VALE OF GLAMORGAN
(A4226 FIVE MILE LANE HIGHWAY IMPROVEMENTS)
COMPULSORY PURCHASE ORDER 2016

AND THE

VALE OF GLAMORGAN
A4226 (FIVE MILE LANE) CLASSIFIED ROAD
SIDE ROADS ORDER 2016

PUBLIC INQUIRY JANUARY 2017

STATEMENT OF EVIDENCE
HIGHWAY ENGINEERING

MR JAMES ROBERT EVANS
(WSP|PARSONS BRINCKERHOFF)

NATIONAL ASSEMBLY FOR WALES
REFERENCE: 3155453/3155473

VALE OF GLAMORGAN COUNCIL REFERENCE: PMU/5ML

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1 INTRODUCTION

1.1 QUALIFICATIONS AND EXPERIENCE

1.1.1 My name is James Evans. I am a Chartered Engineer and a member of the Chartered Institute of Highways and Transportation. I have a Bachelor of Science Honours degree in Civil Engineering from Loughborough University of Technology and have 29 years of experience. I am a Regional Associate within the Highways Business Unit of WSP | Parsons Brinckerhoff and am based at its Cardiff Office.

1.1.2 I have worked on all stages of highway projects from feasibility through to construction.

1.2 DECLARATION

1.2.1 I confirm that my duty to the inspector and the Welsh Ministers as an Expert Witness overrides any duty to those instructing or paying me, that I have understood this duty and complied with it in giving my evidence impartially and objectively and that I will continue to comply with that duty as required.

1.2.2 I confirm that I am not instructed under any conditional arrangement.

1.2.3 I confirm that I have no conflicts of interest.

1.3 NATURE OF EVIDENCE

1.3.1 My evidence covers highway engineering and preliminary design matters, junction design and highway drainage strategy in connection with the A4226 (Five Mile) Lane classified road.

1.3.2 The scheme proposals are published by means of the Vale of Glamorgan (A4226 Five Mile Lane Highway Improvements) Compulsory Purchase Order 2016 and the Vale of Glamorgan A4226 (Five Mile Lane) Classified Road Side Roads Order 2016. An Environmental Statement, which was published in 2016 in support of the planning application, details the environmental aspects of the scheme. The Side Roads Order (SRO) plans show the line of the proposed road and the changes proposed in relation to the improvement of the existing highway, stopping up of existing highway, construction of new highways, stopping up of private means of access and the provision of new means of access where appropriate. The Compulsory Purchase Order (CPO) plans show the land needed to build the proposed road.

1.4 INVOLVEMENT WITH THE SCHEME

1.4.1 Parsons Brinckerhoff was commissioned by Welsh Government in August 2013 to undertake a study into improving access between Culverhouse Cross and the St Athan and Cardiff Airport Enterprise Zone. This commission focused on proposals to improve the A4226 Five Mile Lane classified road.

1.4.2 The preliminary highway design has been developed by Parsons Brinckerhoff and WSP | Parsons Brinckerhoff up to the submission of the planning application in April 2016 and development of the CPO and SRO plans and schedules published in July 2016. I have been the WSP | Parsons Brinckerhoff project manager for the Scheme since January 2015.

1.5 STRUCTURE OF EVIDENCE

1.5.1 Section 2 of this evidence outlines the design process and development of the scheme submitted for planning permission. Section 3 describes the design standards adopted. Section 4 provides a description of the scheme. A summary and conclusions are presented in Section 5.

1.5.2 References to documents and appendices are references to the deposit and library documents and the appendices which are set out and numbered in the Vale of Glamorgan Council's Statement of Case in this matter unless otherwise stated.

2 DESIGN PROCESS AND SCHEME DEVELOPMENT

2.1 STAGES IN THE DESIGN PROCESS

2.1.1 There are there principal stages in the highway design process.

- Stage 1 – Option testing, public consultation and route selection.
- Stage 2 – Development of the selected route through planning application and Orders; and
- Stage 3 – Detailed design for construction

2.1.2 Stage 1 included a WelTAG Stage One Assessment of the proposed route corridor undertaken by Arup in March 2012. Stage 2 involved the development of the design along the identified route corridor culminating in the granting of conditional planning permission in December 2016 and the publishing of the proposed CPO and SRO in July 2016. Stage 3, detailed design would follow in the event of a satisfactory outcome of this Inquiry.

2.2 BACKGROUND TO THE PROPOSED IMPROVEMENT

2.2.1 In July 2013 Edwina Hart AM, the Minister for Business, Enterprise, Technology & Science announced funding for the A4226 Five Mile Road Improvement Scheme. The proposals stem from the strategic plans of both the Welsh Government and the Council. The Scheme will provide strategic and direct access to the St Athan and Cardiff Airport Enterprise Zone, supporting job creation and employment and will improve road infrastructure, safety and provision of a new cycle route.

2.2.2 The existing A4226 Five Mile Lane is a single carriageway road, in a rural location, varying in width between 6.0 and 7.3m. The route is classified and maintained as an 'A' road by the Vale of Glamorgan; however it currently fails to meet appropriate highway standards for a 60mph road. The Five Mile Lane section of the A4226 has acquired a reputation for having a poor accident record in recent years. In order to address the safety issues on the road, the Vale of Glamorgan CBC has introduced a series of measures, including a 40mph speed limit, static speed camera, resurfacing, improved signage, lighting and solar powered LED cats' eyes. However the road still presents some safety issues as drivers have to negotiate a number of sharp bends, has poor forward visibility, and it is narrow in some locations.

2.2.3 The Scheme aims to improve the highway standard of the A4226, in order to reduce accidents whilst improving access and journey time reliability to the Cardiff Airport and St Athan Enterprise Zones.

2.2.4 The WelTAG Stage One (March 2012), identified highway improvements to A4226 (Five Mile Lane) as the most appropriate option to improve the resilience of the local network and provide a realistic alternative to the A4050 Port Road.

2.2.5 This assessment concluded that two packages be considered further:

- Package 1: a combination of the "Orange" and "Purple" routes with improvements at Sycamore Cross junction.
- Package 2: improvements to the Sycamore Cross and Waycock Cross junctions, together with proposals to improve visibility at key points along Five Mile lane.

2.2.6 Further assessment of package 2, providing an on line improvement of the existing highway, was undertaken but it became apparent that extensive works would be needed to achieve even reduced highway standards. Factors for not adopting a completely on on-line widening solution were:

- Extensive widening works would be needed to achieve even reduced highways standards. This could reintroduce safety problems as traffic growth increases;
- The Speed limit would likely need to remain at 40mph;
- Without significant online widening, drainage and visibility work, the online option would not provide as much network resilience as an off-line solution;
- It was considered to have greater impact on business at Amelia Trust Farm and residents at Whitton Lodge, Grovelands Farm, Grovelands House, Sutton Fach Farm;
- Environmental impacts, particularly due to loss of existing hedgerow habitat;
- Cost Benefits would not be as high as an offline solution, particularly due to the considerable disruption during construction;
- Comparable in cost to an offline scheme;
- It would only provide a short to medium term solution.

2.2.7 As a consequence of the above findings, a combination of the WelTAG package 2, “Orange” and “Purple” route was developed. This involves both off-line and on-line improvement works.

3 DESIGN STANDARDS

3.1 GENERAL

3.1.1 The scheme design has been developed using the Design Manual for Roads and Bridges (DMRB). These standards are published by the Welsh Government for motorways and trunk roads, but are also used by local Highway Authorities for Roads design. In terms of geometrical layout (horizontal and vertical alignment), particular reference has been made to the following:

- TD9/93 Highway Link Design (DMRB 6.1.1),
- TD27/05 Cross Sections and Headroom (DMRB 6.1.2).
- TD 50/04 The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts (DMRB 6.2.3)
- TD42/95 Geometric Design of Major / Minor Priority Junctions (DMRB 6.2.6)

3.1.2 The highway design has been developed to ensure that the health and safety of those that are to use, construct, maintain or repair the road are properly considered during the design process. The scheme design has also been the subject of a road safety audit which has informed the design of the Link Road. The comments raised by the auditor have been addressed in the Designer response and will be taken into account during further development of the design.

3.2 GEOMETRIC DESIGN

3.2.1 The new highway improvement (off line section) has been designed for a derestricted speed limit (i.e. 60mph speed limit (100A kph design speed)) to be maintained from Sycamore Cross to the Welsh Hawking Centre. This section of carriageway will be provided to rural all-purpose single carriageway standard (S2) as defined in TD27/05 (DMRB 6.1.2).

3.2.2 Between the Welsh Hawking Centre and Waycock Cross roundabout the road is designed at its current speed limit of 40 mph (70A kph design speed) due to the presence of a number of existing private accesses. This section reflects the urban all-purpose single carriageway standard (SU2) type as defined in TD27/05 (DMRB 6.1.2).

3.2.3 No departures from standard are required for the new section of highway.

3.3 JUNCTION DESIGN

3.3.1 The types of junction to be adopted were determined from a junction strategy report (Parsons Brinckerhoff, July 2014), which recommended the use of major / minor ghost island priority junctions. The ghost island layout provides a central turning lane refuge for a right turning vehicle while maintaining the flow of traffic through the junction. The proposals provide a consistent approach to junction layout over the new section of road. The new junctions have been designed in accordance with TD42/95.

3.4 SIDE ROADS

3.4.1 The side roads connecting to the existing highway have also been designed to the Design Manual for Roads and Bridges standard with a 60B kph design speed.

4 DESCRIPTION OF THE SCHEME

4.1 GENERAL DESCRIPTION OF THE SCHEME

4.1.1 The proposed alignment of the highway improvements along Five Mile Lane is shown in Figure 1.2 of the Environmental Statement. The highway improvements will be 4,850m in length from just north of the Amelia Methodist Trust Farm in the north to Waycock Cross roundabout in the south with most of the improvements being offline.

4.1.2 A 300m length, located just north of the Welsh Hawking Centre, will be on existing road and on-line improvements are to be undertaken on the existing road between the Welsh Hawking Centre and Waycock Cross roundabout.

4.1.3 The Scheme will provide a new rural all-purpose single carriageway 7.3m wide with 1m wide hard strips, making the total carriageway 9.3 metres wide. The on-line improvement for the carriageway section approaching Waycock Cross junction, will be 7.3m wide with no hardstrips. A new 2.5m cycleway / footpath will be located on west side of the on-line road widening. A reduced carriageway cross section has been provided to minimise the impact in the woodland SSSI.

4.1.4 Three new junctions will be constructed along the route including two T-junctions and one staggered junction. All junctions will have ghost islands and will be DMRB compliant. The junction layout enables through traffic to continue along the route without being hindered by right turn traffic at the junctions. The southbound approach to Waycock Cross junction will be widened to two lanes, being approximately 60m in length.

4.1.5 A new bridge structure east of Sutton Fach Farm will maintain landowner access to fields and will accommodate a new bridleway across the new road. Other structures include 2 culverts extensions and 2 mammal underpass pipes.

4.1.6 The new offline section of the scheme will be constructed on a mix of embankment and cutting along its length. Embankments have been provided in areas of recorded and anticipated archaeology to mitigate the impact by retaining the heritage *in situ*.

4.1.7 The existing road will remain open after the Scheme is completed, to provide local access to residents and various farms along its length. Access between the new and existing road will be from the proposed junctions.

4.2 SYCAMORE CROSS JUNCTION

4.2.1 Improvements will be made to the existing traffic signal A48 Sycamore Cross / Five Mile Lane Junction to provide capacity improvements at the junction. The proposed Sycamore Cross Junction improvements are shown on Figure 1.3 of the Environmental Statement.

4.2.2 The works will consist of a widening of the westbound carriageway of the A48 to provide an additional through lane on the approach to the junction. This will require widening to the south of the junction and alteration to the existing street furniture and road markings, and will enable two lanes of traffic to travel westbound through the junction.

4.2.3 For eastbound traffic on the A48 from Bonvilston heading east towards Culverhouse Cross, the proposals introduce a bus lane serving the existing bus stop. The proposals will provide a dedicated straight ahead lane and a dedicated right turn lane to the A4226. The existing verge will be utilised to provide the additional width.

4.2.4 Additional turning lanes will also be introduced on the north and south approaches to the junction.

4.3 ACCOMMODATION WORKS

4.3.1 The Scheme will also include construction of an integral single span steel composite accommodation bridge carrying a farm access road over the proposed route (refer to Figure 3.3 of the Environmental Statement). It will be located immediately north east of Sutton Fach Farm, spanning the proposed road to provide the farm with access to local fields. The bridge will consist of twin steel girders braced together and made composite with a concrete deck slab. The bridge deck will comprise a 3.5m carriageway with a 0.5m verge on either side. Minimum headroom beneath the structure of 6.45m will be provided. In order to minimise the size of the approaches and abutments, the structure has been curved to facilitate additional headroom beneath. The structure will be open to provide the maximum line of sight for drivers using the proposed route, as well as increasing the aesthetic appeal of the structure.

4.3.2 Access to existing land and fields is to be provided from the existing road or the side roads. Where it is necessary to stop up a private means of access an alternative access point is to be provided.

4.4 IMPROVEMENTS FOR NON MOTORISED USERS

4.4.1 The existing cycle provision in the study area is poor, with no cycle route / path along Five Mile Lane, although the local area beyond has a more developed network of cycle routes that link the area to the wider communities, such as Barry and Cardiff.

4.4.2 At the northern end of the Scheme, between Chainage (Ch) 0m to Ch300m, the verge on the west side of the new road will be surfaced to provide an unsegregated footway / cycleway link between the existing Five Mile Lane road and a proposed cycleway route which will utilise the existing roadside verge between the Sycamore Cross junction and the new cycleway (refer to Figure 3.1 of the Environmental Statement).

4.4.3 At the southern end of the Scheme, a new length of unsegregated footway / cycleway will be provided running adjacent to the west side of the on-line road widening, between Ch3545m and Ch4800m, to link the existing Five Mile Lane to the Waycock Cross roundabout.

4.4.4 The intention is to utilise the existing road for cycle access as traffic flows will be significantly reduced.

4.4.5 A new bridleway that can be used by equestrians and pedestrians will provide a link across the new road by joining the lane at Ch2180m to the new accommodation overbridge at Ch2920m and to the existing road at Ch3100m.

4.5 STREET LIGHTING

4.5.1 New street lighting is only proposed on the approach to Waycock Cross roundabout. Revision to the existing lighting at the Sycamore Cross Junction will be required.

4.6 HIGHWAY DRAINAGE

4.6.1 The Scheme will be drained by road edge filter drains and the use of Sustainable Drainage Systems (SUDS) will provide benefits by limiting flow rates, providing storage and allowing some infiltration as well as filtration and bacteriological water quality benefits. The highway drainage will initially outfall into surface flow wetlands to remove contaminants, before entering balancing ponds which will attenuate the water to green field run off rates prior to entering an existing watercourse.

4.6.2 The Surface flow wetlands will be provided in accordance with HA 103/06 - Vegetative Treatment Systems for Highway Runoff (DMRB 4.2.1) and are expected to provide good removal of suspended solids and oil and grease. They will also incorporate a means of isolation for emergency control of spillages.

4.6.3 The balancing ponds will attenuate the rate of flow into watercourses to pre-developed greenfield rates and ensure no flood risk up to and including the 1 in 100 year event, and allowing for the potential effects of climate change.

4.6.4 The highway drainage works will require four areas for treatment and attenuation ponds on land adjacent to the new alignment (see ES Appendix 15.6).

4.6.5 The first treatment and attenuation pond is located approximately 50m south of the start of the Scheme (Ch50m) and will receive highway drainage from the first 600 metres of the new highway falling in a northerly direction. The pond is located to the east of the new road alignment and will outfall into a watercourse leading to the River Waycock.

4.6.6 Heading south the next treatment and attenuation pond is located at Ch1100m to the west of the new road alignment in the vicinity of the existing Ffynon Whitton-Mawr pond. The pond will receive highway drainage from the new highway up to 500m north and 400m south of this location and following treatment and attenuation will outfall into Ford Brook.

4.6.7 Further south another treatment and attenuation pond is located at Ch1900m to the west of the new road alignment. The pond will receive highway drainage from the new highway falling from the north and following treatment and attenuation will discharge via a culvert under the existing Five Mile Lane to the Moulton Brook.

4.6.8 The fourth treatment and attenuation pond is located at Ch3500m to the west of the new road alignment. The pond will receive highway drainage from the new highway falling from the north and following treatment and attenuation will outfall into the River Waycock. An existing watercourse to the east of the new road alignment will require diversion for approximately 300 metres and an existing culvert located beneath the existing road will be extended under the new road.

4.6.9 An existing drainage ditch located to the east of the existing Five Mile Lane route between Ch3700m and Ch4000m will be enlarged for attenuation storage. Existing drainage ditches on both sides of the existing road between Ch4000m and Ch4900m at Waycock Cross junction will require realignment.

4.7 TRAFFIC SIGNS AND ROAD MARKINGS

4.7.1 Traffic signs and road markings along the improvement route will accord with the Traffic Signs Regulations and General Directions 2016 and the Traffic Signs Manuals to ensure clear directional and regulatory guidance to all road users. The detail design of the road markings and traffic signs will be the subject of a Stage 2 (completion of detail design) and Stage 3 (completion of construction) Roads Safety Audit to ensure that Safety is not compromised.

4.8 TRANSPORT ASSESSMENT

4.8.1 A Transport Assessment produced by Parsons Brinckerhoff on behalf of the Vale of Glamorgan County Borough Council (Appendix 13.1 of the Environmental Statement dated March 2016) examines the highway and transportation impacts of improvements to Five Mile Lane.

4.8.2 Traffic modelling indicates that in 2017, the existing A4226 Five Mile Lane will experience around 8,700 vehicles Annual Average Daily Traffic (AADT) flow with around 3.7% being HGV's. With the proposed improvements in place (Do something), at road opening the traffic modelling indicates that the improved road will experience around 16,000 vehicles AADT with 3.4% HGV's while in the design year 2031 the proposed road is predicted to have around 19,500 vehicles AADT travelling along it with 2% of these being HGV's.

4.8.3 The Transport Assessment report concluded that the Five Mile Lane Improvement, along with other junction improvements, will provide an alternative route that gives network resilience and journey time reliability, which are highly desirable in order to unlock development potential at the Enterprise Zones and proposed future expansion of Cardiff Airport.

4.9 STATUTORY UNDERTAKERS

4.9.1 Localised diversions or protection to water mains, electricity cables, telecommunications cables and gas mains will be required to facilitate the Sycamore Cross improvement works.

4.9.2 Along the route corridor water mains and telecommunication cables follow the existing highway route, so will be largely unaffected by the proposals. However, localised diversion or protection will be required at the junction tie-in locations. Electricity cables, water and gas mains cross the proposed route and will require localised protection or diversion works.

4.9.3 Localised diversions or protection to water mains, electricity cables and telecommunications cables will be required for the on line improvement works north of Waycock Cross roundabout.

4.9.4 New Roads Street Works Act C3 stage notices were issued to the Statutory Undertakers in July 2013 for initial consultation purposes. As a consequence of responses, the vertical alignment was reviewed to maintain cover over the existing gas main. A further C4 notice will be issued through the detail design process. Further consultation and liaison to determine detailed diversion and specification requirements will be undertaken through detail design and construction. Diversion works will be planned though consultation with the Statutory Undertakers to minimise any potential for interruption of supplies.

4.10 TRAFFIC NOISE

4.10.1 Traffic noise calculations have been used to assess the impacts of the scheme and inform the Environmental Impact Assessment. These findings have been included in the Environmental Statement.

4.10.2 In accordance with the Noise Insulation Regulations 1975, amended 1988, the Highway Authority must publish a map or list of every building eligible for noise insulation within six months of the opening of the road to traffic.

4.10.3 To be entitled to noise insulation treatment at eligible buildings (i.e. dwellings and other buildings used for residential purposes within 300m from the nearest point on the new or altered highway). The following three conditions should be met:

- The combined expected maximum noise traffic level, i.e. the relevant noise level from the new or altered highway together with any other traffic in the vicinity must not be less than 68 dB(A) L10 (18 hour);

- The relevant noise level is at least 1.0 dB(A) more than the prevailing noise level, i.e. the total noise level has increased by 1.0dB(A);

- The contribution to the increase in the relevant noise level from the new or altered highway must be at least 1.0 dB(A).

4.10.4 The noise should be assessed at a reception point located 1 metre in front of the most exposed façade part of an external window or door of an eligible room. Traffic flows used in the calculations should be the maximum expected in a period of 15 years after opening to traffic. The predictions will be normally undertaken using the Annual Average Weekday Traffic (AAWT).

4.10.5 The Environmental Statement advised that no further mitigation is required other than the provision of low noise road surfacing. However the Highway Authority will undertake further noise calculations through the detail design process and should it be necessary, may consider the use of providing localised noise barriers to reduce noise levels, prior to publishing the noise map.

4.11 ENVIRONMENTAL IMPACT ASSESSMENT

4.11.1 The Environmental Statement (ES) submitted with the planning application in March 2016, provided information in respect of the environmental impacts of the proposed improvement scheme.

4.11.2 The Environmental Impact Assessment determines the current condition and assesses the change to this baseline during construction in the short term, and operation in the longer term. In the following paragraphs I summarise the findings described in the Non-Technical summary:

4.11.3 **Air Quality:** Current air quality in the vicinity of the Scheme is generally good, although some exceedances of the air quality objective for nitrogen dioxide have been observed at the roadside of routes with high volumes of traffic.

4.11.4 There are no Air Quality Management Areas in the vicinity of the Scheme. A Site of Special Scientific Interest (SSSI) lies adjacent to the Scheme, which is split into areas geographically. There is also a Local Nature Reserve to the south of the Scheme. Current nitrogen oxide concentrations at the roadside within the SSSI exceed the air quality objective for the protection of vegetation.

4.11.5 A qualitative assessment of the potential for dust emissions from construction activities was undertaken, and the significance of likely impacts was determined for both human and ecological receptors. The area around the Scheme is not heavily populated and, as such, there is limited potential for dust nuisance or risk to human health as a result of construction activities.

4.11.6 However, largely due to the proximity of ecological receptors to the Scheme, there is potential for adverse effects to habitats during the construction phase. A number of standard mitigation measures will be implemented to ensure that good construction practices are followed including the preparation of a Dust Management Plan for the site.

4.11.7 Changes in pollutant concentration at human and ecological receptors during operation of the Scheme relate largely to the redirection of traffic to the improved route introduced by the Scheme and the spatial realignment of this route. It was calculated that pollutant concentrations will increase at human receptors and woodland habitat along the A48 and Five Mile Lane and decrease along the A4050 and Port Road, to the east and south of the Scheme. No exceedances of air quality objectives at human receptors have been predicted.

4.11.8 Overall the impact of the Scheme is negligible on human health.

4.11.9 **Cultural Heritage:** There are twelve undesignated heritage assets within 250m of the Scheme and five Scheduled Monuments within 1km of the Scheme. The Scheme is also located within a Historic Landscape.

4.11.10 Due to topography and intervening woodland, the five Scheduled Monuments will not be significantly impacted by the Scheme. However, the Scheme may have adverse impacts upon four known below-ground heritage assets, which include remains associated with the Whitton Lodge Roman villa, a ring ditch and part of an extensive Iron Age/Romano-British settlement. There is therefore potential for hitherto unknown buried archaeology to be present within areas of new land take, as indicated by significant evidence for prehistoric and Romano-British activity in the immediate vicinity of the Scheme.

4.11.11 A programme of fieldwork will be undertaken as part of the Scheme's construction to inform a mitigation strategy for a final stage of more detailed archaeological investigation of significant remains.

4.11.12 This mitigation strategy will reduce the adverse effect upon the four below-ground heritage assets to neutral.

4.11.13 It is considered that the Scheme will have a slight to moderate adverse impact upon the setting of three Scheduled Monuments, and a moderate adverse impact on the setting of a Historic Landscape during construction.

4.11.14 Effects from the new road on the setting of the same assets during the operational phase are expected to be the same but permanent. Mitigation of impacts to cultural heritage will be provided through design and screening.

4.11.15 **Landscape:** The Scheme is located to the east of Nant Landcarfan Special Landscape Area (SLA) and to the west of the Dyffrin Basin & Ridge Slopes SLA. The Barry Woodlands SSSI is located adjacent to the Scheme. There are also a number of Sites of Importance for Nature Conservation (SINC) in the surrounding area and one National Trust property is located about 1.7km east of the Scheme.

4.11.16 The land surrounding the Scheme is used as a mixture of arable and pastoral land. There is dense development in Barry to the south east and dispersed houses and individual farms along the route of the Scheme. The area is interspersed with semi natural mixed and broadleaved woodland and smaller intermittent blocks of broadleaved plantation.

4.11.17 The Scheme would introduce some minor to moderate adverse effects to the landscape of the area, especially along the proposed highway embankments and at the proposed junctions, although these will generally reduce over time.

4.11.18 The scale of these impacts is reduced due to the presence of the existing Five Mile Lane, which provides infrastructure through the landscape setting, and forms an important component of the historic context of the landscape. In addition, the landform and existing vegetation limit the visual context of the Scheme, thus reducing the overall impact on the landscape character of the area. The proposed hedgerow and woodland planting will help integrate the Scheme into the local landscape.

4.11.19 The Scheme would result in a range of visual impacts, determined by distance, aspect, elevation and intervening topography and vegetation. However, given the local topography, existing woodland cover and the existing Five Mile Lane, the change in views would be limited to the junctions and embankments.

4.11.20 With mitigation planting in place there would be very limited impact on the visual amenity of the area.

4.11.21 **Nature Conservation:** The assessment was informed through a suite of desk and field based surveys to inform the baseline conditions of the survey area including:

- An Extended Phase 1 Habitat Survey;
- An amphibian survey (including great crested newts);

- Aquatic invertebrate surveys;
- Bat activity surveys;
- Bat roost inspections / tree climbing inspections;
- A dormouse nest tube survey; and
- A water vole survey.

4.11.22 Ecological receptors were identified and assigned a geographic value in consideration of their abundance and location. The potential effects on these receptors during construction and operation of the Scheme and their significance were identified.

4.11.23 Where adverse effects were identified, appropriate mitigation has been prescribed in accordance with the best available guidance and research, where applicable. This has minimised adverse impacts on valued ecological receptors. A limited number of significant adverse effects are predicted to remain. Several beneficial effects have also been predicted.

4.11.24 The most significant impact of the Scheme will be on two of the 14 woodlands, which together comprise the Barry Woodlands SSSI. The Scheme would result in the permanent loss of a 0.264 hectare (ha) strip of vegetation within the 'Middleton Plantation' woodland and another 0.167ha within the Barry College Wood, equating to a total loss of 0.431ha. The operation of the Scheme would also result in air quality impacts to areas of these woodlands that are adjacent to the Scheme.

4.11.25 The Scheme would also result in slight adverse effects on a number of Sites of Importance for Nature Conservation (SINCs) and semi-natural woodlands, scrub, grasslands, hedges and watercourses. These impacts include the loss of 0.12ha of scrub within SINC 222 'Land North-east of Whitton Rosser Farm' and the loss of 0.016ha of broad-leaved woodland within 'SINC 220 Land South of Blackland Farm'.

4.11.26 Slight adverse effects are also expected for a range of other species and habitats, most of which are likely to be of low significance, due to the low populations of species present and the little semi-natural habitat present in the predominantly agricultural area.

4.11.27 Some woodlands in the area (Pencoetre and Cwm Talwyg Woods) are expected to experience beneficial effects during operation of the Scheme. This is due to the improvements in air quality that will be achieved from a decrease in congestion along surrounding roads once the Scheme is constructed.

4.11.28 The loss of 0.431ha of the Barry Woodlands SSSI will be partially mitigated by planting 2.8ha of broad-leaved woodland at Waycock Bridge. This planting will be supplemented with other plantings adjacent to Sutton Wood and Sutton Fach Wood, providing a total additional woodland area of 5ha. It is acknowledged that this will not replace the quality of the SSSI woodland lost in the short term, but longer term it should prove to be of value.

4.11.29 Generally the Scheme's adverse impacts are expected to be balanced with time by the slight beneficial effects delivered through habitat creation and air quality improvements.

4.11.30 Post-construction monitoring will be required to ensure that mitigation measures are effective.

4.11.31 **Geology and Soils:** An assessment was made of the potential impacts on geology, geomorphology and soils arising from the construction and operation of the Scheme. This assessment included consideration of ground instability and potential land contamination issues.

4.11.32 There are no geological SSSIs or Regionally Important Geological Sites located within the study corridor. The Scheme is not located within a groundwater Source Protection Zone. Previous ground investigations have not identified any contamination or the presence of Made ground. The Scheme is in a 'safeguarding minerals area', and agricultural soils are classified as Grade 3 (good to moderate quality) to 4 (poor quality). The Scheme is underlain by aquifers capable of supporting water supplies at a local scale and others of low permeability. There are also two primary watercourses traversing the existing road.

4.11.33 The sensitivity of resources and receptors is considered to range from low to high. However following the implementation of a sufficient design to take into account mitigation measures, there are no significant residual impacts predicted on geology, soils or hydrogeology.

4.11.34 **Materials:** The construction of the Scheme requires a large amount of raw materials and would generate some waste. The consumption of material resources and the generation of waste would give rise to environmental impacts that would need to be managed and mitigated.

4.11.35 The bulk of the material requirements are for the earthworks. About 81,570m3 of fill material is needed to build the Scheme with about 50,330m3 of fill material to be imported from quarry sources and 31,240m3 to be site won from the excavation of cuttings and re-used within the Scheme.

4.11.36 Other materials such as pre-cast concrete culverts and steel plate girders will be used for the Scheme.

4.11.37 Temporary minor impacts are anticipated from the transportation of these materials to site and the associated effects of noise and air pollution on sensitive receptors.

4.11.38 About 62,480m3 material would be produced by the Scheme from the excavation of cuttings. It is expected that half of this material (31,240m3) would be unsuitable for reuse by the Scheme and will go for recycling or disposal offsite. Where possible this material will be used for landscaping on the Scheme.

4.11.39 The remaining half of this material (31,240m3) will be used as fill on Scheme as described earlier. Other waste that will go for recycling or disposal offsite will include putrescible and non-putrescible waste, green waste (that is unable to be reused in onsite landscaping) and residual / unused construction products.

4.11.40 Overall, it is considered that the effects of the Scheme in relation to materials and waste will be no more than minor adverse.

4.11.41 **Noise:** A noise and vibration assessment was undertaken to determine the likely impacts arising from the construction and operation of the Scheme.

4.11.42 A baseline noise survey was conducted between 9th and 10th July 2014 to establish the existing noise environment surrounding the Scheme.

4.11.43 The residual noise and vibration effects from construction of the Scheme are not considered to be significant. A Construction Environmental Management Plan (CEMP) will be developed and implemented that will help to ensure that construction effects are minimised.

4.11.44 A computer noise model was prepared to determine the likely noise effects arising from the operation of the Scheme. Eight properties will experience a significant adverse effect during the day-time in the long-term, however the majority of properties assessed will not experience a significant effect.

4.11.45 The scheme design incorporates a low noise road surface on part of the scheme. On the basis of the studies carried out for the purpose of the Environmental Statement, further mitigation measures are not considered to be required during the operation of the scheme. However, as I have indicated in paragraph 4.10.5 above, the Highway Authority will undertake further noise calculations through the detail design process and should it be necessary, may consider the use of providing localised noise barriers to reduce noise levels. Nevertheless the acknowledged likely adverse noise effects on a small number of properties are not considered to be of a scale or seriousness to warrant material alteration to the design of the scheme, or to call into question its overall desirability as a whole.

4.11.46 **Effects on all Travellers:** During construction, motorised travellers are expected to experience an increase in Driver Stress from existing delays, which will be exacerbated by construction traffic. Whilst this impact will be mitigated through construction management and the implementation of a Construction Traffic Management Plan, it is expected that there will still be a temporary negative impact.

4.11.47 Once operational, the Scheme will deliver improvements for motorised travellers and pedestrians, cyclists and equestrians. Motorised travellers are expected to benefit from reduced congestion and delays, and improved safety along the route. Pedestrians, cyclists and equestrians are expected to benefit through the provision of safer segregated cycle paths / footpaths and bridleways, and also from access to the existing Five Mile Lane alignment. These improvements are expected to encourage pedestrians, cyclists and equestrians to travel between neighbouring rural communities.

4.11.48 **Community and Private Assets:** The Scheme will permanently require about 27.3ha of agricultural land, of which about 3.5ha is considered to be Grade 3a (good quality) land. This will result in a slight adverse effect on agricultural land. This land loss is considered unavoidable given the benefits of the Scheme. The Scheme will also require about 0.6ha of land from private properties, including a small area of parking belonging to the Welsh Hawking Centre, part of an access track leading to Barry College of Further Education and part of a field belonging to Northcliffe Cottage. This will result in a slight to moderate adverse effect on private property. No changes are expected on community land or development land.

4.11.49 **Road Drainage and the Water Environment:** An assessment of the potential impacts associated with construction and operation of the Scheme was undertaken in relation to the water environment.

4.11.50 The assessment identified the potential hydrological effects that the Scheme may have on the surrounding area and assessed the potential implications of any such hydrological effects for the Scheme. Mitigation measures have been proposed, where necessary, to minimise the scale of the impacts identified.

4.11.51 Through the provision of a Sustainable Drainage Systems, the risk of pollution to groundwater and surface water has been assessed to be, for the most part, negligible during operation of the Scheme.

4.11.52 Mitigation measures implemented during the Scheme's construction will ensure that the risk of pollution to surface water and groundwater is largely negligible.

4.11.53 However, a residual risk remains, especially where construction occurs directly above watercourses or in excavations near the groundwater table. These risks are temporary however and therefore do not pose a long term risk to water quality.

4.11.54 The impact of the Scheme on flood risk on users of the road and third party people and property is negligible, and therefore not significant.

4.11.55 **Cumulative Effects:** The following developments (currently within the planning phase) were considered for cumulative effects with the Scheme:

- A residential development of 120 dwellings located about 160m to the west of the Scheme;
- A 6MW Photo Voltaic (PV) solar farm located about 120m east of the Scheme;
- A 8MW PV solar farm located about 300m west of the Scheme;
- A 7MW PV solar farm located about 50m east of the Scheme; and
- An APV solar farm of unknown capacity, but covering an area of 14 ha, located 400m south-west of the Scheme.

4.11.56 During construction, the Scheme will have a cumulative substantial adverse effect on residents of a small number of dwellings (<10) near the Scheme, and a negligible effect on residents of communities neighbouring the Scheme. The Scheme will also have a cumulative minor adverse effect on the experience of travellers, a moderate adverse effect on the riverine environment, and a large adverse effect on some woodland habitats during construction of the Scheme.

4.11.57 During operation, the Scheme will have a neutral cumulative effect on riverine environments, a minor adverse to moderate adverse effect on the residents of nearby dwellings, and a large adverse effect on the directly affected woodland habitats (but mitigation is proposed through the provision of a substantially larger area of replacement woodland). It will also have a minor beneficial cumulative effect on the residents of communities neighbouring the Scheme, and a major beneficial effect on the experience of travellers.

5 CONCLUSIONS

5.1.1 The existing A4226 Five Mile Lane route is substandard and inadequate by modern design standards, and has given rise to significant highway safety concerns.

5.1.2 The proposed road geometry has been designed to current DMRB standards. The proposals will provide a single 7.3 metre wide carriageway between Sycamore Cross junction and Waycock Cross roundabout, by utilising the existing highway, providing a new section of road and improving a section of the existing road.

5.1.3 An online widening option would not provide the benefits that the proposed route will deliver.

5.1.4 The route alignment has been developed with the aim of minimising impacts on the environment, and as far as possible local landowners.

5.1.5 Surface water run-off from the new road will be the subject of Sustainable Drainage systems to clean and attenuate the water in wetland and pond areas before entering the existing watercourses at green field run off rates.

5.1.6 The existing road is to be maintained, providing a low traffic route that can be utilised by local traffic and for cycling and walking.