsula, Haverfordwest and within the local community.		
TPO2 - To conserve and enhance the natural beauty, wildlife and cultural heritage of the Pembrokeshire Coast National Park avoiding, or at least minimising, adverse effects on the natural environment caused by traffic and associated infrastructure	Large adverse impacts on views in and out of the area. Potential slight adverse effect on setting of a Grade II Listed Building and several non-designated assets. The number of properties receiving an increase in noise would be greater than the number of properties receiving a decrease in noise. Potentially significant noise effects are shown at 5 properties in the short term and at 1 property in the long term. A slight reduction in NOx and CO2 emissions.		

	Fewest biodiversity impacts, loss of lowland marsh habitat will have a minimal impact. Moderate adverse impacts on Brandy Brook & Valley.
TPO3 - To improve the actual and perceived safety of the transport network in the study area for all users and residents	The option would improve highway safety along the A487 through Newgale by providing a new route within Newgale to mitigate against existing shingle and flooding constraints. Complimentary improvements to the sustainable transport infrastructure within Newgale should form a key consideration during the design development process in order to minimise conflicts between Vehicles and NMUs.
TPO4 - To make the transport network suitable to facilitate tourism and regeneration in the St David's Peninsula including access to the coast at Newgale	Improved connectivity between Newgale and St. David's Peninsula during storm events. Reducing journey times to St David's Peninsula, in design year (2037). The potential redevelopment of the barracks provides a potential new revenue stream for businesses in Newgale however there would be no improvement in access along the A487 for HGV vehicles.
TP05 - To support and facilitate the safe movement of vulnerable road users to their destination	Complimentary improvements to the sustainable transport infrastructure within Newgale should form a key consideration during the design development process in order to minimise conflicts between Vehicles and NMUs.
Other Factors	
Public acceptability: 62% strongly agreed or agreed this option should be taken forward for further assessment, 28% disagreed or strongly disagreed.	
Acceptability to other stakeholders: No Stakeholder Consultation undertaken at this stage	
Technical and operational feasibility: Construction methods would include earthworks, one structure and two junctions. Requires a major structure to carry the road above the Brandy Brook flood plain. Horizontal curves at the tie-ins substantially below desirable minimum for the 70kph design speed.	
Financial affordability and deliverability: Scheme Forecast Cost is £21.55m	
Land Use: HGV traffic which would still need to navigate the steep and twisty section of Newgale Hill to access the potential development site at Cawdor Barracks	
Agriculture: No loss of agricultural land but severance of camp field impacting on farm enterprise	
Risks: Affects flood plain, flood modelling required at future stages. Further surveys required to establish if protected species are present. Further survey may reveal further archaeological constraints. Ground investigations are required to identify ground condition risks and foundation requirements for viaduct.	
Total Score	**0**

10.3 Option J

Option Description: Option J			
Appraisal Criteria	**Assessment**	**Distribution**	**Significance**
Welsh Impact Areas			
Economy			
Transport Economic Efficiency	Cost - £15.90 m Option J will contribute towards reducing travel times between St David's Peninsula and Haverfordwest; with a Design Year (2037) journey time saving of 381 seconds compared to the Do Minimum Scenario. Option J will also contribute towards a reduction in veh/km within the study area (i.e. distances travelled by each vehicle) in the Design Year (2037) Estimated BCR = 3.0 (High Value for Money)	All 'through traffic' to benefit from reduced journey times and distances.	Large Beneficial (+3)
EALI	N/A	N/A	Neutral (0)
Environment			
Noise	Increases and decreases in noise affect around 35% of 264 receptors. There are around twice as many decreases in noise as there are increases in noise, and most change in noise are potentially significant. Mitigation may be used to reduce the number of adverse impacts.	N/A	Slight Beneficial (+1)
Local Air Quality	More vehicle kilometres travelled with this option in the Opening Year (2022) than with the Do Minimum as a result of traffic travelling along the new route outweighing any decrease through Newgale.	Fewer emissions in Newgale, increased emissions near new route option.	Slight adverse (-1)
Greenhouse Gas Emissions	More vehicle kilometres travelled with this option results in a slight reduction in emissions over the 60 year appraisal period than with the Do Minimum as a result of traffic travelling along the new route outweighing any decrease through Newgale.	Not Assessed	Slight adverse (-1)
Landscape and townscape	PMBRKVS072: Druidston – High Value Large adverse impacts on: fields and farmland between Penycwm and Wood Farm; mature hedgerows/hedgebanks, woodland and individual trees. Moderate adverse impacts on: Brandy Brook & Valley (pending formal SSSI designation) and views in and out of area. Slight adverse impacts on: residential properties at Penycwm and Newgale Farm to the northern end of the route and Pontpren, Wood Farm and Gouts Farm and Wood Farm to the southern end of the route; 1 PRoW across open fields.	N/A	Moderate adverse (-2)
Bio-diversity	Second least favourable. 1 river crossing structure. Significant loss of priority habitats (lowland marsh habitat) and associated biodiversity. A 318m length of hedgerow is due to be lost however considerably less than Option 7 and so proves less of a threat than both Option 7 & 11. Woodland areas are due to be affected. It is unlikely this loss of habitat can be fully compensated within the Scheme.	N/A	Very Large Adverse (-3)
Heritage	Scheduled Monument Bay View Farm Defended Enclosure of high importance [PE540/DAT2816/DAT3053]. 12 non-designated sites of low importance,	Potential to impact on setting of Scheduled Monument – Moderate to Slight Adverse. Potential to impact on setting of non-designated	Moderate to Slight Adverse (-2)

		heritage assets – Slight Adverse. Potential direct physical impact on any surviving below ground remains – Slight Adverse.	
Water environment	Potential for slight adverse impacts to water quality owing to risks associated with additional road runoff and pollution. Potential impacts on groundwater level and quality from cuttings, earthworks and piling. Works could indirectly affect surface water features and abstractions which are dependent upon groundwater inputs and may introduce new pollutant pathways to groundwater. Large adverse impacts in terms of flood risk without mitigation.	N/A	Moderate adverse (-2)
Soils	Sewage works were historically present in the study area. Numerous former quarries and pits which have potentially been infilled, and operational farms are located in the study area.	N/A	Neutral (0)
Society			
Transport safety	Option J will improve highway safety for all road users along the A487; primarily by diverting through traffic away from Newgale	Positive Impact on all road users; particularly vulnerable road users at Newgale Seafront.	Moderate Beneficial (+2)
Personal security	N/A	N/A	Neutral (0)
Permeability	Option J cuts across a PRoW (PP5 1/1) to the south of Penycwm and Bay View Farm. Although this would hinder non-motorised modes of movement, it would not stop NMU from using the PRoW. Although this option severs a PRoW, the removal of vehicular traffic from the existing beach road, along with measures to retain safe access for NMUs along the coast at Newgale, may result in an increase of NMU activity between the village and amenities/settlements to the south of Newgale.	Slightly negative impacts for NMU as they would have to cross the proposed road. Positive impact for NMUs within Newgale and along the coast. Improved gradients and a more direct route improve access between Roch and Penycwn These negative and positive impacts outweigh each other, resulting in no change in permeability.	Neutral (0)
Physical fitness	Option J cuts across a PRoW (PP5 1/1) to the south of Penycwm and Bay View Farm, however this would not stop active modes of travel made here. However a reduction in traffic flows along the beach front in Newgale coupled with the safe NMU provision along this section of the coast should improve the environment for walking and cycling.	Slightly negative impacts for NMU as they would have to cross the proposed road, however this would not stop active modes of travel. Positive impact for NMU within Newgale as the existing beach road becomes free of vehicular traffic. Improved gradients lead to improvement in useability of road for cycling and walking	Slight Beneficial (+1)
Social inclusion	Improvements in accessibility during storm events would have a positive impact in respect of social inclusion (+) Journey times for the residents of St David's Peninsula when accessing facilities in Haverfordwest would be reduced compared to the do nothing scenario (++) Journey times for residents of Newgale when accessing facilities in Haverfordwest would be increased compared to the do nothing scenario (-) There would be a negative impact on public transport users, as the No.411 and No.400 buses would have to re-route their services along the new route but still go via Newgale	Negative impacts would result for car users on limited incomes and cyclists living in Newgale in terms of their accessibility to services in the area. Beneficial impacts would result for car users in St David's Peninsula when accessing services in Haverfordwest	Slight Beneficial (+1)

	resulting in longer journey times to for users when accessing services in St. David's and Haverfordwest (-)	A negative impact would be made on public transport users as bus services would have to be re-routed.	
Equality, Diversity & Human Rights	Any impacts are not considered to be significant.	N/A	Neutral (0)
Transport Planning Objectives			
TPO1 - To improve sustainable long term highway connectivity to and within the local community, and between St David's Peninsula, Haverfordwest and the Trunk Road Network in the context of coastal erosion	The option would improve highway connectivity to shopping, healthcare and education/training facilities during storm events. Significant journey time savings of 381 seconds are forecast, improving connectivity with St David's Peninsula, Haverfordwest and within the local community.		
TPO2 - To conserve and enhance the natural beauty, wildlife and cultural heritage of the Pembrokeshire Coast National Park avoiding, or at least minimising, adverse effects on the natural environment caused by traffic and associated infrastructure	Potential slight to moderate adverse effect on the setting of a Scheduled Monument and a number of non-designated assets. The number of properties experiencing a decrease in noise would be around twice the number of properties experiencing an increases in noise, and most change in noise are potentially significant. An increase in NOx, PM10 and CO^2 emissions. A river crossing poses a risk of potential indirect impacts on Pembrokeshire Marine SAC. Significant loss of lowland marsh habitat and hedgerow and woodland areas. It is unlikely this loss of habitat can be fully compensated within the Scheme. Moderate adverse impacts on farmland, mature hedgerows/hedgebanks, woodland, individual trees, Brandy Brook & Valley.		
TPO3 - To improve the actual and perceived safety of the transport network in the study area for all users and residents	The option would improve highway safety by diverting through-traffic away from sections of the A487 in Newgale which are currently at risk from shingle bank debris and flooding. The option would significantly reduce conflict levels between pedestrians / cyclists and vehicular traffic within Newgale.		
TPO4 - To make the transport network suitable to facilitate tourism and regeneration in the St David's Peninsula including access to the coast at Newgale	Access to St. David's and Newgale would be maintained during storm events. Significantly improved journey times (381 seconds) are forecast in the Design Year (2037), reducing journey times to St David's Peninsula. Permanent closure of the coast road may reduce passing trade and would increase journey times for customers. However improved safety and amenity arising from a reduction in traffic is expected to have a positive impact. Improved access for HGVs along the A487 would support redevelopment of Cawdor Barracks which in turn would have a positive economic impact on Newgale.		
TPO5 - To support and facilitate the safe movement of vulnerable road users to their destination	Removal of vehicular traffic from the existing beach road would improve conditions for pedestrians / cyclists within Newgale.		
Other Factors			
Public acceptability: 66% strongly agreed or agreed this option should be taken forward for further assessment, 22% disagreed or strongly disagreed			
Acceptability to other stakeholders: No Stakeholder Consultation undertaken at this stage			
Technical and operational feasibility: Construction methods would include earthworks, 1 structure and 2 junctions. A change in direction of approximately 140 degrees for through traffic at the southern tie in would require a roundabout and give the appearance of an unnatural/disjointed route. Difficult for drivers to appreciate the layout of the roundabout when approaching uphill.			
Financial affordability and deliverability: Scheme Forecast Cost is £15.90m			

Land Use: Businesses in Newgale likely to experience a reduction in trade due to removal of through-traffic. Improved HGV access on the A487 would support redevelopment of Cawdor Barracks	
Agriculture: Loss of Best and Most Versatile Agricultural Land, severance of field access	
Risks: Affects flood plain, flood modelling required at future stages. Further surveys required to establish if protected species are present. Further survey may reveal further archaeological constraints. Ground investigations may identify ground conditions risks. Route constructed through area of mine-workings and contaminative industrial use, low risk of additional geotechnical or land treatment works and that some soils arising may not be suitable for re-use within the works.	
Total Score	**-3**

10.4 Option 7

Option Description: Option 7			
Appraisal Criteria	**Assessment**	**Distribution**	**Significance**
Welsh Impact Areas			
Economy			
Transport Economic Efficiency	Cost - £20.77 m Option 7 will contribute towards reducing travel times between St David's Peninsula and Haverfordwest; with a Design Year (2037) journey time saving of 429 seconds compared to the Do Minimum Scenario. Option 7 will also contribute towards a reduction in veh/km within the study area in the Design Year (2037) (i.e. distances travelled by each vehicle) Estimated BCR = 2.5 (High Value for Money)	All 'through traffic' to benefit from reduced journey times and distances.	Large Beneficial (+3)
EALI	N/A	N/A	Neutral (0)
Environment			
Noise	Increases and decreases in noise affect around 30% of 264 receptors. The number of increases and decrease in noise are similar, although there are more potentially significant decreases in noise than potentially significant increases in noise. Mitigation may be used to reduce the number of adverse impacts.	N/A	Slight Beneficial (+1)
Local Air Quality	Fewer vehicle kilometres travelled with this option in the Opening Year (2022) than with the Do Minimum as a result of decreases along the A487 through Newgale.	Fewer emissions in Newgale, increased emissions near new route option.	Neutral (0)
Greenhouse Gas Emissions	More vehicle kilometres travelled with this option results in a slight increase in emissions over the 60 year appraisal period than with the Do Minimum as a result of decreases along the A487 through Newgale.	Not Assessed	Slight adverse (-1)
Landscape and townscape	PMBRKVS072: Druidston – High Value Large adverse impacts on: fields and farmland between Penycwm and Pontpren; mature hedgerows/hedgebanks, woodland and individual trees. Moderate adverse impacts on: Brandy Brook & Valley (pending formal SSSI designation) and views in and out of area. Slight adverse impacts on: residential properties at Penycwm, Llethr and Lower Llethr to the northern section of the route; Pontpren at the southern section; 2 PRoWs across open fields. PMBRKVS031 Skyfog Aspect Area - High Value Minor adverse impacts on: fields and farmland and mature hedgerows/hedgebanks and individual trees. PMBRKVS112 St. Bawdy Airfield Aspect Area - Low Value Minor adverse impacts on: fields and farmland and mature hedgerows/hedgebanks and individual trees.	N/A	Moderate adverse (-2)
Bio-diversity	Significant loss of priority habitats (lowland marsh habitat) and associated biodiversity. Significant linear length of hedgerow potentially lost along with 8 woodland areas. It is very unlikely this loss of habitat can be compensated within the Scheme.	N/A	Very Large Adverse (-3)
Heritage	Scheduled Monument Bay View Farm Defended Enclosure of high importance [PE540/DAT2816/DAT3053].	Potential to impact on setting of Scheduled Monument – Moderate to Slight Adverse.	Moderate to Slight Adverse

	Grade II listed buildings in Penycwm [CADW 14405/DAT2814 and CADW 14406/DAT59288] of medium importance. 14 non-designated heritage assets of low importance.	Potential to impact on setting of Listed Buildings – Slight Adverse. Potential to impact on setting of non-designated heritage assets – Slight Adverse. Potential direct physical impact on any surviving below ground remains – Slight Adverse.	(-2)
Water environment	Potential for slight adverse impacts to water quality owing to risks associated with additional road runoff and pollution. Potential impacts on groundwater level and quality from cuttings, earthworks and piling. Works could indirectly affect surface water features and abstractions which are dependent upon groundwater inputs and may introduce new pollutant pathways to groundwater. Large adverse impacts in terms of flood risk without mitigation.	N/A	Moderate adverse (-2)
Soils	The former Southwood Colliery, the former RAF Brawdy, numerous former quarries and pits and operational farms are located in the study area.	N/A	Neutral (0)
Society			
Transport safety	Option 7 will improve highway safety for all road users along the A487; primarily by diverting through traffic away from Newgale	Positive Impact on all road users; particularly vulnerable road users at Newgale Seafront.	Moderate Beneficial (+2)
Personal security	N/A	N/A	Neutral (0)
Permeability	Removal of traffic and retaining safe access for NMUs would reduce severance along the coastal path/National Cycle Route No. 4. Option 7 runs along an existing bridleway (PP5 2/2) for approximately 460m along Erw Lon between Penycwm in the west and Lower Llethr in the east. The option also intersects a PRoW (PP5 37/1) in two places; approximately 135m to the east of Lower Llethr and 345m to the west of Dolgym and east of Heart Covert. As this route severs both a bridleway and a PRoW, an alternative route for pedestrians/horse riders/cyclists would need to be sought.	Negative impacts for NMU outside Newgale due to severance of both a PRoW and a bridleway. Positive impact for NMUs within Newgale and along the coast. Improved gradients and a more direct route improve access between Roch and Penycwn	Slight Adverse (-1)
Physical fitness	Option 7 runs along an existing bridleway (PP5 2/2) for approximately 460m along Erw Lon between Penycwm in the west and Lower Llethr in the east. The option also intersects a PRoW (PP5 37/1) in two places; approximately 135m to the east of Lower Llethr and 345m to the west of Dolgym and east of Heart Covert. As this route severs both a bridleway and a PRoW, an alternative route for pedestrians/horse riders/cyclists would need to be sought. However a reduction in traffic flows along the coast and in Newgale plus provision of a safe access for NMUs along the coast should improve the environment for walking and cycling.	Negative impacts on active modes of travel outside Newgale due to severance of both a PRoW and a bridleway. Positive impact for NMU within Newgale as the existing beach road becomes free of vehicular traffic, encouraging active modes of travel. Improved gradients lead to improvement in useability of road for cycling and walking. These negative and positive impacts outweigh each other, resulting in no change in active modes of travel	Neutral (0)
Social inclusion	Improvements in accessibility during storm events would have a positive impact in respect of social inclusion (+)	Negative impacts would result for car users on limited incomes and cyclists living in Newgale in terms of their	Slight Beneficial (+1)

	Journey times for the residents of St David's Peninsula when accessing facilities in Haverfordwest would be reduced compared to the do nothing scenario (++) Journey times for residents of Newgale when accessing facilities in Haverfordwest would be increased compared to the do nothing scenario (-) There would be a negative impact on public transport users, as the No.411 and No.400 buses would have to re-route their services along the new route but still go via Newgale resulting in longer journey times to for users when accessing services in St. David's and Haverfordwest (-)	accessibility to services in the area. Beneficial impacts would result for car users in St David's Peninsula when accessing services in Haverfordwest A negative impact would be made on public transport users as bus services would have to be re-routed.	
Equality, Diversity & Human Rights	Any impacts are not considered to be significant.	N/A	Neutral (0)

Transport Planning Objectives	
TPO1 - To improve sustainable long term highway connectivity to and within the local community, and between St David's Peninsula, Haverfordwest and the Trunk Road Network in the context of coastal erosion	Option 7 would maintain highway connectivity to shopping, healthcare and education/training facilities during storm events. Significant journey time savings of 429 seconds are forecast, improving connectivity with St David's Peninsula, Haverfordwest and within the local community.
TPO2 - To conserve and enhance the natural beauty, wildlife and cultural heritage of the Pembrokeshire Coast National Park avoiding, or at least minimising, adverse effects on the natural environment caused by traffic and associated infrastructure	Potential to slight to moderate adverse effect on the setting of a Scheduled Monument, 2 Grade II listed buildings and a number of non-designated assets. The number of properties experiencing increases and decreases in noise are similar, although there are more potentially significant decreases in noise than potentially significant increases in noise. Reduction in PM10 emissions but increase in CO^2 emissions over the 60 year appraisal period. Significant loss of lowland marsh habitat, a high number of hedgerow and woodland areas affected and impacts from 2 river crossings. It is unlikely this loss of habitat can be compensated within the Scheme. Moderate adverse impacts on farmland, mature hedgerows/hedgebanks, woodland, individual trees, Brandy Brook & Valley.
TPO3 - To improve the actual and perceived safety of the transport network in the study area for all users and residents	The option would improve highway safety by diverting through-traffic away from sections of the A487 in Newgale which are currently at risk from shingle bank debris and flooding. The option would significantly reduce conflict levels between pedestrians / cyclists and vehicular traffic within Newgale.
TPO4 - To make the transport network suitable to facilitate tourism and regeneration in the St David's Peninsula including access to the coast at Newgale	Access to St. David's and Newgale would be maintained during storm events. Journey times to St David's Peninsula on the A487 would reduce by approx. 429 seconds, in the Design Year (2037). Permanent closure of the coast road would reduce passing trade and increase journey times for customers. However improved safety and amenity arising from a reduction in traffic is expected to have a positive impact. Improved access for HGVs along the A487 would support redevelopment of Cawdor Barracks.
TPO5 - To support and facilitate the safe movement of vulnerable road users to their destination	Removal of vehicular traffic from the existing beach road would improve conditions for pedestrians / cyclists within Newgale.
Other Factors	
Public acceptability: 11% strongly agreed or agreed options 7 and 11 should be short-listed for further assessment, 68% disagreed or strongly disagreed that this option be taken forward.	
Acceptability to other stakeholders: No Stakeholder Consultation undertaken at this stage	

Technical and operational feasibility: Construction methods would include earthworks, 1 structure, 3 junctions and approx. 6 side roads and access upgrades. A number of departures from standards, especially on approaches to junctions at Penycwm. Difficult for drivers to appreciate roundabout layout when approaching uphill. A 10% gradient could lead to delay and driver frustration. Southern tie in would require a roundabout, or a larger radius curve	
Financial affordability and deliverability: Scheme Forecast Cost is £20.77m	
Land Use: Businesses in Newgale likely to experience a reduction in trade due to removal of through-traffic. Improved HGV access on the A487 would support redevelopment of Cawdor Barracks	
Agriculture: Loss of Best and Most Versatile Agricultural Land, severance of field access	
Risks: Affects the flood plain, flood modelling required at future stages. Further surveys required to establish if protected species are present. Further survey may reveal further archaeological constraints. Ground investigations may identify ground conditions risks. Route constructed through area of mine-workings and contaminative industrial use which may require additional grouting of mine workings or land treatment works. Any contaminated soils arising may not be suitable for re-use within the works.	
Total Score	**-4**

10.5 Option 11

Option Description: Option 11			
Appraisal Criteria	**Assessment**	**Distribution**	**Significance**
Welsh Impact Areas			
Economy			
Transport Economic Efficiency	Cost - £28.51 m Option 11 will contribute towards reducing travel times between St David's Peninsula and Haverfordwest; with a Design Year (2037) journey time saving of 358 seconds compared to the Do Minimum Scenario. Veh/km within the study area (i.e distances travelled by each vehicle) would be increased in the Opening Year (2022) but remain unchanged (compared to the Design Year (2037) Do Minimum) with Option 11 in place. Estimated BCR = 1.5 (Medium Value for Money)	All 'through traffic' to benefit from reduced journey times.	Moderate Beneficial (+2)
EALI	N/A	N/A	Neutral (0)
Environment			
Noise	Increases and decreases in noise affect around 60% of 264 receptors. There are more decreases in noise than increases in noise. All increases in noise and most decreases in noise are potentially significant, with similar numbers of each by the design year. The provision of noise mitigation is likely to be difficult for this option.	N/A	Neutral (0)
Local Air Quality	More vehicle kilometres travelled with this option in the Opening Year (2022) than with the Do Minimum as a result of traffic travelling along the new route outweighing any decrease through Newgale.	Fewer emissions in Newgale, increased emissions near new route option.	Moderate adverse (-2)
Greenhouse Gas Emissions	More vehicle kilometres travelled with this option over the 60 year appraisal period results in a moderate increase in emissions than with the Do Minimum and other options as a result of traffic travelling along the new route outweighing any decrease through Newgale.	Not Assessed	Moderate adverse (-2)
Landscape and townscape	PMBRKVS031 Skyfog Aspect Area - High Value: Large adverse impacts on: mature hedgerows/hedgebanks, trees and woodland blocks. Moderate adverse impacts on: residential properties at Penycwm, Rhydygele, Upper and Lower Eweston, Roch Bridge and Roch located along the existing road, including Penuel Baptist Church in addition to scattered properties and farmsteads along the route. Slight adverse impacts on: 3 PRoW across open fields; Fields and farmland adjacent to the road; Brandy Brook & Valley (pending formal SSSI designation); and views in and out of area. PMBRKVS112 St. Bawdy Airfield Aspect Area - Low Value: Moderate adverse impacts on: mature hedgerows/hedgebanks, trees and woodland blocks. Slight adverse impacts on: residential properties at Penycwm and Rhydygele located along the existing road; 1 PRoW at Penycwm indirectly affected; National Cycle Route 4; fields and farmland adjacent to the road; and views in and out of area.	N/A	Slight adverse (-1)

Bio-diversity	Minimal impacts on the nearby lowland marsh habitat but significant length of linear hedgerows affected. Unless hedgerows are translocated it is highly unlikely that this loss of habitat can be compensated within this Scheme	N/A	Large Adverse (-3)
Heritage	Scheduled Monument Bay View Farm Defended Enclosure of high importance [PE540/DAT2816/DAT3053] and Brawdy Promontory Fort Scheduled Monuments [PE422] of High importance. 16 non-designated heritage assets of low importance (settings impact). 7 non-designated heritage assets of low importance (physical impact).	Potential to impact on setting of Scheduled Monument – Moderate to Slight Adverse. Potential to impact on setting of non-designated heritage assets – Slight Adverse. Potential direct physical impact on any surviving below ground remains – Moderate to Slight Adverse. Potential direct physical impact on 7 non-designated heritage assets which could lead to demolition/partial destruction – Moderate Adverse.	Moderate to Slight Adverse (-2)
Water environment	Potential for slight adverse impacts to water quality owing to risks associated with additional road runoff and pollution. Potential impacts on groundwater level and quality from cuttings, earthworks and piling. Works could indirectly affect surface water features and abstractions which are dependent upon groundwater inputs and may introduce new pollutant pathways to groundwater. Large adverse impacts in terms of flood risk without mitigation.	N/A	Moderate adverse (-2)
Soils	The former Southwood Colliery, the former RAF Brawdy, sewage works, numerous former quarries/pits and operational farms are located in the study area.	N/A	Neutral (0)
Society			
Transport safety	Option 7 will improve highway safety for all road users along the A487; primarily by diverting through traffic away from Newgale	Positive Impact on all road users; particularly vulnerable road users at Newgale Seafront.	Moderate Beneficial (+2)
Personal security	N/A	N/A	Neutral (0)
Permeability	No PRoW or bridleways would be severed as a result of this option. The removal of vehicular traffic along the existing beach road along with measures to retain safe access along the coast at Newgale for NMUs, may increase the use here by NMU, improving walking and cycling conditions. Therefore having a positive impact on residents and visitors in the area.	Positive impacts for all as a result of improvements to NMU routes, particularly for residents and visitors without access to a car.	Moderate Beneficial (+2)
Physical fitness	No pedestrian, cycle or horseback routes are severed as a result of this option. A reduction in traffic flows along the coast and in Newgale plus provision of a safe access for NMUs along the coast should encourage more active modes of travel along the coast and in Newgale.	Positive impacts for all as a result of an increase in active modes of travel along the beach front in Newgale.	Moderate Beneficial (+2)

Social inclusion	Improvements in accessibility during storm events would have a positive impact in respect of social inclusion. Option 11 would result in significantly longer journey times to access services in Haverfordwest for the residents of Newgale and St David's Peninsula. There would be a negative impact on public transport users, as the No.411 and No.400 buses would have to re-route their services along the new route but still go to Newgale.	Negative impacts would result for car users on limited incomes and cyclists living in Newgale and St David's Peninsula in terms of journey times to services in Haverfordwest. A significant negative impact would be made on public transport users as the bus services would have to be significantly re-routed.	Moderate Adverse (-2)
Equality, Diversity & Human Rights	Any impacts are not considered to be significant.		Neutral (0)
Transport Planning Objectives			
TPO1 - To improve sustainable long term highway connectivity to and within the local community, and between St David's Peninsula, Haverfordwest and the Trunk Road Network in the context of coastal erosion	Option 11 would ensure highway connectivity to shopping, healthcare and education/training facilities during storm events. A significant reduction of 358 seconds in journey time is forecast, improving journey times to services and facilities in Haverfordwest and St. David's as well as between local communities.		
TPO2 - To conserve and enhance the natural beauty, wildlife and cultural heritage of the Pembrokeshire Coast National Park avoiding, or at least minimising, adverse effects on the natural environment caused by traffic and associated infrastructure	Potential for slight to moderate adverse effects on the setting of 2 Scheduled Monuments and a number of non-designated assets and physical impacts on several non-designated heritage assets. The number of properties experiencing decreases in noise is greater than those experiencing an increase. All increases in noise and most decreases in noise are potentially significant, with similar numbers of each by the design year. The provision of noise mitigation is likely to be difficult. An increase in NOx, PM10 and CO^2 emissions. Significant impacts are largely restricted to loss of linear hedgerows. Slight adverse impacts on: mature hedgerows/hedgebanks, trees and woodland.		
TPO3 - To improve the actual and perceived safety of the transport network in the study area for all users and residents	The option would improve highway safety by diverting through-traffic away from sections of the A487 in Newgale which are currently at risk from shingle bank debris and flooding. The option would significantly reduce conflict levels between pedestrians / cyclists and vehicular traffic within Newgale.		
TPO4 - To make the transport network suitable to facilitate tourism and regeneration in the St David's Peninsula including access to the coast at Newgale	Access maintained to St. David's and Newgale along the A487 during storm events. Change in journey time of 358 seconds is forecast on the A487, improving journey times to Newgale and St. David's Peninsula in the Design Year (2037). Permanent closure of the coast road would reduce passing trade and increase in journey times for customers. However improved safety and amenity arising from a reduction in traffic is expected to have a positive impact. Improved access for HGVs along the A487 would support redevelopment of Cawdor Barracks.		
TPO5 - To support and facilitate the safe movement of vulnerable road users to their destination	Removal of vehicular traffic from the existing beach road would improve conditions for pedestrians / cyclists within Newgale.		
Other Factors			

Public acceptability: 11% strongly agreed or agreed options 7 and 11 should be short-listed for further assessment, 68% disagreed or strongly disagreed, that this option be taken forward.	
Acceptability to other stakeholders: No Stakeholder Consultation undertaken at this stage	
Technical and operational feasibility: Construction methods would include earthworks, 1 structure, 5 junctions and numerous side roads and access upgrades. Cuttings and embankments generally limited however a new bridge approximately 12m high will require significant earthworks at each end. Horizontal alignment likely to require significant deviations from the existing roads to meet standards. A gradient of 9% on a single carriageway with no overtaking sections or climbing lanes could lead to delay and driver frustration.	
Financial affordability and deliverability: Scheme Forecast Cost is £28.51m	
Land Use: Businesses in Newgale likely to experience a reduction in trade due to removal of through-traffic. Improved HGV access on the A487 would support redevelopment of Cawdor Barracks.	
Agriculture: Loss of Best and Most Versatile Agricultural Land, severance of field access	
Risks: Affects the flood plain, flood modelling required at future stages. Further surveys required to establish if protected species are present. Further survey may reveal further archaeological constraints. Ground investigations may identify ground conditions risks. Route constructed through area of prior contaminative industrial use which may require additional geotechnical or land treatment works. Potential impact on services to Cawdor Barracks Army Base which do not show up on Statutory Undertaker searches.	
Total Score	**-6**

10.6 Appraisal Summary Table Comparison for Options

The table below provides a direct comparison between the options showing their relative performance against the Welsh Impact Areas.

Appraisal Criteria	Option 3b	Option J	Option 7	Option 11
Transport Economic Efficiency	Moderate Beneficial (+2)	Large Beneficial (+3)	Large Beneficial (+3)	Moderate Beneficial (+2)
Noise	Neutral (0)	Slight Beneficial (+1)	Slight Beneficial (+1)	Neutral (0)
Local Air Quality	Neutral (0)	Slight adverse (-1)	Neutral (0)	Moderate adverse (-2)
Greenhouse Gas Emissions	Slight beneficial (+1)	Slight adverse (-1)	Slight adverse (-1)	Moderate adverse (-2)
Landscape and townscape	Moderate adverse (-2)	Moderate adverse (-2)	Moderate adverse (-2)	Slight adverse (-1)
Bio-diversity	Slight Adverse (-1)	Very Large Adverse (-3)	Very Large Adverse (-3)	Large Adverse (-3)
Heritage	Slight Adverse (-1)	Moderate to Slight Adverse (-2)	Moderate to Slight Adverse (-2)	Moderate to Slight Adverse (-2)
Water environment	Moderate adverse (-2)	Moderate adverse (-2)	Moderate adverse (-2)	Moderate adverse (-2)
Soils	Neutral (0)	Neutral (0)	Neutral (0)	Neutral (0)
Transport safety	Slight Beneficial (+1)	Moderate Beneficial (+2)	Moderate Beneficial (+2)	Moderate Beneficial (+2)
Permeability	Slight Beneficial (+1)	Neutral (0)	Slight adverse (-1)	Moderate Beneficial (+2)
Physical fitness	Neutral (0)	Slight Beneficial (+1)	Neutral (0)	Moderate Beneficial (+2)
Social inclusion	Slight beneficial (+1)	Slight Beneficial (+1)	Slight Beneficial (+1)	Moderate Adverse (-2)
Total Score	**0**	**-3**	**-4**	**-6**

Note: The following Impact Areas have been excluded because they do not provide a differentiation between the options: EALI; Personal Security; Equality, Diversity & Human Rights

10.7 Relationship between TPOs and Options for Appraisal

In accordance with WelTAG guidance, each option was appraised against the Transport Planning Objectives established for the WelTAG Planning Stage.

The table below provides a test of the degree to which each of the options meet the five TPOs for the scheme. The table shows that all the options would meet TPOs 1, 3, 4 and 5 to varying degrees but none of the options as currently defined this stage would meet TPO 2.

Transport Planning Objectives (TPOs)	Options for Appraisal			
	Option 3b	Option J	Option 7	Option 11
TPO1	✓✓✓	✓✓✓	✓✓✓	✓✓✓
TPO2	xx	xxx	xxx	xxx
TPO3	✓	✓✓	✓✓	✓✓
TPO4	✓	✓	✓	✓
TPO5	✓	✓✓	✓✓	✓✓

KEY	
✓✓✓	Major benefit
✓✓	Moderate benefit
✓	Minor benefit
0	Neutral
x	Minor disbenefit
xx	Moderate disbenefit
xxx	Major disbenefit

Each option would contribute to achieving the majority of the objectives. The rationale for the TPO scores for each of the options in the table above can be summarised as follows:

TPO1: All options would improve highway connectivity to shopping, healthcare and education/training facilities during storm events and would not be affected by coastal change over the lifetime of the scheme. All options would also bring journey time savings improving connectivity with St David's Peninsula, Haverfordwest

TPO2: At this stage the achievement of TP02 is negative for all of the options because of the adverse impacts to the natural beauty of the landscape, to wildlife and to cultural heritage.

TPO3: All options would improve highway safety by providing a new route to mitigate against existing shingle bank debris and flooding constraints. Options J, 7 and 11 would significantly reduce conflict levels between pedestrians / cyclists and vehicular traffic within Newgale.

TPO4: All options would maintain access to St. David's and Newgale during storm events and are forecast to significantly improve journey times to St David's Peninsula. Option 3b would not contribute so effectively to regeneration as it does no improve access along the A487 for HGV vehicles to the same extent that the other options. However Option 3b would maintain passing trade for businesses in Newgale.

TP05: – Unlike Option 3b, Options J, 7 and 11 would remove vehicular traffic from the existing beach road thereby improving conditions for pedestrians / cyclists within Newgale.

10.8 Comparison of Option for Appraisal against Key Considerations

For comparative purposes, the table below provides a direct comparison of the options in terms of costs, summarises public feedback and key engineering considerations.

Criteria	Option 3b	Option J	Option 7	Option 11
Technical and operational feasibility	Requires a major structure to carry the road above the Brandy Brook flood plain. Horizontal curvature at the tie-ins is substantially below desirable minimum for a 70kph design speed and route would not bypass the steep Newgale Hill.	A change in direction of approximately 140 degrees for through traffic at the southern tie in would require a roundabout and give the appearance of an unnatural/disjointed route. Difficult for drivers to appreciate the layout of the roundabout when approaching uphill.	Approximately 6 side roads and access upgrades. A number of departures from standards would be requested, especially on approaches to junctions at Penycwm. A long 10% gradient with no overtaking sections could lead to driver frustration.	Numerous side roads and access upgrades required. A significant structure required to cross the Brandy Brook. Significant realignment of existing roads is likely to be necessary to meet standards.
Scheme Forecast Cost	£21.55m	£15.90m	£20.77m	£28.51m
Public feedback	62% strongly agreed or agreed this option should be taken forward for further assessment, 28% disagreed or strongly disagreed.	66% strongly agreed or agreed this option should be taken forward for further assessment, 22% disagreed or strongly disagreed.	11% strongly agreed or agreed options 7 and 11 should be short-listed for further assessment, 68% disagreed or strongly disagreed that these options be taken forward. Only 19 out of 138 respondents felt Option 7 should be considered.	11% strongly agreed or agreed options 7 and 11 should be short-listed for further assessment, 68% disagreed or strongly disagreed that these options be taken forward. Only 4 out of 138 respondents felt Option 7 should be considered.

11 Wellbeing of Future Generations (Wales) Act 2015

11.1 Introduction

The Wellbeing of Future Generations (Wales) Act 2015 intends to improve the social, economic, environmental and cultural well-being of Wales by ensuring consideration of the long-term, working better with people and communities and taking a more joined up approach. The Act sets out 7 goals for Wales:

- A prosperous Wales;
- A resilient Wales;
- A healthier Wales;
- A more equal Wales;
- A Wales of cohesive communities;
- A Wales of vibrant culture and thriving Welsh Language; and
- A globally responsible Wales

The current 2008 WelTAG guidance does not require appraisals to take the Act into consideration. However, at the time of writing, consultation to update WelTAG 2008 guidance is on-going. The intention is to update the guidance to reflect current best practice and incorporate the principles of the Act, including the seven well-being goals. This section of the report provides a commentary which demonstrates how each of the options contributes to the 7 goals of the Act.

11.1.1 A Prosperous Wales

The assessment of greenhouse gas emissions found that only Option 3b would result in a decrease in CO2 emissions compared with the existing route, supporting a low carbon economy. Whereas for Options 7, J and 11 in 2037, significant increases in CO2 emissions compared with the do minimum scenario are forecast.

The social inclusion assessment demonstrates that all four options would ensure uninterrupted access to education, training and lifelong learning by remaining open during storm events. While none of the four options would lead to the loss of access to these facilities, Options J, 7 and particularly 11 would increase journey times for residents of Newgale compared to the 'do minimum scenario'. This is neutralised by a forecast reduction in journey time for residents of St David's Peninsula.

In terms of effects on employment opportunities, all options would result in the loss of commercial properties due to landtake or coastal change. Relocating these businesses would maintain employment opportunities. Option 3b would improve access for businesses in Newgale, whereas each of the other three options would lead to a decrease in through-traffic which could affect trade. Long term, Options J, 7 and 11 would support redevelopment in the area. All options would result in the loss of no more than 12ha of agricultural land and no farm buildings would be demolished. Severance of fields would be increased by Options J, 7 and 11.

11.1.2 A Resilient Wales

This goal relates to maintaining and enhancing the natural environment with healthy, functioning ecosystems. The assessment of the four options concludes that overall each would have adverse effects on biodiversity. While Option 11 would have a large adverse effect and 7 and J would have very large adverse effects, Option 3b would result in only a slight adverse effect.

Each of the four options have been assessed for their impacts on water quality and flood risk. All options would result in moderate adverse impacts on water quality during and after construction.

Without mitigation each option would have large adverse impacts in terms of flood risk affecting property during and after construction due to the creation of impermeable surfaces and construction in proximity to Brandy Brook.

11.1.3 A Healthier Wales

Physical and mental well-being are affected by a range of environmental and social factors. Each option is assessed in terms of its noise, air quality, landscape and biodiversity impacts as well as physical fitness, transport safety and social inclusion. The assessment of each option has identified a mix of beneficial and adverse impacts. All options would have adverse impacts on biodiversity and landscape as well as beneficial impacts on transport safety compared with the 'do nothing scenario'. Additionally, Option 3b would have benefits to social inclusion as well as no effects on air quality, noise and physical fitness. Option J would have benefits to noise, physical fitness and social inclusion but adverse impacts on air quality. Option 7 would have a beneficial impact on noise and social inclusion and neutral effects on air quality and physical fitness. Finally, Option 11 would have a beneficial impact on physical fitness, a neutral impact on noise and adverse impacts on air quality. Overall each of the four options would support and detract from people's mental and physical well-being.

11.1.4 A More Equal Wales

The WelTAG Stage 1 assessment of social inclusion considers access to healthcare, education, and shopping and leisure facilities. As the four options would remain open during storm events unlike the existing alignment, improved access to such facilities compared with the do nothing scenario would occur. However, the extent of the improvement varies between the options as Option 11 would increase journey times for motorists and public transport users.

11.1.5 A Wales of Cohesive Communities

A series of factors are relevant to creating the attractive, viable, safe and well-connected communities that this goal seeks to achieve. Relevant environmental factors assessed include air quality, landscape, water and land contamination, while the social factors of permeability, physical fitness, social inclusion, and transport safety bear significance. For all options a mix of beneficial and adverse effects are determined. These effects vary in significance between the options.

11.1.6 A Wales of Vibrant Culture and Thriving Welsh Language

The assessment of the surrounding historic environment concluded that none of the options would directly impact on any designated heritage assets. The results of the social inclusion assessment show that while none of the four options would result in a loss of access to education facilities which offer Welsh Language courses, Options J, 7 and 11 would result in longer journey times for residents of Newgale when accessing these facilities. This is balanced by a forecast reduction in journey times for residents of St David's peninsula when accessing the same facilities.

11.1.7 A Globally Responsible Wales

Of the environmental and social factors assessed only greenhouse gas emissions is considered to contribute to global well-being. Option 3b is assessed to result in reduced levels of CO2 emissions in 2022 and 2037 compared with the 'do minimum' scenario. Meanwhile Options 7, J and particularly 11 would lead to significant increases in CO2 emissions by 2037.

12 Conclusion and Recommendations

12.1 Conclusions

12.1.1 Transport Planning Objectives

In accordance with TPO1 all options would improve highway connectivity to shopping, healthcare and education/training facilities during storm events and would not be affected by coastal change over the lifetime of the scheme. All options would also bring journey time savings improving connectivity with St David's Peninsula, Haverfordwest. Taking account of the sensitivity of the National Park, all the options would involve agreed departures from highway standards which would partially constrain connectivity.

At this stage, it is not possible to say that any of the options conserve or enhance the natural beauty the natural beauty, wildlife and cultural heritage of the National Park (TPO2). All options would improve highway safety (TPO3) by providing a new route to mitigate against existing shingle bank debris and flooding constraints. Options J, 7 and 11 would significantly reduce the conflict between NMUs and vehicular traffic within Newgale. For Option 3b complementary improvements to the sustainable transport infrastructure within Newgale would be required to minimise such conflicts.

With respect to TPO 4, Options J, 7 and 11 would significantly reduce journey times to St David's Peninsula thereby supporting tourism and regeneration. Whilst these options would potentially reduce passing trade which would have a negative economic impact on Newgale, improved safety and amenity arising from a reduction in traffic could have a positive economic impact. Option 3b would reduce journey times to St. David's Peninsula to a lesser degree but businesses in Newgale would still enjoy trade from through-traffic. Options J, 7 and 11, unlike Option 3b, would improve access for HGVs along the A487 which would support redevelopment of Cawdor Barracks.

Options J, 7 and 11 would remove vehicular traffic from the existing beach road which would improve conditions for pedestrians / cyclists within Newgale thus supporting the safe movement of vulnerable users in accordance with TPO5.

12.1.2 Welsh Impact Areas

The four options have been subject to a WelTAG appraisal following the guidance for a Stage 1 assessment. The options have been appraised against all the Welsh Impact Areas specified in WelTAG. From the Appraisal Summary Tables, the following net scores can be attributed to the options (by summing the numbers in the significance columns) and ranked as follows:

1. Option 3b Total Score = 0
2. Option J Total Score = -3
3. Option 7 Total Score = -4
4. Option 11 Total Score = -6

Options J and 7 are relatively similar in terms of their length and alignment therefore the close scores is to be expected.

12.1.3 Costs, Engineering Feasibility and Public Feedback

The total scheme costs of the options have been estimated (at 2016 prices), and the ranking of the options from lowest to highest cost is given below:

1. Option J Total Scheme Cost = £15.90m
2. Option 7 Total Scheme Cost = £20.77m
3. Option 3b Total Scheme Cost = £21.55m
4. Option 11 Total Scheme Cost = £28.51m

Option 11 is the most expensive by a sizeable margin whilst Options 7 and 3b are noticeably more expensive than Option J.

All of the options present technical and operational challenges to overcome however options 7 and 11 are shown to have more challenges than Options 3b and J.

Through public consultation, the level of support for more detailed assessment of Options 3b and J has been shown to be greater than pursuing Options 7 and 11.

12.1.4 Overall Conclusions and Recommendations

From an engineering perspective the requirement for several side road and access upgrades and the likely requirement for a number of departures from standard count against Options 7 and 11. Importantly it is apparent from public feedback that there is generally more support for taking forward for further assessment Options 3b and J than for Options 7 and 11.

Taking into account the Welsh Impact Areas Assessment, the TPO analysis and the total scheme costs the following conclusions can be drawn:

- Option 11 should be discounted due to poor performance, high cost and lack of support from the public;
- Option 3b should be subject to more detailed design consideration and assessment; and
- Options J performs better and has a lower scheme cost than Option 7 so should be taken forward for more detailed design consideration and assessment

WelTAG guidance acknowledges that at Stage 1 “Not all the environmental or wider economic impacts may have been fully explored, and costs and aspects of delivery will have contingencies and risk factors applied.” It continues “The period between Stage 1 and Stage 2 can be used for the further development of a proposal to address uncertainties.”

Tasks for next stage

This Stage 1 study has assessed the feasibility of four route corridors and has taken account of standard mitigation measures which could reasonably be anticipated at this stage. In addition, as far as is reasonably practicable at this stage, several iterations of the routes have taken place to design out issues either following an appreciation of the constraints and/or responding to feedback received from various stakeholders.

There is now the opportunity, through more detailed design, assessment, survey and by incorporating stakeholder and public feedback, to further develop and appraise Options 3b and J. The purpose of this work would be to, where possible, improvements to the scoring of the options against the Welsh Impact Areas and TPOs and ultimately recommend a preferred option. This further study could involve some, or all, of the following:

- Consider adjustments to the existing alignment options, perhaps incorporating elements of Option 7 into Option J;
- More detailed feasibility work to inform the engineering design e.g. Ground Investigations, junction arrangements and mitigations to reduce light pollution;
- Explore varying levels of aesthetic quality for each of the options;
- Produce a more mature engineering design to provide more accurate costings and enable the preparation of representative photomontages of the scheme;
- Carry out walkover ecological surveys along the proposed route corridors;
- Carry our archaeological walkover surveys;
- Identification of potential environmental mitigation and enhancement measures;
- Re-assess the merits of the options taking account of themes emerging from the Adaption Masterplan.

Appendices