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## APPENDICES

# 6 Biodiversity

## 6.1 Introduction

6.1.1 This chapter presents the Preliminary Environmental Information (PEI) in relation to the biodiversity assessment, and is informed by Appendix 6.1 – Habitats Regulations Assessment (HRA) Screening Report.

6.1.2 In addition, there are also potential secondary/indirect effects on biodiversity arising from other disciplines. Please also refer to the following chapters to understand potential impact pathways:

- Chapter 5: Air Quality
- Chapter 7: Climate
- Chapter 10: Landscape and Visual Effects
- Chapter 12: Noise and Vibration
- Chapter 14: Road Drainage and the Water Environment.

6.1.3 The methodology follows the requirements of *Design Manual for Roads and Bridges (DMRB) LA 108 Biodiversity* (Highways England, 2020a)[1].

6.1.4 Stakeholder consultation is a key part of the assessment process. Key stakeholders for biodiversity, including Natural England, the Environment Agency and the various Local Authorities (LA) have been consulted throughout the project development process. During the current preliminary design and environmental assessment phase, two biodiversity focussed Technical Working Groups (TWG) have been established involving these organisations (covering the Habitats Regulations Assessment (HRA), and the Ecological Impact Assessment (EcIA)), through which baseline evidence, the emerging design, assessment methodology and initial assessment findings have been shared, discussed and feedback received. Other stakeholders have also been engaged through the project Focus Groups and via the scoping opinion process.

6.1.5 In addition to the TWG, Focus Groups and scoping opinion, a number of stakeholders have been consulted to gather baseline data and inform the assessment.

6.1.6 Stakeholder engagement is ongoing and will continue to the DCO application submission.

## 6.2 Legislative and Policy Framework

### Legislation

6.2.1 The following key legislation is relevant to this assessment:

- The Conservation of Habitats and Species (CHS) Regulations 2017 (as amended by the EU Exit Regulations 2019) (the 'Habitat Regulations 2017')
- *Ramsar Convention on Wetlands* (United Nations Educational, Scientific Cultural Organisation, 1971)
- *The Birds Directive* (Council Directive 2009/147/EC on the conservation of wild birds)
- Wildlife and Countryside Act (WCA) 1981 (as amended)
- *Natural Environment and Rural Communities (NERC) Act 2006* particularly the section 41 list of habitats and species of Principal Importance for Conservation (referred to as Priority Habitats or Species in this report)

[1] Highways England (2020a) Design Manual for Roads and Bridges LA 108 Biodiversity, available at: https://www.standardsforhighways.co.uk/prod/attachments/af0517ba-14d2-4a52-aa6d-1b21ba05b465?inline=true [accessed 1 September 2021]

- The Countryside and Rights of Way Act 2000
- The Hedgerow Regulations 1997
- Protection of Badgers Act 1992
- The Invasive Alien Species (Enforcement and Permitting) Order 2019.

## National planning statement for national networks

6.2.2 The primary policy basis for deciding whether or not to grant a Development Consent Order (DCO) is the *National Policy Statement for National Networks (NPSNN)* (Department for Transport, 2014)[2], which sets out policies to guide how DCO applications will be decided and how the effects of national networks infrastructure should be considered by the relevant decision maker. The policies for biodiversity and ecological conservation include statements that:

*"Biodiversity is the variety of life in all its forms and encompasses all species of plants and animals and the complex ecosystems of which they are a part. Government policy for the natural environment is set out in the Natural Environment White Paper (NEWP). The NEWP sets out a vision of moving progressively from net biodiversity loss to net gain, by supporting healthy, well-functioning ecosystems and establishing more coherent ecological networks that are more resilient to current and future pressures…"* (*NPSNN* paragraph 5.20)

6.2.3 The *NPSNN* also advises:

*"In taking decisions, the Secretary of State should ensure that appropriate weight is attached to designated sites of international, national and local importance, protected species, habitats and other species of principal importance for the conservation of biodiversity, and to biodiversity and geological interests within the wider environment."* (*NPSNN* paragraph 5.26)

6.2.4 Table 6-1: Relevant NPSNN policies for the biodiversity assessment methodology identifies the *NPSNN* policies relevant to the biodiversity assessment methodology.

Table 6-1: Relevant NPSNN policies for the biodiversity assessment methodology

| Relevant NPSNN paragraph reference | Requirement of the NPSNN (paraphrase) |
|---|---|
| 4.22 | Under the Habitats Regulations, consideration will be given to European sites or on any site to which the same protection is applied as a matter of policy, either alone or in combination with other plans or projects. |
| 5.22 | Outline any likely significant effects on internationally, nationally and locally designated sites of ecological or geological conservation importance on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity and that the statement considers the full range of potential impacts on ecosystems. |
| 5.23 | Demonstrate how the project has taken advantage of opportunities to conserve and enhance biodiversity conservation interests. |
| 5.29 | Ensure proposals mitigate the harmful aspects of the development and, where possible, to ensure the conservation and enhancement of the site's biodiversity are acceptable. |

[2] Department for Transport (2014) National Policy Statement for National Networks, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf [accessed 6 September 2021]

| Relevant NPSNN paragraph reference | Requirement of the NPSNN (paraphrase) |
|---|---|
| 5.31 | Sites of regional and local biodiversity (which include Local Nature Reserves and Local Wildlife Sites and Nature Improvement Areas) have a fundamental role to play in meeting overall national biodiversity targets. Give due consideration to such regional or local designations. |
| 5.32 | Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Permission should not be granted which would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need for and benefits of the development, in that location, clearly outweigh the loss. Aged or veteran trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided. Where such trees would be affected by development proposals, the applicant should set out proposals for their conservation or, where their loss is unavoidable, the reasons for this. |
| 5.33 | Development proposals potentially provide many opportunities for building in beneficial biodiversity features. Opportunities to maximise beneficial biodiversity features should be considered. Planning obligations can be used where appropriate in order to ensure that such beneficial features are delivered. |
| 5.34 and 5.35 | Individual wildlife species receive statutory protection under a range of legislative provisions. Other species and habitats have been identified as being of principal importance for the conservation of biodiversity in England and Wales. Undertake measures to ensure these species and habitats are protected from adverse effects. Where appropriate, requirements or planning obligations may be used in order to deliver this protection. |
| 5.36 | Include appropriate mitigation measures as an integral part of their proposed development, including identifying where and how these will be secured |
| 5.37 | Consider what appropriate requirements should be attached to any consent and/or in any planning obligations entered into in order to ensure that mitigation measures are delivered. |
| 5.38 | Take account of what mitigation measures may have been agreed between the applicant and Natural England and/or the MMO, and whether Natural England and/or or the MMO has granted or refused, or intends to grant or refuse, any relevant licences, including protected species mitigation licences. |

## National planning policy framework (NPPF)

6.2.5 The *NPPF* (Ministry of Housing, Communities & Local Government, 2021)[3] originally published in March 2012 and most recently updated in July 2021, sets out the government's planning policies for England and provides a framework within which locally prepared plans can be produced. The *NPPF* is *"an important and relevant matter to be considered in decision making for NSIP".*

[3] Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf [accessed 1 September 2021]

## Local planning policy

6.2.6 The following local planning policies are relevant to the assessment:

- Eden Local Plan (2014-2032) (Eden District Council, 2014)[4] Policy ENV1 and Policy ENV4
- County Durham Plan (Adopted 2020) (Durham County Council, 2020)[5] Policy 26, Policy 40, Policy 41, Policy 42 and Policy 43
- Richmondshire Local Plan (2012-2028) adopted 2014 (Richmondshire District Council, 2014)[6] Core Policy CP12
- *Cumbria BAP* (Cumbria Biodiversity Partnership, 2001)[7]
- *Durham County Council BAP* (2012/13) now listed on North East England Nature Partnership (North East England Nature Partnership, 2013)[8]
- *Richmondshire District Councils BAP* (Richmond County Council, 2014)[9]

## Standards and guidance

6.2.7 In addition to compliance with the *NPSNN* and *NPPF*, this assessment has been compiled in accordance with professional standards and guidance. The standards and guidance which relate to the assessment are:

- *The UK Biodiversity Action Plan (UK BAP)* (Her Majesty's Stationary Office, 1994)[10]
- *Guidance for Ecological Impact Assessment in the United Kingdom* Third Edition (Chartered Institute of Ecology and Environmental Management, 2018)[11]
- *Design Manual for Roads and Bridges (DMRB) LA 101 Introduction to Environmental Assessment (DMRB LA 101)*, Revision 1 July 2019 (Highways England, 2019a)[12]

[4] Eden District Council (2014) Eden Local Plan 2014 to 2032, available at: https://www.eden.gov.uk/media/5032/edenlocalplan2014-2032finalwithoutforeword.pdf [accessed 1 September 2021]
[5] Durham Council (2020) County Durham Plan – Adopted 2020, available at: https://www.durham.gov.uk/media/34069/County-Durham-Plan-adopted-2020-/pdf/CountyDurhamPlanAdopted2020vDec2020.pdf?m=637424969331400000 [accessed 1 September 2021]
[6] Richmond County Council (2014) Richmondshire Local Plan 2012 - 2028 Core Strategy (Adopted 9 December 2014), available at: https://www.richmondshire.gov.uk/media/9616/core-strategy-2012-28.pdf [accessed 1 September 2021]
[7] Cumbria Biodiversity Partnership (2001) The Cumbria Biodiversity Action Plan, available at: https://www.cumbria.gov.uk/planning-environment/conservation/biodiversity/bio_bap.asp [accessed 1 September 2021]
[8] North East England Nature Partnership (2013) Biodiversity Priorities, available at: https://neenp.org.uk/natural-environment/biodiversity-priorities/ [accessed 1 September 2021]
[9] Richmond County Council (2014) Richmondshire Biodiversity Action Plan, available at: https://www.richmondshire.gov.uk/media/5114/richmondshire-biodiversity-action-plan.pdf [accessed 1 September 2021]
[10] Her Majesty's Stationary Office (1994) Biodiversity: The UK Action Plan, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/272038/2428.pdf [accessed 1 September 2021]
[11] Chartered Institute of Ecology and Environmental Management (2018) Guidance for Ecological Impact Assessment in the United Kingdom Third Edition
[12] Highways England (2019a) Design Manual for Roads and Bridges LA 101 Introduction to environmental assessment, available at: https://www.standardsforhighways.co.uk/prod/attachments/54b0eb69-fd65-4fa5-a86b-7313f70b3649?inline=true [accessed 1 September 2021]

- *DMRB LA 104 Environmental Assessment and Monitoring (DMRB LA 104)*, Revision 1, Aug 2020 (Highways England, 2019b)[13]
- *DMRB LA 108 Biodiversity (DMRB LA 108)*, Revision 1, March 2020
- *DMRB LA 115 Habitat Regulation Assessment (DMRB LA 115)*, Revision 1, January 2020 (Highways England, 2020b)[14]
- *DMRB LD 118 Biodiversity Design (DMRB LD 118),* Revision 1, March 2020 (Highways England, 2020c)[15]
- *DMRB LD 119 Roadside environmental mitigation and enhancement (DMRB LD 119)*, Revision 1, March 2020 (Highways England, 2020d)[16]

## 6.3 Assessment Methodology

6.3.1 The assessment on biodiversity resources will be prepared in accordance with *DMRB LA 104*, *DMRB LA 108* and *DMRB LD 118*, (which has been revised to align with the CIEEM *Guidelines for Ecological Impact Assessment in the UK and Ireland).*

6.3.2 The assessment will consider both construction and operation and will also be informed by the air quality assessment (refer to Chapter 5: Air Quality), noise assessments for sensitive resources (Chapter 12: Noise and vibration) and the drainage and hydrology assessment (Chapter 14: Road Drainage and the Water Environment).

### Importance of biodiversity resource

6.3.3 The assessment to inform this PEI Report chapter will first focus on determining the importance of the biodiversity resources identified within the study area using the guidance in Table 3.9 of *DMRB LA 108*. Baseline studies (desk study and field survey) will then be used to establish the relative importance of the biodiversity resource as International or European importance, UK or National importance, Regional importance, County or equivalent authority importance or Local importance.

### Level of impact

6.3.4 Potential impacts to inform this PEI Report will be described in terms of temporary (during construction only) or permanent, reversible or irreversible, positive or negative. Professional judgement will be used to assess whether an impact is likely to negatively or positively impact the integrity of a resource. Where we have not been able to quantify the magnitude of impacts at this stage, due to the gaps in survey data, a precautionary approach has been undertaken to identify the potential level of impact.

[13] Highways England (2019b) Design Manual for Roads and Bridges LA 104 Environmental assessment and monitoring. Revision 1, available at: https://www.standardsforhighways.co.uk/prod/attachments/0f6e0b6a-d08e-4673-8691-cab564d4a60a?inline=true [accessed 1 September 2021]
[14] Highways England (2020b) Design Manual for Roads and Bridges LA 115 Habitat Regulation Assessment, Revision 1, January 2020, available at: https://www.standardsforhighways.co.uk/prod/attachments/e2fdab58-d293-4af7-b737-b55e08e045ae?inline=true [accessed 1 September 2021]
[15] Highways England (2020c) Design Manual for Roads and Bridges LD 118 Biodiversity Design, Revision 1, March 2020, available at: https://www.standardsforhighways.co.uk/prod/attachments/9317652b-4cb8-4aaf-be57-b96d324c8965?inline=true [accessed 1 September 2021]
[16] Highways England (2020c) Design Manual for Roads and Bridges LD 119 Roadside environmental mitigation and enhancement, Revision 1, March 2020, available at: https://www.standardsforhighways.co.uk/prod/attachments/6cacd1e7-dcff-4ff8-aa64-bd5556a5eedc?inline=true [accessed 1 September 2021]

### Assessing significance

6.3.5 The PEI Report will describe any potential likely significant effects of the project on biodiversity resources based on the preliminary baseline information collected to date and the current understanding of the project. An assessment of whether there is the potential for a significant effect has been made using professional judgement using the preliminary information available currently regarding the likely presence of the habitat, species and source impact pathways (where known) and the current stage of design. The level of significance has been defined using Table 3.13 of *DMRB LA 108*. A full impact assessment including assessment of magnitude/level of impact will be undertaken for the ES in accordance with *DMRB LA 108* and in line with CIEEM guidance.

### Surveys completed to date

6.3.6 In order to determine baseline conditions within the study area, a range of habitat and protected species surveys have been undertaken or are currently underway (Appendix 6.2: Ecological field surveys methodology and study areas). All surveys have been undertaken in accordance with relevant industry guidance/standards and/or through consultation with statutory consultees. The scope of these surveys was determined through a desk study, including consideration of the habitats present within the project Zone of Influence (ZoI) through a detailed review of aerial photos, Ordnance Survey (OS) mapping, the Multi-Agency Geographic Information for the Countryside (MAGIC) database and habitat data received from previous surveys undertaken and the Local Environmental Records Centres. Biological records for habitats and species were received from Environmental Records Information Centre North East (ERIC NE), North and East Yorkshire Ecological Data Centre (NEYEDC), Cumbria Biodiversity Data Centre (CBDC), Cumbria Amphibian and Reptile Group (ARG) and Rachel Hepburn for an adder record (member of North East Reptile and Amphibian Group NERAG). Only biological records recorded within the last ten years were included in the assessment as these are most likely to represent the current species assemblage of an area. Freshwater ecology records were downloaded from the Environment Agency Ecology and Fish Data Explorer[17] and white-clawed crayfish and fish survey data was provided by the Eden Rivers Trust (ERT).

6.3.7 Survey areas for respective survey types have been informed by desktop data, best practice guidance for each feature type (as detailed in *DMRB LA 108*) and considering the likely ZoI applicable to the anticipated impacts of the project. Survey areas and methodologies are described in Appendix 6.2: Ecological field surveys methodology and study areas.

6.3.8 Ecology surveys are ongoing, as indicated in the last column of Appendix 6.1: Ecological field surveys methodology and study areas. Baseline surveys will be completed in time to inform the ES.

## 6.4 Assessment Assumptions and Limitations

6.4.1 There are a small number of areas within the desktop study area where the full list of biological records, as detailed in paragraph 6.5.2, were yet to be provided at the time of writing the PEI. An updated request for biological records for the full extent of the draft DCO boundary will be included in the ES.

6.4.2 Ecology surveys are ongoing as set out in Appendix 6.2: Ecological field surveys methodology and study areas, and therefore this assessment has been based on preliminary desktop assessment and survey data available at the time of assessment

[17] Environment Agency (2021) Ecology and Fish Data Explorer, available at https://environment.data.gov.uk/ecology/explorer/ [accessed 1 September 2021]

(incorporating data from surveys to end of June 2021, with surveys after that time unavailable due to time required for data processing and quality assurance and assessment). The complete baseline will be included in the ES.

6.4.3 Surveys were undertaken within a study area based on the draft DCO boundary at the time of survey. There are a limited number of locations where the current draft DCO boundary extends further (particularly where alternative routes are under consideration), therefore surveys are (or will be, depending on season) being undertaken to cover the full draft DCO boundary in order to inform the ES. For the purpose of the PEI Report a precautionary approach has been applied assuming presence of a protected/notable species in the absence of survey data.

6.4.4 Phase 1 Habitat surveys are planned for all draft DCO scheme boundaries plus a 250m buffer but are not complete in all areas (due to changes in boundary and/or restricted land access). Consequently, assumptions on habitat assemblages have been based on aerial photos to complete gaps until a Phase 1 Habitat survey can be undertaken. The initial Phase 1 Habitat plan (Figure 6.3: Phase 1 Habitat Survey) has not to date been fully ground-truthed in these areas that are as yet un-surveyed so may contain inaccuracies. This will be updated for the ES.

6.4.5 Use of desk data from Natural England relating to Priority Habitats has not been reviewed in the field to confirm condition. This resource also omits rivers and hedgerows as Priority Habitats within the dataset for this study area, and as a result these linear habitats are not presented within report mapping for Priority Habitats (Figure 6.2: Priority Habitats and Ancient Woodland). These habitats have been considered within baseline reporting and the likely significant effect tables in the PEI Report and will be fully mapped for the ES.

6.4.6 No aquatic species field survey data was available at the time of writing due to time required for data processing and analysis. Consequently, assumptions on species presence/likely absence are based on desktop data and habitat assessment of rivers.

6.4.7 Limited bat activity survey data was available at the time of writing; consequently, the assessment of impacts on crossing points is limited and based on a review of the desk top information, known bat species and Phase 1 Habitat survey information. These sources have been used to assess areas of high habitat quality for foraging and connectivity within the landscape that may be affected by the proposed scheme. For these bat species a precautionary approach has been taken (assuming species are present where the habitat is suitable) and therefore represents a robust approach to identifying potential significant effects at this stage. Full survey data will be available for, and will inform, the ES.

6.4.8 Great crested newt were assumed present for ponds that were difficult to access e.g. extensive wetlands or steep sided water features, when they were within 250m of an existing population.

6.4.9 There are limitations related to the Affected Road Network (ARN) as described in 6.5.3.

## 6.5 Study Area

### Route wide

6.5.1 The study area is defined in accordance with *DMRB LA 108*, *LD 118 and CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland*. In line with this guidance, the draft DCO boundary, including potential construction areas, is included along with the project's ZoI on each biodiversity resource. In establishing the ZoI, potential impact pathways during construction and/or operational phases were

considered in relation to air quality, water quality, noise and vibration, which could have direct or indirect effects on biodiversity resources.

6.5.2 For the purposes of the ecological desktop study, the study area was defined as follows with measurements taken from the nearest point from the draft DCO boundary and the desk study areas are shown on Figure 6.1: Designated Sites.

- 2km radius for international sites of nature conservation importance (or 30km for SAC where bats are noted as one of the qualifying interests).
- 2km radius for nationally designated sites for nature conservation importance.
- 1 km radius for regionally important and local non-statutory designated sites.
- 1 km radius for protected/notable species.
- 1 km radius for Section 41 Habitats of Principal Importance, Ancient Woodland Inventory sites and veteran trees.

6.5.3 Additionally, a high level review of any other statutory sites where a potential impact pathway exists (e.g. considered to be hydrologically linked or where there may be changes in air quality and noise due to increased traffic volume on the road) has been undertaken. This has included a review of designated sites and ancient woodlands within the ecology study area to identify any that that are potentially impacted by changes to the traffic within the wider ARN (sites within 200m of the ARN). The assessment at this stage has focussed on the sensitivity of the habitats and species for which the sites have been designated to changes in air quality, and a review of likely air quality changes anticipated through the preliminary modelling. Once more air quality information is available, including relating to nitrogen deposition, a full assessment of impact on receptors along the ARN will be undertaken and will be reported in the ES. A detailed review alongside other topics (e.g. hydrology, soils, geomorphology, etc) of potential impact pathways associated with designated sites will be undertaken to inform the ES.

6.5.4 The desktop assessment has incorporated the use of OS mapping and aerial imagery to identify key habitats and areas for field survey.

6.5.5 Environmental records obtained included freely available data from the MAGIC website, Natural England Open Data and the National Biodiversity Network (NBN) Atlas. In addition, records from database searches with relevant statutory and non-statutory consultees including the Environment Agency, CBDC, North Cumbria Barn Owls Study Group, ERIC Natural England, NEYEDC, River Eden Rivers Trust, Charles Fletcher (Yorkshire County Recorder for macro-moths), Suzanne May Cumbria Amphibian and Reptile Group (CARG), Bob Marsh (Yorkshire County Recorder for Coleoptera), the North Yorkshire Bat Group and Richard Lansdown for aquatic plant, moss, liverwort and lichen species associated with the River Eden SSSI.

6.5.6 The ZoI for each biodiversity resource is described in Appendix 6-2: Ecological field surveys methodology and study areas.

## 6.6 Baseline Conditions

### Route wide

#### Statutory designated sites

6.6.1 There are four SACs, one SPA, one Local Nature Reserve (LNR) and one National Nature Reserve (NNR) within the 2km route wide study area. There are no SACs designated for bats within 30km of any of the schemes. There are ten SSSIs designated for biodiversity within the route wide study area (three SSSI are

designated for their geology and are retained here, due to the presence of non-qualifying features of biodiversity interest).

6.6.2 There are three SAC (River Eden, North Pennine Moor and Asby Complex), one SPA (North Pennine Moors), four SSSIs (Argill Woods and Pastures, Augill Valley Pasture, River Eden and Tributaries and Crosby Ravensworth Fell), which are situated within 200m of the ARN.

6.6.3 There are no Ramsar or Royal Society for the Protection of Birds (RSPB) Reserves within the study area.

6.6.4 Details of the statutory designated sites within the 2km route wide study area are provided in Table 6-2: Statutory designated sites within the biodiversity study area within the biodiversity study area, and the sites are shown on Figure 6.1: Designated Sites. The designated sites to be considered in each scheme assessment are detailed below the tables.

Table 6-2: Statutory designated sites within the biodiversity study area

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| River Eden SAC<br>International value due to level of designation. | Annex I habitats that are a primary reason for selection of this site:<br>Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*[1]<br>Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitrich o-Batrachion* vegetation<br>Alluvial forests with alder (Alnus glutinosa) and ash (Fraxinus excelsior) (Alno-Padion, Alnion incanae, Salicion albae) * Priority feature<br>Annex II species that are a primary reason for selection of this site:<br>White-clawed (or Atlantic stream) crayfish (*Austropotamobius pallipes*)<br>Sea lamprey (Petromyzon marinus)<br>Brook lamprey (Lampetra planeri)<br>River lamprey (Lampetra fluviatilis)<br>Atlantic salmon (*Salmo salar*)<br>Bullhead (Cottus gobio)<br>Otter (Lutra lutra) | M6 Junction 40 to Kemplay Bank (within, south)<br>Penrith to Temple Sowerby (within, west)<br>Temple Sowerby to Appleby (Blue/Orange/ Red alternatives all within)<br>Appleby to Brough (Black-Black-Black and both Blue and Orange alternatives all 377m, south/south-west)<br>Within 200m of the ARN (immediately adjacent to the A66) |
| Helbeck and Swindale Woods SAC<br>International value due to level of designation. | Annex I habitats that are a primary reason for selection of this site:<br>*Tilio-Acerion* forests of slopes, screes and ravines* Priority feature | Appleby to Brough (Black-Black-Black and Blue alternative 755m, north-east; Orange alternative 468m north-east) |
| Moor House-Upper Teesdale SAC | Annex I habitats that are a primary reason for selection of this site: | Appleby to Brough (Black-Black-Black and both Blue and Orange alternatives) 704m, north-east. |

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| International value due to level of designation. | Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.<br>Alpine and Boreal heaths<br>Juniper *(Juniperus communis)* formations on heaths or calcareous grasslands<br>Calaminarian grasslands of the *Violetalia calaminariae*<br>Siliceous alpine and boreal grasslands<br>Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia)* (* important orchid sites)<br>Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae)*<br>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels<br>Mountain hay meadows<br>Blanket bogs<br>Petrifying springs with tufa formation (*Cratoneurion*) *Priority feature<br>Alkaline fens<br>Alpine pioneer formations of the *Caricion bicoloris-atrofuscae** Priority feature<br>Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia*<br>ladani)<br>Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii)*<br>Calcareous rocky slopes with chasmophytic vegetation<br>Siliceous rocky slopes with chasmophytic vegetation<br>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:<br>European dry heaths<br>Limestone pavements *Priority feature<br>Annex II species that are a primary reason for selection of this site: | |

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| | Round-mouthed whorl snail (*Vertigo genesii)*<br>Marsh saxifrage (*Saxifraga hirculus)* | |
| North Pennines Moors SAC<br>International value due to level of designation. | Annex I habitats that are a primary reason for selection of this site:<br>European dry heaths<br>Juniper *(Juniperus communis)* formations on heaths or calcareous grasslands<br>Blanket bogs (* if active bog) *Priority feature<br>Petrifying springs with tufa formation (*Cratoneurion)* *Priority feature<br>Siliceous rocky slopes with chasmophytic vegetation<br>Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles<br>Annex I habitats present as a qualifying feature, but not a primary reason for selection of site:<br>Northern Atlantic wet heaths with cross-leaved heath (*Erica tetralix)*<br>Calaminarian grasslands of the *Violetalia calaminariae*<br>Siliceous alpine and boreal grasslands<br>Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia)* (*important orchid sites)<br>Alkaline fens<br>Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Gale opsietalia ladani)*<br>Calcareous rocky slopes with chasmophytic vegetation<br>Annex II species present as a qualifying feature, but not a primary reason for site selection:<br>Marsh saxifrage | Bowes Bypass (39m north)<br>Within 200m of the ARN |
| Asby Complex SAC<br>International value due to level of designation. | Annex I habitats that a primary reason for selection of this site:<br>Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) | Within 200m of the ARN relating to M6 Junction 40 to Kemplay Bank (immediately adjacent to the M6 motorway) |

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| | Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)<br>Petrifying springs with tufa formation (*Cratoneurion*) * Priority feature<br>Alkaline fens<br>Limestone pavements *Priority feature<br>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:<br>Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.<br>European dry heaths<br>Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* * Priority feature<br>Annex II species that are a primary reason for selection of this site:<br>Geyer's whorl snail (*Vertigo geyeri)*<br>Slender green feather-moss (Drepanocladus (Hamatocaulis) vernicosus) | |
| North Pennine Moors Special Protection Area (SPA)<br>International value due to level of designation. | Qualifying features:<br>Golden plover (Pluvialis apricaria)<br>Hen harrier (Circus cyaneus)<br>Merlin (Falco columbarius)<br>Peregrine (Falco peregrinus)<br>Curlew (Numenius arquata)<br>Dunlin (Calidris alpina schinzii)<br>Non-qualifying species of interest:<br>Montagu's harrier (*Circus pygargus)*<br>Short-eared Owls (*Asio flammeus)* | Appleby to Brough, all alternatives (704m north-east)<br>Bowes Bypass (39m north)<br>Within 200m of the A66 (ARN) |
| River Eden and Tributaries SSSI<br>National value due to the level of designation | Notifiable features:<br>Floating vegetation of plain and sub-mountainous rivers<br>White-clawed crayfish (Austropotamobius pallipes)<br>Atlantic salmon (*Salmo salar*)<br>Brook lamprey<br>River lamprey<br>Sea lamprey<br>Bullhead (Cottus gobio)<br>Otter (Lutra lutra)<br>Nesting sand martin within the riverbanks of the River Eden and Tributaries are known to | M6 Junction 40 to Kemplay Bank (within, south)<br>Penrith to Temple Sowerby (within, west)<br>Temple Sowerby to Appleby (All alternatives within)<br>Appleby to Brough (All alternatives 377m, south/south-west)<br><br>Within 200m of the ARN (immediately adjacent to the M6) |

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| | comprise the largest colony in Cumbria. | |
| Crosby Ravensworth Fell SSSI<br>National value due to the level of designation | Notifiable features:<br>One of the few remaining areas of lowland heathland in Cumbria.<br>Limestone pavements are an important feature of the site and form the western outliers of the Great Asby Complex of pavements.<br>Other habitats which are of secondary interest but contribute to the overall value of the site include calcareous and acid grasslands and base-rich flushes.<br>The site also supports an assemblage of typical moorland breeding birds such as golden plover (Pluvialis apricaria), red grouse (Lagopus lagopus scotica), redshank, oystercatcher, curlew and lapwing. | Within 200m of the ARN relating to M6 Junction 40 to Kemplay Bank (immediately adjacent to M6) |
| Cliburn Moss SSSI and NNR<br>National value due to the level of designation | A basin mire which supports wet fen/bog, wet grassland and dry heath, self-sown woodland, ditches/drains and a pond. Supporting a mix of fen, bog and heath communities with several rare and or scarce plant species. It also supports a diverse range of aquatic beetle species and is of county significance for breeding birds. | M6 Junction 40 to Kemplay bank (1.77km west) |
| Udford Low Moss SSSI<br>National value due to the level of designation | Notifiable features:<br>Fen and carr-woodland communities as one of the few intact valley fens in eastern Cumbria.<br>Tall fen and diverse fen grassland.<br>Wet (willow and alder) and dry woodland (ash, or oak-birch), some semi-natural and ancient in origin.<br>Breeding records for redshank, water rail, snipe, reed bunting, sedge warbler and marsh tit.<br>Presence of red squirrel. | Penrith to Temple Sowerby (957m, eastnorth) |
| Cowraik Quarry Local Nature Reserve (LNR)<br>National level for biodiversity resource due to the presence of the Priority Habitat deciduous woodland and potentially on the | Notifiable features:<br>Red squirrel (*Sciurus vulgaris*)<br>Deciduous woodland<br>Heathland<br>Many bird species | M6 Junction 40 to Kemplay Bank 1.80km north<br>Penrith to Temple Sowerby 1.58km north |

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| presence of heathland. | | |
| Temple Sowerby Moss SSSI<br>National value due to the level of designation | Notifiable features:<br>The development of fen communities<br>A fringe carr, dominated by alder, grey willow (*Salix cinerea)* and bay willow (*S. pentandra)*<br>Aquatic invertebrates include the water beetle (*Laccornis oblongus)*, which is a rare species within the United Kingdom | Temple Sowerby to Appleby (Orange alternative, within. Blue and Red alternatives 142m, north). |
| George Gill SSSI<br>National value for geology due to the level of designation and National for biodiversity resource due to the presence of Priority Habitat. | Geological SSSI designated for geological features, but also has ecological interest within broad-leaved and coniferous plantation and upland heathland, the latter of which is classed as Priority Habitat. | Appleby to Brough (All alternatives, 411m north) |
| Appleby Fells SSSI<br>National value due to the level of designation | Notifiable features:<br>Blanket mire has developed over most of the ground and represents the most extensive habitat within the Appleby Fells<br>*Agrostis-Festuca* grassland occurs along steep, partially screed slopes around the limestone scars. Blue moor-grass (*Sesleria caerulea)* species predominates the area in association with spring sedges (*Carex caryophyllea)* and glaucous sedges (*C. flacca)*<br>Tall herb vegetation is a further important feature of the SSSI<br>Throughout the altitudinal range of the Appleby Fells, particularly at the periphery of the peat bog, there are numerous base-rich flushes<br>The site supports a large variety of breeding bird species<br>The site also provides hibernation sites for Brandts (*Myotis brandti*) and Whiskered bats (*Myotis mystacinus*) within the mine shafts that are present. | Appleby to Brough (All alternatives, 730m north) |
| Helbeck Wood SSSI<br>National value due to the level of designation | Notifiable features:<br>Considered by some as one of the best ash-elm wood on limestone left in England. | Appleby to Brough (Black-Black-Black and Blue alternative 459m, north-east.<br>Orange alternative 731m north-east) |

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| | Dominant ash (*Fraxinus excelsior)* tree species.<br>Rich herb communities including dog's mercury (*Mercurialis perennis)* and ramsons (*Allium ursinum).*<br>Presence of lichen species which are characteristic of an ancient woodland.<br>Presence of two small artificial tarns<br>Large breeding bird population | |
| Swindale Wood SSSI National value due to the level of designation | Notifiable features:<br>Dominant ash (*Fraxinus excelsior)* tree species<br>Rich herb communities including dog's mercury (*Mercurialis perennis)* and ramsons (*Allium ursinum).*<br>Presence of lichen species which are characteristic of an ancient woodland<br>Large breeding bird population | Appleby to Brough (Black-Black-Black and Blue alternatives 1.3km, north-east.<br>Orange alternative 1.28km north-east) |
| Bowes Moor SSSI National value due to the level of designation | Notifiable features:<br>Bowes Moor SSSI meets the criteria for designation under the terms of the European Community Directive 79/409/EEC on the Conservation of Wild Birds, in particular moorland birds.<br>Drier parts of the blanket bog support areas dominated by species such as heather<br>Shallower peats and drier mineral soils support heathland. | Bowes Bypass (255m north-west) |
| Augill Valley Pasture SSSI National value due to the level of designation | Species-rich unimproved grassland containing a number of rare and locally restricted plant species and represents one of the most diverse of its kind in East Cumbria. This grassland grades to woodland along the steep banks of Augill Beck, supporting a varied ground flora with ancient woodland indicator species. | Within 200m of the ARN related to Appleby to Brough (all alternatives) |
| Kilmond Scar SSSI National value due to the level of designation | Notifiable features:<br>On the shallow soils which are prone to drought, rock ledges, crevices and scree, open vegetation contains a well-developed moss layer, which contains an abundant number of drought tolerant annual and perennial species, including biting stonecrop (*Sedum acre).* | Bowes Bypass (747m south-east)<br><br>Cross Lanes to Rokeby (all alternatives) 1.39km north-east |

| Site and valuation | Reason for designation | Schemes within 2km |
|---|---|---|
| | Deeper limestone soils support grassland species. The most common of which are common bent (*Agrostis capillaris)* and red fescue (*Festuca rubra).* | |
| Brignall Banks SSSI<br>National value due to the level of designation | Notifiable features:<br>The wood itself has had little human management which has resulted in the site being species rich.<br>On base-rich soils wych elm (*Ulmus glabra)* and ash (*Fraxinus excelsior)* mainly dominate the area.<br>On the more acidic soils, mature trees are present.<br>The site supports a varied bryophyte and lichen flora, including several lichens which are sensitive to air pollution and are rare in Durham County.<br>There is a diverse range of woodland bird species including great spotted woodpecker (*Dendrocopos major*). | Cross Lanes to Rokeby (all alternatives) 607m south-east |
| Black Scar Quarry SSSI<br>National level for geological resource and National level for biodiversity resource due to the presence of Priority Habitat | Geological SSSI supporting dense woodland habitat as a non-qualifying feature which is classified as Priority Habitat. | A1(M) Junction 53 Scotch Corner (1.25km east). |

### Non-statutory designated sites

6.6.5 There are 22 non-statutory designated sites within the route wide study area. These are shown on Figure 6.1: Designated Sites and described in Table 6-3. It is assumed for the purposes of the PEI Report, that all non-statutory sites are designated for biodiversity resources of importance on a **County** level unless the site contains ancient woodland, where the importance is of **National** value (see paragraph 6.6.8) or Annexe 1 habitat where the importance is of **International** value.

6.6.6 Within 200m of the ARN, there is one CWS (Disused Railway Line near Newbiggin), three LWS (Pallet Hill, Ravensworth Park – Castle Fetch and the de-notified site of Stephen Bank Road Verge) and one Natural England Nature Improvement Area.

Table 6-3: Non-statutory designated sites

| Site | Reason for designation | Scheme within 1km or within 200m of the ARN |
|---|---|---|
| Morecombe Bay Limestone and Wetlands Nature Improvement Area | The Morecambe Bay area – internationally important for its wildlife –is of only 12 Nature Improvement Areas (NIAs) in England. The site supports over | Within 200m of ARN (M6, closest to the M6 J40 to Kemplay Bank Roundabout scheme (approximately 38km south west). |

| Site | Reason for designation | Scheme within 1km or within 200m of the ARN |
|---|---|---|
| (**International** value due to level of designated sites within the Area). | 1700 ha of Priority Habitat (including wetland, limestone, grassland and woodland) supporting a variety of bird, invertebrate and plant species. | |
| Disused Railway Line near Newbiggin County Wildlife Site (CWS) | Species-rich grassland, scrub and tree habitats on banks of railway. | M6 Junction 40 to Kemplay Bank (1km, south)<br><br>Within 200m of the ARN |
| Skirsgill Woods County Wildlife Site (CWS) | Broadleaved woodland | M6 Junction 40 to Kemplay Bank (within, south) |
| Yanwath Wood CWS | Broadleaved woodland | M6 Junction 40 to Kemplay Bank (53m, west) |
| Myers Beck (Mardale Road) CWS | Myers Beck and associated riparian grassland. Water vole population listed in reasons for designation. | M6 Junction 40 to Kemplay Bank (444m, north) |
| Whinfell Forest CWS (National value) | Mainly ancient, replanted woodland with waterbodies and grassland mosaics. Also designated for a population of red squirrels. | Penrith to Temple Sowerby (adjacent to scheme, east) |
| Watersmeet (Eamont & Eden) CWS | Riparian habitat. | Penrith to Temple Sowerby (983m, north) |
| Acorn Bank Woods and Garden CWS | Broadleaved woodland with formal gardens and pond habitats. | Temple Sowerby to Appleby, Orange alternative 337m, north |
| River Lyvennet Floodplain CWS | Low lying wetland (mire and swamp)/woodland habitat mosaic. | Temple Sowerby to Appleby. (Blue, and Red alternatives 914m, west and Orange 776m, west) |
| Chapel Wood (Appleby in Westmorland) CWS (up to International value) | Broadleaved ancient woodland. May qualify as Annexe 1 alluvial woodland habitat, for which the adjacent River Eden SAC is designated (to be confirmed pending further surveys). | Temple Sowerby to Appleby (Blue, Red and Orange alternative, within, south-west) |
| Ross Wood CWS (National value) | Broadleaved ancient woodland (oak). | Temple Sowerby to Appleby (Blue, Orange and Red alternatives at 146m, south). |
| Dowpits Wood (National value) | Broadleaved ancient woodland (ash and oak). | Temple Sowerby to Appleby (Orange and Red alternatives at 904m, west and Blue 933m west) |
| Sandford Mire CWS | Lowland Fens, species-rich mire. | Appleby to Brough (All alternatives - within) |
| Swindale Woodland CWS | Broadleaved woodland. | Appleby to Brough (Black-Black-Black and Blue alternative, 513m, |

| Site | Reason for designation | Scheme within 1km or within 200m of the ARN |
|---|---|---|
| | | south. Orange alternative 514m, south) |
| Tricklebanks Wood CWS (National value) | Ancient woodland. | Appleby to Brough (All alternatives) 933m, south west. |
| Thorsgill Wood LWS (National value) | Broadleaved ancient woodland and marsh. | Cross Lanes to Rokeby (455m, east) |
| Teesbank Woods, Rokeby LWS (National value) | Mainly ancient woodland, with river, bare rock and shingle banks. | Cross Lanes to Rokeby (60m, north east) |
| Rokeby Park and Mortham Wood LWS (National value) | Parkland, woodland and pasture (Priority habitat and potential Ancient Woodland). | Cross Lanes to Rokeby (within) |
| Stephen Bank Road Verge (De-notified LWS) | Species-rich grassland habitat | Stephen Bank to Carkin Moor (within, north)<br><br>Within 200m of the ARN |
| Aske Estate Woodlands LWS (National value) | Deciduous woodland, possibly ancient woodland. | Stephen Bank to Carkin Moor (938m, south-west) |
| Ravensworth Park – Castle Fetch LWS | Pond, marsh, wet grassland, scrub and tree habitats and open mosaic habitats. | Within 200m of the ARN relating to Stephen Bank to Carkin Moor |
| Pallet Hill LWS | Significant population of non-breeding waterbirds. | Within 200m of the ARN relating to A1(M) Junction 53 Scotch Corner |
| Limekiln Wood Site of Importance for Nature Conservation (SINC) (County, though Limekiln Wood itself is Ancient Woodland therefore partly National value) | Broadleaved woodland including ancient woodland. | Within 200m of the ARN, approximately 8.7km south of the A1(M) Junction 53 Scotch Corner |

6.6.7 There are also ten sites of invertebrate significance within the River Eden SAC/River Eden and tributaries SSSI namely: Eamont Bridge Banks of River Eamont (River Eamont), Lowther Bridge (River Lowther), Temple Sowerby Shingle Bank (River Eden), Temple Sowerby Moss, River Eden Oglebird Scar Ers (River Eden) and Acorn Bank (Crowdundle Beck), Bolton shingle bank (River Eden), Helbeck Wood, Swindale Wood and Great Musgrave Swindale Beck Ers. These are of **County** level value due to the designation at the level of Cumbria.

### Priority habitats and ancient woodland sites

6.6.8 The desktop study identified nine Priority Habitat types within the draft DCO boundary of the route wide project: deciduous woodland (broadleaved and mixed), rivers and streams, good quality semi-improved grassland (lowland meadows and pastures),

lowland fens, upland heath purple moor-grass and rush pastures, lowland dry acid grassland, coastal and floodplain grazing marsh (floodplain grazing marsh only) and traditional orchards. The additional Priority Habitats upland hay meadow was identified within 250m of the route wide draft DCO boundary.

6.6.9 Within 200m of the ARN there are 22 ancient woodlands (Augill Beck, Augill Bridge Wood, Bessygill, Borrowdale, Chapel, Cocklet, Deepdale, Deepgill, Gillbeck Wood, Graham's Gill/ Jack Wood, Limekiln, Lowgill, Lowhurst Wood, Newbiggin Wood, Oglebird Plantation, Raughtonguil Wood, Sexton Hagg, Sexton Hagg Extension, Teesbank, Thorsgill Wood, Warth, Waterfall).

6.6.10 All ancient woodland sites and veteran trees are considered to be of **National** importance due to their irreplaceable nature. Areas of which meet the criteria for Priority Habitat are considered to be of **National** value.

6.6.11 The location of Priority Habitats, ancient woodlands and ancient/veteran trees are shown on Figure 6.2: Priority Habitats and Ancient Woodland.

### Phase 1 habitats

6.6.12 The habitats recorded within 250m of the draft DCO boundary during the Phase 1 Habitat surveys are outlined in Table 6-4: Phase 1 Habitat types and shown on Figure 6.3: Phase 1 Habitat Survey. Valuations are based on current survey data and a review of habitats included in relevant County/Local Authority Plans and Strategies. Valuations may be revised down for the ES when further Phase 1 Habitat survey data is available. This is considered to be a robust assessment with highest possible level of valuation stated on a precautionary basis.

Table 6-4: Phase 1 Habitat types

| Habitat type and valuation | Description |
|---|---|
| Broadleaved semi-natural woodland<br>Majority up to National value due to the presence of Priority Habitats (deciduous woodland types).<br>Up to International value for the Temple Sowerby to Appleby scheme due to the possible presence of an Annex 1 woodland habitat<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Upland oak woodland, upland mixed ash woodland, wet woodland.<br>Durham County Council BAP - Woodland and Scrub (Ancient Semi-Natural Woodland including Planted Ancient Woodland Sites, Restored Native Woodland on Ancient Sites, Other Broadleaf Woodland, Wet Woodland.<br>Richmondshire District Councils BAP - Ash woodland, oak woodland, wet woodland, other woodland types, lowland wood pasture and parkland | Several types of this woodland are present across the route, most being small and/or fragmented from other areas of continuous semi-natural habitats, with varying degrees of naturalness. Drier soils/areas support pedunculate oak (*Quercus robur)* as the canopy dominant. The drier stands are dominated by ash (*Fraxinus excelsior*). Where field layers are evident in both the ash (*Fraxinus excelsior)* and oak woodlands, these are often represented by dog's mercury (*Mercurialis perennis*) and native bluebell (*Hyacinthoides non-scripta*).<br>Chapel Wood CWS is designated for broad-leaved woodland habitats. These woodlands may qualify as the Annex 1 alluvial woodland habitat, for which the adjacent River Eden SAC is designated. |
| Broadleaved plantation woodland<br>Up to National value due to the possible presence of Priority Habitats (deciduous woodland types).<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Upland oak woodland, upland mixed ash woodland, wet woodland. | This is present in many locations either as part of amenity planting contiguous to the A66 corridor, or over more native woodland habitats. There is great diversity amongst the planted stands. |

| Habitat type and valuation | Description |
|---|---|
| Durham County Council BAP - Woodland and Scrub (Ancient Semi-Natural Woodland including Planted Ancient Woodland Sites, Other Broadleaf Woodland, Wet Woodland.<br>Richmondshire District Councils BAP - Ash woodland, oak woodland, wet woodland, other woodland types, lowland wood pasture and parkland. | |
| Coniferous plantation woodland<br>Up to National value due to the possible presence of Priority Habitats (heathland).<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Wet woodland.<br>Durham County Council BAP - Woodland and Scrub (Ancient Semi-Natural Woodland including Planted Ancient Woodland Sites, Wet Woodland.<br>Richmondshire District Councils BAP - Wet woodland, other woodland types, lowland wood pasture and parkland | These are either dominated wholly by conifer species or have a low mix of broad-leaved species. These woodlands tend to be dominated by Scot's pine, Norway spruce (*Picea abies)*, silver fir (*Abies alba*), or are stands of Leyland cypress (*Cupressus x leylandii*). |
| Mixed semi-natural woodland<br>Up to National value due to the presence of Priority Habitats (deciduous woodland types and heathland).<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Upland oak woodland, upland mixed ash woodland, wet woodland.<br>Durham County Council BAP - Woodland and Scrub (Ancient Semi-Natural Woodland including Planted Ancient Woodland Sites, Restored Native Woodland on Ancient Sites, Other Broadleaf Woodland, Wet Woodland.<br>Richmondshire District Councils BAP - Ash woodland, oak woodland, wet woodland, other woodland types, lowland wood pasture and parkland | Various species-mixes are present across the scheme, often originating from plantation woodland but sufficiently developed as to form mixed semi-natural woodlands. |
| Mixed semi-natural plantation woodland<br>Up to National value due to the possible presence of Priority Habitats (deciduous woodland types and heathland).<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Upland oak woodland, upland mixed ash woodland, wet woodland.<br>Durham County Council BAP - Woodland and Scrub (Ancient Semi-Natural Woodland including Planted Ancient Woodland Sites, Restored Native Woodland on Ancient Sites, Other Broadleaf Woodland, Wet Woodland. | Often these are associated with mature gardens, game planting or are more recently planted woodland blocks within private land. |

| Habitat type and valuation | Description |
|---|---|
| Richmondshire District Councils BAP - Ash woodland, oak woodland, wet woodland, other woodland types, lowland wood pasture and parkland | |
| Dense scrub<br>Up to County value due to the possible presence of County or Local Authority Habitats (woodland and scrub).<br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Woodland and Scrub, | The route wide area is typified by dominant stands of hazel, hawthorn, willow, gorse or bramble, each being locally dominant where they occur. Blackthorn occurs at much lower densities. |
| Scattered scrub<br>Local value unless within the Priority Habitat Open Mosaic Habitat, which would be National value as a whole | Self-seeded and planted stands of scrub on rail embankments and road verges, scattered along rocky exposures/ escarpments, scattered along riverbanks, is represented by growth at woodland edges, or occurs as remnants of defunct hedge systems. Species composition similar to dense scrub. |
| Broadleaved parkland scattered trees<br>National value due to presence of Priority Habitat (Wood- Pasture and Parkland) and ancient and/or veteran trees<br><br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Parkland and Wood Pasture<br>Richmondshire District Councils BAP - lowland wood pasture and parkland | This is represented by diverse types which include areas of semi-natural grassland overplanted with trees. Some of these trees are mature with veteran features; where such trees are present, these have been noted as of importance. |
| Mixed parkland scattered trees<br>National value due to presence of Priority Habitat (Wood- Pasture and Parkland)<br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Parkland and Wood Pasture<br>Richmondshire District Councils BAP - lowland wood pasture and parkland | Includes trees over marshy grassland habitats with mature pine trees and standing deadwood or scattered trees on amenity grasslands including mature examples of Scot's pine. |
| Semi-improved acid grassland<br>Up to National value due to presence of Priority Habitat (Lowland Acid Grassland)<br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Lowland Heath (Acid Grassland)<br>Richmondshire District Councils BAP - moorland edge including Upland acid grassland, | This grassland type is only found in a few locations, typically of sheep-grazed pasture. |
| Semi-improved neutral grassland | False oat grass (*Arrhenatherum elatius*) is dominant with abundant red fescue, frequent presence of Yorkshire-fog, occasional cock's-foot, |

| Habitat type and valuation | Description |
|---|---|
| Up to National value due to presence of Priority Habitat (Lowland Meadows and Upland Hay Meadows)<br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Lowland Meadows and Pasture | common bent, crested dog's-tail, common couch (*Elymus repens*), meadow foxtail (*Alopecurus pratensis*) and rare sheep's fescue. Forb diversity in these grasslands varies and can be limited to ruderal species or can be diverse. |
| Improved grassland<br>Local value | This is one of the most frequent habitat types route wide, outside the highway boundary. It is typically dominated by perennial rye grass (*Lolium perenne*), sometimes with frequent smooth meadow grass (*Poa pratensis*), cock's-foot (*Dactylis glomerata*), Yorkshire-fog (*Holcus lanatus*) and white clover (*Trifolium repens*). |
| Marsh/marshy grassland<br>Up to National value due to presence of Priority Habitat (Coastal and Floodplain Grazing Marsh, Upland Flushes, Fens and Swamps, Purple Moor-grass and Rush Pastures)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - purple moor-grass and rush pasture, reedbed.<br>Durham County Council BAP - Lowland Fen (Reedbed, Lowland Fen habitats), Floodplain Grazing Marsh<br>Richmondshire District Councils BAP - flood plain grassland, fens, reedbeds. | This habitat is evident in both areas of floodplain and other low-lying ground across the scheme. Areas of the Yorkshire-fog dominated /damp neutral grasslands frequently grade into this habitat. This includes a range of areas where tufted hair-grass dominates, to areas dominated by hard-rush; and across gradients from low species diversity to species-rich damp habitats. |
| Poor semi-improved grassland<br>Local value | False oat grass (*Arrhenatherum elatius*) is dominant with abundant grasses similar to semi-improved grassland. |
| Continuous bracken<br>Local value | This occurs as monotypical stands on steep hillsides. Occasional bracken management was recorded within agricultural land, with evidence of areas that have been cut and bailed. |
| Tall ruderal vegetation<br>Local value | This habitat is present along the river and stream corridors route wide, which are often fenced off from adjacent pasture. It is also present at field margins, within hedgerow ground flora, and on embankments and cuttings for current and prior rail corridors, and at roadsides.<br>The most dominant species is common nettle, with locally frequent patches of rosebay willowherb, and occasional ragwort, hogweed (Heracleum sphondylium), cow parsley (Anthriscus sylvestris), coltsfoot (Tussilago far-fara), broad-leaved dock, scattered throughout.<br>Several stands of Himalayan balsam were identified across the route wide project. |

| Habitat type and valuation | Description |
|---|---|
| Non-ruderal<br>Local value | This habitat is too small to be mapped but is present in limited and largely inaccessible areas comprising both steep banksides of ditches and streams through woodland habitats and on steep river banks above flood level. Species present include male fern, broad-buckler fern and hart's-tongue fern with moss and liverwort cover between and occasional presence of opposite-leaved golden saxifrage (*Chrysoplenium oppositifolium*). |
| Wet dwarf shrub heath<br>Up to National value due to presence of Priority Habitat (Upland and Lowland Heathland)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Upland heathland, blanket bog<br>Durham County Council BAP - Lowland Heath (Acid Grassland),<br><br>Richmondshire District Councils BAP - Upland heathland & bog | This habitat is limited to one main location within the scheme. Stands of common heather between small tussocks of heath grass, with abundant bog asphodel (*Narthecium ossifragum*), frequent heath woodrush, occasional cross-leaved heath (*Erica tetralix*), with red bog-moss (*Sphagnum capillifolium*) and (*Polytrichum commune*). |
| Lichen/bryophyte heath<br>Up to National value due to presence of Priority Habitat (Upland and Lowland Heathland)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Upland heathland, blanket bog<br>Durham County Council BAP - Lowland Heath (Acid Grassland),<br>Richmondshire District Councils BAP - Upland heathland & bog | This habitat is limited in extent adjacent to the scheme. It consists of areas with limited grass presence and dominated by moss species, with varying levels of common heather presence. |
| Swamp<br>Up to National value due to presence of Priority Habitat (Reedbed)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP – Reedbed, purple moor-grass and rush pasture<br>Durham County Council BAP - Lowland Fen (Reedbed, Lowland Fen habitats),<br>Richmondshire District Councils BAP – Fens, reedbeds | This habitat is limited both in presence and extent route wide. It is dominated by common reed (*Phragmites australis*), reed canary grass (*Phalaris arundinacea*) and bulrush (*Typha latifolia*). |
| Inundation vegetation<br>Up to National value due to presence of Priority Habitat (Coastal and Floodplain Grazing Marsh, Upland Flushes, Fens and Swamps, Purple Moor-grass and Rush Pastures)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Reedbed<br>Durham County Council BAP - Lowland Fen (Reedbed, Lowland Fen habitats), Rivers and | Very few examples of this habitat have been recorded to date route wide. Where recorded present, it includes bulrush, soft rush, with occasional stands of common reed and meadowsweet. |

| Habitat type and valuation | Description |
|---|---|
| Streams (Floodplain Grazing Marsh, Exposed Riverine Sediments)<br>Richmondshire District Councils BAP – Fens, reedbeds, flood plain grassland | |
| Standing water eutrophic<br>Up to National value due to presence of Priority Habitat (Ponds)<br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Ponds<br>Richmondshire District Councils BAP – standing water | A variety of waterbodies are present across the scheme including quarry ponds, large ornamental ponds, farmland ponds, waterbodies formed from old ox-bows of the rivers, ponded areas with wetland areas, wet ditches, and man-made drainage or water storage ditches. |
| Standing water mesotrophic<br>Up to County value due to presence of County or Local Authority Plan Habitat<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Mesotrophic standing waters<br>Richmondshire District Councils BAP – Standing water | This habitat is limited to a recently created ornamental pond with good water quality but little to no marginal or aquatic vegetation. |
| Running water eutrophic<br>Up to County value due to presence of County or Local Authority Plan Habitat<br>County or Local Authority Plan Habitats present;<br>Richmondshire District Councils BAP – Flowing water | Field ditch systems are limited in extent but were almost always found to be in flow. In most cases these pass-through agricultural lands and have slightly higher nutrient status than the sources they are connected to. |
| Running water mesotrophic<br>International value due to them being within or functionally linked to the River Eden SAC<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Rivers and streams<br>Durham County Council BAP - Rivers and Streams (Floodplain Grazing Marsh, Exposed Riverine Sediments)<br>Richmondshire District Councils BAP - Flowing water | The scheme is crossed by the River Eden and tributaries of River Eamont/Trout Beck to the west of the Pennines and then by the River Greta/River Tees and River Swale to the east of the Pennines. |
| Natural inland cliff acid/neutral<br>Up to National value due to possible presence of Priority Habitat (Inland Rock Outcrop and Scree Habitats) | This area is too small to be mapped but is evident in several locations along the banks of the River Eden and its tributaries. Often this is up to 4m high; however, on the River Eamont in the Whinfell area and along the River Greta east of Rokeby Hall is a section where this is significantly higher. |
| Other exposure acid/neutral<br>Up to National value due to possible presence of Priority Habitat (Inland Rock Outcrop and Scree Habitats) | There are limited areas of rock exposure route wide, none very extensive and mostly obscured by surrounding vegetation. |
| Artificial spoil | Large areas of this habitat are associated with quarry industries along the route or with storage |

| Habitat type and valuation | Description |
|---|---|
| Local value as has some value for reptiles and invertebrates | areas and comprise piles of vegetated (rank grasses) to non-vegetated sands and gravels and in limited areas manure heaps. |
| Arable<br>Local value for arable fields but arable field margins may be up to National value due to the presence of Priority Habitat (Arable Field Margins)<br>County or Local Authority Plan Habitats present;<br>Richmondshire District Councils BAP - Farmland | Farmlands adjacent to the route wide project are largely pastureland (improved grasslands), but closely followed by arable farming. The majority of the crops grown are bread wheat but also occasionally of barley, and rarely for swede and potatoes. In general, the arable lands do not appear to have appreciable arable margins. |
| Amenity grassland<br>Local value | Amenity grassland habitats are situated adjacent to areas of urban dwellings and infrastructure. This habitat is typically dominated by perennial rye-grass, with frequent cock's-foot, dandelion, common daisy (*Bellis perennis*), ribwort plantain, white clover, red clover and common mouse-ear. |
| Ephemeral/short perennial<br>Local value unless within the Priority Habitat Open Mosaic Habitat, which would be National value as a whole | Recorded at gates/ field entrances, small areas of disturbed habitats associated with play areas and sports pitches and by larger areas within quarries or areas of current works/housebuilding. |
| Introduced shrub<br>Local value | This habitat is present in areas of amenity planting, urban areas, shopping centres and within gardens. |
| Native species-rich hedge and trees<br>National value due to the presence of Priority Habitats (Hedgerows)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Ancient and/or species-rich hedgerows<br>Durham County Council BAP - Native Hedgerows | This habitat bounds fields that are still in active management. These hedges often have semi-mature to mature specimens of ash (*Fraxinus excelsior*) or pedunculate oak, with rare large specimens of grey poplar, or occasionally with younger specimens of sycamore, wild cherry or silver birch trees. |
| Species-poor hedge and trees<br>National value due to the presence of Priority Habitats (Hedgerows or ancient or veteran trees) | This habitat is the third most prevalent hedgerow category, found often at boundaries of more intensively grazed pasture or areas adjacent to urban settlements. |
| Intact native species rich hedge<br>National value due to the presence of Priority Habitats (Hedgerows)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Ancient and/or species-rich hedgerows<br>Durham County Council BAP - Native Hedgerows | This covers recently planted to historic hedgerows. Hawthorn is the dominant species with abundant hazel, ash (*Fraxinus excelsior)*, rowan, elder, oak, wild cherry, crab apple, field maple and bramble. |
| Intact species-poor hedge<br>National value due to the presence of Priority Habitats (Hedgerows)<br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Native Hedgerows | This habitat is the second most common hedgerow category, bordering agricultural land and dominated by hawthorn. |

| Habitat type and valuation | Description |
|---|---|
| Defunct native species-rich hedge<br>Up to National value due to the possible presence of Priority Habitats (Hedgerows)<br>County or Local Authority Plan Habitats present;<br>Cumbria BAP - Ancient and/or species-rich hedgerows<br>Durham County Council BAP - Native Hedgerows | This habitat occurs as either gappy mature hedges or as hedges where the gaps have been planted by young whips. |
| Defunct species-poor hedge<br>Up to National value due to the possible presence of Priority Habitats (Hedgerows)<br>County or Local Authority Plan Habitats present;<br>Durham County Council BAP - Native Hedgerows | The majority of hedgerows within 250m of the scheme and are represented by defunct species-poor hedgerows. These are primarily dominated by hawthorn, or occasionally by blackthorn. |
| Dry stone wall<br>Local value | Dry stone walls are evident route wide as boundary features. These features vary in condition to being intact to dilapidated with moss and lichen species present on the stone. |
| Dry ditch<br>Local value | Limited areas of dry ditches are present route wide, dominated by species typical of acid or neutral grasslands, with occasional presence of wetland species or ruderals. |
| Bare ground<br>Local value unless within the Priority Habitat Open Mosaic Habitat, which would be National level as a whole | Bare ground is found along riverbanks, adjacent to inland cliff areas. Greater expanses of this habitat are found at areas of current works or quarries. |

### Rivers and tributaries

6.6.13 The project crosses a number of rivers of varying magnitude. The largest river crossed by the project is Trout Beck which forms part of the River Eden and Tributaries SAC/SSSI. There are also watercourse crossings of numerous tributaries that flow into the River Eden and Tributaries SAC/SSSI, including the River Eden itself and the River Eamont. Based on habitat assessment and available desk study records, a number of these watercourses are considered likely to support the qualifying species (Atlantic salmon (*Salmo salar*), European bullhead (*Cottus gobio*), lamprey species and otter) and are therefore considered to be functionally linked to the River Eden and Tributaries SAC/SSSI. These watercourses include: Light Water, Keld Sike, Cringle Beck, Moor Beck, Eastfield Sike, Yosgill Sike and Woodend Sike.

6.6.14 The River Eden, River Eamont, Trout Beck and Light Water qualify as a sub-type 2 water course of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260), a qualifying feature of the River Eden and Tributaries SAC. The eastern section of the route crosses tributaries that flow into the River Greta, River Tees, River Swale and Tutta Beck, as well as Tutta Beck itself. With the exception of Tutta Beck, these watercourses are minor in nature and are typically high in the catchment and close to the source.

6.6.15 None of the watercourses crossed by the route meet the qualifying criteria for headwater stream priority habitat as defined by JNCC due to their modified nature (Brig, 2008)[18]. The River Eden, River Eamont and the lower reaches of Crooks Beck

[18] Brig (2008) UK Biodiversity Action Plan Priority Habitat Descriptions

and Lowgill Beck are mapped as Priority Habitat (rivers) on Natural England's open source data layer.

6.6.16 All rivers and streams are considered to be of **International** value where they are within the River Eden SAC or functionally linked to the SAC. All other watercourses outside of designations are considered to be of **Local** value.

### Protected and Priority Species

6.6.17 Surveys for protected and Priority Species are ongoing and Table 6-5: Protected and Priority Species, provides a high-level summary of preliminary findings up to the end of June 2021. The complete baseline will be included in the ES. Valuations are based on current survey data and may be revised down for the ES when further species survey data is available. This is considered to be a robust assessment as the highest expected level of valuation is stated on a precautionary basis.

Table 6-5: Protected and Priority Species

| Species and valuation | Description | Scheme |
|---|---|---|
| Bats (roosting in structures and trees)<br>Up to Regional value due to the expected size of maternity and hibernation roosts present. | Roosting opportunities exist throughout the project within residential properties (predominantly constructed of stone), farm buildings and many mature trees present across all the habitat types.<br>The desktop study identified the presence of numerous roost sites throughout the project, including maternity roosts for common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), brown long-eared bat (*Plecotus auritus*) and Daubenton's bat (*Myotis daubentonii*). Hibernation sites for whiskered bat (*Myotis mystacinus*) and Brandt's bat (*Myotis brandtii*) were also noted within mines present within Appleby Fell SSSI, over 1.5km from the Appleby to Brough scheme.<br>Preliminary bat roost assessments for structures have identified six confirmed roosts, 61 structures with high potential, 70 with moderate potential and 63 with low potential.<br>Preliminary bat roost assessments for trees have identified 39 trees with high potential, 100 with moderate potential and 95 with low potential. | All schemes apart from A1(M) Junction 53 Scotch Corner had potential bat roosts.<br>All schemes have potential tree roosts. |
| Bats (activity)<br>Up to National value due to the scheme supporting key flight routes for rarer species at the limit of their published range for example Leisler's bat (*Nyctalus leisleri*) | The desk study (completed in September 2020) identified common species of bat (Wray *et al*. 2010), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), and brown long-eared bat (*Plecotus auritus*) and the rarer species (Wray et al. (2010) Nathusius pipistrelle (*Pipistrellus nathusii*), Natterer's bat (*Myotis nattereri*), Daubentons bat (*Myotis daubentonii),* Whiskered bat (*Myotis mystacinusi*) and Brandt's bat (*Myotis brandtii*). No Annex II bat species were identified.<br>Preliminary review of the data collected by the static bat detectors show that 33,257 bat passes from 53 locations were recorded. Preliminary results have shown that species recorded include soprano pipistrelle (16669 passes), common pipistrelle (11168 passes), Myotis | All schemes apart from A1(M) Junction 53 Scotch Corner have potential bat crossing points. |

| Species and valuation | Description | Scheme |
|---|---|---|
| | species (3331 passes), noctule *(Nyctalus noctule)* (1265 passes), Leisler's bat *(Nyctalus leisleri)* (489 passes), brown long-eared bat (304 passes) and Nathusius pipistrelle (31 passes).<br>A total of 56 locations were identified through the desk study where potential bat flight routes will be directly affected by the proposed scheme alignment. These points cover a range of habitat types including woodland, hedgerow/linear feature, river corridor or culvert/underpass. | |
| Red squirrel (*Sciurus vulgaris*)<br>Up to National value due to the rarity and conservation status of this species | Habitats suitable for supporting red squirrel were present within 250m of the project and records occurred within 2km, including a designated national red squirrel refuge.<br>The initial terrestrial mammal transect surveys undertaken between November 2020 to January 2021 identified potential red squirrel field signs within 250m of the draft DCO boundaries. Due to the difficulty of distinguishing between field signs for grey or red squirrels, these findings cannot be used to confirm the presence of red squirrels. Subsequent camera traps and incidental sightings confirmed red squirrel presence towards the eastern end of the project. | Red squirrels are confirmed at M6 Junction 40 to Kemplay Bank, Penrith to Temple Sowerby and Appleby to Brough. |
| Otter (Lutra lutra)<br>Up to International value for key natal sites within the SAC. Up to County value in other locations due to the inclusion in Local Biodiversity Action Plans. | Suitable watercourses and associated riparian habitats are present within 250m of the project. In addition, the desk study identified records of otter within 2km. There are a range of main rivers and suitable tributaries in both rural and urban areas across the length of the project. There are no significant wetlands or pond networks within 250m of the draft DCO boundary.<br>Otter field signs were identified within 250m of the project including (at the time of writing) 32 potential holts and/or resting sites.<br>The camera trap surveys are ongoing and data is unavailable for inclusion in the PEI Report; however results will be used to inform the ES. | All schemes apart from A1(M) Junction 53 Scotch Corner have suitable habitat for otters and records of otters.<br>Otters field signs were identified at all schemes apart from A1(M) Junction 53 Scotch Corner and Stephen Bank to Carkin Moor. |
| Water vole (*Arvicola amphibius*)<br>Up to County value due to the conservation status of this species and inclusion in Local Biodiversity Action Plans. | There is suitable habitat to support water vole within 100m of the project and a small number of water vole records were identified within 2km. A water vole reintroduction project in the Warcop area was carried out in 2007 with further releases in 2010. This project has been coordinated by the Cumbria Water Vole Project based at Cumbria Wildlife Trust in partnership with Eden River Trust (Cumbria Biodiversity Data Centre, 2010). Sites are appropriately managed by landowners in conjunction with the Environment Agency and the Cumbria Water Vole Project.<br>Only one potential water vole field sign was identified across the project, a feeding station that could not be | All schemes apart from A1(M) Junction 53 Scotch Corner have suitable habitat. Water vole records were only found within 2km of Appleby to Brough scheme. |

| Species and valuation | Description | Scheme |
|---|---|---|
| | confirmed as water vole. The feeding station was located in the Penrith to Temple Sowerby scheme. | |
| Badger (Meles meles)<br>Local value as this species is not of conservation concern | Habitats suitable for supporting badger are present within 250m of the project, along with records of badger within 2km. These habitats include areas of woodland, scrub, hedgerows, rough grassland, road verges and ditches.<br>Ten main badger setts, 18 outlier setts, six subsidiary setts and four annexe setts have been identified within 250m of the draft DCO scheme boundaries. All identified setts have been subject to badger bait marking surveys, the results of which are detailed under the relevant schemes. | All schemes include suitable habitat. All schemes have desktop records for badger within 2km apart from<br>A1(M) Junction 53 Scotch Corner |
| Other terrestrial mammals –<br>Pine marten (Martes martes)<br>Up to National value due to the rarity conservation status of this species<br>Polecat (Mustela putorius)<br>Brown hare (Lepus europaeus)<br>Hedgehog (Erinaceus europaeus)<br>Deer<br>Up to County value due to inclusion with local Biodiversity Action Plans | There were no biological records of pine marten within 2km of the project boundary and limited suitable habitat.<br>Suitable habitat with potential to support polecat was recorded within 250m of the project draft DCO boundaries, including records of this species within 2km. No polecat signs were identified during survey transects. However, camera traps did record evidence of an unconfirmed species of the mustelidae family, which had potential to be polecat.<br>There is an abundance of suitable habitat that could support brown hare within 250m of the project draft DCO boundary and records occurred within 2km. Brown hare field signs and incidental sightings were recorded, and camera traps showed brown hare to the east and west of the project.<br>There is an abundance of suitable habitat that could support hedgehog within 250m of the project draft DCO boundary and records of hedgehog occurred within 2km. No field signs of hedgehog or camera trap/incidental sightings have been identified so far.<br>There is an abundance of suitable habitat that could support deer within 250m of the project draft DCO boundary and records of roe deer occurred within 2km. Field signs, camera traps and incidental sightings have all confirmed roe deer in the area. | Pine marten is scoped out of all schemes.<br>Polecat, brown hare, hedgehog and deer are scoped into all schemes with details listed under Scheme descriptions. |
| Birds<br>Up to International value due to breeding and wintering bird habitat and populations being functionally linked to the SPA.<br>Up to National value for non-SPA qualifying species due to | The majority of habitats within the project provide suitable nesting and foraging opportunities for species typical of farmland, hedgerows and open habitats. Land within the project which may be functionally linked to the North Pennine Moors SPA was considered as a priority for bird surveys. The desk study produced records of several notable bird species which are relevant to the route wide project. These included: lapwing *(Vanellus vanellus),* curlew *(Numenius arquata*), oystercatcher *(Haematopus ostralegus),* snipe (*Gallinago gallinago*), redshank, pink-footed goose (*Anser brachyrhynchus*), whooper swan (*Cygnus cygnus*), woodcock (*Scolopax rusticola*), redwing | Suitable habitats occur on all schemes for both breeding and wintering birds. |

| Species and valuation | Description | Scheme |
|---|---|---|
| inclusion of some species on Schedule 1 of the Wildlife and Countryside act and Red and Amber Birds of Conservation Concern. | (*Turdus iliacus*), fieldfare (*Turdus pilaris*), black redstart (*Phoenicurus ochruros*), kingfisher (*Alcedo atthis*), golden plover (*Pluvialis apricaria)* and barn owl (*Tyto alba*). Natural England provided additional information about potential locations (close to Kirkby Thore and Warcop) which were known to support significant numbers of wintering and breeding lapwing and breeding redshank, oystercatcher and potentially curlew.<br>Of the four SPA citation species, only golden plover was recorded during breeding bird surveys. A single golden plover was recorded during the June survey visit, on the southern edge of the SPA, northwest of Bowes. Two Schedule 1 species were recorded during the breeding bird surveys – fieldfare and kingfisher – along with 16 Birds of Conservation Concern (BoCC) Red List species a maximum of 21 Amber BoCC Listed species. Three active sand martin colonies were recorded.<br>Two SPA species were recorded during wintering bird surveys – golden plover and merlin *(Falco columbarius).* Golden plover was recorded across the majority of the survey area, with a maximum count of 750 noted during the January visit. Single merlins were recorded near moorland areas during the January surveys only. A total of six Schedule 1 species were recorded during the wintering bird surveys – barn owl, redwing, fieldfare, brambling *(Fringilla montifringilla),* marsh harrier *(Circus aeruginosus)* and merlin – along with a maximum of 16 BoCC Red List species and 16 Amber BoCC Listed species. | |
| Reptiles<br>Up to County value due to the inclusion of all four common reptile species in Local Biodiversity Action Plans | Desk study records for slow worm (*Anguis fragilis*) and adder (*Vipera berus*) occurred within 2km of the route wide project. The majority of habitats within the study area are unsuitable for reptiles due to the prevalence of agricultural land (arable and grazed pasture). Nevertheless, pockets of suitable habitat exist, and these are largely associated with linear features (such as roadside verges, stone walls, hedgerows, ditches and streams) and a few areas of rank semi-natural habitat. Large populations and widespread presence are thought to be unlikely due to a lack of records and unsuitable nature of the majority of the habitats within the study area. However, common lizard presence is anticipated in certain areas and other widespread reptiles, namely adder, slow worm, grass snake (*Natrix helvetica)* may be present in low numbers. | Suitable habitat for reptiles occurs within all schemes.<br>A limited reptile survey was undertaken within the Temple Sowerby to Appleby scheme but no reptiles were recorded. |
| Amphibians<br>Up to County value due to the inclusion of great crested newts in | Great crested newt (*Triturus cristatus*) presence has been confirmed through desktop study and field survey within the project draft DCO boundary, along with common frog (*Rana temporaria*), common toad (*Bufo bufo*), palmate | All schemes include waterbodies within 500m and suitable |

| Species and valuation | Description | Scheme |
|---|---|---|
| Local Biodiversity Action Plans | newt (*Lissotriton helveticus*), smooth newt (*Lissotriton vulgaris*) and alpine newt (*Ichthyosaura alpestris*). There were 87 waterbodies within 500m of the route wide project, of which 64 were either dry, not present or had a negative eDNA results for great crested newts. There was confirmed presence of great crested newt for 11 of the 23 ponds with some further surveys results still pending. | terrestrial habitat for amphibians.<br>Field survey data confirmed presence of great crested newts at four schemes – Penrith to Temple Sowerby, Temple Sowerby to Appleby, Appleby to Brough and Stephen Bank to Carkin Moor. |
| Fish<br>Up to International value for key spawning or commuting routes within the SAC. Up to County value in other locations due to the inclusion of some fish species in Local Biodiversity Action Plans. | Desk study records of fish species of conservation value exist for rivers crossed by the scheme including Trout Beck, Hayber Beck and Lowgill Beck. Atlantic salmon *(Salmo salar),* European bullhead *(Cottus gobio), lamprey* sp., European eel *(Anguilla anguilla),* brown/sea trout *(Salmo trutta)* and European grayling *(Thymallus thymallus)* have been recorded in Trout Beck. Atlantic salmon, European bullhead and brown/sea trout were recorded in Hayber Beck. Atlantic salmon and brown/sea trout were also recorded in Low Gill Beck.<br>Species of conservation value were recorded within the wider desk study search area for all schemes; however, it should be noted that many of these sites where these records exist may not be hydrologically connected to watercourses crossed by the scheme and are provided for context. Furthermore, many of the watercourses crossed by the project are considered unsuitable for notable fish species due to habitats present, their ephemeral nature or the presence of barriers to fish migration downstream of the crossing point. Barriers to fish migration were typically anthropogenic in nature (for example perched culverts), but natural barriers such as waterfalls were also noted.<br>No field survey data is available for fish at the time of writing. The results of route wide fish surveys will be reported in the ES. | All schemes apart from A1(M) Junction 53 Scotch Corner include suitable habitat for fish. |
| White-clawed crayfish (Austropotamobius pallipes)<br>Up to International value for key sites within the SAC. Up to County value in other locations due to the inclusion of in Local Biodiversity Action Plans. | Desktop study records of white clawed crayfish were identified within 2km of the project. However, it should be noted that many of the sites where these records exist may not be hydrologically connected to watercourses crossed by the project and are provided for context and to highlight the potential for this species to be present.<br>In 2020, field surveys were undertaken at six of twenty-two sites screened in for survey based on habitat assessment. Five of the six surveys completed returned a nil catch. A healthy population of white-clawed crayfish were recorded in Unnamed Tributary of Mire Sike 6.12 (Mire Sike is a tributary of the River Eden). The survey | All schemes apart from A1(M) Junction 53 Scotch Corner include suitable habitat for white clawed crayfish.<br>Desk study records were identified at M6 Junction 40 to Kemplay Bank, Penrith to Temple Sowerby, Temple |

| Species and valuation | Description | Scheme |
|---|---|---|
| | site is located approximately 2.5km upstream of the confluence with the River Eden and the SAC/SSSI boundary. | Sowerby to Appleby and Appleby to Brough. |
| Terrestrial invertebrates<br>Up to National value as there are Priority Habitats of particular value to invertebrates and national rarities could be identified. | Records for six-hundred and twenty-four terrestrial invertebrates were returned within 2km of the scheme. One hundred and seventy-three of these were species of conservation concern. The following Pantheon Broad Habitat Types (Pantheon, 2018)[19] were identified across the Scheme - DW1 Decaying Wood, A1 Arboreal, F21 Tall Sward and Scrub, F22 Short Sward and Bare Ground, F24 Upland, S1 Shaded Woodland Floor, W23 Running Water, W24 Marshland. In addition, several areas were identified as Open Mosaic Habitat on Previously Developed Land, which is a Priority Habitat and of particular value to terrestrial invertebrates. | All schemes contained areas of high terrestrial invertebrate potential apart from A1(M) Junction 53 Scotch Corner. |
| Aquatic invertebrates<br>Up to National value as there are nationally scarce invertebrates known to be present. | Desktop records of aquatic invertebrate species of conservation value were identified across the project. The large-mouthed valve snail (*Valvata macrostoma*) (recorded in the River Eden, within the desk study search area for the Temple Sowerby to Appleby Scheme) is a Nationally Rare, and a Priority Species.<br>In addition, eight Nationally Scarce aquatic invertebrate species were identified in the desk study. No other notable species or Invasive Non-native Species were identified in the desk study.<br>No field survey data is available for aquatic invertebrates at the time of writing. The results of route wide aquatic invertebrate surveys will be reported in the ES. | Aquatic invertebrate species of conservation value have been identified within the desk study search area for all schemes with the exception of Stephen Bank to Carkin Moor and A1 (M) Junction 53 Scotch Corner. |
| Macrophytes<br>Up to National value as there are nationally scarce macrophyte species known to be present. | Macrophyte species of conservation value have been identified within the desk study area for the project. The Nationally Scarce stream water crowfoot (*Ranunculus penicillatus* subsp. *Penicillatus)* was recorded on the River Eamont and River Lowther, within the desk study search area for the M6 Junction 40 to Kemplay Bank and Penrith to Temple Sowerby schemes.<br>Bladder sedge (*Carex vesicaria*), which is Vulnerable in England, was identified within the desk study search area for the Appleby to Brough Scheme.<br>The Invasive Non-Native Species Canadian pondweed (*Elodea canadensis*) and Nuttall's waterweed (*Elodea nuttallii*) was also identified in the desk study search area for a number of Schemes.<br>Whilst complete analysis of macrophyte field survey data was not available at the time of writing this report, it should be noted the Nationally Scarce bryophyte *Porella pinnata* was recorded during surveys of Trout Beck | All schemes apart from A1(M) Junction 53 Scotch Corner include suitable habitat for macrophytes. |

[19] Pantheon (2018) Pantheon, available from: https://www.brc.ac.uk/pantheon

| Species and valuation | Description | Scheme |
|---|---|---|
| | (Temple Sowerby to Appleby, in the vicinity of the Red alternative). | |

## M6 Junction 40 to Kemplay Bank

6.6.18 River Eden SAC and River Eden Tributaries SSSI are immediately adjacent to the south of this scheme in two locations and drain into the River Eamont (a tributary of the River Eden and part of the SAC and SSSI designations). Qualifying features for each statutory designation are listed in Table 6-2: Statutory designated sites within the biodiversity study area. The following habitats and vegetative communities, that are the qualifying features of the River Eden SAC, are assumed to be present in the River Eamont:

- Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior Alno-Padion, Alnion incanae, Salicion albae * Priority feature.

6.6.19 Cowraik Quarry SSSI (1.5km north) is designated for its geological features, but also supports the Priority Habitats deciduous woodland and lowland heathland. With the A686 forming a likely barrier, between this site and the scheme. Cowraik Quarry LNR (1.5km north) is designated for the aforementioned Priority Habitats.

6.6.20 The scheme has four non-statutory sites nearby; Disused Railway Line near Newbiggin CWS, Skirsgill Woods CWS, Yanwath Wood CWS and Myers Beck CWS, and the county value invertebrate sites at Eamont Bridge, Banks of River Eamont (River Eamont), Lowther Bridge (River Lowther).

6.6.21 There are four statutory designated sites within 200m of the ARN, namely River Eden SAC, River Eden and Tributaries SSSI, Asby Complex SAC and Crosby Ravensworth Fell SSSI, the non-statutory site Disused Railway Line near Newbiggin CWS and ancient woodland at Newbiggin Wood and Raughtonguil Wood.

6.6.22 Within 200m of the draft DCO boundary (construction dust/demolition activities) are River Eden SAC, River Eden and Tributaries SSSI, Yanwath Wood CWS and Skirsgill Wood CWS.

6.6.23 The majority of habitats here were identified as areas of improved grassland, hardstanding areas and buildings, followed by the amenity grasslands associated with urban habitat and infrastructure at Penrith. The riparian corridor/running water habitat category provided by the River Eden and River Eamont formed the next most prevalent habitat, adjacent to which were areas of semi-natural woodlands and mixed woodland habitats. There were several areas of semi-natural mixed woodland habitats identified through desk study and confirmed through field study to be the Priority Habitat (deciduous woodland). Protected plant species present in this scheme include bluebell. Invasive species recorded include giant hogweed and Himalayan balsam associated with the banks of the River Eamont.

6.6.24 This scheme crosses Thacka Beck, a tributary of the River Eamont, south of Pategill and forms part of the Eamont (Upper) WFD waterbody (GB102076071020) which achieved 'Good' Ecological status under WFD in 2019. The proposed alignment falls within a section of Thacka Beck that is already culverted as a result of the existing A686, A66 and of the Cumbria Constabulary buildings. There is potential for habitats upstream and downstream of the existing culverts to support notable and/or protected aquatic species. However, this watercourse is considered to be disconnected from the River Eamont under low flow conditions as it is significantly perched at the

confluence with the River Eamont, which restricts fish migration between the two rivers.

6.6.25 The desk study identified 30 records of bats (eight species) within a 2km radius of the scheme. The desk study confirmed three roosts of notable conservation interest, one common pipistrelle maternity roost, one pipistrelle species maternity roost, and one soprano pipistrelle maternity roost. Two further roosts were noted, a myotis species roost and a whiskered bat roost. The preliminary bat roost assessment identified two confirmed bat roosts, one at Cumbria Police Headquarters and one at Carlton Hall. Cumulative results for activity transects undertaken for this scheme were 27 common pipistrelle, 27 soprano pipistrelle, two myotis species and five noctule. A potential bat crossing point providing connectivity between the maternity roost in Penrith hospital to the River Eamont corridor was identified at the Carleton Hall underbridge passing beneath the A66.

6.6.26 There were nine otter records from the past ten years located within 2km of the draft DCO boundary of this scheme including road casualties and sightings along the River Eamont and Thacka Beck. Otter field signs were identified on all the watercourses surveyed within 250m of the scheme and eight potential holts/resting sites identified. There is one potential crossing point where Thacka Beck is culverted under the A66.

6.6.27 There were no records of water vole within 2km of this scheme although Myers Beck CWS lists a water vole population in reasons for designation. Three sections of watercourses were surveyed for water vole. There were no field signs for water vole identified within 100m of the scheme.

6.6.28 There were 61 red squirrel records from the past ten years located within 2km of the draft DCO boundary of this scheme. Initial terrestrial mammal walking transects confirmed red squirrel presence. Detailed red squirrel carrying capacity and visual surveys were then carried out and evidence of red squirrel was recorded along all transects within all identified suitable habitat surrounding this scheme.

6.6.29 There were 23 badger records from the past ten years located within 2km of the draft DCO boundary of this scheme, including badger roadkill and one sett. Field surveys have identified two main setts (with associated outlier/annexe setts) and one independent outlier sett has been identified within 250m of the draft DCO boundary of the scheme. Badger bait marking was undertaken at one of the setts, which indicated badgers were foraging and commuting through the woodland directly north of the A66 carriageway and using the existing underpass which provides access to the Cumbria Police Constabulary under the A66 to reach woodland to the south.

6.6.30 No camera trap data or field signs of pine marten were observed from suitable habitat located within 250m of this scheme.

6.6.31 There were four polecat, two brown hare, four roe deer and 37 hedgehog records from the past ten years located within 2km of the draft DCO boundary however no field signs or incidental sightings of any of the species were identified for this scheme. Four out of the six camera traps did record the presence of potential polecat species.

6.6.32 During wintering bird surveys, reasonable numbers of four gull species (black-headed, common, herring and lesser black-backed), house sparrow, bullfinch and dipper were recorded. During breeding bird surveys, reasonable numbers of lesser black-backed gull (peak count of 41 in April), oystercatchers (five in April), grey wagtail, dipper (both recorded during all visits), house martin and swift (low numbers recorded in May and June) were recorded. Two active sand martin colonies were located directly adjacent to the draft DCO boundary and a third was recorded approximately 200m from boundary.

6.6.33 Three records of slow worm were identified just north of Penrith. No other reptile records occurred within 2km of the scheme. Further reptile habitat assessment and/or potential surveys are proposed for areas of rough-semi natural grasslands, open mosaic habitat and woodland edge habitats as suitable terrestrial habitat. Connective corridors are provided by rail corridors and watercourse banks.

6.6.34 The historic records for common lizard are separated from the works by urban dwellings and associated infrastructure, however the presence of suitable habitat within 100m of the works, which may be subject to potential fragmentation impacts, requires further survey for reptile species.

6.6.35 Historic desk data records are held for substantial numbers of common toad (aggregation/migration) on the River Eamont at Brougham Bridge and for smaller numbers of the common species palmate newt, smooth newt, common frog. In addition there are records for the invasive species alpine newt at Gilwilly Industrial estate with suitable links for this species to move along, via rail and watercourses connecting to this scheme.

6.6.36 Two ponds were fully surveyed (including eDNA surveys) for great crested newt and both are scoped out based on the surveys undertaken with the assumption great crested newt are likely absent. Neither of these ponds supported common toad (breeding habitat). Further desk review and/or surveys are required with regard to potential impacts upon common toad.

6.6.37 Seven terrestrial invertebrate species of conservation concern were identified in the desktop study: Grey Dagger (*Acronicta psi*), Dot Moth (*Melanchra persicariae*), *Melanostoma dubium*, Banded General soldierfly (*Stratiomys potamida*), Banded Demoiselle (*Calopteryx splendens*), Comma (*Polygonia c-album*) and Dark Giant Horsefly (*Tabanus sudeticus*).

6.6.38 Thacka Beck was classified by the Environment Agency as 'Good' for the fish element in 2019 and was classified as "high" in 2015 and 2016. Environment Agency fish surveys undertaken within the desk study area between 2013 and 2016 recorded the presence of the following species of conservation value: Atlantic salmon, European bullhead, brown/sea trout (*Salmo trutta*), European eel (*Anguilla anguilla*), lamprey sp. (*Petromyzontidae* sp.) and European grayling (*Thymalus thymalus*).

6.6.39 Records of white-clawed crayfish were identified within the desk study search area but none identified in Thacka Beck. A survey of Thacka Beck will be undertaken later in 2021.

6.6.40 Thacka Beck was classified by the Environment Agency as 'High' for the macroinvertebrate element in 2019 and has been classified as 'High" since 2014. Five Environment Agency invertebrate monitoring sites were identified within the desk study search area. The black-legged water-snipefly *Ibisia marginata* was recorded within the desk study search period; 2010 to 2021. Thacka Beck was classified as 'Good' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'Good' since 2015. The only notable species recorded (desk study data) in Thacka Beck were stream water crowfoot *Ranunculus penicillatus* subsp. *Penicillatus* and the invasive species Canadian pondweed.

## Penrith to Temple Sowerby

6.6.41 River Eden SAC and River Eden Tributaries SSSI are both within the scheme boundary, their qualifying features are listed in Table 6-2: Statutory designated sites within the biodiversity study area Udford Low Moss SSSI (954 east), Cliburn Moss SSSI and Cliburn Moss NNR are located 1.7km to the south. There are two non-statutory designated sites within 1km of the scheme, Whinfell Forest CWS (adjacent, east) and Watersmeet (Eamont and Eden) CWS.

6.6.42 Cowraik Quarry SSSI is designated for geological features, but supports the Priority Habitats deciduous woodland and lowland heathland. There are likely barriers between this site and the scheme from the River Eamont and the A686 main road. Cowraik Quarry LNR is designated for the aforementioned Priority Habitats.

6.6.43 Within 200m of the ARN are the River Eden SAC, River Eden and Tributaries SSSI.

6.6.44 Within 200m of the draft DCO boundary (construction dust/demolition activities) are River Eden SAC, River Eden and Tributaries SSSI, Whinfell Forest CWS, Salter Wood AW and Oglebird Plantation AW.

6.6.45 This scheme was surveyed as being dominated by improved grassland, arable and species-poor semi-improved neutral grassland. These were bound mainly by fences and stone walls but to the east more intact species-rich hedgerows with trees and species-poor hedges with trees were present. The farmland habitats were crossed by the River Eamont to the north (rivers and streams Priority Habitat), with an area of broad-leaved woodland (deciduous woodland Priority Habitat) and a vertical area of inland cliff (sandstone). There was a small tributary Light Water which was connected to floodplain marshy grassland habitat (Priority Habitat). Smaller areas of species–rich semi-improved neutral grassland (Priority Habitat), plantation woodland, marsh and scrub and scattered trees were present in areas both north and south of the A66. The large woodland block to the south associated with the Centre Parcs tourist destination, contained mixed woodland habitats (Planted Ancient Woodland Site and Priority Habitat) and coniferous plantation. An area of wet woodland is also present to the east of the scheme. Pond habitats are present of varying type and quality and condition (some confirmed as the pond Priority Habitat).

6.6.46 The protected and/or otherwise notable plant species recorded from desk and field study include bluebell, hoary cinquefoil, common cudweed and a stream water crowfoot subspecies. (*Ranunculus pencillatus* subsp. *pencillatus*), and river jelly lichen (*Collema dichotomum*). The following invasive species are also present: Himalayan balsam, Canadian waterweed, Nuttall's waterweed and yellow archangel (*L. galeobdolon* subspecies *argentatum*).

6.6.47 This scheme crosses four tributaries (Unnamed Tributary of Light Water 3.1, Light Water, Unnamed Tributary of River Eamont 3.3 and Unnamed Tributary of River Eamont 3.5; Figure 14.1: Surface Water Features) that form part of the Eamont (Lower) WFD waterbody (GB102076070990) and one watercourse (Swine Gill) that forms part of the Eden Lyvennet to Eamont waterbody (GB102076070980). These waterbodies achieved 'Good' and 'Moderate' Ecological status respectively under WFD in 2019.

6.6.48 With the exception of Light Water, the watercourses crossed by this Scheme are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species (including qualifying species of the River Eden SAC/SSSI) as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of natural and man-made barriers.

6.6.49 In contrast, the habitats in Light Water upstream and downstream of the existing A66 culvert (which is considered passable for aquatic species) have the potential to support notable and/or protected aquatic species, including the qualifying species of the River Eden SAC/SSSI. This watercourse likely qualifies (surveys pending) as a sub-type 2 water course of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and is considered to be functionally linked to the SAC/SSSI.

6.6.50 The desk study identified 88 records of bats (seven species) within a 2km radius of the scheme, including 37 roosts, of which five were maternity roosts including a Daubentons bat maternity roost within Brougham castle 150m from the western end

of the scheme. The preliminary bat roost assessment identified two bat roosts, the first within the structure known as Highbarn and the second roost (assumed) relates to bat tiles that were observed within the roof section of one of the buildings within Whinfell Park. Cumulative results of bat passes from activity transects for the scheme were 31 common pipistrelle, 61 soprano pipistrelle, one pipistrelle species, ten myotis species, 51 noctule and eight brown long eared bat. Six potential bat crossing points have been identified across the scheme. These include one culvert at Light Water bridge, four 'hopover' locations at Whinfell Park, High Barn, Swinegill plantation and Whinfell House and one location at the proposed Center Parcs junction.

6.6.51 There were 11 otter records from the past ten years located within 2km of the draft DCO boundary of this scheme. Records consist of seven counts of roadkill, prints and counts of individuals at Brougham Old Bridge. The roadkill on Swine Gill and the unnamed tributaries of River Eamont relate to existing watercourse road crossing points that are to be expanded under the draft DCO boundary. Seven sections of watercourses were surveyed for otter. There were nine potential holt and/or resting features within 250m of the scheme. Seven were on the River Eamont, one was on Swine Gill and the remaining feature was on an unnamed tributary of River Eamont.

6.6.52 Seven sections of watercourses were surveyed for water vole. A potential water vole feeding station (highly suitable reed bed) was identified within 100m of the scheme.

6.6.53 There were 167 red squirrel records from the past ten years located within 2km of the draft DCO boundary of this scheme. The high number of records is due to the red squirrel reserve at Whinfell Forest. Initial terrestrial mammal walking transects, followed by detailed red squirrel carrying capacity and visual surveys, confirmed the presence of red squirrels along all transects within all identified suitable habitat surrounding this scheme.

6.6.54 There were 21 badger records from the past ten years located within 2km of the draft DCO boundary of this scheme. Records included counts of individual adults, a sett and an associated latrine and one roadkill record. Field surveys have identified four main setts, one independent outlier sett and one independent annexe sett within 250m of the draft DCO boundary of this scheme. Three of the main setts (setts 8, 9 and 11) were identified as requiring badger bait marking surveys which were all undertaken during March 2021.

6.6.55 No camera trap data or field signs of pine marten were observed from suitable habitat located within 250m of this scheme.

6.6.56 There were four polecat records from the past ten years located within 2km of the draft DCO boundary of this scheme. No field signs of polecat were identified during the terrestrial mammal walking transect surveys that took place between November 2020 and January 2021. However, ten out of the 16 camera traps that were deployed did record the presence of potential polecat species.

6.6.57 There were two brown hare and 23 hedgehog records from the past ten years located within 2km of the draft DCO boundary of this scheme. No field signs or incidental sightings of brown hare were identified.

6.6.58 There were six roe deer records from the past ten years located within 2km of the draft DCO boundary of this scheme. Deer field signs and incidental sightings have also been recorded within 250m of the scheme and deer have been pictured on the wildlife cameras left on site.

6.6.59 During wintering bird surveys, considerable numbers of common gull, mistle thrush and skylark (all recorded during all four surveys, peak count of 401 in December, peak count of 19 in January and peak count of 79 in February, respectively) were recorded. Three bramblings and 28 yellowhammer were recorded in February. During

breeding bird surveys, one lesser redpoll, 19 meadow pits, 11 oystercatchers and 12 yellowhammers were recorded in April. In May, 52 house martins, five tree sparrows and three reed buntings were recorded and in June, 52 house sparrows and two common sandpipers were recorded. One active sand martin colony was recorded along the River Eamont.

6.6.60 There are historic records for common lizard at Whinfell Forest due south of the A66. Further reptile habitat assessment and/or potential surveys are proposed for areas of rough-semi natural grasslands, marsh and woodland edge habitats as suitable terrestrial habitat.

6.6.61 Historic desk data records are held for substantial numbers of common toad (aggregation/migration) on the River Eamont at Brougham Bridge. There are historic records for all native amphibian species within Whinfell Forest (due south of A66) and using the ponds for breeding activities and extensive terrestrial habitat provision. There are also records for all native amphibian species at Acorn Bank, and for common toad and common frog at Temple Sowerby SSSI both sites are over 1km east of the scheme and separated by the River Eden, both sites with good local provision of suitable terrestrial habitat.

6.6.62 Nine ponds were subject to amphibian survey, of these seven ponds were removed from survey (pond habitat not evident/pond habitats unsuitable/great crested newt assumed likely absent). Two ponds were found to support great crested newt to the south of the A66, one online with Light Water (west of the Centre Parks Junction), based on eDNA results and one pond (due east of the Centre Parks Junction) with confirmed breeding. Both of these latter ponds have good adjacent terrestrial habitat for amphibians and some connectivity to further areas of good habitat within Whinfell Forest.

6.6.63 Fifty-six terrestrial invertebrate species of conservation concern were recorded; five Priority Species, 38 notable, eight Red data book and five nationally scarce.

6.6.64 The waterbodies mentioned in paragraph 6.6.38 were classified by the Environment Agency as 'High' for the fish element in 2019 and have both been classified as 'high' since 2015. Environment Agency fish monitoring sites were identified within the desk study search area on the River Eamont, River Lowther and Crowdundle Beck and the following species of conservation value were recorded between 2010 and 2021: Atlantic salmon, European bullhead, lamprey species, European eel, brown/sea trout and European grayling.

6.6.65 Records of white-clawed crayfish were identified within the desk study search area from the River Lowther, River Eden and River Eamont and a survey of Light Water was undertaken in 2020 and returned a nil catch.

6.6.66 The Eamont (Lower) WFD waterbody was classified by the Environment Agency as 'Good' for the invertebrate element in 2019. The Eden Lyvennet to Eamont WFD waterbody was classified as 'High' for the invertebrate element in 2019 and has been classified as 'High' since 2015. The following species of conservation value were recorded on the River Eden, River Eamont and River Lowther between 2010 and 2021: black-legged water-snipefly, yellow-legged water-snipefly (*Atherix ibis*), March brown mayfly (*Rhithrogena germanica*) and the whirligig beetle (*Gyrinus aeratus*).

6.6.67 The same waterbody classified by the Environment Agency as 'Good' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'Good' since 2015. The Eden Lyvennet to Eamont WFD waterbody was classified as 'Moderate' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'Moderate' since 2015. Environment Agency macrophyte survey data was available from five sites within the desk study search area from the River Lowther, River Eamont and River Eden and the following species have been

recorded: stream water crowfoot (*Ranunculus penicillatus* subsp. *Penicillatus*) and the invasive species Canadian pondweed and Nuttall's waterweed.

## Temple Sowerby to Appleby

6.6.68 As set out in Chapter 2: The Project and Chapter 3: Alternatives, three alternative routes are under consideration for this scheme. This section includes a general overview of all three alternatives for this scheme then describes biodiversity resources for each route where they differ from the overview (Refer to Chapter 2: The Project, for detailed descriptions for each route alternative).

6.6.69 River Eden SAC and River Eden Tributaries SSSI are within all alternatives for this scheme. Temple Sowerby Moss SSSI is 700m north-west of this scheme. Qualifying features for each statutory designation are listed in Table 6-2: Statutory designated sites within the biodiversity study area. Chapel Wood (Appleby in Westmorland) CWS, Acorn Bank Woods and Garden CWS and River Lyvennet Floodplain CWS, Ross Wood CWS and Dowpits Wood CWS are all within 1km of this scheme. The following county level invertebrate sites are within 1km of the scheme: Temple Sowerby Shingle Bank (River Eden), Temple Sowerby Moss, River Eden Oglebird Scar Ers (River Eden) and Acorn Bank (Crowdundle Beck) and Bolton shingle bank (River Eden).

6.6.70 The following designated sites are within 200m of the ARN: River Eden SAC and River Eden Tributaries SSSI.

6.6.71 Within 200m of the draft DCO boundary (construction dust/demolition activities) are River Eden SAC, River Eden and Tributaries SSSI, Temple Sowerby SSSI, Chapel Wood CWS and AW, Ross Wood CWS and AW.

6.6.72 This scheme predominantly passed through mixed farmland of improved pasture and arable which were bound by species-rich hedgerows with trees (Priority Habitat) some of which supported mature trees of importance in their own right. To the west was an area of fen with peat formation and willow and alder carr (Annex 1 habitat and Priority Habitat) woodland, namely Temple Moss SSSI. To the east was Trout Beck a tributary of the River Eden, which the scheme crossed with both natural and man-made channel features and evidence of *Ranunculus* spp. (Annex 1 habitat). Pond habitats were present of varying type, quality and vegetation composition (some potential Priority Habitats and others very poor). Other habitats included young to established areas of broad-leaved and mixed plantation woodlands with diverse canopy species and a species-rich area of semi-improved acid grassland (Priority Habitat). The protected and or otherwise notable plant species recorded from desk and field study included: harebell (*Campanula rotundifolia*), tormentil (*Potentilla erecta*), bitter vetch (*Lathyrus linifolia*), crosswort (*Cruciata laevipes*), devils-bit scabious (*Succissa pratensis*), common wintergreen (*Pyrola rotundifolia*), slender sedge (*Carex lasiocarpa*) and the liverwort *Porella pinnata*. The following invasive species are also present: Himalayan balsam and rhododendron.

6.6.73 All three alternatives for this scheme cross Trout Beck which forms part of the River Eden and Tributaries SAC/SSSI and is considered to be of high conservation value. Watercourses in this scheme form part of the Trout Beck WFD waterbody (GB102076070930) which achieved 'Good' Ecological status under WFD in 2019.

6.6.74 The desk study identified 121 records of bats (eight species) within the study area for all routes, including 80 roosts of which 16 were maternity roosts. The desk study identified 19 roosts of notable conservation interest within 2km of the scheme.

6.6.75 There were 13 otter records from the past ten years located within 2km of the draft DCO boundary of each route alternative. Six of the records were roadkill, one of which was related to Trout Beck, three to the River Eden, and two of which were not

associated with a watercourse or body of water. None of the roadkill records were on road watercourse crossing points, existing or proposed. The remaining records were of spraint, prints and counts of individuals.

6.6.76 There were no records of water vole. There were 61 red squirrel records, no pine marten, three polecat, two roe deer and 23 hedgehog records within 2km of the draft DCO boundary for any route of this scheme.

6.6.77 There were nine badger records from the past ten years located within 2km of the draft DCO boundary of each route alternative. The records consisted of counts of individuals and a latrine.

6.6.78 Badger, otter, water vole, red squirrel, pine marten, polecat, brown hare, roe deer, hedgehog surveys have not yet been completed for all route alternatives being considered for this scheme.

6.6.79 There were notable flocks of wintering and breeding birds along this scheme which are described under each route.

6.6.80 There are no historic reptile records for this scheme. A single reptile survey has been completed to date within this scheme. No reptiles were recorded and are assumed likely absent, however further surveys are ongoing across areas of suitable habitat associated with the alternative routes.

6.6.81 There are historic records for all native amphibian species at Acorn Bank and for common toad and common frog at Temple Sowerby SSSI both sites are within connected semi-natural habitat to the scheme. In a pond north-west of British Gypsum, there are records for great crested newt, smooth newt, common frog and common toad. To the west of the scheme are further records for common frog. There are historic records for great crested newt, common toad and palmate newt at Colby, but the River Eden in this location is a perceived barrier at least for great crested newt and palmate newt.

6.6.82 Twenty-four ponds were subject to amphibian survey. Seventeen were removed from surveys (pond habitat not evident/pond habitats unsuitable/great crested newt assumed likely absent). A cluster of seven ponds were found to support great crested newt due west of Main Street in Kirkby Thore, prior to the British Gypsum site. Through this area connective corridors are likely provided by banks of watercourses, hedgelines and the disused and active rail corridors.

6.6.83 Fifty terrestrial invertebrate species of conservation concern were recorded within the draft DCO boundary of each route alternative; 19 Priority Species, 18 notable, seven Red data book and six nationally scarce.

6.6.84 Environment Agency desk study data exists for Trout Beck where the following fish species of conservation value were recorded between 2010 and 2021: Atlantic salmon, European bullhead, lamprey sp., European eel, brown/sea trout and European grayling.

6.6.85 No desk study data for white clawed crayfish was identified for the watercourses crossed by any of the routes but records are known to occur on the River Eden, River Lyvennet, Hoff Beck and Nether Hoff Sike watercourses.

6.6.86 Six Environment Agency invertebrate monitoring sites were identified within the desk study search area for all routes. The large-mouthed valve snail (*Valvata macrostoma*) (recorded in the River Eden) is a Nationally Rare, UK BAP species and Priority Species. In addition, the following species of conservation value (Nationally Scarce) were recorded: the caddisfly *Allotrichia pallicornis*, yellow-legged water-snipe, March brown mayfly, the riffle beetle *Riolus subviolaceus*, the whirligig beetle *Gyrinus*

*aeratus*, black-legged water water-snipefly and smooth ramshorn snail *Gyraulus laevis.*

6.6.87 No desk study data for macrophyte species of conservation value was returned, with the exception of the invasive species Canadian pondweed. Whilst complete analysis of macrophyte field survey data was not available at the time of writing this report, it should be noted the Nationally Scarce bryophyte *Porella pinnata* was recorded during surveys of Trout Beck (Temple Sowerby to Appleby, in the vicinity of the Red alternative).

### Blue alternative

6.6.88 The scheme here is in close proximity to the River Eden SAC and River Eden SAC and Tributaries SSSI (Annex 1 habitats and Priority Habitat) and goes over an area of woodland and scrub (Chapel Wood CWS and Priority Habitat), with open mosaic habitats (Priority Habitat) and acid grassland (Priority Habitat) that forms the northern bank of the river. West of this the scheme passes over the Settle to Carlisle railway (active) with scrub and open mosaic habitats (Priority Habitat) and adjacent hedgerows, semi-improved grassland and improved and arable habitats.

6.6.89 Whilst following the habitats present in the overall habitat description, this alternative crosses greater areas of species-rich hedgerows with trees, improved grassland and arable fields at the eastern end of the route. Generally greater areas of agricultural land and intact species-poor hedgerows are crossed, due to this route having a wider land take for the new carriageway and verges. It then crosses mixed woodland, species-rich hedgerow habitats and crosses double hedges (confirmed Priority Habitat and may be classed as 'Important' hedges).

6.6.90 The route crosses Trout Beck on a viaduct, over banks with scattered trees and riparian habitats of gravels, sandy inland cliffs and in channel habitats with water crowfoot species (*Ranunculus* spp.) confirmed present (Annex 1 habitat and Priority habitat). Open mosaic habitat (Priority Habitat) is also affected by this alternative.

6.6.91 Trout Beck in the vicinity of the Blue alternative is considered to be of high conservation value despite being subject to historic over deepening and straightening, which is evident from review of aerial imagery and old maps. This section of river is actively recovering from being straightened and the installation of soft bank protection; this is evidenced by the extensive bank erosion that was recorded. This alternative also crosses Unnamed Tributary of Trout Beck 4.2 (Figure 14.1 Surface Water Features).

6.6.92 Nineteen potential bat crossing points have been identified from the desk study assessment of the habitats and records associated with this alternative. Of these five are tree/hedgerow lined narrow roads, one is Trout Beck river corridor and the remaining 12 are hedgerows/field boundaries with occasional mature trees. The preliminary bat roost assessments identified one structure with moderate bat roost potential and one structure with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points.

6.6.93 There are three brown hare records from the past ten years located within 2km of the draft DCO boundary of Blue.

6.6.94 During wintering bird surveys there were large flocks of lapwing including a flock of over 500 observed in fields northwest of Kirkby Thore in January. Reasonable numbers of fieldfare were recorded in December (162) and January (201). During breeding bird surveys oystercatcher and curlew, which were both recorded in low numbers, one kingfisher, two dippers. A peak count of 146 house sparrows were recorded across all routes, with many records associated with Kirkby Thore.

6.6.95 Three areas were identified as having high terrestrial invertebrate potential along this alternative, namely the shingle banks adjacent to the Troutbeck crossing, along the Roman Road between Long Marton and the railway, and the parkland at Colby Laithes. Surveys are ongoing and results are not available for the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

### Red alternative

6.6.96 This alternative crosses largely mixed farmland and the same habitats as per the Blue alternative, despite minor differences, including a different and much reduced area for the construction compound to the north of the scheme crossing a portion of a mixed semi-natural woodland, a newly planted mixed plantation on slope above Keld Sike and improved and semi-improved grassland. Due south it passes through habitats of improved grassland and arable, before crossing Keld Sike and a further field of improved grassland and species-rich intact hedgerows. The alternative continues through arable habitats, passing to the north of a species-rich acid grassland (confirmed Priority Habitat) and coniferous and mixed plantations, before improved grassland and crossing Trout Beck (confirmed Priority Habitat and presence of Annex 1 Habitat) and associated woodland habitats (may be Priority Habitat and an Annex 1 habitat) and floodplain area.

6.6.97 This alternative also crosses Trout Beck (approximately 1km further upstream than the Blue alternative) and Keld Sike (a tributary of Trout Beck). The section of Trout Beck in the vicinity of this route is characterised by areas of bedrock (bed and banks) on the left-hand bank and areas of bank erosion on the right-hand bank. This alternative crosses Keld Sike approximately 400m upstream of its confluence with Trout Beck.

6.6.98 A total of 18 potential bat crossing points have been identified from the desk study assessment of the habitats and records associated with the Red alternative. Of these five are tree/hedgerow lined narrow roads, and 15 are hedgerows/field boundaries with occasional mature trees. The preliminary bat roost assessments identified five structures with moderate bat roost potential and three structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points.

6.6.99 During wintering bird surveys there were reasonable flocks of lapwing, including 100 observed on fields west of Long Marton. A flock of 220 starlings was recorded during the February surveys. Willow warbler was recorded across all alternatives in reasonable numbers. A total of 126 house sparrows were recorded across all alternatives, with many records associated with Kirkby Thore. During breeding bird surveys there were curlew, oystercatcher and tree sparrow, which were all recorded in low numbers. Willow warbler was recorded across all alternatives, with a peak count of 24 in April. Low numbers of yellow wagtail were noted in fields to the east and southeast of Kirkby Thore.

6.6.100 Four areas were identified as having high terrestrial invertebrate potential along this alternative, namely shingle banks adjacent to the Troutbeck crossing at Powis House, along the Roman Road between Long Marton and the railway, the parkland at Colby Laithes, and Brandcrook Hill. Surveys are ongoing and results are not available for the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

6.6.101 Whilst complete analysis of macrophyte field survey data was not available at the time of writing this report, it should be noted the Nationally Scarce bryophyte *Porella pinnata* was recorded during surveys of Trout Beck (Temple Sowerby to Appleby, in the vicinity of the Red alternative).

### Orange alternative

6.6.102 To the north, this alternative crosses mixed arable and improved grassland habitats, some with species-rich intact hedges and trees (Priority Habitat and may be 'Important'). Parallel to this to the south along the existing A66 the dualling crosses improved grassland and intact hedgerow.

6.6.103 The dualling of the existing A66, includes local road upgrades to the south of the A66 over hedgerow and roadside verge habitats of semi-improved grassland and tall ruderal habitats, whilst the main route then moves south of the existing A66 alignment and over the designation of River Eden SAC and River Eden and Tributaries SSSI at Trout Beck (Annex 1 habitat and Priority Habitat). It then crosses an area of mixed habitats including open mosaic habitat (Priority Habitat), pond/ marsh, bracken, grassland scrub and woodland, associated with an old channel of the river and the roman road. It then passes through further farmland habitats of improved grassland, arable and hedgerows (Priority Habitat and may be 'Important'), but also over semi-natural habitats associated with the disused rail corridor and the roman road where not used as grazing pasture.

6.6.104 On the existing A66, the route is diverted to the north across the roman road, which forms an islanded area of hedgerow (Priority Habitat or may be 'Important') sections, dense to scattered scrub, scattered broad-leaved trees and grassland habitats, this also being in close proximity to and encroaching into the adjacent River Eden SAC/River Eden SSSI designation (with Annex 1 habitats and Priority Habitat). This route then sweeps to the south and under the proposed new section of A66.

6.6.105 There is one brown hare record located within 2km of the draft DCO boundary of this alternative.

6.6.106 Four areas were identified as having high terrestrial invertebrate potential along this alternative namely along the Roman Road between Long Marton and the railway, the parkland at Colby Laithes, the disused railways at Eden View and Bridge End Farm. Surveys are ongoing and not available to inform the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

## Appleby to Brough

6.6.107 As set out in Chapter 2: The Project and Chapter 3: Alternatives, alternative routes are under consideration for this scheme for two of the three sections. This section describes features relevant to all alternatives. Information specific to any single alternative is described under each heading below (Refer to Chapter 2: The Project for detailed descriptions for each alternative).

6.6.108 Moor House and Upper Teesdale SAC and North Pennine SPA are 704m north east of this scheme and the River Eden SAC and River Eden Tributaries SSSI are 700m south of this scheme. Appleby Fells SSSI is 1.5km north off the eastern end of this scheme and Hellbeck and Swindale Woods SAC and SSSIs are 520m north of this scheme. George Gill geological SSSI is 400m to the north.

6.6.109 There are six non-statutory sites for this scheme: Sandford Mire CWS, Tricklebanks Wood CWS, Swindale Woodland CWS and the following sites of invertebrate significance: Helbeck Wood, Swindale Wood and Great Musgrave Swindale Beck Ers.

6.6.110 The following designated sites are within 200m of the ARN: Argill Woods and Pastures SSSI, Augill Valley Pasture SSSI and Sandford Mire CWS.

6.6.111 Sandford Mire CWS is the only designated site within 200m of the draft DCO boundary (construction dust/demolition activities).

6.6.112 This scheme passes to the south of the North Pennines Area of Outstanding Natural Beauty (AONB), with more upland influences on the habitat types present including both good and poor condition fen, mires, bryophyte heath, dry heath, wet dwarf shrub heath, acid grassland (all Priority Habitats and Annex 1 upland heathland habitat present); amongst arable and improved grassland habitats and some large areas of marshland, coniferous woodland and mixed woodland. In the wider area there are further important habitats (many Priority Habitats as per upland and deciduous woodland, rivers and streams and floodplain grazing marsh). The protected and or otherwise notable plant species recorded from desk and field study include: harebell (*Campanula rotundifolia*), tormentil (*Potentilla erecta*), bitter vetch (*Lathyrus linifolia*), crosswort (*Cruciata laevipes*), devils-bit scabious (*Succissa pratensis*), common wintergreen (*Pyrola rotundifolia*), slender sedge (*Carex lasiocarpa*). The following invasive species are also present: giant hogweed on the River Eden and rhododendron.

6.6.113 This scheme crosses two tributaries (Unnamed Tributary of Mire Sike 6.12, and Cringle Beck) that form part of the Eden - Scandal Beck to Lyvennet WFD waterbody (GB102076070880) and seven tributaries (Hayber Beck/Moor Beck, Eastfield Sike, Unnamed Tributary of Lowgill Beck 6.1, Lowgill Beck, Woodend Sike, Yosgill Sike and Unnamed Tributary of Lowgill Beck 6.7; Figure 14.1: Surface Water Features) that form part of the Low Gill (Crooks Beck) WFD waterbody (GB102076070750). These waterbodies achieved 'Good' and 'Poor' Ecological status respectively under WFD in 2019.

6.6.114 All the tributaries crossed by the scheme ultimately flow into the River Eden and Tributaries SAC/SSSI. Based on habitat assessment and desk study records, all the watercourses (with the exception of Unnamed Tributary of Lowgill Beck 6.1 and Unnamed Tributary of Lowgill Beck 6.7) crossed by this scheme are considered to be functionally linked to the SAC/SSSI. Crooks Beck (which Moor Beck and Lowgill Beck flow in to) and the lower reaches of Lowgill Beck are mapped as priority river habitat on Natural England's open source data layer.

6.6.115 The desk study identified 135 records of bats (eight species) within a 2km radius of the study area for all routes, including 57 roosts of which three were maternity roosts (two locations). Five roosts of notable conservation interest were identified through the desk study. Survey results are described under each alternative below.

6.6.116 A water vole reintroduction project in the Warcop area was carried out in 2007 with further releases in 2010. 127 animals were released at Rossmede Tarn & Plantation ponds in 2007. 165 animals were released at Forestry pond, Conservation pond and Cringle Beck in 2008. There were 17 water vole records in the study area.

6.6.117 There were 78 red squirrel records, no pine marten, two polecat, no brown hare and 18 hedgehog records from the past ten years located within 2km of the draft DCO boundary of the Black-Black-Black route and the alternative sections.

6.6.118 There were ten badger records from the past ten years located within 2km of the draft DCO boundary of the Black route/Blue alternative route. The records consist of counts of individuals with low accuracy and field signs in Helbeck Wood.

6.6.119 The desk study returned one adder record located close to the River Eden south-west of Greta Bridge, three records of slow worm; one near the adder location and two that are adjacent Greta Bridge.

6.6.120 Historic records are scant within 2km of this scheme and are for common frog at the west and eastern ends of the scheme to the north of the A66. And a single record for common toad to the west of the scheme, due south of the A66 at Ormside. There is much presence of connective corridors across this area provided by the many small streams on the hill sides of the Pennines.

6.6.121 Twenty-two ponds were subject to amphibian survey, of these 15 ponds were removed from surveys (pond habitat not evident/pond habitats unsuitable/great crested newt assumed likely absent). Two (of the 22) ponds with great crested newt confirmed present (breeding habitat) and five (of the 22) are deemed inconclusive from a survey perspective (some within extensive wetland habitat that is extremely difficult to survey safely), but are within connective habitat of great crested newt presence, so have great crested newt assumed present for the purposes of assessment.

6.6.122 Forty-five terrestrial invertebrate species of conservation concern were recorded; 12 Priority Species, 28 notable, four Red data book and one nationally scarce.

6.6.123 Environment Agency desk study data exists for Hayber Beck where the following fish species of conservation value were recorded between 2010 and 2021: Atlantic salmon, European bullhead and brown/sea trout. Both Atlantic salmon and brown/sea trout were also recorded in Low Gill Beck. Additional Environment Agency fish monitoring sites were identified within the desk study search area for the Scheme on George Gill, River Eden, Swindale Beck and Augill Beck. The following species of conservation value were recorded between 2010 and 2021: Atlantic salmon, European bullhead, European eel and brown/sea trout.

6.6.124 Desk study records for white clawed crayfish exist for Hayber Beck approximately 2km upstream of the existing A66 crossing at Warcop. Further records of white-clawed crayfish were identified within the desk study search area from Mire Sike, River Eden, and Helm Beck. The survey of Unnamed Tributary of Mire Sike 6.12 identified a healthy white-clawed crayfish population. Further surveys are ongoing and will be reported in full in the ES.

6.6.125 The waterbodies described in paragraph 6.6.91 were classified by the Environment Agency as 'High' for the invertebrate element in 2019 and have both been classified as 'High' since 2015. Six Environment Agency invertebrate monitoring sites were identified within the desk study search area for this scheme, on Helm Beck, Hitlon Beck, Crooks Beck, Swindale Beck and Augill Beck. The following species of conservation value (Nationally Scarce) were recorded (2010 - 2021) from Helm Beck and Hitlon Beck: the Riffle beetle *Riolus subviolaceus* and the caddisfly *Potamophylax rotundipennis*.

6.6.126 The Eden - Scandal Beck to Lyvennet WFD waterbody was classified by the Environment Agency as 'High' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'High' since 2015. The Low Gill (Crooks Beck) WFD waterbody was classified by the Environment Agency as 'High' for the combined macrophyte and phytobenthos element in 2019 and was classified as 'High' in 2016 and 'Good' in 2015. Six Environment Agency invertebrate monitoring sites were identified within the desk study search area for this scheme, from Helm Beck, Hitlon Beck, Crooks Beck, Swindale Beck and Augill Beck. Bladder sedge (*Carex vesicaria*) which is Vulnerable in England and the invasive species Canadian pondweed were both recorded.

### Black-Black-Black route

6.6.127 This route crosses the watercourses and habitats described above.

6.6.128 A total of 13 potential bat crossing points have been identified through the scheme extents for the Black-Black-Black route. The preliminary bat roost assessments identified seven structures with moderate bat roost potential and five structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points.

6.6.129 There were five otter records from the past ten years including two roadkill records, one on the existing road watercourse crossing point on Eastfield Sike, and the second on the existing road watercourse crossing point on Moor Beck main river. This alternative extends existing crossing points and creates several new crossing points for otter.

6.6.130 There were six roe deer records from the past ten years located within 2km of the draft DCO boundary of Black route/Blue alternative.

6.6.131 Wintering bird survey results included a peak count of 880 lapwings during January surveys, 40 golden plovers during February's visit, 186 curlew in March, 16 pink-footed geese in February and 22 oystercatchers in March. A single marsh harrier was recorded during the January survey. One dead barn owl was noted during the March survey visit. During the 2020 Arcadis breeding bird surveys, a single peregrine was observed flying north to south over the current A66. Barn owls were also recorded along this scheme. During the 2021 breeding bird surveys, the following records were of note: a single tree pipit was observed north of Sandford during the May survey. Low numbers of tree sparrow and one kestrel were also noted.

6.6.132 Six areas were identified as having high terrestrial invertebrate potential, namely Meadow Bank View, Warcop Training Area, along the B6259, opposite Sandiford Mire, opposite New Hall, and Ketland Moor. Surveys are ongoing and not available to inform the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

### Blue alternative (central section)

6.6.133 This alternative crosses the same watercourses and habitats described above, with the exception of the section in the vicinity of the Warcop Training Centre. This alternative also has two additional watercourse crossings of Moor Beck, one approximately 100m upstream of the current A685 crossing and a second approximately 50m upstream of the Moor Beck and Eastfield Sike confluence.

6.6.134 There are five otter records from the past ten years located within 2km of the draft DCO boundary of this alternative. There are two roadkill records, one on the existing road watercourse crossing point on Eastfield Sike, and the second on the existing road watercourse crossing point on Moor Beck main river. This alternative also extends existing crossing points and creates several new crossing points for otter, of particular note this alternative crosses Moor beck (highly suitable maternity habitat) five times.

6.6.135 Wintering bird survey results included 136 curlews in March and 36 meadow pipits during March. Breeding bird survey results included four curlews, 22 meadow pipits and low numbers of tree sparrow. Willow warblers were recorded across all alternatives, with a peak count of 28 in May.

6.6.136 Seven areas were identified as having high terrestrial invertebrate potential, namely Meadow Bank View, Warcop Training Area, along the B6259, opposite Sandiford Mire, opposite New Hall, Ketland Moor and Toddygill Plantation. Surveys are ongoing and not available to inform the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

### Orange alternative (eastern section)

6.6.137 This alternative crosses the same watercourses and habitats described above. The alignment is broadly consistent with the Black-Black-Black route described above with respect to its interaction with watercourses, with the exception of the section to the far east of the scheme. At this location the Orange alternative section crosses Lowgill Beck and Unnamed Tributary of Lowgill Beck 6.7 further south of the Blue

and Black alignments in this section of the route, which are consistent in this location and represent a widening of the existing A66 culvert. Unlike the Black-Black-Black route and Blue alternative that cross Lowgill Beck in a section that is already modified by the existing A66, the Orange alternative crosses a more natural section of river that is well-connected to the low-lying floodplain. The river in this reach has natural bed and banks and a wide riparian corridor consisting of riparian woodland and some riparian ponds.

6.6.138 Unnamed Tributary of Lowgill Beck 6.7 is shallow with gravel and cobble substrate in the vicinity of the proposed Orange alternative watercourse crossing. Downstream of this point the river was characterised by very shallow water over deep sand and silt. This watercourse is unlikely to be of high conservation value and is considered unlikely to support notable and/or protected aquatic species, including qualifying species of the River Eden and Tributaries SAC/SSSI.

6.6.139 For bats, the Orange alternative shares the majority of the same crossing points as detailed above within the Black-Black-Black route and the Blue alternative, but differs at the eastern end of the alignment with an additional crossing point with a line of trees/hedgerow to the south of Mains House farm, giving a total of 14 crossing points identified for the alternative. The preliminary bat roost assessments identified seven structures with moderate bat roost potential and seven structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points. Two further structures are yet to be assessed due to access limitations, namely a cottage in Low Broomrigg and Mainsgill House to the west of Brough. These assessments will be reported in the ES.

6.6.140 There are four otter records from the past ten years located within 2km of the draft DCO boundary of this alternative. There are two roadkill records, one on the existing road watercourse crossing point on Eastfield Sike, and the second on the existing road watercourse crossing point on Moor Beck main river. This alternative also extends existing crossing points and creates several new crossing points for otter, of particular note, the draft DCO boundary creates a new crossing point over Lowgill beck that is currently undisturbed and is highly suitable otter habitat.

6.6.141 There are two roe deer records from the past ten years located within 2km of the draft DCO boundary of this alternative.

6.6.142 Wintering bird survey results included 50 starlings in March, west of Brough and 73 common gulls during March survey visit. Breeding bird survey results included 18 lesser redpolls, recorded near the eastern end of the scheme and 12 oystercatchers noted in fields west of Brough.

6.6.143 Seven areas were identified as having high terrestrial invertebrate potential namely Meadow Bank View, Warcop Training Area, along the B6259, opposite Sandiford Mire, opposite New Hall, Ketland Moor and West View. Surveys are ongoing and not available to inform the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

### Bowes Bypass

6.6.144 The scheme is situated at the eastern edge of the North Pennines AONB and the North Pennines Moors SAC and North Pennine Moors SPA are 39m north. Qualifying features are listed in Table 6-2: Statutory designated sites within the biodiversity study area. Bowes Moor SSSI is located 39m north-west and Kilmond Scar SSSI is located 747m south-east of this scheme.

6.6.145 The following designated sites are within 200m of the ARN: North Pennines Moors SAC, North Pennine Moors SPA, Bowes Moor SSSI.

6.6.146 Within 200m of the draft DCO boundary (construction dust/demolition activities) are North Pennines Moors SAC, North Pennine Moors SPA, Bowes Moor SSSI.

6.6.147 The habitats recorded largely comprised improved grassland with fences or stone walls as boundary features. There were a few areas of arable, species-poor semi-improved grassland, amenity grassland, scattered trees, marshy grassland. There was a disused rail line to the east which contains areas of semi-improved neutral grassland and stone walls with non-ruderal habitat (ferns), This area and the wider area also supported a few pond habitats. To the east were also active and disused limestone quarries, part of which is a designated site Kilmond Scar SSSI. In the wider area were many ancient or veteran trees, many associated with Deepdale Ancient Woodland. The protected and or otherwise notable plant species recorded: common heather, early purple orchid (*Orchis mascula*), good-King-Henry (*Blitum bonus henricus*), tormentil, marsh ragwort (*Jacobaea aquaticus*), Welsh poppy (*Meconopsis cambrica*), harebell, and the endemic species perennial flax (*Linum perenne* ssp. *anglicum*).

6.6.148 This scheme crosses only Unnamed Tributary of River Greta 7.3 north of Bowes, which forms part of the Greta from Sleightholme Beck to Eller Beck WFD waterbody (GB103025072140). This waterbody achieved 'Moderate' Ecological status under WFD in 2019. This minor watercourse is heavily modified by numerous culverts; the proposed alignment falls entirely within a section of the watercourse that is already culverted for 600m (under the existing A66 and surrounding agricultural land). Approximately 150m upstream of the confluence with the River Greta, the watercourse flows down a series of waterfalls which are impassable for all fish species; the watercourse is therefore considered unlikely to support notable and/or protected aquatic species associated with the River Greta.

6.6.149 The desk study identified a total of ten records of bats within a 2km search radius including four species (common pipistrelle, soprano pipistrelle and whiskered/Brandt's bat). No notable roosts of conservation interest were identified as part of the desk study. The preliminary bat roost assessments identified three structures with moderate bat roost potential and six structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points. A total of four potential bat crossing points were identified within the scheme, all of which are attributed to existing accommodation underpass or underbridge structures. Cumulative results (bat passes) for the scheme were limited to one common pipistrelle.

6.6.150 There was one otter record from the past ten years located within 2km of the draft DCO boundary of this scheme. One otter field sign was identified on a watercourse surveyed within 250m of this scheme. No potential holt and/or resting features have been identified within 250m of the scheme.

6.6.151 There were no records of water vole within 2km of the draft DCO boundary. No field signs for water vole were identified within 100m of the scheme.

6.6.152 There were no red squirrel records from the past ten years located within 2km of the draft DCO boundary of this scheme. Due to the lack of red squirrel field signs being identified during the terrestrial mammal walking transect route surveys, no further detailed surveys were considered necessary.

6.6.153 There were 41 badger records from the past ten years located within 2km of the draft DCO boundary of this scheme. All records were associated with a sett located north of Bowes at High Crag, spanning from 2013 to 2014 and consisted of badger movements and field signs such as snuffle holes and latrines. Field surveys found no badger setts of any classification or field signs of badgers using the area for foraging or commuting purposes within 250m of the scheme.

6.6.154 No camera trap data or field signs of pine marten were observed from suitable habitat located within 250m of this scheme.

6.6.155 There were no polecat records but eight brown hare, four roe deer and 14 hedgehog records from the past ten years located within 2km of the draft DCO boundary of this scheme. No field signs of any species were identified during the relevant surveys and no species have been pictured on the wildlife cameras.

6.6.156 During wintering bird surveys there were, 157 common gull, 326 lapwings (both recorded in December), 662 starling, 15 golden plovers and one merlin (all recorded in January). Data from the Arcadis breeding bird surveys (2020) included golden plover commuting in the survey area. Breeding bird surveys (2021) identified: in April, 22 curlews, 13 mistle thrushes and three redshanks. In May, a peak count of 102 lapwings, 28 oystercatchers and one spotted flycatcher. In June, one golden plover (SPA citation species) and on the southern edge of the SPA, a single marsh tit was recorded and a peak count of 308 starlings were recorded.

6.6.157 There are no historic records for reptiles within 2km of the draft DCO boundary, but there is a record for adder (4km south-west) on the northern bank of the River Greta south of Rokeby, with potential for connections via the River Greta to Bowes. There is also an anecdotal record for adder on moorland to the north of Bowes in February 2021, approximately 2.6km distance north and with connective habitat to the proposed scheme. There is a record for common lizard 521m to the west of the works within habitats connected to Hulands Quarry and the northern road verge. The presence of suitable habitats at the peripheries of this scheme have the potential to support adder (north of the scheme within moorland and south of the Scheme associated with the banks of the River Greta). Common lizard may also be present within habitats to the peripheries of Hulands Quarry, the disused rail corridor and road verges. Due to these areas being connected to the works further surveys are required.

6.6.158 The only historic record is for great crested newt at Hulands Quarry to the east of this scheme. Works are proposed within 600m, with connective habitat provided by the quarry fringes and stone wall habitats.

6.6.159 Three ponds were subject to amphibian survey, and of these two are within the quarry, these have been scoped out based a complete survey (great crested newt assumed likely absent). It is likely other ponds in this area will require survey based on the adjacent desk study record for great crested newt. The remaining one was scoped out due to this being running water and not a pond.

6.6.160 Five terrestrial invertebrate species of conservation concern were recorded; Small Heath (*Coenonympha pamphilus*) a Priority Species; Green Hairstreak (*Callophrys rubi*) a Durham BAP species; and three notable flies *Dactylolabis transversa, Limnophila pulchella* and *Limonia trivittata*.

6.6.161 The waterbody mentioned in paragraph 6.6.148 was classified by the Environment Agency as 'Moderate' for the fish element in 2019 and has been classified as "Moderate" since 2015. Environment Agency fish monitoring sites were identified within the desk study search area on the River Greta. The following species of conservation value were recorded between 2010 and 2021: Atlantic salmon, European bullhead and brown/sea trout.

6.6.162 No records of white-clawed crayfish were identified within the desk study search area for this scheme. A survey of Unnamed Tributary of River Greta 7.3 is scheduled for 2021.

6.6.163 The waterbody mentioned in paragraph 6.6.54 was classified by the Environment Agency as 'High' for the invertebrate element in 2019 and has been classified as

"High" since 2015. Environment Agency invertebrate monitoring sites were identified within the desk study search area on the River Greta, Slightholme Burn and Greta Burn. The only species of conservation value recorded (2010 - 2021) was the caddisfly *Allotrichia pallicornis* from the Greta Burn.

6.6.164 The waterbody mentioned in paragraph 6.6.54 was classified by the Environment Agency as 'High' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'High' since 2014. One Environment Agency macrophyte monitoring sites was identified within the desk study search area for the scheme.

6.6.165 No desk study records of macrophyte species of conservation value or invasive species were returned.

## Cross Lanes to Rokeby

6.6.166 As set out in Chapter 2: The Project and Chapter 3: Alternatives, two alternative junctions are under consideration for this scheme. This section describes features relevant to all alternatives. Information specific to any single alternative is described under each heading below (Refer to Chapter 2: The Project for detailed descriptions for each alternative).

6.6.167 Brignall Banks SSSI (607m south-east) and Kilmond Scar SSSI are within 2km of this scheme. There are three non-statutory sites within 1km. Teesbank Woods, Rokeby LWS (460m north), Thorsgill Woods LWS (558m north) and Rokeby Park and Mortham Woods LWS (immediately adjacent to the scheme).

6.6.168 There are currently no designated sites within 200m of the ARN, but several Ancient Woodland sites are present including Jack Wood, Thorsgill Wood, Waterfall Wood and Teesbank Wood).

6.6.169 Within 200m of the draft DCO boundary (construction dust/demolition activities) are Jack Wood AW and Waterfall Wood AW.

6.6.170 The dominant habitat is arable with smaller areas of broad-leaved woodland (Priority Habitat/Ancient Woodlands) and a large extent of parkland habitat with many veteran and ancient trees and deadwood resource. The protected or otherwise notable plant species are extensive for this scheme. Notable protected plant species include: early purple orchid (*Orchis mascula*), common cow wheat (*Melampyrum pratense*) and bluebell. The following invasive species are present: Himalayan balsam and Japanese knotweed. There is an area of suspected treated giant hogweed, to the south of the A66.

6.6.171 The alternatives in this scheme cross watercourses that form part of the Greta from Gill Beck to River Tees WFD waterbody (GB103025072130) and Tees from Percy Beck to River Greta WFD waterbody (GB103025072512). These waterbodies both achieved 'Good' Ecological status under WFD in 2019.

6.6.172 The desk study identified 39 records of bats (seven species), including four roost records for common/soprano pipistrelle.

6.6.173 Badger, otter, water vole, red squirrel, pine marten, polecat field, brown hare, deer, hedgehog surveys have not yet been completed for all route alternatives being considered for this scheme.

6.6.174 There are six badger, 24 otter, two red squirrel, ten brown hare, 13 roe deer records and 21 hedgehog records from the past ten years located within 2km of the draft DCO boundary of this route. The draft DCO boundary creates five new potential otter crossing points that are currently undisturbed and expands of three existing potential crossing points.

6.6.175 There are no polecat or water vole records from the past ten years located within 2km of the draft DCO boundary for this scheme.

6.6.176 The desk study identified records for slow-worm adjacent to the highway boundary and suitable habitat is present. A single adder record was also returned from the River Greta due south of the A66. The connective distance to the works from the adder record is significant, being at 2.6km and almost within the accepted home range of 2km for adder, with suitable habitat between the record and the works. The two records for slow-worm near to Greta Bridge, due south-west of the works are significant and are within connective habitat to the works areas via road verges, grasslands, hedgerows and woodlands. Therefore, the presence of slow-worm is anticipated for habitats both within and adjacent to the works. For adder there also remains potential for this species to be present within works areas, based on connective features between the record and the works.

6.6.177 No historic records were received for any amphibian species.

6.6.178 Eight ponds were subject to amphibian survey, of these five ponds were removed from surveys (pond habitat not evident/pond habitats unsuitable/great crested newt assumed likely absent). Three (of the eight ponds) remain scoped in for further survey due to access limitations.

6.6.179 Six terrestrial invertebrate species of conservation concern were recorded for this scheme.

6.6.180 Greta from Gill Beck to River Tees WFD waterbody was classified by the Environment Agency as 'High' for the invertebrate element in 2019 and has been classified as "High" since 2015. Tees from Percy Beck to River Greta WFD waterbody was classified by the Environment Agency as 'High' for the invertebrate element in 2019 and 2016, having been classified as 'Good' previously. The following species of conservation value were recorded (2010 - 2021): the caddisfly *Allotrichia pallicornis* and the yellow-legged water-snipe.

6.6.181 Greta from Gill Beck to River Tees WFD was classified by the Environment Agency as 'High' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'High' since 2014. Tees from Percy Beck to River Greta WFD waterbody was classified by the Environment Agency as 'Good' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'Good' since 2014.

### Black Cross Lanes – Black Rokeby route

6.6.182 The Black Cross Lanes – Black Rokeby route (herein referred to as Black route) creates islands of previously connected land at the Rokeby junction within which are habitats of stone walls, semi-improved grasslands, gardens with amenity grasslands and scattered trees, buildings.

6.6.183 This route crosses four watercourses (Unnamed Tributary of Tutta Beck, Unnamed Tributary of Tutta Beck 8.1, Tutta Beck, Unnamed Tributary of Tutta Beck 8.2). Tutta Beck is crossed approximately 150m east of Moorhouse Lane. Optimal fish habitat was recorded in this section, characterised by diverse habitats (pools, runs, riffles and glides) with gravel and cobble substrate, and marginal silt deposits. The section of this watercourse in the vicinity of the proposed crossing is sinuous and dynamic; the channel is actively meandering, as evidenced by significant bank erosion and point bar deposition. This watercourse has the potential to support notable and/or protected aquatic species, including species associated with the River Greta and River Tees. The tributaries of Tutta Beck are minor watercourses and considered likely to be ephemeral; based on habitat assessment (surveys pending) and their

ephemeral nature, these watercourses are considered unlikely to support notable and/or protected aquatic species.

6.6.184 The preliminary bat roost assessments identified nine structures with moderate bat roost potential and seven structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points. One further structure is yet to be assessed due to access limitations. A total of seven potential bat crossing points have been identified within the alignment. All of these points are linear hedgerow/woodland corridors that cross the alignment providing connectivity between the woodland areas noted above. The locations include Cross Lanes junction (B6277), Streetside Farm, the farm track entrance to Rokeby Grange, a hedgerow to the south of Rokeby Chapel and two further locations to the west of Rokeby Grove.

6.6.185 The Black route alignment creates a new water vole crossing point on Tutta Beck and expands an existing crossing point on an unnamed tributary of Manyfold Beck.

6.6.186 Records of note from the wintering bird surveys included: during March, 850 lapwings, 679 golden plovers and 75 fieldfares. One dead barn owl was recorded during the February survey. Records of note from the breeding bird survey included the following: 11 tree sparrows and reasonable numbers of oystercatchers noted on fields to the north and south of the Black alignment.

6.6.187 Four areas were identified as having high terrestrial invertebrate potential, namely Rokeby Park, Greta Bridge, Church Plantation and Cross Lanes. Surveys are ongoing and not available to inform the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

6.6.188 The Tees from Percy Beck to River Greta waterbody has not been assessed by the Environment Agency for the fish element. The Greta from Gill Beck to River Tees waterbody was not assessed for the 'fish' element in 2019; this waterbody was last classified by the Environment Agency as 'Good' for the fish element in 2014. The following species of conservation value were recorded between 2010 and 2021: Atlantic salmon, European bullhead, European eel, brown/sea trout and European grayling.

### Blue (Cross Lanes) alternative

6.6.189 Habitats present here are as in the description above, differing in that the footprint of this alternative includes a greater extent of hedgerows and trees and improved grassland habitats. This alternative creates islands of previously connected land at the Cross Lanes junction and an islanded area between the two roads (existing and proposed route of A66), within which are habitats of stone walls, semi-improved grasslands, gardens with amenity grasslands and scattered trees and buildings.

6.6.190 This alternative junction crosses four watercourses (Punder Gill, Unnamed Tributary of Punder Gill 8.1, Unnamed Tributary of Tutta Beck 8.1 and Unnamed Tributary of Tutta Beck 8.2). Punder Gill is crossed approximately 500m west of Moorhouse Lane. A habitat assessment of this section of watercourse has yet to be completed, however based on review of aerial imagery, this section is considered likely to consist of similar habitats to those recorded in the surveyed section of Tutta Beck (which Punder Gill becomes further downstream) as described above. Based on this assumption, this watercourse has the potential to support notable and/or protected aquatic species, including species associated the River Greta and River Tees. As for the Black route, the minor tributaries of Manyfold Beck and Punder Gill that are crossed are considered likely to be ephemeral. They are considered unlikely (surveys pending) to support notable and/or protected aquatic species.

6.6.191 All the potential bat crossing points listed above for the Black route/Orange alternative are duplicated within the Blue alternative junction with an additional point on Tutta Beck to the east of Tutta Bridge. The preliminary bat roost assessments identified nine structures with moderate bat roost potential and seven structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points. One further structure is yet to be assessed due to access limitations.

6.6.192 The draft DCO boundary expands existing water vole crossing points over Punder Gill, an unnamed tributary of Manyfold Beck, Manyfold Beck and an unnamed tributary of Tutta Beck, and creates new crossing points on an unnamed tributary of Punder Gill.

6.6.193 Records of note from the wintering bird surveys include, during March, 14 house sparrows, 32 mallards and common gull. Records of note from breeding bird surveys include, during April, 69 fieldfares and reasonable numbers of Mallard. A single yellow wagtail was noted on fields west of Rokeby during the June survey.

6.6.194 Seven areas were identified as having high terrestrial invertebrate potential namely Rokeby Park, Greta Bridge, Church Plantation, Cross Lanes, Princess Charlotte Wood, Smithy Cottage and North Bitts. Surveys are ongoing and not available to inform the PEI Report; however, the presence of species assemblage types and notable species has been assumed based on the preliminary results received to date.

6.6.195 Given that fish are a highly mobile species and the aquatic habitat is broadly consistent in the vicinity of the Black route and the Red and Orange alternatives, the desk study records described for the Black route above are equally relevant to this junction alternative.

### Orange (Rokeby) Alternative

6.6.196 The habitats within this alternative junction are the same as the overview, differing in that the habitat affected includes both severance of and disturbance to an area of broad-leaved woodland (Priority Habitat) and a greater area of the southern boundary of the parkland habitat associated with Rokeby Hall. This junction alternative does not interact with any watercourses.

6.6.197 The preliminary bat roost assessments identified five structures with moderate bat roost potential and three structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points. A total of five potential bat crossing points have been identified within the junction alternative. All of these points are linear hedgerow/woodland corridors that cross the alignment providing connectivity between the woodland areas noted above.

6.6.198 Records of note from the wintering bird surveys include: during March, 12 fieldfares, 12 meadow pipits and six black-headed gulls. Breeding bird records consist of common and widely encountered Green List species.

6.6.199 The four areas identified as having high terrestrial invertebrate potential for the Black route are applicable for this alternative junction and walkover surveys were/will be undertaken.

6.6.200 Given that fish are a highly mobile species and the aquatic habitat is broadly consistent in the vicinity of the Black route, Red and Orange alternative junctions, the desk study records described for the Black route above are equally relevant to this alternative junction.

## Stephen Bank to Carkin Moor

6.6.201 There are no statutory designated sites scoped in for assessment for this scheme. There are two non-statutory sites within 1km of the scheme, namely Aske Estate

Woodlands LWS and Ravensworth Park – Castle Fetch LWS. Stephen Bank Road Verge LWS (within the scheme) has been de-notified and is no longer a LWS.

6.6.202 Ravensworth Park – Castle Fetch LWS is within 200m of the ARN.

6.6.203 The de-notified Stephen Bank Road Verge LWS is within 200m of the draft DCO boundary (construction dust/demolition activities).

6.6.204 The predominant habitat here was identified as arable with some improved grassland, between which are small areas of broadleaved woodland, a variety of hedge conditions from new to old and species-rich with trees. A few small watercourses were present which supported modified wetland habitats including a previously wooded area, that has been felled and developed into an extensive reedbed (classed as deciduous woodland Priority Habitat but now the majority is reed bed which is also considered Priority Habitat). The scheme also passes through several woodland blocks of mixed plantation (deciduous woodland Priority Habitat) which are largely lacking in good structure, and/or good ground flora. The protected and/or otherwise notable plant species recorded include: field mouse-ear, lesser spearwort (*Ranunculus flammula*), devil's-bit scabious, corn spurrey (*Spergularia arvensis*), bluebell, crosswort, harebell and tormentil. The following invasive species present include: Himalayan balsam, Japanese rose (*Rosa rugosa*), rhododendron.

6.6.205 This scheme crosses five minor tributaries (Unnamed Tributary of Dalton Beck 9.2, Unnamed Tributary of Dalton Beck 9.3, Mains Gill, Unnamed Tributary of Holme Beck 9.1, Unnamed Tributary of Holme Beck 9.2) that flow into Holme Beck and form part of the Skeeby/Holme/Dalton Bk from Source to River Swale WFD waterbody (GB104027069180). This waterbody achieved 'Moderate' Ecological status under WFD in 2019. The watercourses crossed by this scheme are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of man-made barriers that restrict the movement of aquatic species.

6.6.206 The desk study identified three records of bats (common pipistrelle and noctule) within a 2km search area from the scheme, neither record related to a roost site. The preliminary bat roost assessments identified two structures with moderate bat roost potential and five structures with high bat roost potential within the draft DCO boundary or within 100m of the potential bat crossing points. A total of seven potential bat crossing points were identified within the scheme. Of these, one is a woodland block that will be predominantly lost (opposite Ravensworth Lodge), five are linear habitats (hedgerow/woodland) and one is Mains Gill watercourse to the south of the existing A66 alignment. Cumulative results (bat passes) for the scheme were four common pipistrelle, six soprano pipistrelle and one noctule.

6.6.207 There were three otter records from the past ten years located within 2km of the draft DCO boundary of this scheme. The records consisted of spraints and two roadkill. One roadkill is associated with an existing crossing point on an unnamed tributary of Smallways Beck and adjoining fishing ponds, the second is an existing road crossing point on the unnamed Tributary of Holme Beck. No otter field signs were identified on any of the watercourses surveyed within 250m of this scheme. Seven sections of watercourses were surveyed for otter. No potential holt and/or resting features have been identified within 250m of the Stephen Bank to Carkin Moor scheme.

6.6.208 Six sections of watercourses were surveyed for water vole. There were no field signs for water vole identified within 100m of this scheme.

6.6.209 There were two badger records from the past ten years located within 2km of the draft DCO boundary of this scheme. Field surveys have found no badger setts of any classification or field signs of badgers using the area for foraging or commuting

purposes within 250m of the scheme. However, camera traps 4 and 5 did identify badger activity within two of the woodland areas located to the north of the existing A66 carriageway.

6.6.210 No camera trap data or field signs of pine marten were observed from suitable habitat located within 250m of this scheme.

6.6.211 There are three otter records, no polecat, no brown hare, one roe deer, one hedgehog and no red squirrel records from the past ten years located within 2km of the draft DCO boundary of this scheme.

6.6.212 Red squirrel detailed surveys have not yet been completed for this scheme.

6.6.213 Records of note from the wintering bird surveys include six grey partridges, 101 linnets and 22 stock doves (December). Records from the breeding bird surveys include: 21 linnets, 17 tree sparrows, 15 skylarks and one kestrel (May) and 14 house martins, 31 house sparrows and one spotted flycatcher (June).

6.6.214 There were no reptile desktop records returned for this scheme, though suitable habitats are present and surveys are ongoing.

6.6.215 There are records for smooth newt and great crested newt to the west of this scheme. And within connected habitats provided by the roadside verge. There is only one further historic record for common frog to the north-west of this scheme, but within connected habitats.

6.6.216 Nine ponds were subject to amphibian survey, of these four ponds were removed from surveys (pond habitat not evident/ pond habitats unsuitable/great crested newt assumed likely absent) and one further pond was not accessed. Of the remaining four ponds, one pond has confirmed presence of great crested newt (between farm buildings at the junction of Waitlands Lane and New Lane), one has inconclusive eDNA result (within 168m due south of the existing A66 on New Lane) with assumed presence of great crested newt for the purposes of assessment, and two poor quality ponds are subject to further survey with precautionary assumed presence of great crested newt. Adjacent to here is the watercourse crossing on the Unnamed Tributary of Holme Beck 9.3. which may be used for great crested newt to reach other adjacent areas of suitable terrestrial habitat both north and south of the A66, along with Smallways Beck to the immediate west of Stephen Bank to Carkin Moor Scheme.

6.6.217 Three records of terrestrial invertebrate species of conservation concern were identified: Small Heath and Wall, both Priority Species; and the Near Threatened water beetle *Oreodytes davisii*.

6.6.218 The WFD waterbody discussed in paragraph 6.6.205 was classified by the Environment Agency as 'Good' for the fish element in 2019 and has been classified as 'Good' since 2015. The following species of conservation value were recorded between 2010 and 2021: European bullhead and brown/sea trout.

6.6.219 No records of white-clawed crayfish were identified within the desk study search area for this scheme. A survey of Mains Gill was undertaken in 2020 and returned a nil catch, surveys are ongoing.

6.6.220 This WFD waterbody was classified by the Environment Agency as 'High' for the invertebrate element in 2019 and has been classified as 'High' since 2015.

6.6.221 This WFD waterbody was classified by the Environment Agency as 'Moderate' for the combined macrophyte and phytobenthos element in 2019 and has been classified as 'Moderate' since 2015.

## A1(M) Junction 53 Scotch Corner

6.6.222 There is only one geological SSSI, namely Black Scar Quarry SSSI (1.25km east) scoped in for assessment for this scheme, this site supports the Priority Habitat deciduous woodland.

6.6.223 No further non-statutory sites have been identified within 1km of the works.

6.6.224 There are no statutory sites within 200m of the ARN, there is one non-statutory site Pallet Hill LWS within 200m of the ARN.

6.6.225 There are no designated sites within 200m of the draft DCO boundary (construction dust/demolition activities).

6.6.226 This scheme passes over areas of recently disturbed ground associated with recent junction works at Scotch Corner and small areas of the following habitats: broad-leaved semi-natural woodland within the roundabout (Priority Habitat), broad-leaved plantation, scattered broad-leaved trees and hedgerow (Priority Habitat). The following invasive species are present: yellow archangel (*L. galeobdolon* subsp. *argentatum*) and montbretia (*Crocosmia* x *crocosmiiflora*), rhododendron, hollyberry cotoneaster (*Cotoneaster bullatus*). This scheme does not interact with any watercourses.

6.6.227 The desk study identified five bat records within a 2km search, area of the scheme. The records were of three species, common pipistrelle, soprano pipistrelle and Daubenton's bat. Of these records, only one was for a roost, noted as a 200-count soprano pipistrelle roost an indicative 750m to the east of the draft DCO boundary. The soprano pipistrelle roost identified above is the only significant roost identified in the desk study for the scheme. No potential bat crossing points were identified within the extent of the proposed alignment. Cumulative results (bat passes) for the scheme were seven common pipistrelle, six soprano pipistrelle, one myotis species and one noctule.

6.6.228 There were no badger, otter, water vole, red squirrel, pine marten, brown hare or hedgehog records from the past ten years located within 2km of the draft DCO boundary of this scheme. Field surveys and camera traps have also found no field signs of any species listed above.

6.6.229 There is one polecat record from the past ten years located within 2km of the draft DCO boundary of this scheme. No field signs of polecat were identified during the terrestrial mammal walking transect surveys that took place between November 2020 and January 2021. However, four out of the five camera traps that were deployed did record the presence of potential polecat species.

6.6.230 There is one roe deer record from the past ten years located within 2km of the draft DCO boundary of this scheme. There have been no field signs identified or incidental sightings of deer within 250m of the scheme. However, deer have been pictured on four out of the five wildlife cameras left on site around this scheme.

6.6.231 Records of note from the wintering bird surveys include: six grey partridges during February, nine yellowhammers during March, ten house sparrows during February and 60 meadow pipits during March. Records from the 2021 breeding bird surveys included the following: in April, two lesser redpolls, and 14 yellowhammers. In May, 25 starlings and six skylarks. June records included: two kestrels, three mistle thrushes and six house martins.

6.6.232 There are historic records for smooth newt from a couple of ponds within a cluster, located to the north-east of the A1M and Junction 53.

6.6.233 Five ponds were subject to amphibian survey, four of these were removed from surveys (pond habitat not evident/ pond habitats unsuitable/great crested newt assumed likely absent). With one pond scoped in for further survey.

6.6.234 No reptile desktop records were returned for this scheme, though there is suitable habitat present and surveys are ongoing.

6.6.235 Three records of terrestrial invertebrate species of conservation concern were identified: Small Heath and Wall, both Priority Species; and the Near Threatened water beetle *Oreodytes davisii*.

## 6.7 Potential Impacts

### Construction

#### Habitat loss

6.7.1 Temporary and permanent habitat loss will occur route wide. The draft engineering boundary (shown in Figures 2.1: M6 Junction 40 to Kemplay Bank to Figure 2.8: A1(M) Junction 53 Scotch Corner) shows the expected maximum extent of temporary and permanent site clearance to facilitate construction.

6.7.2 The highways designs detailed for each scheme, where available, indicate the likely extent of permanent habitat loss (See Chapter 4: Environmental Assessment Methodology and Chapter 2: The Project, for further details). The types of habitat lost permanently are predominantly improved grassland, arable land, hedgerows, woodland and semi-improved grassland. The highways design has fully considered designated sites and Priority Habitats and seeks to avoid habitat loss of high conservation value. The alignment width will also be minimised at water crossings to reduce potential impacts.

6.7.3 The remainder of the area included in the draft engineering boundary that falls outside the permanent land take will be used for temporary compounds, haul and access routes, storage and borrow pits, or has been included to allow for flexibility when fixing the detailed design (e.g. to achieve balance of cut and fill). Temporary land take areas will be reinstated post-construction taking account of disturbance and compaction. Opportunities to enhance sites, where possible, will be considered within the ES in consultation with stakeholders and landowners. The construction period is expected to last between 2024 to 2029. The majority of habitats affected by temporary loss are arable land, improved grassland and hedgerow. Priority Habitats have been avoided through design, where possible, although losses remain. Areas of parkland (potentially ancient woodland) and mature trees may be lost at Rokeby and will be subject to further design review to avoid or reduce impacts.

#### Habitat fragmentation

6.7.4 Construction of the project will cause temporary and permanent habitat fragmentation both directly through habitat loss, severance, and through disturbance. This will have the greatest impact on schemes which are all or partially offline including Temple Sowerby to Appleby, Appleby to Brough, Bowes Bypass and Stephen Bank to Carkin Moor. This may affect the ability of plants to disperse, alter community composition and compromise species persistence. In terms of fauna, the offline sections of the road may reduce the viability of existing habitats through reduction of core area and edge effects, sever breeding, foraging or other important resources, reduce dispersal, increased competition and inbreeding. For example, a number of hedgerows will be lost during the construction phase.

6.7.5 Noise and temporary lighting from construction compounds and vehicle movements along haul routes may compound disturbance effects and also deter species from crossing an area to reach an important resource.

### Habitat damage or degradation

6.7.6 Habitats within or adjacent to the scheme, and those which are hydrologically connected, will be at risk of damage and degradation through sediment run-off, water pollution, dust and vehicle emission deposits. Changes to temporary drainage and the hydrological regime may lead to loss, degradation and/or pollution of sensitive habitats. This is particularly relevant at the crossing at Trout Beck which forms part of the River Eden SAC and River Eden and Tributaries SSSI. There are numerous other watercourse crossings along the route wide project. Further details of potential impact pathways are discussed in Chapter 14: Road Drainage and the Water Environment.

6.7.7 Increased deposition of dust on sensitive habitats may cause degradation (for example loss of species, alteration of vegetation community) on sensitive habitats such as the ancient woodland and Chapel Wood CWS adjacent to the Temple Sowerby to Appleby scheme, and Rokeby Park and Mortham Wood LWS adjacent to the Cross Lanes to Rokeby scheme.

### Disturbance

6.7.8 Construction activities including vehicle and personnel movements, noise and vibration may have potential impacts on sensitive species such as breeding and over-wintering birds, roosting bats and other mammals such as otters. If disturbance causes one or several individuals to move away from an area this can result in abandonment of young, reduction in territory and breeding opportunities, increased predation risk and use of critical energy reserves.

6.7.9 Temporary lighting for construction may affect nocturnal species including bats by deterring use of traditional foraging resources, commuting routes or roost locations; and changing the availability of airborne invertebrate prey.

### Species mortality

6.7.10 Vegetation clearance, topsoil stripping and construction have potential to injure and kill a wide range of species. For example, slow moving species, such as reptiles, amphibians, hedgehogs, terrestrial invertebrates and nesting birds, are susceptible to vegetation clearance activities. Similarly, tree felling operations can directly injure or kill roosting bats, nesting birds and squirrels. In-channel works may also risk injury or killing of fish, crayfish and aquatic invertebrates. In addition, and depending on the timing of vegetation and site clearance, species may be in hibernation or breeding season increasing the risk of direct mortality. The effects of mortality on species populations will vary depending on their reproductive strategy, parental investment, how long-lived individual animals are, the rarity of the species and how well connected the habitat is to source populations. For example, site clearance on a habitat containing a rare species may affect long-term population viability, or destruction of a bat maternity colony may have a long-term effect on a regional population.

6.7.11 Temporary construction traffic and vehicle diversions may also increase the chance of a road traffic collisions, on other species including badger, otter, deer, polecat, hedgehog, bats and barn owl.

6.7.12 Increased mortality may also be caused by risk of entrapment in excavations, storage piles and equipment

## Operation

### Habitat fragmentation

6.7.13 During the operational phase, the proposed project will result in permanent habitat fragmentation through severance from traffic movements. The east-west alignment of the proposed project will result in loss of ecological connectivity for north-south movements, which has potential implications for ecosystem and species resilience. However, with habitat creation and enhancement along the route, east-west dispersal and commuting opportunities are likely to be increased for many species.

### Habitat damage or degradation

6.7.14 Habitats within or adjacent to the operational project, and those which are hydrologically connected, will be at risk of indirect damage and degradation through permanent changes to drainage, pollution from road-run off, changes to vehicle emissions and nitrogen deposition. The permanent effects of changes to drainage design and pollution from the operational road surface are detailed in Chapter 14: Road Drainage and the Water Environment.

6.7.15 Increased deposition of nitrogen and other airborne pollutants arising from increased traffic volumes in the wider road network and/or diversions, may also affect the integrity of vegetation communities. Crosby Ravensworth Fell SSSI and Asby Complex SAC are ancient woodlands within 200m of the ARN and therefore have been included in further assessment in relation to potential air quality impacts (refer to the Chapter 5: Air Quality).

### Disturbance

6.7.16 Operational traffic noise and lighting may have permanent effects on how species use foraging, commuting and breeding resources. Limited and ubiquitous species may habituate to areas with higher disturbance effects (Bennie, et al.,, 2018)[20]. However, increased levels of disturbance, such as noise and lighting, will displace most species, including inhibiting and compromising breeding in faunal species and in plants may be shown to affect vegetation composition, times of flowering and/or complex impacts through effects upon plant and invertebrate interactions (foraging). (Bennie, et al., 2016)[21].

6.7.17 Roads and associated infrastructure, such as footpaths, cycle paths and bridleways may also increase levels of human disturbance, through access to recreation areas, which were not previously accessible.

6.7.18 Newly installed permanent lighting at junctions may adversely affect nocturnal species such as bats, by affecting use of traditional foraging ground, commuting routes or inhibiting use of roosting locations. Lighting may also change the availability of airborne invertebrate prey, which can benefit some bat species and reduce foraging availability for others. Lighting along watercourse crossings and underpasses along the road can also affect mammals such as otter.

[20] Bennie, J., Davies, T.W., Cruse, D., Bell.F.,Gaston, K.J., (2017). Journal of Applied Ecology 2018; 55;442-440 for Artificial light at night alters grassland vegetation species composition and phenology, available at: https://BESjournals.online.wiley.com/doi/full/10.1111/1365-2664.1927 [accessed 1 September 2021]

[21] Bennie, J., Davies, T.W., Cruse, D., Gaston, K.J., (2016). Journal of Applied Ecology 2016; Vol104; issue3; pgs611-620 for Ecological effects of artificial light at night on wild plants, available at: https://BESjournals.online.wiley.com/doi/full/10.1111/1365-2745.12551 [accessed 1 September 2021]

### Species mortality

6.7.19 Habitat severance may result in species crossing the new carriageway to access foraging and breeding resources. This is likely to result in injury and direct mortality and an increased risk of road traffic accidents through vehicle collision with larger mammal species such as deer, badger and otter. Many other smaller species are equally susceptible to direct mortality from vehicle collision and subsequent impacts on local-regional populations. Barn owl can be particularly susceptible to road traffic collision as they forage/hunt on roadside verges; equally, many bat species are at risk of collision with vehicles as they fly low when crossing roads.

6.7.20 The dualling of the route wide project is likely to increase traffic speeds and volume in most stretches, which may exacerbate vehicle collision risk. Traffic on side roads may also increase at certain times.

6.7.21 In addition, species with reduced ranges, compromised foraging/breeding resources and suffering stresses from changes to their environment, may be more susceptible to wildlife diseases as a result of the works.

## 6.8 Design, Mitigation and Enhancement Measures

### Design

6.8.1 Baseline information has been used to highlight the presence of biodiversity resources, (for example designated sites, Priority Habitats and areas of importance for species), to ensure, where possible, these receptors are avoided during the design process and designed out where possible. Land take has been minimised as far as possible and construction impacts have been designed out/minimised as far as possible, for example locating access tracks/haul roads and site compound/material storage areas outside of ecologically sensitive sites/habitats. This is an ongoing process and ecological constraints will continue to be fully considered during preliminary and detailed design.

6.8.2 To avoid loss of riparian habitat, fragmentation of riparian corridors and impacts to riverbeds, new bridges will be designed as clear spanning structures with abutments set well back from the river's edge, wherever possible. It is anticipated that the Environment Agency will require a 5m undisturbed buffer zone between the river's edge and the abutment, or more where the position of the abutments have the potential to alter geomorphological processes and natural river function. Aquatic ecologists will work closely with design engineers to ensure proposed watercourse crossings meet best practice in terms of ecological connectivity, based on the species present..

6.8.3 The indicative Environmental Masterplans, to be submitted with the DCO application, will indicate areas for ecology mitigation and enhancement with the objective of connecting surrounding habitats and suggested areas of replacement habitat. Habitats will be replaced on at least a like for like basis with some habitats including waterbodies and watercourses replaced with two for each one lost. Woodland of conservation value will be replaced at a suitable ratio to account for the longevity of that habitat. Planting required for landscape integration, visual screening or noise and water attenuation will all be reviewed to maximise biodiversity gain where possible. The value of all habitat reinstatement, creation and enhancement will be measured

by applying the *Defra Biodiversity Metric 2.0* (Natural England, 2019)[22]. Initial indicative ecological mitigation areas are shown on the map book[23].

6.8.4 Underpasses and crossing point installations for a range of mammal species will be incorporated into the design at appropriate points. These will be comprehensively determined based on data from the ongoing surveys and preliminary design. Ecologists will work closely with design engineers to ensure proposed crossings meet DMRB standards. However, at this time the extent and location of mammal crossing points are, as yet, unconfirmed.

6.8.5 Lighting will be minimised across the project. Where lighting is required, for example at junctions, suitable lighting choices or adaptations will be designed in to avoid light spill to sensitive habitats.

6.8.6 Drainage design will ensure road run-off is channelled into a suitable system to protect retained and newly created habitats. Balancing ponds will be designed as a biodiversity resource with draw-down zones, shallow sides and shelving to maximise opportunities for aquatic wildlife. All balancing ponds will be surrounded by either wetland planting, species-rich grassland or a scrub/grassland mosaic to maximise opportunities for a range of species.

## Mitigation

6.8.7 In accordance with best practice, an Environmental Management Plan (EMP) will be produced in advance of construction works commencing. Impacts during construction, handover and operation will be managed through strict adherence to the EMP (see Appendix 4.1: Outline of Environmental Management Plan for a description of what will be contained in the EMP). This will entail application of best practice techniques and a suite of bespoke control measures to demonstrate compliance with relevant environmental legislation. In addition, with respect to the European Site designations, the EMP will outline environmentally sensitive areas and detail how such areas will be protected during the construction works and subsequent maintenance.

6.8.8 All site works will be carried out in accordance with best environmental working practices to ensure adequate pollution control measures are implemented during construction and operation. This will also include monitoring to ensure the continued effectiveness of working practices.

6.8.9 Any works that disturb drainage features will include necessary mitigation or reinstatement to ensure the features retain their correct working function.

6.8.10 All trenches and work excavations will either be backfilled or covered overnight, or fenced off, to prevent animals falling in, or earth ramp(s)/egress points will be included to allow a means of escape.

6.8.11 Short term airborne pollution resulting from site vehicle emissions and dust will be controlled through best practice measures such as wetting, if dictated by very dry weather conditions.

6.8.12 Appropriate measures will be taken to avoid the spread of invasive and non-native plants, such as Himalayan balsam.

[22] Natural England (2019) The Biodiversity Metric 2.0 (JP029)
[23] The map book is available as part of the consultation materials at: http://www.highwaysengland.co.uk/A66-NTP

6.8.13 Where tree surgery to the crown or roots of trees is necessary, this will be undertaken in accordance with *British Standard (BS) 3998:2010 Tree Work Recommendations* (British Standard, 2010)[24] and appropriate Arboricultural Association advice notes.

6.8.14 The presence of important ecological features has implications for the timing of construction activities. The avoidance of periods of particular sensitivity for protected species such as nesting birds, fish, reptiles and amphibians will be detailed in the EMP and adhered to.

6.8.15 In the event that there is a likelihood of adverse effects on protected species (such as great crested newts, bats, otter, water vole or badger for example), the project will only proceed under a licence granted by Natural England. This will require evidence that there is no alternative approach, and that there will be no detriment to the maintenance of the species at a favourable status in its natural range in order to issue a licence. Where appropriate, specific mitigation and compensation measures will be implemented in such circumstances.

6.8.16 Where certain important ecological features have been identified, or where there is potential presence, and impacts are unavoidable during construction, Reasonable Avoidance Measures and/or Precautionary Working Methods will be developed and implemented under supervision by an Ecological Clerk of Works (ECoW). For example, during a sensitive site clearance and displacement for reptiles.

6.8.17 Pre-construction surveys will be carried out where required.

6.8.18 Planting will be native and locally sourced, where possible. The EMP will include details of the objectives to be achieved by the Landscape and Ecological Management Plan (LEMP) and key measures that must be undertaken (see Appendix 4.1: Outline of Environmental Management Plan) for a description of what will be included in the EMP). This will likely include a framework for long term management and monitoring

## Enhancement

6.8.19 In line with national and local policy, opportunities have been sought to landscape the soft estate in such a way as to provide habitats of enhanced ecological value compared to those that are lost and to increase connectivity. This can be achieved, for example, by altered management of retained habitat and/or planting treelines/hedgerows to provide safe commuting routes for species. Areas required for temporary land-take during construction, for example compound areas and access tracks, will be enhanced for wildlife where possible during reinstatement. All projects must be designed to maximise biodiversity delivery to contribute to Highways England's Corporate target to achieve no net loss of biodiversity by 2025 (Department for Transport & Highways England, 2020)[25]; (Highways England, 2015)[26]. Detailed habitat and species-specific enhancement measures are yet to be designed and will be influenced by ongoing survey information.

[24] British Standard (2010). BS 3998:2010 Tree Work Recommendations
[25] Department for Transport and Highways England (2020) Road Investment Strategy 2 (RIS2):2020 to 2025, available at: https://www.gov.uk/government/publications/road-investment-strategy-2-ris2-2020-to-2025 [accessed 1 September 2021]
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## 6.9 Assessment of the Likely Significant Effects

### Route wide

6.9.1 The potential impacts, high level mitigation and Likely Significant Effects (LSE) based on the preliminary information available are summarised in the table below for the route wide project. All information in this table will be applicable to each scheme, unless otherwise indicated. Table 6-6: Route wide - likely significant effects to Table 6-20: A1(M) Junction 53 Scotch Corner - likely significant effects (Biodiversity) include details for each scheme for each biodiversity resource to highlight additional impacts/mitigation requirements specific to that scheme.

6.9.2 The following biodiversity receptors have been scoped out of the assessment for all schemes.

- Pine marten: scoped out due to the absence of historical biological records within 2km of the schemes in addition to the scheme locations being outside known ranges for pine martens. Furthermore, no evidence has been collected during initial terrestrial mammal surveys to indicate their presence. Consequently, pine marten has been scoped out of the assessment.
- Hazel dormouse: scoped out due to the absence of historical biological records within 2km, the lack of suitable habitat being present within the survey area. Furthermore, no evidence has been collected during initial terrestrial mammal surveys to indicate their presence. Consequently, hazel dormouse has been scoped out of the assessment.

6.9.3 The assessment of air quality (deposition) effects on designated sites and habitats has been informed by the outputs of air quality modelling, as described in Chapter 5: Air Quality and the noise modelling, as described in Chapter 12: Noise and Vibration. The potential effects are reported in relation to each specific site within the scheme closest to the site or habitat, however it should be noted that the air quality and noise modelling is route-wide and therefore consider the effect of all schemes (the project) on that site or habitat. They are also based on traffic modelling that includes consideration of other proposed development and proposed upgrades to the wider Strategic Route Network and is therefore inherently cumulative.

Table 6-6: Route wide - likely significant effects

| **Receptor and Valuation:** | **Statutory Designated sites (National to International Value – see Table 6-2 for values** |
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| **Potential Impacts (Construction)** | |
| Habitat loss: potential for direct loss of habitat through site clearance for the temporary or permanent footprint of the route wide project.<br>Habitat fragmentation: potential for fragmentation impacts on designated sites relating to watercourses such as River Eden SAC and SSSI. No direct fragmentation impacts are predicted for terrestrial-based designated sites. Habitat fragmentation for species associated with the designated site may cause issues with dispersal or access to foraging resources, which may affect local population viability.<br>Habitat damage/degradation: there are potential air quality effects on designated sites within 200m of construction activities, which may cause degradation to sensitive habitats and species. Potential water pollution issues may also cause indirect effects on designated sites. Potential spread of invasive species into designated sites. | |

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| Disturbance: potential noise and lighting from construction activities may disturb species associated with the site.<br>Species loss: direct mortality of species associated with the designated site may occur during site clearance if due care is not taken. |
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| Habitat damage/degradation: there are potential air quality effects on designated sites within 200m of the Affected Road Network which may cause degradation to sensitive habitats and species. Air quality impacts have been assessed for each designated site separately, within Chapter 5: Air Quality section of the PEI Report. Where there is the potential for impacts to sites or habitats then these are stated under each scheme, but this is currently limited to where a 1% change in the baseline concentrations for nitrogen (gaseous) are detected through air quality modelling and assessment following LA105 guidance. Further details are required regarding nitrogen loading (deposition), increased nitrogen impacts due to ammonia, and detail regarding cumulative effects. These will be addressed within the ES. Water pollution from road run off and changes to drainage may cause habitat degradation.<br>Disturbance: potential required lighting for safety at junctions may have a negative impact on plant species/vegetation communities within designated sites. Potential for increased disturbance through recreational activities from new walking, cycling, and horse-riding routes and increased traffic noise, which may disturb species associated with the site.<br>Species loss: potential for increased direct mortality of mobile species associated with the site from traffic collisions. |
| **Design, Mitigation and Enhancement Measures** |
| Habitat loss: designated sites have been avoided through design, where possible. Any remaining temporary direct impacts, such as discharge routes, will be examined through ongoing design reviews to relocate these outside of designated sites, where possible.<br>Habitat fragmentation: mitigation related to habitat and species fragmentation below will be relevant to mitigate impacts on designated sites. Avoiding isolation of designated sites, and identifying opportunities to improve connectivity, will be considered during the ongoing design of habitat replacement and enhancement.<br>Habitat damage and degradation: best practice construction methods with respect to working in/near water and dust suppression will be employed and will be set out in the EMP. Protection measures to avoid disturbance to invasive species that could cause their spread and likely implementation of measures to eradicate these species from works areas will be detailed in the EMP. The air quality assessment is ongoing and appropriate mitigation for the operational stage will be considered full for the ES if air quality impacts are identified.<br>Disturbance: operational lighting design will be reviewed by ecology specialists to avoid or mitigate lighting impacts. Further assessment is required for recreational impacts and operational traffic noise to inform any required mitigation.<br>Species loss: measures set out in the EMP will include sensitive vegetation clearance and ECoW supervision during vegetation clearance and construction activities. |

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| **Likely Significant Effect Following Mitigation?** | *Set out under each scheme for individual designated sites.* |
| **Receptor and Valuation:** | Non-statutory Designated sites (County value) |
| **Potential Impacts (Construction and Operation)** | |

Habitat loss: potential for direct loss of habitat through site clearance for the temporary or permanent footprint of the route wide project.
Habitat fragmentation: potential for fragmentation impacts where part of a site is lost. Habitat fragmentation for species associated with the designated site may cause issues with dispersal or access to foraging resources, which may affect local population viability.
Habitat damage/degradation: there are potential air quality effects (dust) on designated sites within 200m of construction activities, which may cause degradation to sensitive habitats and species. Potential water pollution issues may also cause indirect effects on designated sites. Potential spread of invasive species into designated sites
Disturbance: potential noise and lighting from construction activities may disturb species associated with the site.
Species loss: direct mortality of species associated with the designated site may occur during site clearance if due care is not taken

**Potential Impacts (Construction and Operation)**

Habitat loss: potential for direct loss of habitat through site clearance for the temporary or permanent footprint of the route wide project.
Habitat fragmentation: potential for fragmentation impacts on designated sites relating to watercourses such as River Eden SAC and SSSI. No direct fragmentation impacts are predicted for terrestrial-based designated sites. Habitat fragmentation for species associated with the designated site may cause issues with dispersal or access to foraging resources, which may affect local population viability.
Habitat damage/degradation: there are potential air quality effects (dust) on designated sites within 200m of construction activities, which may cause degradation to sensitive habitats and species. Potential water pollution issues may also cause indirect effects on designated sites. Potential spread of invasive species into designated sites
Disturbance: potential noise and lighting from construction activities may disturb species associated with the site.
Species loss: direct mortality of species associated with the designated site may occur during site clearance if due care is not taken

**Design, Mitigation and Enhancement Measures**

Habitat loss: designated sites have been avoided through design, where possible. Any remaining temporary direct impacts, such as discharge routes, will be examined through ongoing design reviews to relocate these outside of designated sites, where possible.
Habitat fragmentation: mitigation related to habitat and species fragmentation below will be relevant to mitigate impacts on designated sites. Avoiding isolation of designated sites, and identifying opportunities to improve connectivity, will be considered during the ongoing design of habitat replacement and enhancement.
Habitat damage and degradation: best practice construction methods with respect to working in/near water and dust suppression will be employed and will be set out in the EMP. Protection measures to avoid disturbance to invasive species that could cause their spread and likely implementation of measures to eradicate these species from works areas will be detailed in the EMP. The air quality assessment is ongoing and appropriate mitigation for the operational stage will be considered full for the ES if air quality impacts are identified.
Disturbance: operational lighting design will be reviewed by ecology specialists to avoid or mitigate lighting impacts. Further assessment is required for recreational impacts and operational traffic noise to inform any required mitigation.
Species loss: measures set out in the EMP will include sensitive vegetation clearance and ECoW supervision during vegetation clearance and construction activities.

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| **Likely Significant Effect Following Mitigation?** | Set out under each scheme for individual designated sites. |
| **Receptor and Valuation:** | Habitats (apart from Rivers and Streams) (Local to International value - see Table 6-3 for specific habitat values) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential direct impacts include temporary and permanent habitat loss of predominantly improved grassland and arable fields with smaller losses of woodland and parkland, scrub, semi-improved and marshy grassland, tall ruderal, amenity grassland, waterbodies, bracken, lichen/bryophyte heath and ephemeral/ short perennial habitats. In terms of linear habitats, losses are anticipated for predominantly hedgerows with smaller losses of tree lines, ditches and running water.<br>Habitat fragmentation: the existing road already causes fragmentation though this may be widened in many areas. Offline sections and clearance for construction activities have the potential to cause further fragmentation. This impact may occur during vegetation removal activities and may affect natural colonisation and dispersal of native plant species.<br>Habitat damage/degradation: potential for an increased risk of air and water pollution or siltation incidents from construction activities as well as changes to the hydrological regime which may cause degradation of retained habitats.<br>With sensitive design the project also has the potential to reduce or rectify existing pollution issues with a potential beneficial impact upon existing vegetation or ecological potential. Ground compaction of construction areas may damage soil mycorrhiza and reduce potential for successful ecological recovery or success of new planting post construction. There is a risk of indirect loss of trees through poor provision or maintenance of protection measures. Poor soil storage may limit the potential for existing seed banks to develop a natural vegetative community when re-used. Potential for spread of existing invasive species of giant hogweed and impacts to semi-natural habitats, as a result of loss of the known present invasive species giant hogweed and Himalayan balsam.<br>Species loss: no impacts are anticipated to notable or protected plant species, however general losses to a number of common or widespread species may occur during construction through vegetation clearance or construction traffic movement.<br>Potential for positive impacts to semi-natural habitats, as a result of removal of the known present invasive species giant hogweed and Himalayan balsam.<br>These impacts may affect the integrity of a range of habitat types on a permanent/irreversible basis. | |
| **Potential Impacts (Operation)** | |
| Habitat loss: potential shading of bankside vegetation under or adjacent to bridges may prevent re-colonisation of native flora, which may result in different species being found in close proximity to new structures (aquatic and terrestrial habitats).<br>Habitat fragmentation: the operational widened carriageway could impact species undertaking a northward acclimatisation as a result of climate change. More positive impacts may occur for species with an east- west increase in distribution due to reconnection of habitats as a result of planned mitigation.<br>Habitat damage/degradation: potential for air pollution from traffic, road-run off and pollutants or sediments to impact adjacent habitats through infiltration into soils or through flowing into watercourses. Potential for failure of planting proposals or target habitat type not being reached.<br>Disturbance: potential required lighting for safety at junctions to have a negative impact on plant species/vegetation communities, particularly those associated with Priority Habitats or Priority Species and those within designated sites. Potential for increased disturbance through recreational activities from new walking, | |

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| cycling, and horse-riding routes through creation of bare soil habitats, or may promote the provision of additional habitats for species more tolerant of/ or that thrive on some levels of disturbance.<br>Species loss: potential for increased air pollution impacts upon local species in terms of ability to attain species-rich habitats and reduction in pollinators for species present and reduced seed production and dispersal for species using invertebrate pollination mechanisms.<br>Poor replacement or orientation of the affected existing stone wall habitats may affect any local lichen and moss species from continued presence and result in loss of these communities or loss of those more sensitive species.<br>*These impacts may affect the integrity of a range of habitat types on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: use of mitigation hierarchy and good design to avoid impacts to habitats of value or high/very high distinctiveness, where feasible.<br>Loss on a temporal scale would be mitigated to some effect by planting sufficiently mature vegetation, but some effects would remain.<br>Use of green hay or heather brash from existing roadside verges of value, or adjacent local nature sites may also be employed and stated in the EMP.<br>Translocation of hedgerow habitats may be employed alongside planting schemes, to retain local diversity and to provide early establishment of vegetation to promote connectivity of habitats.<br>Planting of some areas of more mature vegetation may be employed to provide early establishment of vegetation to promote connectivity of habitats.<br>Sensitive soil storage is required to avoid loss of any valued natural seed bank and to avoid potential for encroachment on adjacent habitats during construction.<br>Habitat fragmentation: losses of connective habitat along verges is to be mitigated for by early planting of vegetative strips adjacent to the verges to maintain vegetative community presence of semi-natural habitats, where possible.<br>Habitat damage/degradation: use of pollution avoidance measures, and soil/ substrate storage as per EMP. Efforts to be taken to retain semi-mature to mature trees by appropriate protection measures during construction. Protection measures to avoid disturbance to invasive species that could cause their spread and likely implementation of measures to eradicate these species from works areas will be detailed in the EMP.<br>Disturbance: operational lighting design will be reviewed by ecology specialists to avoid or mitigate lighting impacts. Further assessment is required for recreational impacts and operational traffic noise to inform any required mitigation.<br>Species loss: specific protection measures as defined in the EMP would limit the potential for impacts to any protected or noteworthy species or habitats (including trees). This may include translocation where feasible. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of impacts are considered to be temporary/reversible when mitigation for habitat replacement and protection of retained/created habitat is taken into account. Due to ongoing mitigation design, permanent impacts on loss and fragmentation of habitats cannot be ruled out at this stage. Losses of Priority habitat such as broad-leaved woodland and species-rich grassland will take a long time to replace and the loss of mature trees cannot be mitigated. Air quality impacts on habitats have yet to be assessed. Habitat loss, fragmentation and degradation may be assessed as a major impact on a resource of up to National importance (for the majority of schemes), which is a Large or Very Large effect and therefore significant. Potential LSE* |

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| | *anticipated for construction and operation. There are habitats of potentially International importance on the Temple Sowerby to Appleby scheme and the significance level is adjusted accordingly.* |
| **Receptor and Valuation:** | Rivers/streams (International with regards to SAC and Local at all other locations) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential loss of river/stream habitat during construction of watercourse crossings on a temporary and permanent basis. This has the potential to decrease numbers and diversity of aquatic species in those areas. This includes localised shading from proposed water crossing.<br>Habitat fragmentation: potential fragmentation of aquatic habitats either temporarily during construction of watercourse crossings or permanently.<br>Habitat damage/degradation: potential damage to aquatic habitats and/or degradation physically during construction as a result of in-channel works and dewatering, or as a result of degradation of surface water quality (for example. sediment and chemical discharge from site runoff). In addition, there is risk of accidental spillage of pollutants (for example fuel/oil leakage from the storage of plant).<br>*These impacts may affect the integrity of rivers/streams on a permanent/irreversible basis.* | |
| **Potential Impacts (Operation)** | |
| Habitat damage/degradation: potential damage to aquatic habitats and/or degradation during operation. Polluted surface water runoff containing sediment, hydrocarbons and soluble pollutants, such as copper and zinc, may enter surface water features or groundwater resources via the proposed highway drainage system, including from spillages. Impacts to rivers and streams as a result of air quality are not considered, in line with LA 105 Air Quality, therefore operational air quality impacts are only considered for sensitive riparian habitat.<br>*These impacts may affect the integrity of rivers/streams on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: loss of river/stream habitat will be avoided where possible through sensitive watercourse crossing design in line with best practice guidance. Wherever possible for larger channels, watercourse crossings, including channels and floodplains, will be clearspan rather than culverts and the length of the crossing minimised. Natural riverbed and banks will be maintained, limiting the impact on watercourse crossings to shading and associated loss of in-channel and riparian vegetation locally.<br>Where culverts are used (on minor watercourses), they will be bottomless (or sunk/inverted 30cm below natural bed level to allow natural substrate to be deposited) and aim to maintain natural bank features.<br>Habitat fragmentation: during construction, passage will be maintained within watercourses; dewatering of the entire channel will be avoided.<br>During operation, aquatic habitat upstream and downstream of new watercourse crossings will be as well connected as possibleas a result of best practice crossing design as outlined above.<br>Habitat damage/degradation: best practice construction methods with respect to working in/near water will be employed. This will involve avoiding use of plant in-channel where possible, creation of dry working areas and the control of sediment (for example through the use of silt fencing, filtration systems and settling ponds). These measures will be set out in the EMP. | |

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| During operation road runoff will be treated according to *DMRB LA 113* guidance to ensure the water quality of discharges to surface water. | |
| **Likely Significant Effect Following Mitigation?** | *Habitat loss, fragmentation and damage/degradation are considered unlikely to affect integrity if best practice watercourse crossing design is followed which limits the impacts to shading only at the crossing point, but localised effects may be on a permanent basis. If permanent impacts remain after mitigation which do not affect the integrity of the resource, this may be assessed as a minor impact on a resource of up to International importance, which is a Moderate or Large adverse effect and therefore significant. Potential LSE anticipated for construction and operation. It should be noted that several rivers/streams across the route wide scheme are of Local value and the level of effect would be adjusted accordingly. Air quality impacts which affect riparian habitat are considered on a scheme by scheme basis.* |
| **Receptor and Valuation:** | Bat Roosts (Regional) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential loss of temporary and permanent woodland, mature trees, structures and hedgerow habitats will influence the local bat populations' Core Sustenance Zones (CSZs) (Collins, 2016), specifically the number of roosting opportunities in the landscape. The functionality of replacement or reinstated habitats will require time to establish and mature to the equivalent resources currently available (notably potential roosting features in mature trees).<br>Disturbance: proximity of construction work/traffic to sensitive bat roosts (notably seasonally important maternity/hibernation roosts) may cause disturbance through noise.<br>Temporary lighting for construction could affect bats by deterring them from roost locations.<br>Species mortality: the construction stage of the scheme may result in loss or disturbance of key bat roosts (for example maternity roosts) through demolition of structures which may affect the Favourable Conservation Status (FCS) of local bat populations by impairing breeding. Vegetation clearance has the potential to cause injury or mortality of roosting bats, notably when hibernating in roosts that have not been identified.<br>*The loss of roosts of high conservation value along with habitat that sustains the roost may affect population integrity on a permanent/irreversible basis.* | |
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| Disturbance: operational noise and lighting together with increased human disturbance from changes in use may influence how bats use the landscape, including the potential abandonment of roosting locations.<br>*Disturbance to roosts of high conservation value may affect population integrity on a temporary/reversible basis.* | |
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| Habitat loss: where the scheme results in losses of an identified bat roosts, these will be compensated for in a form appropriate to the species of bat and type of roost in accordance with the Bat Mitigation Guidelines (Mitchell-Jones, 2004) and as part of the mitigation scheme approved by Natural England through the European Protected Species Licensing (EPSL) process. Replacement roosts will be installed/constructed in advance of the roost destruction/damage occurring. All tree bat roosts identified within the draft DCO boundary will be replaced with either bat boxes or by retention of the tree roost cavity on adjacent trees within similar habitats. Roost destruction will be undertaken in compliance with an approved European Protected Species Licence (EPSL) for all roosts. | |

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| In areas of proposed vegetation clearance, any trees containing cavities/Potential Roosting Features that have no evidence of use by bats (and therefore do not fall within the requirements of mitigation through the EPSL process), should be retained and attached to nearby trees and/or artificial structures to provide a 'temporal bridging' of tree roost opportunities. This will compensate for the loss of woodland roosting opportunities and mitigate for the time allowed for alternative tree roost features to develop in nearby trees/woodland. Where mature trees offer the opportunity, such techniques can also be used to replace potential roosting features.<br>Disturbance: the construction methodology will require implementation of preventative measures to avoid disturbance of roost locations from construction noise and vibration. Any sensitive locations will also require measures to avoid light spill illuminating roost entrances.<br>Species mortality: destruction of known roosts will be undertaken under the EPSL process with a method statement in place for sensitive timing of works, or movement of bats by a bat-licensed ecologist prior to works commencing, to reduce the risk of injury or mortality. The EPSL process will also ensure replacement roosts are provided so that the FCS of local bat populations will not be impaired. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of impacts are considered to be temporary/reversible when mitigation is taken into account or reduced so as not to affect the integrity of the bat population (this will be a requirement under EPSL). Due to ongoing surveys, There may be further identification of bat roosts of high conservation value (maternity roosts of rarer species) for which mitigation design (including design of associated crossing features and foraging resource) is not confirmed. Loss of such roosts and associated habitat or connectivity may affect integrity of the population on a permanent/irreversible basis. If permanent impacts remain after mitigation, this may be assessed as a major impact on a resource of Regional importance, which is a Moderate or Large effect and therefore significant. Potential LSE anticipated for construction and operation.* |
| **Receptor and Valuation:** | Bat Activity (Foraging and Commuting) (up to National) |
| **Potential Impacts (Construction)** | |
| Habitat loss: the temporary and permanent loss of woodland, grassland, wetland and hedgerow habitats will have an effect on the local bat populations' CSZs, namely their ability to forage and commute through the landscape. Whilst lost habitats will be replaced post construction, the functionality of these new habitats will require time to establish and mature to the equivalent resources currently available (notably woodland height and structure).<br>Habitat fragmentation: the vegetation clearance required for construction of the schemes will affect bat flight lines on a temporary basis. Removal of linear corridors for construction compounds will result in temporary severance of flight routes and/or a loss of functionality through severance of connections between roosts and foraging grounds.<br>Habitat damage/degradation: potential increase in dust and vehicle emission deposits from the construction phase which may degrade sensitive habitats used as key resource for foraging, notably ancient woodland. Additionally, water pollution may affect aquatic habitats. This degradation may result in a potential loss of invertebrate food source(s) in the local area.<br>Disturbance: potential disturbance impacts arising from temporary lighting for construction and associated elevated noise level which may affect nocturnal species; for example, inhibiting bats from using existing foraging resources or commuting routes. This may also affect the availability of airborne invertebrate prey. | |

Species mortality: the construction stage of the scheme will likely result in temporary loss or disturbance of key foraging/commuting habitat resources, affecting the FCS of local bat populations by impairing their ability to breed (for example severing links between maternity roosts and key foraging resources).
Increases in construction traffic in proximity to bat roosts may increase road mortality through collisions with site vehicles (RTAs).
*The loss of foraging resource and flight lines may affect population integrity on a permanent/irreversible basis.*

**Potential Impacts (Operation)**

Habitat fragmentation: the widening of the road online and the creation of new offline sections will sever/fragment the landscape north to south on a permanent basis. Key flight routes between foraging resources and roost locations may be affected in the long term.
Habitat damage/degradation: the operation of the new road alignment may result in an increase in vehicle emissions which may affect sensitive habitats used as key resources for foraging. This degradation has potential to change invertebrate biomass and species composition in the local area.
Disturbance: operational noise and lighting together with increased human disturbance from changes in use will affect how bats use the landscape, including the potential abandonment of roosting locations and reduction in use of foraging resource which may reduce the range of the species present.
Species mortality: bats habituate to established flight routes connecting roosting and foraging resources, even when the flight paths have been severed by a new road alignment. Bats crossing new live carriageway will be highly susceptible to collision with vehicles where they will follow the new contour profile of the historic crossing point.
*The habitat fragmentation and increase in mortality may affect population integrity on a permanent/irreversible basis.*

**Design, Mitigation and Enhancement Measures**

Habitat loss: the CSZs for the bat species identified within the Scheme areas extend between 1km to 4kms radius from communal roost sites (Collins 2016). Where losses of key foraging habitats are noted as affecting a notable/significant proportion of this habitat type within the CSZ, measures to phase habitat removal will be considered.
Landscape design will be sympathetic to the locations of key foraging habitats, any retained bat roosts, established flight lines and any roost structures/bat boxes that are provided as mitigation for roost loss and habitats will be replaced and enhanced for bats where possible.
Habitat fragmentation: mitigation measures to retain key flight routes during construction will include the following:

- Minimising the physical break and duration of the flight path severance.
- Minimising light and noise pollution.
- Erecting temporary alternative flight routes (wattle screens and/or pot grown plants to create temporary hedgerows within severed flight routes).
- Reinstating severed flight routes each evening and on completion of the works.
- Established flight lines will be retained in their original location where possible through design, in conjunction with planting schemes to direct and encourage bats to maintain the crossing location.
- Replacement of established flight paths will likely be required via either greening of over bridges or installation of wildlife underpasses/culverts of appropriate dimensions. Additionally, wattle screening will be provided as a temporary measure whilst new planting matures.

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| • Where flight routes coincide with planned structures, these will be designed with the requirements of the species to provide appropriate and effective mitigation for the severance, where possible.<br>• Foraging/commuting parallel to the alignments will be encouraged through habitat mitigation and landscaping plans.<br>Habitat damage/degradation: the planned mitigation/planting throughout the scheme extents will replace lost habitats providing alternative sources of foraging resource. Habitat removal will be staged to ensure local resources are not substantially reduced concurrently. Pollution control measures will be implemented as outlined in the habitats and rivers section.<br>Disturbance: where possible the effects of disturbance to key commuting routes will be avoided/minimised through design and location of construction activities. The construction methodology will require implementation of preventative measures to avoid light spill on bat flight routes or key foraging resources. These will be incorporated into the EMP.<br>The operational lighting plan will be reviewed by a bat ecologist to ensure light spill on sensitive habitats is avoided or mitigated.<br>Species mortality: the above measures to maintain bat flight lines across the project will reduce the likelihood of species mortality in both construction and operational stages. In addition, other measures during construction may include traffic calming where vehicles are operational during the crepuscular/night-time hours that bats are active. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of impacts are considered to be temporary/reversible when mitigation is taken into account or reduced so as not to affect the integrity of the bat population. Due to ongoing surveys, there may be further identification of key flight routes for rarer species at the limit of their published range (Leisler's bat (Nyctalus leisleri) for which mitigation design (including design of crossing features and associated planting) is not confirmed. Loss of such connectivity and increased risk of mortality may affect integrity of the population on a permanent/irreversible basis. If permanent impacts remain after mitigation, this may be assessed as a major impact on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential LSE are anticipated for both construction and operation.* |
| **Receptor and Valuation:** | Red squirrel *(Sciurus vulgaris)* (Up to National) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential for temporary and permanent loss of red squirrel foraging, commuting and breeding habitat such as areas of woodland, tree lines and hedgerows to decrease numbers of red squirrels in areas which are impacted.<br>Habitat fragmentation: potential temporary fragmentation and severance of suitable habitat during construction due to clearance of hedgerows between woodland blocks may affect local population viability.<br>Habitat damage/degradation: potential increase in dust deposition during construction may represent harmful impacts to woodland habitats utilised by red squirrel resulting in reduction in foraging resource which may affect local population viability.<br>Disturbance: potential increase in noise and lighting during construction may cause stress in red squirrels forcing individuals to unnecessarily expend energy and time responding to disturbance which may affect local population viability. | |

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| Species mortality: clearance of vegetation (woodland, tree lines and hedgerows in particular) associated with the route wide project development has the potential to directly injure or kill red squirrels.<br>*The loss of habitat may affect population integrity on a permanent/irreversible basis.* |
| **Potential Impacts (Operation)** |
| Habitat fragmentation: the widening of the road online and the creation of new offline sections will sever/fragment the landscape north to south on a permanent basis. Suitable woodland areas located north and south of the alignment may become permanently severed, isolating populations.<br>Habitat damage/degradation: the operational phase may cause an increase in noise, vibration and light which may represent a negative impact to habitats utilised by red squirrel such as areas of woodland, tree lines and hedgerows. Air quality related degradation through emissions may result in a loss of food source in woodland.<br>Disturbance: increased traffic noise and lighting may cause individuals to unnecessarily expend energy and time responding to disturbance which may affect local population viability.<br>Species mortality: potential mortality associated with crossing roads to disperse or access foraging resources.<br>*The fragmentation of habitat may affect population integrity on a permanent/irreversible basis.* |
| **Design, Mitigation and Enhancement Measures** |
| Habitat loss: both temporary and permanent suitable red squirrel habitat loss will be mitigated by habitat replacement and enhancement measures. These measures will include compensation tree and hedgerow planting and woodland management for existing woodland areas. Whilst lost habitats will be replaced post construction, the functionality of these new habitats will take time to develop to the equivalent resources currently available (notably woodland height and structure).<br>Habitat fragmentation: will be mitigated by the inclusion of red squirrel crossing points along appropriate areas of new road alignments. These crossing points may include rope bridges or green bridges. Habitat fragmentation will also be mitigated by compensational planting along the route which will ensure suitable red squirrel commuting and foraging resources are connected, where possible.<br>Habitat damage/degradation:<br>Air quality impacts on woodland will be minimised during construction through dust suppression. Operational air quality impacts on woodland are to be confirmed.<br>Disturbance: direct and indirect impacts associated with construction activities will be mitigated by measures included within the EMP to reduce noise and temporary lighting impacts on sensitive woodland sites.<br>Species mortality: measures set out in the EMP will include sensitive vegetation clearance and ECoW supervision during vegetation clearance and construction activities. Clearance of red squirrel habitat will be undertaken under a conservation licence, which will ensure the risk of species mortality is reduced and habitat features are replaced. |
| **Likely Significant Effect Following Mitigation?** — *The majority of impacts are considered to be temporary/reversible when mitigation is taken into account or reduced so as not to affect the integrity of the red squirrel population. Due to ongoing surveys, there may be further identification of woodlands* |

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| | *supporting red squirrel and design of crossing features and associated planting to reconnect fragmented habitat is not confirmed. Any replacement woodland habitat will also take time to mature and be of use to the species. Loss of habitat, connectivity and increased risk of mortality may affect integrity of the population on a permanent/irreversible basis. If permanent impacts remain after mitigation, this may be assessed as a major impact on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential LSE anticipated for both construction and operation.* |
| **Receptor and Valuation:** | Otter *(Lutra lutra)* (Up to International) |
| **Potential Impacts (Construction)** | |
| Habitat loss: temporary and minor permanent loss of otter foraging, commuting and holt habitat along main rivers, tributaries and ordinary watercourses throughout the scheme has the potential to decrease otter numbers in affected areas.<br>Habitat fragmentation: otters may be physically prevented from travelling along watercourses during construction activities in the absence of mitigation which may reduce access to foraging resources or shelter or prevent them dispersing or breeding successfully.<br>Habitat damage/degradation: surface run off of pollutants may compromise the quality of foraging resources.<br>Disturbance: potential noise and light disturbance impacts could cause stress to otters forcing individuals to unnecessarily expend energy and time responding to disturbance which may affect local population viability.<br>Species mortality: otter mortality has the potential to increase during the construction period through destruction of holts or resting sites without due care, changes to commuting routes that may increase road traffic collisions or accidental injury or death on construction sites.<br>The minor loss of habitat and direct loss of holts may affect population integrity on a temporary/reversible basis. | |
| **Potential Impacts (Operation)** | |
| Habitat fragmentation: otters may be physically prevented from travelling along watercourses in the operation phase due to poor design of culverts or bridges. This may be exacerbated in flood conditions.<br>Habitat damage/degradation: the operational phase may cause an increase in vehicle deposits and surface run off of pollutants which may affect local population viability.<br>Disturbance: traffic noise, vibration and lighting and increased presence of people have potential to impact otter foraging, commuting and holts which may affect local population viability.<br>Species mortality: potential increase in mortality associated with crossing roads to disperse or access foraging resources.<br>Habitat fragmentation and increased risk of mortality may affect population integrity on a permanent/irreversible basis. | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: both temporary and permanent habitat loss will be mitigated by riparian habitat replacement and enhancement measures.<br>Habitat fragmentation: mitigation through design of watercourse crossing points that are suitable for otter to use. Inclusion of mammal ledges, where appropriate, will ensure otter use in flood conditions. | |

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| Habitat damage/degradation: direct and indirect impacts associated with construction activities will be mitigated by measures included within the EMP. These measures will include sensitive working practices and potential use of ECoW supervision during activities such as vegetation clearance and construction around existing and new watercourse crossing points. An assessment of the potential impacts of operations-phase runoff on surface water quality will be undertaken by the water team using the Highways England Water Risk Assessment Tool (HEWRAT); HEWRAT outputs are used to design suitable treatment ponds for road runoff. During operation road runoff will be treated according to DMRB LA 113 guidance to ensure the water quality of discharges to surface water (See Chapter: 14 Road Drainage and the Water Environment).<br>Species mortality: temporary or permanent destruction of known holts and resting sites will be undertaken under the EPSL process with a method statement in place for sensitive clearance and supervision by an otter-licensed ecologist to reduce the risk of injury or mortality. The EPSL process will also ensure installation of artificial holts, as required. Otter crossing points on watercourses will be accompanied by otter-proof fencing to ensure animals are funnelled into safe crossing points and reduce the risk of mortality on the carriageway. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of impacts are considered to be temporary/reversible when mitigation is taken into account or reduced so as not to affect the integrity of the otter population. As long as construction and design mitigation is in place, including design of water crossing points suitable for otters to prevent road mortality, the remaining impacts should not affect the integrity of this resource and would be temporary/reversible in nature. This may be assessed as a negligible impact on a resource of up to International importance, which is a Slight effect and therefore not significant. No LSE are anticipate (Construction and Operation).* |
| **Receptor and Valuation:** | Water vole *(Arvicola amphibius)* (County) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential temporary and minor permanent loss of water vole foraging and burrow habitat along tributaries and ordinary watercourses throughout the scheme may affect local population viability.<br>Habitat fragmentation: potential for new crossing points over watercourses to fragment water vole habitat which may affect local population viability.<br>Habitat damage/degradation: potential increase in dust, noise and vibration may lead to surface run off of pollutants/dust and habitats becoming less desirable, which may affect local population viability.<br>Disturbance: potential noise and visual disturbance are unlikely to have a significant effect on water vole.<br>Species mortality: water vole mortality has the potential to increase during the construction period through direct destruction of burrows and riparian habitat without due care or collapse of burrows due to nearby vibration and excavation.<br>*The minor loss of habitat and direct loss of burrows may affect population integrity on a temporary/reversible basis.* | |
| **Potential Impacts (Operation)** | |
| Habitat fragmentation:<br>water voles may be physically prevented from travelling along watercourses in the operation phase due to poor design of culverts or bridges. This may be exacerbated in flood conditions. | |

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| Habitat damage/degradation: the operational phase has potential to cause an increase in vehicle deposits and surface run off of pollutants into watercourses which may affect local population viability.<br>Disturbance: potential increased presence of people along watercourses may cause localised disturbance.<br>Species mortality: potential mortality associated with crossing roads to disperse or access foraging resources.<br>*Habitat fragmentation and increased risk of mortality may affect population integrity on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: both temporary and permanent habitat loss will be mitigated by riparian habitat replacement and enhancement measures.<br>Habitat fragmentation: will be mitigated by the inclusion of watercourse crossing points that are suitable for water vole to use.<br>Habitat damage/degradation: direct and indirect impacts associated with construction activities will be mitigated by measures included within the EMP. During operation road runoff will be treated according to DMRB LA113 guidance to ensure the water quality of discharges to surface water.<br>Species mortality: temporary and permanent closure of burrows will be mitigated for under conservation licences. Where permanent closure of burrows is necessary, habitat enhancement and/or habitat creation will be required to compensate for the loss under the licence. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of impacts are considered to be temporary/reversible when mitigation is taken into account or reduced so as not to affect the integrity of the water vole population. As long as construction and design mitigation is in place, including design of water crossing points suitable for water voles to allow dispersal and prevent road mortality, the remaining impacts should not affect the integrity of this resource and would be temporary/reversible in nature. This may be assessed as a negligible impact on a resource of up to County importance, which is a Neutral or Slight effect and therefore not significant. No LSE are anticipated.* |
| **Receptor and Valuation:** | Badger *(Meles meles)* (Local) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential direct temporary and permanent loss of high-quality badger foraging, commuting and sett habitat including woodlands, rough grasslands, farmland, hedgerows and tree lines, which may affect local population viability.<br>Habitat fragmentation: potential fragmentation of suitable badger foraging and commuting habitat by site clearance and construction activities may reduce foraging territory size and dispersal ability which may affect local population viability on a temporary basis.<br>Habitat damage/degradation: soil compaction may affect foraging resources but habitats that badgers rely on are not considered highly sensitive to pollution issues.<br>Disturbance: potential disturbance in the form of construction noise, vibration and lighting may impact badger foraging, commuting and setts which may affect local population viability.<br>Species mortality: setts are likely to require permanent and/or temporary closure, which may risk badger mortality or injury without due care. Excavations and vibrations may cause collapse of existing badger setts and tunnels. | |

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| Badger mortality may increase during the construction period through changes to commuting routes that may increase road traffic collisions or accidental injury or death on construction sites.<br>*All the potential impacts, apart from habitat degradation/damage, may affect local population integrity on a temporary/reversible basis.* |
| **Potential Impacts (Operation)** |
| Habitat fragmentation: potential fragmentation of suitable badger foraging and commuting habitat by offline sections of the project may reduce foraging territory size and dispersal ability which may affect local population viability on a permanent or longer-term basis.<br>Habitat damage/degradation: habitats that badgers rely on are not considered highly sensitive to pollution issues and badgers are known to acclimatise to traffic noise and the presence of people as they are regularly found in roadside locations and urban areas.<br>Disturbance: badgers are known to acclimatise to traffic noise and the presence of people as they are regularly found in roadside locations and urban areas so no long- term disturbance impacts are anticipated.<br>Species mortality:<br>potential increase in mortality associated with crossing roads to disperse or access foraging resources.<br>*Habitat fragmentation and mortality may affect local population integrity on a permanent/irreversible basis.* |
| **Design, Mitigation and Enhancement Measures** |
| Habitat loss: temporary and permanent habitat loss will be mitigated by habitat replacement and enhancement measures. These measures will include compensation tree and hedgerow planting and woodland management for existing woodland areas but may include a further loss of intensively managed agricultural land and improved grassland which are prime foraging resources for badger.<br>Habitat fragmentation: mitigated by the inclusion of crossing points suitable for badger along new road alignments along with appropriate badger fencing. These crossing points may include culverts with terrestrial mammal ledges, badger underpasses, overpasses and tunnels. Habitat fragmentation will also be mitigated by compensational replanting schemes along the route which will ensure suitable badger commuting and foraging habitats remain connected to one another throughout the route.<br>Habitat damage/degradation: Damage and degradation to suitable badger habitats will be mitigated via compensational replanting schemes of woodland, tree lines, rough grasslands and hedgerows. If temporary and/or permanent closure of existing badger setts is required, this will be mitigated for under individual licences to interfere with setts (dens). Where permanent closure of a sett is necessary artificial setts may be required to compensate for the loss.<br>Disturbance: the EMP will include sensitive working practices to reduce disturbance impacts to badgers during construction.<br>Species mortality: temporary and permanent closure of existing badger setts will be mitigated for under individual licences to interfere with setts.<br>Badger fencing will be used around sections of carriageway where high badger activity has been identified and/or badger territories are likely to be significantly impacted and severed as a result of new road alignments to prevent road mortality. |
| **Likely Significant Effect Following Mitigation?** — *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account, although permanent fragmentation and species road mortality cannot be ruled out at this stage as specific crossing features for badgers have not yet been confirmed. Mitigation for fragmentation and road mortality will be considered at the next stage of design* |

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| | *development. If permanent impacts remain after mitigation, this may be assessed as a major adverse impact on a resource of Local importance, which is a Slight effect and therefore not significant. No LSE are anticipated.* |
| **Receptor and Valuation:** | Other terrestrial mammals (County):<br>Polecat *(Mustela putorius);* Brown hare *(Lepus europaeus);* Deer; Hedgehog *(Erinaceus europaeus) (Up to County)* |
| **Potential Impacts (Construction)** | |
| Habitat loss: loss of suitable terrestrial mammal habitats such as hedgerows, woodlands, rough grasslands, open arable fields, areas of scrub and riparian banks will be lost on a temporary and permanent basis which may affect local population viability.<br>Habitat fragmentation: potential fragmentation of suitable foraging and commuting habitat by new road alignments will reduce foraging territory size and may affect local population viability.<br>Habitat damage/degradation: habitats that these species rely on are not considered highly sensitive to pollution issues although hedgehog does rely on invertebrate-rich habitats and polecats on certain aquatic species, which may be affected by local pollution incidents.<br>Disturbance: potential disturbance in the form of construction noise, vibration and lighting may impact mammal foraging, commuting and sheltering which may affect local population viability.<br>Species mortality: vegetation clearance has the potential to disturb, kill or injure deer, polecat, hedgehog and brown hare. Hedgehogs are particularly susceptible to mortality or injury from vegetation clearance during hibernation. Excavations and vibration may cause collapse of burrows used by polecats.<br>*All the potential impacts may affect local population integrity on a temporary/reversible basis.* | |
| **Potential Impacts (Operation)** | |
| Habitat fragmentation: potential permanent fragmentation of suitable terrestrial mammal foraging and commuting habitat as a result of the new road alignments may affect local population viability.<br>Habitat damage/degradation: habitats that these species rely on are not considered highly sensitive to pollution issues during the operational phase.<br>Disturbance: potential increase in traffic noise, vibration and lighting and increased presence of people have potential to impact foraging, commuting and sheltering sites which may affect local population viability.<br>Species mortality: terrestrial mammal mortality may increase during operation as species such as polecat, hedgehog, deer and brown hare cross the road to access foraging and commuting routes.<br>*Habitat fragmentation and increased risk of mortality may affect local population integrity on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: will be mitigated via the development of integrated landscaping plans which include the replacement of important terrestrial mammal foraging, commuting and resting habitats and the enhancement of these habitats, where possible and appropriate.<br>Habitat fragmentation: mitigated by the inclusion of crossing points suitable for terrestrial mammals along new road alignments along with appropriate fencing (including deer-proof where required). Habitat fragmentation will also be mitigated by compensational replanting along the route. | |

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| Habitat damage/degradation: Direct and indirect impacts associated with construction impacts will be mitigated by measures included within the EMP.<br>Disturbance: the EMP will include sensitive working practices to reduce disturbance impacts to terrestrial mammals during construction.<br>Species mortality: measures will include sensitive working practices and potential use of ECoW supervision during vegetation clearance and construction activities. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account, although permanent fragmentation and species road mortality cannot be ruled out at this stage as specific crossing features for terrestrial mammals have not yet been confirmed. Mitigation for fragmentation and road mortality will be considered at the next stage of design development. If permanent impacts remain after mitigation, this may be assessed as a major adverse impact on a resource of up to County importance, which is a Slight or Moderate effect and therefore significant. Potential LSE are anticipated during operation.* |
| **Receptor and Valuation:** | Wintering Birds (up to International value due to SPA species) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential loss of high-quality bird foraging and roosting habitats such as hedgerows, wetlands and wet pasture may decrease numbers and diversity of wintering birds in areas which are impacted.<br>Habitat damage/degradation: potential increase in dust and polluted run-off during construction which may represent a deleterious impact to habitats utilised by wintering birds such as heathland, ancient woodland and aquatic habitats which may result in a loss of food source. Potential increased risk of pollution of aquatic environments through the surface run off of pollutants/dust. Both impacts may affect local population viability on a temporary basis.<br>Disturbance: potential increase in noise, vibration and light during construction as well as increased visual disturbance may cause stress in wintering birds, force individuals to unnecessarily expend energy and time responding to disturbance rather than feeding which may affect local population viability on a temporary basis.<br>Species mortality: clearance of vegetation associated with the project has the potential to disturb wintering birds.<br>*Habitat loss may affect local population integrity on a permanent/irreversible basis.* | |
| **Potential Impacts (Operation)** | |
| Habitat damage/degradation: the operational phase has potential to cause an increase in vehicle deposits and surface run-off of pollutants into watercourses and wetland habitats which may affect food resources.<br>Disturbance: increased noise and visual impacts associated with the operational activities of increased traffic and human presence have the potential to cause stress in wintering birds. The route may be brought closer to a notable wintering bird site where 500 lapwing were recorded to the north west of Kirkby Thore.<br>Species mortality: potential to increase mortality through traffic collision due to higher traffic volume, greater width of the carriageway and increased speed of traffic.<br>*Disturbance and increased road mortality are unlikely to affect local population integrity and will have temporary/reversible effects only due to habituation.* | |

| **Design, Mitigation and Enhancement Measures** | |
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| Habitat loss: mitigated through the development of integrated landscaping plans which include the replacement of important wintering bird foraging and roosting habitats and the enhancement of these habitats, where possible and appropriate.<br>Habitat damage/degradation:<br>direct and indirect impacts associated with construction impacts will be mitigated by measures included within the EMP. During operation road runoff will be treated according to *DMRB LA 113* guidance to ensure the water quality of discharges to surface water.<br>Disturbance: noise barriers and visual screens will be used during construction. The reduction of disturbance effects during the operational phase is yet to be confirmed.<br>Species mortality: measures will include sensitive working practices and potential use of ECoW supervision during vegetation clearance and construction activities. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account. Replacement for habitat loss for wintering birds has also yet to be designed fully, but due to the mobility of wintering birds and availability of suitable habitat in the vicinity this impact is considered to not affect the integrity of the population and be temporary/reversible. These mitigation requirements will be considered at the next stage of design development. This is a minor adverse impact on a resource of up to International importance, which is a Moderate or Large effect and therefore significant. Potential LSE are anticipated during construction and operation. The valuation for wintering birds varies by scheme and this is set out in the tables below.* |
| **Receptor and Valuation:** | Breeding Birds (Up to International value due to SPA species) |
| **Potential Impacts (Construction)** | |
| Habitat loss: direct impacts associated with the loss of high-quality bird breeding and foraging habitats such as hedgerows, rough grassland, scrub, woodland and field margins have the potential to decrease numbers and diversity of breeding birds in those areas.<br>Habitat damage/degradation: potential increase in dust and polluted run-off during construction may represent a deleterious impact to habitats utilised by wintering birds such as heathland, ancient woodland and aquatic habitats which may result in a loss of food source. Potential increased risk of pollution of aquatic environments through the surface run off of pollutants/dust may make habitats less desirable to wintering bird. Both impacts may affect local population viability on a temporary basis.<br>Disturbance: potential increase in noise, vibration and light during construction as well as increased visual disturbance may cause stress in barn owl, forcing individuals to unnecessarily expend energy and time responding to disturbance rather than feeding which may affect local population viability on a temporary basis.<br>Species mortality: clearance of vegetation associated with the project has the potential to cause injury or mortality to breeding birds without due care.<br>*Habitat loss may affect local population integrity on a permanent/irreversible basis.* | |
| **Potential Impacts (Operation)** | |

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| Habitat damage/degradation: the operational phase has potential to cause an increase in vehicle deposits and surface run-off of pollutants into watercourses and wetland habitats which may affect food resources for some species.<br>Disturbance: potential disturbance impacts associated with the increased traffic noise and presence of people have the potential to cause stress in breeding birds which may cause a reduction in resilience and survival rates.<br>Species mortality: potential to increase mortality through traffic collision due to higher traffic volume, greater width of the carriageway and increased speed of traffic.<br>*Disturbance and increased road mortality are unlikely to affect local population integrity and will have temporary/reversible effects only due to habituation.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: mitigated through the development of integrated landscaping plans which include the replacement of important breeding bird foraging and nesting habitats and the enhancement of these habitats, where possible and appropriate.<br>Habitat damage/degradation: direct and indirect impacts associated with construction impacts will be mitigated by measures included within the EMP. During operation road runoff will be treated according to *DMRB LA 113* guidance to ensure the water quality of discharges to surface water.<br>Disturbance: noise barriers and visual screens will be used during construction along with careful timing of vegetation clearance and certain construction activities outside the breeding bird season, where possible.<br>To avoid disturbance impacts from construction activities, it may be necessary to monitor the presence of SPA citation species during works close to the SPA to ensure any negative impacts are minimised. Specific measures would be included in the EMP.<br>The reduction of disturbance effects from traffic noise during the operational phase is yet to be confirmed. If recreational areas are created in areas of breeding bird habitat, footpaths will be included to encourage people away from sensitive areas.<br>Species mortality: measures will include sensitive working practices and timing and potential use of ECoW supervision during vegetation clearance and construction activities. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account. Replacement for habitat loss for breeding birds has also yet to be designed fully, but due to the mobility of breeding birds and availability of suitable habitat in the vicinity this impact is considered to not affect the integrity of the population and be temporary/reversible. These mitigation requirements will be considered at the next stage of design development. This is a minor adverse impact on a resource of up to International importance, which is a Moderate or Large effect and therefore significant. Potential LSE are anticipated during construction and operation. The valuation for breeding birds varies by scheme and this is set out in the tables below.* |
| **Receptor and Valuation:** | Barn Owl (*Tyto alba*) (Regional due to habitat assessment indicating the area would support no more than 10 pairs route wide) |
| **Potential Impacts (Construction)** | |
| Habitat loss: direct impacts associated with construction activities include the loss of high-quality barn owl breeding, roosting and foraging habitats such as mature trees, tussocky grassland, farm buildings and field margins have potential to decrease numbers of barn owls in those areas. | |

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| Habitat damage/degradation: potential increase in dust which may represent a deleterious impact to habitats utilised by barn owl such as ancient woodland, tussocky grassland, old structures and mature trees. Construction related degradation may result in a loss of food source which may affect local population viability.<br>Disturbance: potential increase in noise, vibration and light during construction as well as increased visual disturbance may cause stress in barn owl, forcing individuals to unnecessarily expend energy and time responding to disturbance rather than feeding which may affect local population viability on a temporary basis.<br>Species mortality: clearance of trees and structures for the project has the potential to kill or injure breeding and/or roosting barn owls.<br>*Habitat loss may affect local population integrity on a permanent/irreversible basis.* |
| **Potential Impacts (Operation)** |
| Habitat damage/degradation: the operational phase has potential to cause an increase in vehicle deposits and surface run-off of pollutants into adjacent habitats which may affect food resources.<br>Disturbance: potential disturbance impacts associated with the increased traffic noise and presence of people have the potential to cause stress in breeding barn owls which may cause a reduction in resilience and survival rates.<br>Species mortality:<br>potential to increase mortality through traffic collision due to higher traffic volume, greater width of the carriageway and increased speed of traffic. This may be a particular issue if barn owls are attracted to newly created road side habitats for foraging.<br>*Species mortality may affect local population integrity on a permanent/irreversible basis.* |
| **Design, Mitigation and Enhancement Measures** |
| Habitat loss: suitable barn owl foraging habitat and any loss of confirmed nest sites would be mitigated for through the provision of nest boxes and habitat creation in areas which have been identified as being suitable through survey work.<br>Habitat damage/degradation: direct and indirect impacts associated with construction activities will be mitigated by measures included within the EMP.<br>Disturbance: careful timing of certain construction activities near to known barn owl breeding sites, where possible. The EMP will include sensitive working practices to reduce any disturbance impacts on barn owl.<br>Species mortality: careful timing of structure demolition and tree clearance of known barn owl roosts will be undertaken under method statement.<br>Likely mitigation measures along the project would include construction of cuttings or mounds to increase the flight height of barn owls at areas identified as likely crossing points. These measures would minimise the risk of barn owl mortality through collisions with vehicles. |
| **Likely Significant Effect Following Mitigation?** — *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account, although permanent changes to operational disturbance and risk of species road mortality cannot be ruled out at this stage as specific mitigation has not been confirmed as yet. Replacement for habitat loss and nesting sites for barn owls has also yet to be designed fully. These mitigation requirements will be considered at the next stage of design development. If permanent impacts* |

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| | *remain after mitigation, this may be assessed as a major adverse impact on a resource of up to Regional importance, which is a Moderate or Large effect and therefore significant. Potential LSE are anticipated during construction and operation.* |
| **Receptor and Valuation:** | Reptiles (up to County) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential for loss of habitats used by reptile species including hibernation sites and/or refuges and potential for loss of natal den site for adder.<br>Habitat fragmentation: potential for fragmentation impacts during construction through loss of habitats and widening of existing barriers to dispersal.<br>Habitat damage/degradation: potential for pollution incidents during construction within reptile habitats in particular aquatic habitats for grass snake, which may be affected by local pollution incidents and sedimentation.<br>Disturbance: potential additional vehicle and personnel movements through reptile habitats during construction may affect local population viability on a temporary basis.<br>Species mortality: clearance of vegetation and reptile habitat features without due care, has the potential to cause injury or mortality to active or hibernating reptiles.<br>*Habitat loss may affect local population integrity on a permanent/irreversible basis.* | |
| **Potential Impacts (Operation)** | |
| Habitat fragmentation: permanent widening of existing barriers and severance or isolation of areas by creation of habitat 'islands' surrounded by road infrastructure. Potential additional shading from structures or new planting may reduce basking areas.<br>Habitat damage/degradation and disturbance: potential for operational pollution from road run-off and disturbance by additional people using the roadside habitats which may affect local population viability.<br>Species mortality: potential for species mortality through provision of additional roads and cycle paths.<br>*Habitat fragmentation may affect local population integrity on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: mitigated through the development of integrated landscaping plans which include the replacement of reptile habitat, features such as hibernacula and the enhancement of existing habitats, where possible and appropriate.<br>Habitat fragmentation: habitat connectivity features for reptiles provided throughout construction and through the landscaping plans. Where islanded populations are likely, reptile translocation may be required.<br>Habitat damage/degradation: direct and indirect impacts associated with construction impacts will be mitigated by measures included within the EMP. During operation road runoff will be treated according to *DMRB LA 113* guidance to ensure the water quality of discharges to surface water.<br>Disturbance: retained habitat will be fenced off for protection during construction, and vehicles and personnel will use clearly marked haul routes and footpaths. In the operational stage, if recreational areas are created in areas of reptile habitat, footpaths will be included to encourage people away from sensitive habitats. | |

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| Species mortality: sensitive site clearance following standard reptile displacement and/or translocation guidance will be followed and documented in the EMP. Measures to reduce operational mortality have yet to be confirmed. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account and not to affect the integrity of the population. Although reptile surveys are ongoing and mitigation for habitat loss is not finalised, the requirements for habitat replacement for reptiles are well understood and relatively straightforward to create. The extent of habitat fragmentation cannot be assessed until further surveys are undertaken and crossing points along the scheme are confirmed, therefore a potential effect on population integrity on a permanent/irreversible basis remains. These mitigation requirements will be considered at the next stage of design development. If permanent impacts remain after mitigation, this may be assessed as a major adverse impact on a resource of up to County importance, which is a Slight or Moderate effect and therefore significant. Potential LSE are anticipated during operation.* |
| **Receptor and Valuation:** | Amphibians (up to County) |
| **Potential Impacts (Construction)** | |
| Habitat loss: potential for loss of habitats used by amphibian species including overwintering sites and/or refuges and potential for loss of breeding ponds for great crested newts and toads.<br>Habitat fragmentation: potential for fragmentation impacts during construction through loss of habitats and widening of existing barriers to dispersal.<br>Habitat damage/degradation: potential for pollution incidents during construction within waterbodies, which may be affected by local pollution incidents and sedimentation.<br>Disturbance: potential additional vehicle and personnel movements through amphibian habitats and additional lighting during construction may affect local population viability on a temporary basis.<br>Species mortality: clearance of vegetation and ponds without due care, has the potential to cause injury or mortality to active or overwintering amphibians.<br>*Habitat loss may affect local population integrity on a permanent/irreversible basis.* | |
| **Potential Impacts (Operation)** | |
| Habitat fragmentation: permanent widening of existing barriers and severance or isolation of areas by creation of habitat 'islands' surrounded by road infrastructure.<br>Habitat damage/degradation and disturbance: potential for operational pollution from road run-off and disturbance by additional people using the roadside habitats which may affect local population viability.<br>Species mortality:<br>potential for species mortality through provision of additional roads and cycle paths.<br>*Habitat fragmentation may affect local population integrity on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |

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| Habitat loss: mitigated through the development of integrated landscaping plans which include the replacement of amphibian habitat, features such as replacing ponds on a 2:1 basis and the enhancement of existing habitats, where possible and appropriate.<br>Habitat fragmentation: habitat connectivity features for amphibians provided throughout construction and through the landscaping plans. Where islanded populations are likely, great crested newt translocation may be required which will also cover other amphibians.<br>Habitat damage/degradation: direct and indirect impacts associated with construction impacts will be mitigated by measures included within the EMP. During operation road runoff will be treated according to *DMRB LA 113* guidance to ensure the water quality of discharges to surface water.<br>Disturbance: retained habitat will be fenced off for protection during construction, and vehicles and personnel will use clearly marked haul routes and footpaths. In the operational stage, if recreational areas are created in areas of amphibian habitat (particularly around great crested newt ponds), footpaths will be included to encourage people away from sensitive habitats.<br>Species mortality: sensitive site clearance following standard great crested newt displacement and/or translocation guidance will be followed and documented in the EMP. Measures to reduce operational mortality have yet to be confirmed but may include measures to ensure amphibians are not entrapped within new structures such as balancing ponds and control structure or appropriate use of fencing. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account and not to affect the integrity of the population. Although mitigation for amphibian habitat loss is not finalised, the requirements for habitat replacement for amphibians are well understood and relatively straightforward to create. The extent of habitat fragmentation has not been assessed to date and crossing points along the scheme are yet to be confirmed, therefore a potential effect on population integrity on a permanent/irreversible basis remains. These mitigation requirements will be considered at the next stage of design development. If permanent impacts remain after mitigation, this may be assessed as a major adverse impact on a resource of up to County importance, which is a Slight or Moderate effect and therefore significant. Potential LSE are anticipated during operation. It should be noted that great crested newts are subject to the EPSL process which would ensure the integrity and favourable conservation status of this species is maintained therefore residual LSE are unlikely but cannot be ruled out at this stage.* |
| **Receptor and Valuation:** | Fish (up to International) |
| **Potential Impacts (Construction)** | |
| As per the Rivers section. Considerations specific to fish are described below.<br>Habitat loss: potential for the temporary loss (during construction) of spawning and nursery habitats including, clean gravels used for spawning by salmonids (*Salmo salar*) and lamprey species and marginal silts used by larval (ammocoete) stage lampreys.<br>Disturbance: elevated levels of noise and vibration associated with the construction phase have the potential to disturb aquatic species, including the migratory features of the River Eden and Tributaries SAC/SSSI.<br>Temporary lighting for construction may affect aquatic species by disturbing nocturnal migratory behaviours. | |

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| Species mortality: aquatic species could be killed or injured during construction. Eggs laid in spawning habitats could be destroyed or damaged and individuals (particularly juveniles) could be killed or injured as a result of direct impact with plant or through hypoxia associated with dewatering.<br>*These impacts may affect local population integrity on a permanent/irreversible basis.* | |
| **Potential Impacts (Operation)** | |
| Potential operations phase impacts to fish are described above for Rivers; these include road runoff, the potential for habitat fragmentation and habitat degradation as a result of poorly designed watercourse crossings that could restrict the migration of fish.<br>*Habitat fragmentation and degradation may affect local population integrity on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Mitigation to protect fish during construction and operation is outlined in the Rivers section.<br>Habitat loss and fragmentation: watercourse crossings will be designed to facilitate fish passage and the design will consider the potential loss of habitat upstream and downstream of the crossing location associated with altered fluvial geomorphological processes.<br>Disturbance: impacts will be minimised through sensitive timing of works giving rise to significant noise and vibration and best practice construction, such as low impact piling methodologies. This is of particular relevance to migratory aquatic species (Atlantic salmon, sea lamprey and river lamprey). No night work will be permitted in close proximity to watercourses without prior agreement from the Environment Agency and Natural England, and sensitive site lighting will be used. Methodologies and timing of works in/near water will be agreed with Natural England and the Environment Agency.<br>Species mortality: all fish (including juvenile lamprey that live in marginal sediments) will be translocated prior to dewatering works. Methods and translocation sites will be agreed in consultation with Natural England and the Environment Agency. | |
| **Likely Significant Effect Following Mitigation?** | *Habitat loss, fragmentation and damage/degradation are considered unlikely to affect integrity of fish populations on a permanent basis if best practice watercourse crossing design and pollution controls are followed. There remains the potential for temporary/reversible impacts after mitigation which do not affect the integrity of the resource, this may be assessed as a negligible adverse impact on a resource of up to International importance, which is a Slight effect and therefore not significant. No LSE anticipated for construction and operation. It should be noted that several rivers/streams across the route wide scheme vary in their value for fish and the level of effect would be adjusted accordingly.* |
| **Receptor and Valuation:** | Aquatic Invertebrates, including White clawed crayfish (*Austropotamobius pallipes*)<br>(County to International) |
| **Potential Impacts (Construction)** | |
| As per the Rivers section of this table. Considerations specific to aquatic invertebrates are described below.<br>Habitat damage/degradation: in the absence of suitable mitigation, there is potential for invertebrate (including crayfish) habitat/refuges to be damaged/degraded. This may be physically as a result of in-channel works and dewatering, or as a result of degradation of surface water quality from site runoff or chemical/fuel spill and siltation. | |

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| Species mortality: in the absence of mitigation, there is potential for aquatic invertebrates to be killed or injured during construction, either as a result of direct impact with plant/equipment or through hypoxia associated with dewatering.<br>In addition to pollution, there is also the risk of introducing invasive crayfish, particularly signal crayfish (*Pacifastacus leniusculus*) to project sites on plant/equipment during construction. This species is known to outcompete white-clawed crayfish and also carries a plague (*Phanomyces astaci*) that white-clawed crayfish are not immune to which can rapidly kill off an entire population at a site/area in just a few weeks.<br>*Habitat loss and degradation may affect local population integrity on a permanent/irreversible basis.* |
| **Potential Impacts (Operation)** |
| As per the Rivers section of this table. Considerations specific to aquatic invertebrates are described below.<br>Habitat fragmentation: poorly designed watercourse crossings/culverts have the potential to restrict the movement of aquatic invertebrates.<br>Habitat damage/degradation: in the absence of mitigation, there is potential for aquatic invertebrates to be impacted by polluted surface water runoff. This includes accidental spills on the road entering watercourses.<br>Species mortality: in the absence of mitigation there is potential for aquatic invertebrate mortality as a result of accidental spill of toxic chemicals.<br>*Habitat fragmentation and degradation may affect local population integrity on a permanent/irreversible basis.* |
| **Design, Mitigation and Enhancement Measures** |
| As per the Rivers section of this table. Considerations specific to aquatic invertebrates are described below.<br>Habitat damage/degradation: best practice construction methods with respect to working in/near water will be employed during construction, and operational phase road runoff will be treated prior to discharge.<br>Species mortality: Prior to dewatering or intrusive in-channel works, all crayfish will be translocated by a suitably licenced, white-clawed crayfish surveyor. This would be undertaken in combination with a fish translocation. Methods and translocation sites will be agreed in consultation with Natural England and the Environment Agency.<br>Strict biosecurity protocols will be followed during construction and maintenance of assets to mitigate the risks of introducing signal crayfish and other aquatic Invasive Non-native Species and pathogens to watercourses. |

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| **Likely Significant Effect Following Mitigation?** | *Habitat loss, fragmentation and damage/degradation are considered unlikely to affect integrity of aquatic invertebrate populations on a permanent basis if best practice watercourse crossing design and pollution controls are followed. There remains the potential for temporary/reversible impacts after mitigation which do not affect the integrity of the resource, this may be assessed as a negligible adverse impact on a resource of up to International importance, which is a Slight effect and therefore not significant. No LSE anticipated for construction and operation. It should be noted that several rivers/streams across the route wide scheme will likely vary in their value for aquatic invertebrates and the level of effect would be adjusted accordingly.* |
| **Receptor and Valuation:** | Terrestrial invertebrates (Up to National) |
| **Potential Impacts (Construction)** | |

Habitat loss: potential direct terrestrial invertebrate habitat loss includes loss of deadwood, structured mature woodland, tall sward and scrub, short sward and bare ground, marshland, upland, shingle banks and open mosaic habitat. Indirect habitat loss may be caused by change of water levels reducing available wetland, draw down or shingle habitat, and change of flow regime in rivers may result in shingle banks reducing, moving or being removed. Whilst lost habitats will be replaced post construction, the functionality of these new habitats will take time to develop to the equivalent resources currently available (notably deadwood habitats and mature woodland).
Habitat fragmentation: terrestrial invertebrates generally exist as metapopulations, and therefore creating barriers to dispersal between suitable habitats can result in localised and area wide extinctions of populations. Habitat fragmentation for invertebrates is likely from creation of linear features including roads, water courses, hedgerows, woodlands, bunds and walls. Localised impacts of fragmentation may also occur where invertebrate life stages depend on different habitats if these are disassociated.
Habitat damage/degradation: damage to trees during construction may increase the amount of available deadwood over time to the benefit of saproxylic invertebrates. Changes to hydrology may result in degradation of wetland and shingle habitats through drying out or rapid increase in water levels.
Disturbance: the construction phase will likely have an effect on terrestrial invertebrate populations from the proximity of construction work/traffic creating elevated levels of noise, vibration and turbulence (notably poor dispersers such as fritillary butterflies).
Temporary lighting for construction could affect nocturnal species attracting or deterring them from their usual habitats or commuting routes and increasing vulnerability to predators.
Species mortality: the likelihood of individual mortality is very high during construction particularly of immobile life stages such as eggs or pupae due to habitat removal or modification, movement of people and machinery through habitats, exposure of habitats, and fragmentation of habitats on a localised scale.
*Habitat loss and fragmentation may affect local population integrity on a permanent/irreversible basis.*

**Potential Impacts (Operation)**

Habitat loss: there is potential for terrestrial invertebrate habitat loss through pollution and inappropriate management of the soft estate.
Habitat fragmentation: the loss of deadwood, structured mature woodland, tall sward and scrub, short sward and bare ground, marshland, upland, shingle banks and open mosaic habitat will influence the movement across the landscape of local terrestrial invertebrate populations. Whilst lost habitats will be replaced post construction, the connectivity of these new habitats will take time to develop to the equivalent resources currently available (notably hedgerow and stream habitats and mature linear woodland).
Habitat damage/degradation: the operation of the new road alignment will cause an increase in vehicle emission deposits which may have an effect on degradation of sensitive habitats used by terrestrial invertebrates. Inappropriate management of the soft estate may lead to failure to achieve required mitigation or further degradation of habitats.
Disturbance: in the absence of mitigation there is potential for terrestrial invertebrate disturbance due to increased lighting, increased vibration and increased turbulence from road traffic.
Species mortality: in the absence of mitigation there is potential for terrestrial invertebrate mortality due to increased collisions with road traffic, increased attraction to the road through additional lighting, and pollution from vehicle emission deposits particularly of aquatic phases of many terrestrial invertebrates.

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| *Habitat loss and fragmentation may affect local population integrity on a permanent/irreversible basis.* | |
| **Design, Mitigation and Enhancement Measures** | |
| Habitat loss: loss of high value habitats will be avoided where possible. High value habitats lost as a result of the construction will be re-instated post construction. Where the scheme results in a loss of an identified terrestrial invertebrate habitat of importance, they will be compensated for in a form appropriate to the habitat requirements of the species assemblages present, where possible.<br>Habitat fragmentation: fragmentation of habitats will be avoided where possible. Habitats fragmented as a result of the construction will be re-connected post construction, where possible. Where the scheme results in disconnection of an identified terrestrial invertebrate habitat of importance, they will be compensated for in a form appropriate to the habitat requirements of the species assemblages present. Hedgerows and other linear features will include gaps such as gates to provide access points for invertebrate movement.<br>Habitat damage/degradation: minor damage to trees can be of benefit to invertebrates through creation of deadwood habitat. Translocation of existing standing deadwood and creation of new deadwood will increase available habitat. Degradation of habitats will be avoided, and mitigation will include enhancement of retained habitats and additional habitat creation.<br>Disturbance: mitigation will include careful design to minimise light spill, pollution control, and buffering of habitats to reduce turbulence effects.<br>Species mortality: Possible translocation of invertebrates in specific life stages and/or food or other plants, including deadwood, important for their lifecycle. | |
| **Likely Significant Effect Following Mitigation?** | *The majority of potential impacts are considered to be temporary/reversible when mitigation is taken into account as long as habitat features are replaced and fragmentation can be mitigated by additional habitat creation. There is potential for a permanent/irreversible loss of species associated with mature woodland or mature trees but this should not affect the integrity of the population after mitigation. If permanent impacts remain after mitigation, this may be assessed as a minor adverse impact on a resource of up to National importance, which is a Slight or Moderate effect and therefore significant. Potential LSE are anticipated during construction and operation.* |
| **Receptor and Valuation:** | Macrophytes (International) |
| **Potential Impacts (Construction)** | |
| As per the Rivers section of this table. Considerations specific to macrophytes are described below.<br>Habitat loss: macrophytes (including Annex I habitat: 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation, a qualify feature of the River Eden and Tributaries SAC/SSSI).<br>Habitat damage/degradation:<br>there is potential for macrophytes (including Annex I habitat: 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation, a qualify feature of the River Eden and Tributaries SAC/SSSI) to be damaged/degraded during construction. This may be physically as a result of in-channel works and dewatering, or as a result of degradation of surface water quality from site runoff or chemical/fuel spill.<br>In addition, there is the potential for the introduction and/or spread of invasive species of macrophyte when working in or near watercourse as a result of contaminated plant/equipment. This may negatively impact/alter the function of the native macrophyte assemblage. | |

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| *Habitat loss and degradation may affect local population integrity on a permanent/irreversible basis.* |
| **Potential Impacts (Operation)** |
| As per the Rivers section of this table. Considerations specific to macrophytes are described below.<br>Habitat loss: habitat with the potential to support macrophytes in the future may be lost/degraded as a result of shading associated with new watercourse crossings.<br>Habitat damage/degradation: In the absence of mitigation, there is potential for macrophytes to be impacted by polluted surface water road runoff (including one-off accidental chemical spills) and excessive sediment delivery to watercourses.<br>*Habitat fragmentation and degradation may affect local population integrity on a permanent/irreversible basis.* |
| **Design, Mitigation and Enhancement Measures** |
| As per Rivers section of this table. Considerations specific to macrophytes are described below.<br>Habitat loss: opportunities to translocate macrophyte beds of conservation value that will be lost will be investigated and assessed on a case-by-case basis, as will the potential to reduce riparian shading (where appropriate) to promote natural macrophyte growth to mitigate for the loss of macrophytes at new watercourse crossings.<br>Habitat damage/degradation: best practice construction methods with respect to working in/near water will be employed during construction, and operational phase road runoff will be treated prior to discharge.<br>Strict biosecurity protocols will be followed to mitigate the risk associated with the introduction of invasive species. |

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| **Likely Significant Effect Following Mitigation?** | *Habitat loss, fragmentation and damage/degradation are considered unlikely to affect the integrity of macrophyte populations, including Annexe 1 habitat which is a qualifying feature of the River Eden SAC, if best practice watercourse crossing design and pollution controls are followed. There will be localised loss through shading on a permanent/irreversible impacts, which is unlikely to affect the integrity of the resource. This may be assessed as a minor adverse impact on a resource of up to International importance, which is a Moderate or Large effect and therefore not significant. Potential LSE anticipated for construction and operation. It should be noted that several rivers/streams across the route wide scheme will likely vary in their value for macrophytes and the level of effect would be adjusted accordingly.* |

## M6 Junction 40 to Kemplay Bank

6.9.4 Table 6-7: M6 Junction 40 to Kemplay Bank - likely significant effects, provides some specific details about the biodiversity resources on the above scheme. In general, potential impacts and mitigation measures described in Section 6.8 will be applicable unless otherwise stated.

6.9.5 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-7: M6 Junction 40 to Kemplay Bank - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Statutory Designated sites River Eden SAC and River Eden and Tributaries SSSI (International) | As per route wide for designated sites and rivers.<br>No new watercourse crossing points (and associated habitat loss/degradation) are proposed for this scheme.<br>Small-scale direct and indirect impacts may occur through the construction of discharges into the River Eamont, which forms part of the SAC/SSSI, though direct habitat loss is not anticipated.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide for designated sites and rivers.<br>Proposed new discharges to the River Eamont, which forms part of the SAC/SSSI, have the potential to impact water quality.<br>The following Annex 1 habitat type is susceptible to negative impacts from nitrogen deposition: Alluvial forests with alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*) (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature. This habitat has not been recorded on this scheme currently, but Phase 1 habitat surveys are ongoing and its presence cannot be ruled out.<br>Further air quality assessment will be undertaken to inform the ES and operational impacts on riparian habitats associated with the SAC and SSSI cannot be ruled out at this stage.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may | As per route wide for designated sites and rivers.<br>Proposed mitigation is predicted to reduce impacts during construction so as not to affect the integrity of the site, although small-scale temporary terrestrial habitat loss may occur. Annex 1 habitats will be avoided through design, where possible.<br>Opportunities to translocate macrophyte beds of conservation value that will be lost will be investigated and assessed on a case-by-case basis, as will the potential to reduce riparian shading (where appropriate) to promote natural macrophyte growth to mitigate for the loss of macrophytes at new watercourse crossings. Such mitigation will be agreed in consultation with the Natural England and the Environment Agency. This may be assessed as a negligible adverse impact during construction once mitigation is taken into account. | Potential for negligible adverse impacts on a resource of International importance, which is a Slight effect and therefore not significant. No LSE anticipated relating to habitat loss/degradation (Construction).<br>Potential for major adverse impacts on a resource of International importance, which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality (Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | be assessed as a major adverse impact. | During operation, the water quality effects will be fully mitigated, but operational air quality impacts are not yet known. Air quality impacts have the potential to affect the integrity of the site only if the Alluvial forest habitat is present within the SAC and within 200m of the ARN (to be confirmed by further survey). This may be on a permanent/irreversible basis, which may be assessed as a major adverse impact.<br>Additional land may be required to support mitigation measures. | |
| Asby Complex SAC (International) | As per route wide.<br>No potential for direct impacts due to this site being situated too far from the works.<br>There is limited potential from indirect air pollution impacts (noxious/deposition) and the presence of habitats and/or species sensitive to these effects within this site.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide,<br>There is the potential for indirect air pollution impacts as a result of increased nitrogen loading (noxious/deposition) and the presence of habitats and/or species sensitive to these effects within this site.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide,<br>Further air quality assessment is required before impact levels can be reduced. | Potential for major adverse impacts on a resource of International importance, which is a Very Large effect and therefore significant.<br>Potential adverse LSE anticipated relating to air quality *(Operation)*. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | |
| Crosby Ravensworth Fell SSSI (National) | As per route wide,<br>No potential for direct impacts due to this site being situated too far from the works.<br>There is limited potential from indirect air pollution impacts (noxious/deposition) and the presence of habitats and/or species sensitive to these effects within this site (mosses, liverworts and lichens). | As per route wide,<br>There is the potential for indirect air pollution impacts as a result of increased nitrogen loading (noxious/deposition) and the presence of habitats and/or species sensitive to these effects within this site (mosses, liverworts and lichens). | As per route wide,<br>Further air quality assessment is required before impact levels can be reduced. | Potential for major adverse impacts on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality *(Operation).* |
| Cowraik Quarry (geological) SSSI (National value, based on presence of Priority Habitats) | This site is separated from the Scheme via a main road (A686) and urban dwellings in east Penrith, therefore no direct losses and situated at too great a distance (>200m from works) for indirect impacts.<br>No change anticipated. | None identified | None identified | No change on a resource of National importance would be a Neutral effect and therefore not significant. No LSE are anticipated. |
| Non-statutory Designated sites<br>Skirsgill Wood CWS (County)<br>Yanwath Wood CWS (County)<br>Myers Beck (Mardale Road) CWS (County)<br>Disused Railway Line near | As per route wide for designated sites and habitats.<br>Temporary disturbance to land within Skirsgill Woods through disturbance or compaction of soils upon ground flora and trees. Loss of trees possible for watercourse connection. Total area of potential temporary loss is approximately 700m$^2$.<br>No direct impacts are anticipated for Myers Beck CWS and Yanwath Wood | As per route wide for designated sites and habitats.<br>There is the potential for indirect air pollution impacts to as a result of increased nitrogen loading (noxious/deposition) and the presence of sensitive habitats and/or further sensitive species as receptors within Skirsgill Wood and Disused Railway Line near Newbiggin LWS. | As per route wide for designated sites and habitats.<br>Skirsgill woods: planting of appropriate species over area disturbed for connection to watercourse. Tree protection and replacement tree planting.<br>Skirsgill woods: measures to avoid spread of and removal of non-native invasive plant species giant hogweed and | Potential for major adverse impacts on a resource of County importance, which may be assessed as a Slight/Moderate effect and therefore significant. Potential LSE are anticipated related to habitat loss and air |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Newbiggin LWS (County)<br>Lowther Bridge Site of Invertebrate Significance (County)<br>Eamont Bridge/ Banks of River Eamont Sites of Invertebrate Significance (County) | CWS due to distance from the scheme. Yanwath Wood and Lowther Bridge site of invertebrate may be subject to indirect, pollution impacts. Myers Beck is also designated for water voles. This is assessed under water voles and the impact on the local population will be assessed relative to this site subject to further surveys.<br>At Skirsgill Wood and Disused Railway Line near Newbiggin LWS, there is also limited potential through indirect air pollution impacts (noxious/deposition) due to presence of sensitive habitats/further sensitive species as receptors within this site.<br>The small-scale woodland loss and air quality impacts may affect the integrity of Skirsgill Wood and Disused Railway Line near Newbiggin and pollution affects may affect the integrity of Yanwath Wood CWS and the Lowther Bridge site on a permanent / irreversible basis in the absence of mitigation, therefore a major adverse impact is predicted. | Potential operational impacts are considered to be permanent/irreversible and have potential to affect the integrity of these sites therefore a major adverse impact is predicted. | localised removal of Himalayan balsam (impossible to eradicate based on upstream resource) could be considered as a potential benefit of the scheme.<br>Yanwath Wood and Lowther Bridge site of invertebrate significance: as per route wide measures to be detailed in EMP.<br>Proposed mitigation is predicted to reduce impacts during construction so as not to affect the integrity of the Yanwath Wood and the Lowther Bridge site. Due to loss of mature woodland habitat, the impact on Skirsgill Wood may be assessed as a major adverse impact during construction. Further design review will aim to avoid impacts on the woodland thereby reducing this impact level.<br>Further air quality assessment is required before impact levels can be reduced. | quality (*Construction and Operation*). |
| Morecombe Bay Limestone and Wetlands Nature | This site is 37km away from the scheme and only included here for | Within 200m of ARN, no significant increase in nitrogen deposition (<1%) and the current nitrogen | Mitigation for air quality is yet to be agreed but may include provision of newly created | Potential for major adverse impacts on a resource of International |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Improvement Area (International). | potential operational impacts related to the ARN.<br><br>No change anticipated. | deposition is below critical load. However, due to further inputs required for air quality modelling, potential impacts cannot be ruled out at this stage.<br><br>Potential for operational air quality to affect a small proportion of the site, which is may affect the integrity of the site on a permanent / irreversible basis, which may be assessed as a major adverse impact. | habitats where existing habitats are to be degraded. | importance, which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality *(Operation).* |
| Habitats<br>Newbiggin Wood AW<br>Raughtonguil Wood AW<br><br>Woodland, Improved grassland, woodlands, semi-improved neutral grasslands and hedgerow<br>(Up to National value due to | As per route wide<br>Direct habitat loss is predominantly improved grassland then woodland (approx. 12ha, of which 1.39ha is Priority Habitat) and semi-improved neutral grassland (approx. 6Ha) with approx. 250m of hedgerow lost and smaller losses on other habitat types. Approximately 15 semi-mature or mature individual trees will be lost, some of which may be ancient or veteran.<br>Newbiggin Wood Ancient Woodland is 22.7km north and Raughtonguil Wood AW is 18.2km north of this scheme and only included due to being 200m from | As per route wide<br>Air quality impacts may occur on Newbiggin Wood AW and Rautonguil Wood AW as they are within 200m of the ARN. The current stage of air quality modelling has identified a 1% increase in nitrogen for where Newbiggin Wood and Raughtonguil Wood are within 200m of the ARN, this increase provides the potential for detrimental impacts upon habitats and species (mosses, liverworts and lichens). In addition the current critical loads for nitrogen are exceeded in both these ancient woodlands. | As per route wide<br>Further air quality assessment and mitigation design is required but there may be a need for further mitigation areas to offset air quality impacts related to habitat degradation.<br>Habitat creation to include woodland planting including parkland, hedgerow and species-rich grassland and wetland mosaic.<br>Identification of areas with native bluebell and provide suitable protection measures through EMP. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats *(Construction and Operation).*<br>Potential for major adverse impacts on a resource of up to National importance, which is a Large or Very Large effect and therefore significant, in relation to air quality (*Operation)* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| presence of Priority Habitat) | the ARN. No direct impacts are anticipated.<br>Online alignment therefore widening of an existing form of fragmentation rather than creating new fragmentation impacts.<br>Potential for wind-throw impacts to trees not subject to existing wind forces upon removal of external facing trees at periphery of M6/ A66 junction and verges.<br>Potential for spread of existing invasive species of giant hogweed and Himalayan balsam at location due west of M6 on River Eamont.<br>Potential for loss of bluebell through ground disturbance to wooded habitats during construction.<br>No further impacts are anticipated to notable or protected plant species in this scheme. | These potential impacts may affect the integrity of the resource on a permanent / irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact.<br>Temporal loss of new habitat condition to reach target condition for all new areas of planting. | | |
| Rivers/streams (International with regards to SAC and Local at all other locations) | As per route wide<br>No new watercourse crossing points (and associated habitat loss/degradation) are proposed for this scheme; the alignment falls within a section of Thacka Beck that is already culverted as a result of the existing | As per route wide<br>Impact assessment as per River Eden SAC. | As per route wide<br>The existing culvert at Thacka Beck is significant in length and is considered likely to be a barrier to migration for aquatic species therefore there are potential beneficial effects to be | Potential adverse LSE anticipated relating to air quality *(Operation)* as per River Eden SAC. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | A686, A66 and of the Cumbria Constabulary buildings.<br>Small-scale direct and indirect impacts may occur through the construction of discharges into the River Eamont, which forms part of the SAC/SSSI, though direct habitat loss is not anticipated.<br>Impact assessment as per River Eden SAC. | | explored in further design review. | |
| Bats (Roosts) (Regional) | As per route wide.<br>Based on current survey results, no structures with bat roost potential are likely to be lost as a result of the scheme although preliminary surveys have identified two bat roosts within 50m of the draft DCO boundary which may be subject to disturbance.<br>Nine trees with moderate to high potential to support roosting bats are within the construction area and likely to require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys<br>(Construction and Operation). |
| Bat Activity (Foraging and Commuting)<br>(National) | As per route wide<br>Temporary loss of key foraging resource until habitat replanting scheme completed and matures. | As per route wide.<br>One potential bat crossing point (Carleton Hall underpass) has been identified that will be affected by the scheme where it is extended. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts<br>(Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Red Squirrel (Up to National) | As per route wide. Habitat loss (temporary and permanent) for red squirrel for this scheme includes small areas of woodland and woodland edges as well as connecting tree lines and hedgerows. | As per route wide. Possible fragmentation impacts at the eastern end of the scheme. | As per route wide, including a potential requirement for a crossing point feature (rope bridge) at the eastern extents of the scheme to ensure suitable woodland habitats remain connected and help reduce the risk of squirrel mortality through traffic collision. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |
| Otter (Up to International) | As per route wide. Loss of terrestrial otter habitat is limited to areas surrounding the existing Thacka Beck crossing point. Based on current survey results, no otter holts are likely to be lost as a result of the scheme as no new road watercourse crossing points are proposed. Surveys have identified potential holts within 250m of the draft DCO boundary along the River Eamont which may be subject to disturbance. | As per route wide. There is potential for disturbance impacts of otter commuting and foraging habitats and otter holts due to the proximity of the new road alignment to the River Eamont. | As per route wide. | No LSE are anticipated as per route wide table. |
| Water Vole (Up to County) | As per route wide. Myers Beck CWS has a water vole population in the reasons for designation and presence of water vole on this scheme cannot be ruled out. Loss of terrestrial water vole habitat is limited to areas surrounding the existing Thacka Beck crossing point. | As per route wide. The operational phase could cause an increase in vehicle deposits and surface run off of pollutants into Thacka Beck which could cause a deleterious impact to foraging habitats. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Vibration and excavations could cause the collapse of burrows if active water voles burrows are present. | | | |
| Badger<br>(Local Value) | As per route wide.<br>Loss of suitable badger foraging and commuting habitat is limited to woodland and scrub edges and some open rough grassland areas immediately surrounding this scheme.<br>Construction areas are located immediately next to or within known badger territories, with three setts likely to require closure on a temporary or permanent basis. | As per route wide.<br>There is potential for permanent fragmentation of suitable badger habitat to the eastern extents of this scheme where a known badger clan have territory and setts either side of the existing A66 carriageway.<br>There is potential for the permanent closure of three setts due to the proximity of the new road alignment to these existing setts. | As per route wide.<br>Habitat loss will be compensated by additional woodland planting immediately to the north and south of the new road alignment.<br>The potential habitat fragmentation will be mitigated by the presence of a badger friendly crossing point being installed or enhanced at the eastern extents of this scheme combined with badger fencing which will increase the usage of this safe crossing point. | No LSE are anticipated as per route wide table. |
| Other Terrestrial Mammal species<br>Polecat<br>Brown hare<br>Deer<br>*Hedgehog*<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme includes hedgerows, woodland, woodland edges, grassland, open fields, areas of scrub and riparian banks. | As per route wide. | As per route wide.<br>Potential habitat fragmentation for hedgehog, polecat and brown hare will be mitigated by the presence of a mammal friendly crossing point being installed or enhanced at the eastern extents of this scheme | As per route wide table due to habitat loss and fragmentation impacts (*Construction and Operation)* although this is likely to be mitigated by the proposed underpass. If this is confirmed, this would reduce the impact level to Moderate and the level of effect to Slight, |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | which is not significant. No LSE predicted. |
| Wintering Birds (Up to County) | As per route wide. Habitat loss for wintering birds for this scheme includes hedgerows, mature trees and grassland. | As per route wide. | As per route wide | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE predicted. |
| Breeding Birds (Up to County) | As per route wide. Habitat loss for breeding birds for this scheme includes hedgerows, mature trees and grassland. The River Eamont is located to the south of this Scheme so disturbance impacts on riverine species will be a particular issue. Three active breeding sand martin colonies (two adjacent to the Scheme boundary) were identified during surveys and grey wagtail and dipper were also noted. | As per route wide Disturbance impacts on riverine birds associated with the River Eamont will also be an issue in the operational phase, as the Scheme brings the road closer to riverine habitat. | As per route wide | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE predicted. |
| Barn owl (County) | As per route wide. This Scheme is located on the southern edge of Penrith and opportunities for barn owl are less common compared to the wider DCO Draft Boundary. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table (Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | However, there are mature trees and structures largely confined to the south of the route with potential for barn owl but surveys are ongoing. | | | |
| Reptiles<br>(Up to County) | As per route wide.<br>Reptile habitat potential along road verges and other habitats. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table (Construction and Operation). |
| Amphibians<br>(Up to County) | As per route wide.<br>No impacts anticipated to great crested newt as assumed likely absent based on surveys.<br>No anticipated impacts to pond habitats used by amphibian species or to the River Eden in terms of potential breeding habitat for common toad.<br>Large numbers of common toad in vicinity and potential for colonisation of new balancing ponds created (even prior to their completion). Other more common amphibian species may also colonise these ponds. Potential for alpine newt presence. Care to be taken with regard to biosecurity and legal requirements (cannot be released into the wild if trapped during works). | As per route wide and including potential for entrapment of amphibians within drainage structures (road drainage and balancing pond control structures) with resultant mortality.<br>Potential for mortality associated with road traffic interaction on migratory routes.<br>Potential for impact on migratory movements of common toad. | As per route wide and including suitable design of road drainage measures at control structures for both road drainage and balancing pond control structures to either prevent ingress or entrapment.<br>Avoidance of use of road salts adjacent to balancing ponds (desiccating impact on amphibians).<br>Review requirement for suitable fencing to reduce potential for amphibian road traffic accidents.<br>Provision of overwintering habitat outside of floodplain near to balancing ponds.<br>Ponds with shallow margins on at least one side (south preferably) to allow natural | Potential adverse LSE as per route wide table relating to common toad only (Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | colonisation of plant species and invertebrate assemblages as prey for amphibian species. | |
| Fish (Up to International) | As per route wide.<br>No new watercourse crossing points (and associated habitat loss/degradation) are proposed for this Scheme.<br>Fish survey and eDNA data, which will be used to identify fish species of conservation value, is pending. | As per route wide. | As per route wide. | No LSE anticipated as per route wide table. |
| White-Clawed Crayfish (WCC) (Up to International) | As per route wide.<br>No new watercourse crossing points (and associated habitat loss/degradation) are proposed for this Scheme.<br>Desk study records of WCC exist within close proximity to Thacka Beck. Survey and eDNA data, which will be used to confirm the presence/absence of WCC in Thacka Beck, is pending. | As per route wide. | As per route wide. | No LSE anticipated as per route wide table. |
| Terrestrial invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates (Up to National) | As per route wide.<br>No new watercourse crossing points (and associated habitat loss/degradation) are proposed for this | As per route wide. | As per route wide. | No LSE anticipated as per route wide table (Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Scheme; the alignment falls within a section of Thacka Beck that is already culverted.<br>Aquatic invertebrate survey data, which will be used to identify species of conservation value and assess the current condition of Thacka Beck, is pending. | | | |
| Macrophytes (up to International) | As per route wide.<br>No new watercourse crossing points (and associated habitat loss/degradation) are proposed for this Scheme; the alignment falls within a section of Thacka Beck that is already culverted.<br>Macrophyte survey data, which will be used to identify species of conservation value and assess the current condition of Thacka Beck, is pending. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table (Construction and Operation). |

## Penrith to Temple Sowerby

6.9.6 Table 6-8: Penrith to Temple Sowerby - likely significant effects provides some specific details about the biodiversity resources on the above scheme. In general, potential impacts and mitigation measures described in Section 6.8 will be applicable unless otherwise stated.

6.9.7 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-8: Penrith to Temple Sowerby - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Eden SAC and River Eden and Tributaries SSSI (International) | As per route wide for designated sites and rivers.<br>No new watercourse crossing points (and associated habitat degradation as a result of shading) are proposed within the SAC/SSSI site boundary.<br>Very localised (~20m) degradation (shading) of sub-type 2 water course of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) associated with the widening of the existing crossing of Light Water; this watercourse is considered likely (surveys pending) to be functionally linked to the SAC/SSSI.<br>Construction of proposed new discharges to the River Eamont, which forms part of the SAC/SSSI have the potential to adversely impact water quality in the SAC/SSSI.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide for designated sites and rivers.<br>In the absence of mitigation proposed new discharges to the River Eamont which form part of the SAC/SSSI have the potential to adversely impact water quality in the SAC/SSSI.<br>The following Annex 1 habitat type is susceptible to negative impacts from nitrogen deposition: Alluvial forests with alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*) (Alno-Padion, Alnion incanae, Salicion albae) * Priority feature. This habitat has not been recorded on this scheme currently but Phase 1 habitat surveys are ongoing and its presence cannot be ruled out.<br>Further air quality assessment will be undertaken to inform the ES and operational impacts on riparian habitats associated with the SAC and SSSI cannot be ruled out at this stage.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis | As per route wide for designated sites and rivers.<br>Opportunities to translocate macrophyte beds of conservation value that maybe lost will be investigated and assessed on a case-by-case basis, as will the potential to reduce riparian shading (where appropriate) to promote natural macrophyte growth to mitigate for the loss of macrophytes at new watercourse crossings. Such mitigation will be agreed in consultation with the Natural England and the Environment Agency.<br>In order to further address localised habitat loss through shading, the possibility of remediating a failed culvert (Light Water), considered likely to restrict the free movement of aquatic species, will be explored further. This would improve connectivity between Light Water (Annex I habitat) and the River Eamont. | Potential for negligible adverse impacts on a resource of International importance, which is a Slight effect and therefore not significant. No LSE anticipated relating to habitat loss/degradation (Construction).<br><br>Potential for major adverse impacts on a resource of International importance, which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | in the absence of mitigation, which may be assessed as a major adverse impact. | This may be assessed as a negligible adverse impact during construction once mitigation is taken into account.<br>Proposed mitigation is predicted to reduce impacts from water pollution during construction, although localised habitat loss through shading remains. therefore impacts may affect the integrity of the resource on a permanent/irreversible basis.<br>The proposed habitat improvements will reduce this impact but have not yet been confirmed through design. This may therefore be assessed as a major adverse impact during construction.<br>For works areas in channel, water crowfoot beds (if present and provided evident at time of works) can be moved upstream, these can then re-colonise downstream in the areas where works have occurred once complete, to reduce localised loss.<br>During operation, the water quality effects will be fully | |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | mitigated, but operational air quality impacts are not yet known. Air quality impacts have the potential to affect the integrity of the site only if the Alluvial forest habitat is present within this section of the SAC and within 200m of the ARN (to be confirmed by further survey). This may be on a permanent/irreversible basis, which may be assessed as a major adverse impact. | |
| Udford Low Moss SSSI<br>(National) | As per route wide.<br>This site is at too great a distance for direct effects but is connected to the scheme via semi-natural habitat along the river corridor and could be subject to changes in water quality and changes to hydrological processes from the proposed works.<br>The site is notified for mobile species such as birds and red squirrel so impacts on these in the wider area are also relevant to the assessment and will be looked at in detail for the ES.<br>No direct habitat loss or degradation from air quality as site is over 200m from all construction activity, in line with *DMRB LA 105* guidelines. | As per route wide.<br>No habitat degradation due to air quality is predicted for this site.<br>Potential fragmentation impacts relating to birds and red squirrel, although due to the distance from the proposed scheme and good connectivity to habitats to the north it is considered unlikely this would affect the integrity of the site.<br>Potential impacts on operational water quality and hydrology may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, | As per route wide.<br>Chapter 14 Road Drainage and the Water Environment conclude no LSE on hydrology for this scheme and no LSE related to water quality and hydrology are anticipated for the River Eden SAC as long as design and construction mitigation is followed. Therefore, no change is expected on this site for hydrology although further hydrology assessment may be required to inform mitigation.<br>As mitigation for red squirrel connectivity is not fully | Potential for negligible adverse impacts on a resource of National importance, which is a Slight effect and therefore not significant. No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Potential impacts on water quality and hydrology may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | which may be assessed as a major adverse impact. | designed, there is potential for temporary/reversible impact to remain, which would be assessed as negligible. | |
| Cowraik Quarry (geological) SSSI (National value, based on presence of Priority Habitats) | This site is separated from the scheme via a main road (A686) and the River Eamont, therefore no direct losses and it is situated at too great a distance (>200m from works) for indirect impacts.<br>No change is anticipated. | None identified | None required | No LSE anticipated. |
| Cliburn Moss SSSI and Cliburn Moss NNR<br>(both National) | This site is at too great a distance for direct effects.<br>The site has a county-value breeding bird assemblage and is connected to the scheme via hedgerows and woodland. It is considered to be well buffered from the proposed scheme against disturbance impacts to citation species. It is also well buffered against water pollution or hydrology impacts.<br>No air quality degradation as site is over 200m from all construction activity, in line with *DMRB LA 105* guidelines.<br>No change is anticipated. | None identified | As per route wide<br>Mitigation relating to breeding birds will be relevant as birds from the SSSI may use the wider area. | No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Non-statutory designated sites<br>Whinfell Forest CWS (National)<br>Watersmeet (Eamont & Eden) CWS<br>(County) | As per route wide.<br>No direct impacts on either site.<br>No air quality degradation as both sites are over 200m from all construction activity, in line with *DMRB LA 105* guidelines.<br>Planting within proposed ecology mitigation areas may be adjacent to the Whinfell CWS, but habitat management and creation activities should not cause significant air or water pollution effects.<br>This site is known to support red squirrel and habitat loss and fragmentation impacts may affect the population of red squirrel in the area as detailed in the red squirrel section of this table.<br>Watersmeet (Eamont & Eden) CWS supports over-wintering birds and barn owls, which are considered further in the birds section, but no indirect impacts are predicted due to distance from the scheme.<br>Potential impacts on fragmentation and habitat loss for red squirrels at Whinfell CWS may affect the integrity of the resource on a permanent/irreversible basis in the | As per route wide.<br>No change is anticipated though if the proposed ecology mitigation to reconnect woodland at Whinfell CWS goes ahead in this area, there could be a significant beneficial effect.<br>No air quality degradation is predicted as both sites are over 200m from the ARN, in line with *DMRB LA 105* guidelines. | As per route wide.<br>Proposed ecology mitigation would aim to connect this woodland to woodlands to the north including a crossing point for red squirrel dispersal. This is yet to be confirmed. | Potential for major adverse impacts on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential adverse LSE anticipated relating to red squirrel at Whinfell Forest CWS only *(Construction and Operation).*<br>A significant beneficial effect may occur subject to ecology mitigation design and agreement. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | absence of mitigation, which may be assessed as a major adverse impact.<br>If the proposed ecology mitigation to reconnect woodland north to south goes ahead in this area, there could be a significant beneficial effect. | | | |
| Habitats –<br>Salter Wood Ancient Woodland,<br>Deciduous woodland<br>Veteran trees<br>Floodplain grazing marsh<br>Lowland meadows<br>Ponds<br>Hedgerow<br>(Up to National) | As per route wide<br>Losses anticipated to improved grassland, arable, poor semi-improved grassland and hardstanding (totalling approximately 97Ha). Smaller scale losses to woodland, semi-improved neutral grassland, marshy grassland, scrub tall ruderal and bracken habitats.<br>The largest losses to linear habitats are to wall and fence habitats and to linear woodland habitats.<br>Within the above are perceived impacts of loss or disturbance to the following Priority Habitats: rivers and streams, floodplain grazing marsh, hedgerows, neutral grasslands/lowland meadows, deciduous woodland.<br>Loss of intact hedgerows with both species-poor and species-rich hedgerows and defunct species-poor hedges affected. Loss of smaller lengths of dry ditches, species-rich | As per route wide.<br>No air quality impacts are anticipated to Salter Wood AW | As per route wide.<br>Provision of buffer strips within adjacent agricultural landscape to provide connective corridor for species colonisation.<br>Ensure good species diversity within islanded areas, to reduce impacts of slow or poor local colonisation.<br>Loss of non-native invasive species through active management to limit potential for further spread and reduce impacts on existing semi-natural habitats for yellow archangel (subsp. argentatum), Himalayan balsam and for waterweed species (noting difficulty of eradication for marginal or aquatic invasive species due to upstream resources). | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | defunct hedges and species-rich hedge and tree habitats.<br>Areas within road junctions at minor access areas and at the Center Parks junction form islands, surrounded by urban road infrastructure, preventing local colonisation and fragmentation.<br>Loss of roadside verge habitat within otherwise poor agricultural landscape, with loss of connectivity for species colonisation.<br>Potential to expose underlying seed bank with diverse seed bank adjacent to ancient woodland areas.<br>Potential for disturbance to ancient and veteran trees (ash and pedunculate oak) in close proximity to works through accidental intrusion which may cause ground compaction or root damage. Potential for pollution impacts to these trees as sensitive receptors.<br>Potential for disturbance to soils with seed banks of Himalayan balsam and yellow archangel, or to riparian soils with waterweed species.<br>Potential to impact through water pollution impacts to riparian habitats to affect existing notable species including Ranunculus species | | | |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | (species forming Annex 1 habitat) and river jelly lichen.<br>Works within ecology mitigation areas are within 200m of Salter Wood AW, but habitat management and creation activities should not cause dust or water pollution effects.<br>Changes to verge gradients and losses of some habitats may lead to localised losses of common species such as cowslips and to locally notable arable weeds of common cudweed, or to a stream water crowfoot, bluebell or hoary cinquefoil if evident. | | | |
| Rivers/streams (International) | As per route wide<br>River/stream habitat will be lost/degraded (shaded) as a result of widening of the existing A66 culverts. With the exception of Light Water, the watercourses crossed by this Scheme are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species (including qualifying species of the River Eden SAC/SSSI) as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of natural and man-made barriers. | As per route wide | As per route wide<br>See River Eden SAC for specific mitigation related to Light Water.<br>Enhancement of existing culverts (where being replaced and/or extended) to aid movement of aquatic species has yet to be agreed but will be part of the next design review and detailed in the ES. | Potential adverse LSE anticipated as per route wide and River Eden SAC *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Bats (Roosts)<br>(Regional) | As per route wide.<br>Preliminary surveys have identified 16 structures and 20 trees with moderate to high potential to support roosting bats that are likely to be affected by the scheme.<br>Of these structures, two are scheduled for demolition and all identified trees will require clearance. | As per route wide. | As per route wide | Potential adverse LSE as per route wide table subject to ongoing surveys *(Construction and Operation).* |
| Bat Activity (Foraging and Commuting)<br>(Up to National) | As per route wide.<br>Six potential crossing points will be affected by the scheme during construction.<br>Temporary loss of key foraging resource. | As per route wide.<br>Six potential crossing points will be affected by the scheme.<br>Temporary loss of key foraging resource until habitat replanting scheme completed and matures. | As per route wide.<br>Potential crossing point features to be mitigated through planting and/or structures. Designs and locations are yet to be agreed but will form part of the next design review for the ES. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts *(Construction and Operation).* |
| Red Squirrel (Sciurus vulgaris)<br>(National) | As per route wide.<br>Habitat loss for red squirrel for this scheme includes woodland edges as well as connecting tree lines and hedgerows. | As per route wide.<br>Due to widening of the existing carriageway areas of woodland located north and south of the route which are suitable for red squirrel may become permanently fragmented as a result of operation. | As per route wide.<br>A potential red squirrel crossing point feature (rope bridge and associated planting) may be necessary around the centre of this scheme to ensure suitable woodland habitats remain connected and a safe crossing feature can be used to help reduce the risk of RTAs. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |
| Otter (Lutra lutra)<br>(Up to International) | As per route wide.<br>Loss of terrestrial otter habitat is limited to works adjacent to the | As per route wide.<br>Increased noise, light, and vibration disturbance adjacent to | As per route wide.<br>Enhancement of existing culverts (where being replaced | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | unnamed tributaries of River Eamont and areas surrounding the existing watercourse crossing points on Swine Gill and Light Water.<br>Based on current survey results, no otter holts are likely to be lost as a result of the scheme. No new road watercourse crossing points are proposed. Surveys have identified nine potential holts within 250m of the draft DCO boundary along the River Eamont, Swine Gill and an unnamed tributary of the River Eamont which may be subject to disturbance during construction.<br>Direct impacts associated with the temporary loss of otter habitat during the expansion of existing road watercourse crossing points on Swine Gill and Light Water.<br>Works adjacent to the unnamed tributaries of River Eamont are likely to cause permanent bankside habitat loss and could discourage commuting from the River Eamonth north of the existing A66 alignment. | the unnamed tributaries of River Eamont may reduce otter use for commuting and foraging. Disturbance from traffic could cause holts to be abandoned and deter commuting otter.<br>Expansion of culverts at existing crossing points likely to reduce frequency of use by otter and could cause an increase in RTA incidents if they chose to commute over the culvert instead of through it. | and/or extended) to aid movement of aquatic species has yet to be agreed but will be part of the next design review and detailed in the ES. | |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Water Vole (Arvicola amphibious) (County) | As per route wide.<br>Loss of suitable water vole habitat is limited to bankside vegetation and reed beds associated with works to an unnamed tributary of the River Eamont at Whinfell Park and existing watercourse crossing points on Swine Gill and Light Water. | As per route wide.<br>There is potential for an increase in traffic as a result of the scheme. This may cause a deleterious impact to foraging habitats on Swine Gill, Light water and in the reed bed. | As per route wide.<br>Enhancement of existing culverts (where being replaced and/or extended) to aid movement of aquatic species has yet to be agreed but will be part of the next design review and detailed in the ES. | *No LSE are anticipated as per route wide table.* |
| Badger (Meles meles) (Local) | As per route wide.<br>Loss of suitable badger foraging and commuting habitat is limited to woodland and scrub and some open rough grassland and arable fields immediately surrounding this scheme.<br>Loss of linear boundary features may isolate woodlands known to be used by badger clans from one another.<br>Construction areas are located immediately next to or within known badger territories, with five setts likely to be impacted and four setts likely to require closure on a temporary or permanent basis. | As per route wide.<br>There is potential for permanent fragmentation of suitable badger habitat to the north and south of this scheme where a known badger clan have territory and setts either side of the existing A66 carriageway.<br>There is potential for the permanent closure of four setts due to the proximity of the new road alignment to these existing setts. | As per route wide.<br>Habitat loss will be compensated by additional woodland planting immediately to the north and south of the new road alignment.<br>Proposed mitigation for potential habitat fragmentation would be badger friendly crossing points being installed or enhanced at the eastern and central extents of this scheme combined with badger fencing which will increase the usage of this safe crossing point. The design and location for this has not yet been confirmed and will be part of the next design review and detailed in the ES. | *No LSE are anticipated as per route wide table.* |
| Other Mammal Species | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Polecat (Mustela putorius)<br>Brown hare (Lepus europaeus)<br>Deer<br>Hedgehog (Erinaceus europaeus)<br>(Up to County) | Habitat loss (temporary and permanent) for this scheme includes hedgerows, small pockets of woodland, woodland edges, grassland, open fields, areas of scrub and riparian banks. | Due to widening of the existing carriageway suitable habitats may become permanently fragmented as a result of operation. | | due to habitat loss and fragmentation impacts *(Construction and Operation).* |
| Wintering Birds<br>(Up to County) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes woodland, hedgerows, mature trees and grassland with additional impacts associated with watercourses.<br>Watersmeet (Eamont & Eden) CWS supports wintering birds but is considered at too great a distance for disturbance impacts. | As per route wide | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Breeding Birds<br>(Up to County) | As per route wide.<br>Habitat loss for breeding birds for this scheme includes woodland, hedgerows, mature trees and grassland with additional impacts associated with watercourses.<br>The River Eamont is located directly west of this Scheme and further north so disturbance impacts on riverine species will be a particular issue. One | As route wide | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | active sand martin colony was recorded along the River Eamont, north of the existing A66. The colony was approximately 160m from the DCO boundary. | | | |
| Barn Owl (Regional) | As per route wide. Watersmeet (Eamont & Eden) CWS is known to support barn owl and impacts on the local population of barn owl relating to this site will be considered in the ES. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Reptiles (Up to County) | As per route wide.Historic records for common lizard from habitats connected to the scheme and suitable reptile habitat within engineering boundary. | As per route wide. Potential for permanent severance of migratory routes for adder and fragmentation (isolation) of populations within islanded areas of road infrastructure. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians (Up to County) | As per route wide Losses of terrestrial habitats in the vicinity of two great crested newt breeding ponds. The new junction at centreparks results in the loss of spoil banks, which may support overwintering sites. Losses to stone wall habitats may also result in temporal losses to any overwintering habitats in these areas, | As per route wide Should the mitigation licence route be followed as opposed to District Level Licencing, then there may be a temporal loss in quality of replacement habitat provision, despite additional habitat being created. Potential for mortality associated with road traffic interaction on migratory routes. | As per route wide and M6 Junction 40 to Kempley Bank scheme. Mitigation licensing or District Level Licensing will be required for losses to terrestrial habitats and for measures to prevent harm to great crested newt. | Potential adverse LSE as per route wide table relating to common toad and GCN (Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | but there is alternative suitable provision of this in the wider area.<br>Fragmentation of migratory routes during works to watercourses or general vegetation loss or severance.<br>Temporal loss or disruption to potential routes for north/ south migration across the A66 or between areas of good foraging resource, due to works for the new junction at centreparks and at Lightwater and Swine Gill, particularly if all are affected at the same time.<br>Islands created within the centreparks junction which have the potential to increase road traffic interactions if this is used by amphibians.<br>Large numbers of common toad in vicinity and potential for colonisation of new balancing ponds created (even prior to their completion). | Potential for impact on migratory movements of common toad. | | |
| Fish<br>(Up to International) | As per route wide.<br>River/stream habitat will be lost/degraded (shaded) as a result of widening of the existing A66 culverts. With the exception of Light Water, the watercourses crossed by this Scheme are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species. | As per route wide. | As per route wide. Replacement culverts will be built to facilitate the movement of fish where they are recorded during surveys.<br>Fish passage will be maintained at the Light Water crossing point.<br>Fish survey and eDNA data, which will be used to identify fish | No LSE anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | species of conservation value, is pending. | |
| WCC (Austropotamobius pallipes) (Up to International) | As per route wide | As per route wide | As per route wide. WCC survey and eDNA data, which will be used to confirm WCC presence, is pending. | No LSE anticipated as per route wide table. |
| Terrestrial invertebrates (Up to National) | As per route wide | As per route wide | As per route wide | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates (Up to National) | As per route wide | As per route wide | As per route wide | No LSE anticipated as per route wide table *(Construction and Operation).* |
| Macrophytes (Up to International) | As per route wide | As per route wide | As per route wide | Potential adverse LSE anticipated as per route wide table (Construction and Operation). |

## Temple Sowerby to Appleby

### Blue alternative

6.9.8 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-9: Temple Sowerby to Appleby Blue alternative - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Eden SAC and River Eden and Tributaries SSSI<br>(International) | As per route wide for designated sites and rivers.<br>Localised loss of riparian and in-channel vegetation associated with the Trout Beck Crossing.<br>Construction of the new crossing has the potential to adversely impact water quality in the SAC/SSSI.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide for designated sites and rivers.<br>There is the potential for discharges to adversely impact water quality in the River Eden within the SAC/SSSI.<br>There is the potential for indirect river impacts (fluvial geomorphological) which may alter the quality and distribution of aquatic habitat. This could have indirect impacts on the qualifying species the habitat supports.<br>Air quality impacts cannot be ruled out at this stage. The following Annex 1 habitat type is susceptible to negative impacts from nitrogen deposition: Alluvial forests with alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*) (Alno-Padion, Alnion incanae, Salicion albae) * Priority feature. This habitat has not been recorded on this scheme currently but Phase 1 habitat surveys are ongoing and its presence cannot be ruled out.<br>Further air quality assessment will be undertaken to inform the ES and operational impacts on riparian habitats associated with the SAC | As per route wide for designated sites and rivers.<br>Proposed mitigation is predicted to reduce impacts from water pollution during construction.<br>Detailed fluvial geomorphological modelling has been undertaken to inform the alignment options in this scheme and demonstrate that the open span bridge structure and pier spacing are sufficient to enable the river to function naturally under a variety of flow conditions. Watercourse crossing design will ensure that current fluvial geomorphological processes and fish passage are maintained. The potential impacts on habitat upstream and downstream of the crossing location will be assessed and mitigated through appropriate design. The design and assessment of impacts will be informed by detailed hydromorphological | Potential for major adverse impacts relating to air quality on a resource of International importance, which is a Very Large effect and therefore significant.<br>Potential adverse LSE anticipated relating to habitat loss (*Construction*) and air quality *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | and SSSI cannot be ruled out at this stage.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | modelling, as described in Chapter 14: Road Drainage and the Water Environment.<br>For works areas in channel, water crowfoot beds (provided evident at time of works) can be moved upstream, these can then re-colonise downstream in the areas where works have occurred once complete, to reduce localised loss.<br>Localised habitat loss through shading remains but with mitigation this not expected to adversely affect the integriy of the SAC/SSSI and therefore impacts can be reduced to a minor adverse impact during construction.<br>During operation, the water quality effects will be fully mitigated, but operational air quality impacts are not yet known. Air quality impacts have the potential to affect the integrity of the site particularly if the Alluvial forest habitat is present within this section of the SAC and within 200m of the ARN (to be | |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | confirmed by further survey). This may be on a permanent/irreversible basis, which may be assessed as a major adverse impact. | |
| Temple Sowerby Moss SSSI (National) | As per route wide.<br>This site is situated at too great a distance for direct impacts and no habitat loss or pollution effects are anticipated.<br>Ecological mitigation proposals adjacent to the site may have a beneficial effect but these are yet to be confirmed.<br>No change is anticipated. | As per route wide.<br>Air pollution impacts cannot be ruled out at this stage as this site has not been assessed fully.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide.<br>If adjacent ecological mitigation planting goes ahead, suitable habitats to compliment the wetland habitats within the SSSI and to further support species within the SSSI would be selected. | Potential for major adverse impacts on a resource of National importance would be a Large or Very Large effect and therefore significant.<br>Potential LSE are possible in relation to air quality (*Operation*). |
| Non-statutory designated sites<br>Chapel Wood CWS (up to International)<br>Ross Wood CWS (National)<br>Dowpits Wood CWS (National)<br>Acorn Bank Woods and Garden CWS<br>River Lyvennet Floodplain CWS<br>Temple Sowerby Shingle Banks, Temple Sowerby | There is potential for habitat loss or damage to Chapel Wood CWS and ancient woodland as a result of a construction buffer for an access road that runs through adjacent woodland on an existing track.<br>No direct impact to Ross Wood CWS however there is the potential for indirect air pollution impacts (dust) for this and Chapel Wood. These are ancient woodlands and have habitats and species that may be sensitive to these effects within them. | As per route wide.<br>Air quality impacts may occur on Chapel Wood CWS and Ross Wood CWS as they are within 200m of the ARN.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide.<br>Further drainage design iterations will aim to avoid loss of ancient woodland at Chapel Wood CWS and protect retained woodland habitat.<br>Further surveys or analysis of data regarding the ancient woodland sites and whether these qualify as the Annex 1 alluvial woodland habitat type is required to confirm valuation. | Potential for major adverse impacts on a resource of up to International importance, which is a Very Large effect and therefore significant.<br>Potential adverse LSE anticipated relating to habitat loss (*Construction*) and air quality *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Moss, River Eden Oglebird Scar Ers, Acorn Bank and Bolton Shingle Bank Sites of Invertebrate Significance (all four invertebrate shingle sites are County level) | There are no direct impacts predicted for Dowpits Wood, Acorn Bank Woods and Garden CWS and River Lyvennet Floodplain CWS and all are over 200m from all construction activities therefore no air quality impacts are predicted.<br><br>All invertebrate sites are situated greater than 200m from the works with no direct impacts anticipated and no potential for indirect air pollution impacts (dust deposition).<br>The potential impacts on the Chapel Wood and Ross Wood CWSs may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact.<br>No change is predicted for the invertebrate sites. | | As avoidance through design has not yet been confirmed, there is potential for habitat loss and severance which may affect the integrity of the Chapel Wood CWS and ancient woodland on a permanent/irreversible basis, which would be assessed as a major adverse impact. | |
| Habitats –<br>Oglebird Plantation AW<br>Chapel Wood AW<br>Ross Wood AW<br>Dowpits Wood AW<br>Veteran trees | As per route wide<br>Losses and/or disturbance to Chapel Wood ancient woodland habitat and soils.<br>Potential damage to adjacent mature trees (root damage, limb | As per route wide<br>Long term loss to irreplaceable ancient woodland habitat.<br>Potential for air quality impacts upon Chapel Wood CWS, Ross Wood CWS and Oglebird Plantation ancient woodland. | As per route wide.<br>Further design review will aim to avoid any impact on ancient woodland and retain mature/veteran trees.<br>Potential for any losses to Annex 1 habitat // deciduous woodland in terms of | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats although valuation is higher due to the possible presence of Annex 1 habitats. Therefore, a potential major adverse impact on a feature |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Woodland<br>Hedgerow<br>Ponds<br>Open Mosaic habitat.<br>(Up to International) | damage, ground compaction, pollution or deposition).<br>Severance of historic routes at Priest Lane/ Cross St and Main Street/ Sleastonhowe Lane, with hedgerows and mature trees (some ancient/veteran Pedunculate oak and ash trees), some of which are confirmed Priority Habitat and may qualify as 'important' hedgerows and/ or irreplaceable habitat.<br>Severance of large open agricultural habitats.<br>Changes to hydrology, shading or pollution impacts may negatively affect or result in the loss of the following notable plant species: harebell, tormentil, bitter vetch, crosswort and devils-bit scabious and to notable riparian species of *Ranunculus* species (as Annex 1 habitats) and lower plants: liverworts and lichens, or to lower plants or lichen species on rock, wall or tree habitats.<br>Potential for spread of non-native species Himalayan balsam and rhododendron. | The current stage of air quality modelling has identified a 1% increase in nitrogen for where Oglebird Plantation is within 200m of the ARN, this increase provides the potential for detrimental impacts upon habitats and species (mosses, liverworts and lichens).<br>Continued north-south severance impacts which may affect dispersal of plant species.<br>Temporal scale impacts for new planting to become established. | ash/alder woodland to not be able to be replaced through additional planting, due to biosecurity restrictions on planting of alder and ash.<br>Local landscape is largely agricultural so the provision of additional varied habitats in the landscape may also provide new routes of connectivity for species colonisation in east-west movements. Improved pollution control measures for the River Eden and opportunity to design greater provision for floodplain connectivity for marsh habitats, within floodplain for marginal and aquatic plant species colonisation, or to provide space for woodland habitats to develop (50 years plus). As ecology mitigation design is not yet finalised potential beneficial effects have not been reported.<br>Further air quality assessment for ES reporting for Oglebird Plantation to identify whether nitrogen | of International importance may be assessed as a Very Large effect, which is significant. Potential LSE anticipated due to loss and degradation of ancient woodland *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | loading per kg per year (plus any awaited Ammonia concentrations), are against established thresholds and/or has to potential to cause an impact on a component species or habitat. | |
| Rivers/streams (International) | As per route wide.<br>Localised loss of riparian and in-channel vegetation associated with the Trout Beck Crossing; this watercourse qualifies as an Annex I habitat: sub-type 2 water course of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. | As per route wide.<br>The crossing of Trout Beck has the potential to impact the natural (fluvial geomorphological) river process which control the quality and distribution of aquatic habitat within the SAC/SSSI. This could have indirect impacts on the qualifying species the habitat supports. | As per route wide. | Potential adverse LSE anticipated as per route wide and River Eden SAC *(Construction and Operation).* |
| Bats (Roosts)<br><br>(Regional) | As per route wide<br>One structure and 11 trees with moderate to high potential will require demolition as a result of the scheme. (Note: one further residential property scheduled to be demolished has not provided access for the PBRA surveys to be undertaken). | As per route wide | As per route wide | Potential adverse LSE as per route wide table subject to ongoing surveys<br>(Construction and Operation). |
| Bat Activity (Foraging and Commuting) (National) | As per route wide<br>The scheme contains 19 potential bat crossing points that will be affected by construction. | As per route wide<br>The scheme contains 19 potential bat crossing points that will be affected by the scheme. | As per route wide | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | Due to this alignment being offline, previously undisturbed suitable habitats will become permanently fragmented.<br>Temporary loss of foraging resource until habitat replanting scheme is completed and matures. | | *(Construction and Operation).* |
| Red Squirrel<br>(Up to National) | As per route wide<br>Temporary and permanent habitat loss for red squirrel for this scheme is limited to connecting linear features such as tree lines and hedgerows and the occasional woodland edge and old railway line. A small pocket of isolated woodland located immediately to the east of Kirkby Thore may also be lost. | As per route wide | As per route wide | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts<br>(Construction and Operation). |
| Otter<br>(Up to International) | As per route wide.<br>Direct impacts associated with the temporary loss of otter habitat at the new crossing points on Tutta Beck.<br>Disturbance impacts associated with construction activity is likely to impact commuting and foraging otter and may cause holts to be temporarily abandoned if present (field surveys have not yet been completed for all route alternatives being considered for this scheme). | As per route wide.<br>Potential permanent increased noise, light, vibration and surface water runoff containing pollutants may reduce otter commuting and foraging and could cause habitat fragmentation on Trout Beck due to the previously undisturbed nature of the watercourse. Disturbance from traffic could cause holts nearby to be abandoned. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Water Vole (County) | As per route wide.<br>Direct impacts associated with the temporary loss of water vole habitat at the new crossing point over Trout Beck.<br>Disturbance impacts associated with construction activities could impact foraging water vole and cause burrows to be abandoned or to collapse if present - field surveys have not yet been completed for all route alternatives being considered for this scheme.<br>Disturbance impacts associated with construction activities at previously undisturbed areas of Trout Beck could impact foraging water vole and cause burrows to be abandoned or to collapse if present - field surveys have not yet been completed for all route alternatives being considered for this scheme.<br>The River Eden does not provide suitable habitat for water vole. | As per route wide. | As per route wide | No LSE are anticipated as per route wide table. |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which includes pockets of small woodland areas, woodland and scrub edges, open rough grassland areas and | As per route wide.<br>Due to this alignment being offline, previously undisturbed suitable habitats will become permanently fragmented. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | predominantly open arable fields with linear boundary features including hedgerows, tree lines and dry stone walls.<br>Badger surveys are not complete for all routes, but it is likely setts will be identified in the area. | Crossing points may be identified through further survey. | | |
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme includes hedgerows, one area of woodland, woodland edges, grassland, open fields, areas of scrub and riparian banks. | As per route wide.<br>Due to this alignment being offline, previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented as a result of operation. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts *(Construction and Operation).* |
| Wintering Birds<br>(Up to County) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes hedgerows, mature trees and grassland with additional impacts associated with watercourses.<br>Habitats around Kirkby Thore were found to support large flocks of lapwing so disturbance impacts on wintering lapwing will be a particular issue. A large flock of over 500 lapwing were recorded in | As per route wide.<br>Due to this alignment being offline, previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented and disturbed as a result of operational disturbance. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | fields to the north west of Kirkby Thore. | | | |
| Breeding Birds (Up to County) | As per route wide.<br>Habitat loss for breeding birds for this scheme includes hedgerows, mature trees and grassland with additional impacts associated with watercourses.<br>Trout Beck (River Eden SSSI) is crossed by the Blue alternative of this scheme so disturbance impacts on riverine species will be a particular issue. Whilst no sand martin colonies were recorded, a single kingfisher was recorded along Trout Beck approximately 100m from the Blue alternative for this scheme.<br>Habitats around Kirkby Thore were found to be of value to ground nesting bird so disturbance impacts on ground nesting birds will be a particular issue. Low numbers of oyster catcher and curlew were recorded in fields across Blue and Red alternatives for this scheme. | As per route wide.<br>Habitat loss for breeding birds for this scheme includes hedgerows, mature trees and grassland with additional impacts associated with watercourses. Due to this alignment being offline, previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented and disturbed as a result of operational disturbance. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Barn Owl (Regional) | As per route wide.<br>Habitat loss for barn owls for this scheme includes agricultural | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | buildings, tussocky grassland, hedgerows and mature trees. | | | |
| Reptiles<br>(Up to County) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians<br>(Up to County) | As per route wide.<br>There are no losses to pond habitats that are currently known to support or have the potential to support great crested newts. There are losses to terrestrial habitat and potentially severance impacts to terrestrial habitats over 290m from known great crested newt populations.<br>Temporary negative impacts to one pond north of Temple Sowerby SSSI and one formed by the SSSI wetland itself. Both have yet to be surveyed for great crested newt (within connected habitat to great crested newt populations at Acorn Bank).<br>Fragmentation of potential terrestrial habitats within islands surrounded by road infrastructure that are within 500m of known great crested newt breeding ponds. | As per route wide.<br>Creation of balancing ponds has the potential to provide greater breeding and terrestrial habitat for amphibian species.<br>Potential to sever existing (north/south) migratory routes between garden pond habitats at Kirkby Thore Village and the wider area. Potential for some increased east to west connective habitats along new alignment verges. | As per route wide. | Potential adverse LSE as per route wide table relating to amphibian species including GCN (Construction and Operation). |
| Fish | As per route wide | As per route wide | As per route wide. | No LSE anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| (Up to International) | Of particular note for this Scheme is potential for disturbance of migratory fish as a result of elevated levels of noise/vibration and artificial lighting during the construction of the Trout Beck crossing. | The crossing of Trout Beck has the potential to impact the natural (fluvial geomorphological) river process which control the quality and distribution of aquatic habitat within the SAC/SSSI. This could have indirect impacts on fish. | | |
| WCC (Up to International) | As per route wide. | As per route wide. | As per route wide. | No LSE anticipated as per route wide table. |
| Terrestrial invertebrates (Up to National) | As per route wide.<br>Potential direct terrestrial invertebrate habitat loss through loss or change in structure of shingle bank habitat.<br>Potential for wider loss of species if removal or degradation of shingle banks splits populations of shingle dependent invertebrates.<br>Changes to hydrology may result in degradation of shingle habitats in the vicinity and further up or down stream through drying out or rapid increase in water levels.<br>The construction phase will likely have an effect on terrestrial invertebrate populations using shingle banks from in water working increasing water movement, shading and vibration. | As per route wide.<br>Increased shading has the potential to affect species movement by creating a barrier of cooler air and water which may impact shingle dependent invertebrate metapopulations.<br>Increases in vehicle emission deposits and changes in hydrology may have an effect on degradation of shingle habitats used by terrestrial invertebrates.<br>In the absence of mitigation there is potential for shingle dependent terrestrial invertebrate disturbance due to increased lighting, increased vibration and increased turbulence from road traffic.<br>In the absence of mitigation there is potential for terrestrial invertebrate | As per route wide.<br>Loss of shingle habitats will be avoided where possible through design and construction protocol. Construction will avoid in-water working where possible, where this is not possible techniques involving minimum disturbance to water flow will be employed.<br>Fragmentation of shingle habitat will be avoided where possible. Fragmentation as a result of the construction will be re-connected post construction by creation of further shingle habitat.<br>Degradation of habitats will be avoided, and mitigation will | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | The likelihood of individual mortality is very high during construction particularly of immobile life stages such as eggs or pupae due to shingle habitat removal or modification. | mortality due to increased collisions with road traffic and pollution from vehicle emission deposits particularly of aquatic phases of many terrestrial invertebrates. | include enhancement of retained shingle habitats and additional shingle habitat creation.<br>Mitigation will include careful design to minimise light spill, pollution control, and disturbance to water flow.<br>Possible translocation of shingle dependent invertebrates. | |
| Aquatic invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | No LSE anticipated as per route wide table. |
| Macrophytes (Up to International) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |

Red alternative

6.9.9 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-10: Temple Sowerby to Appleby Red alternative - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Eden SAC and River Eden | This alternative also crosses Trout Beck (approximately 1km further upstream than the Blue alternative) | As per Blue alternative. | As per Blue alternative. | Potential for major adverse impacts on a resource of International importance, |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| and Tributaries SSSI (International) | and Keld Sike (a tributary of Trout Beck). The potential impacts of this alternative are consistent with those described in Table 6-8: Penrith to Temple Sowerby - likely significant effects for the Blue alternative, with additional habitat degradation (shading) of Keld Sike, which is not located within the SAC/SSSI boundary but may be functionally linked (surveys pending). | | | which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to habitat loss (*Construction*) and air quality *(Operation).* |
| Temple Sowerby Moss SSSI (National) | As per Blue alternative. | As per Blue alternative. | As per Blue alternative. | Potential for major adverse impacts on a resource of National importance would be a Large or Very Large effect and therefore significant. Potential LSE are possible in relation to air quality (*Operation*). |
| Non-statutory designated sites Chapel Wood CWS (up to International) Ross Wood CWS (National) Dowpits Wood (National) Acorn Bank Woods and Garden CWS | As per Blue alternative however there is potential for greater habitat loss and severance impacts to Chapel Wood CWS and ancient woodland as a result of the north-south outfall pipeline from the balancing pond to the north to the River Eden. | As per Blue alternative. | As per Blue alternative. | Potential for major adverse impacts on a resource of up to International importance, which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to habitat loss (*Construction*) and air quality *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Lyvennet Floodplain CWS<br>Bolton Shingle Bank site of invertebrate significance (Local) | | | | |
| Habitats –<br>Chapel Wood AW (Up to International)<br>Oglebird Plantation AW<br>Ross Wood AW<br>Dowpits AW<br>Veteran trees<br>Woodland<br>Hedgerow<br>Acid Grassland<br>Orchards<br>Ponds<br>Open Mosaic habitat.<br>(Up to National) | As per route wide.<br>Habitat loss and/or disturbance to Chapel Wood ancient woodland habitat and soils.<br>Greater potential for losses to scattered semi-mature to mature trees (some likely veteran trees).<br>Priority Habitats likely affected within the habitats include those listed for the Blue alternative, with differing scales of impacts and additionally includes an orchard (potential for dust deposition pollution impacts).<br>Losses and potential habitat degradation to deciduous woodland and hedgerows (significant loss and severance at Sleastonhowe Lane) and losses to open mosaic habitat.<br>No direct loss of acid grassland, but works immediately adjacent, therefore indirect impacts through changes to hydrology or pollution impacts are possible. | As per Blue alternative | As per Blue alternative<br>Additional design review to ensure mitigation hierarchy is followed to avoid impacts to Priority Habitats with hydrological connectivity adjacent to construction areas. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats although valuation is higher due to the possible presence of Annex 1 habitats. Therefore, a potential major adverse impact on a feature of International importance may be assessed as a Very Large effect, which is significant.<br>Potential adverse LSE anticipated due to loss and degradation of ancient woodland *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Changes to hydrology, shading or pollution impacts may negatively affect habitats or result in the loss of the following notable plant species: harebell, tormentil, bitter vetch, crosswort and devils-bit scabious and to notable riparian species of *Ranunculus* species (as Annex 1 habitats) and lower plants: liverworts and lichens, lichen species on rock, wall or tree habitats. | | | |
| Rivers/streams (International) | As per Blue alternative with additional habitat loss/degradation (shading) of Keld Sike, which is not located within the SAC/SSSI boundary. This alternative also crosses Trout Beck (approximately 1km further upstream than the Blue alternative) and Keld Sike (a tributary of Trout Beck). | As per Blue alternative. | As per Blue alternative. | Potential adverse LSE anticipated as per route wide and River Eden SAC *(Construction and Operation)*. |
| Bats (Roosts) (Regional) | As per route wide.<br>One structure and eight trees with moderate to high potential will require demolition as a result of the scheme. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting) | As per route wide | As per route wide.<br>Twenty potential crossing points will be affected by the scheme. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| (National) | Twenty potential crossing points will be affected by the scheme during construction.<br>Loss of foraging resource during construction. | Temporary loss of foraging resource until habitat replanting scheme completed and matures | | impacts *(Construction and Operation).* |
| Red Squirrel<br>(Up to National) | As per route wide.<br>Habitat loss (temporary and permanent) for red squirrel for this scheme is limited to connecting linear features such as tree lines and hedgerows and the occasional woodland edge and old railway line.<br>Only one small pocket of isolated woodland located immediately to the east of Kirkby Thore is anticipated to be impacted and potential red squirrel habitat lost. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |
| Otter<br>(Up to International) | As per route wide.<br>Direct impacts associated with the temporary loss of otter habitat at the new crossing points on Trout Beck. Disturbance impacts associated with construction activity is likely to impact commuting and foraging otter at previously undisturbed areas of Trout Beck and its tributary and in close proximity to the River Eden and may cause holts to be temporarily abandoned if present. Ffield | As per route wide.<br>Potential permanent increased noise, light, vibration and surface water runoff containing pollutants may reduce otter commuting and foraging and could cause habitat fragmentation on Trout Beck due to the previously undisturbed nature of the watercourse. Disturbance from traffic could cause holts nearby to be abandoned. | As per route wide | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | surveys have not yet been completed for all route alternatives being considered for this scheme. | | | |
| Water Vole (County) | As per route wide.<br>Direct impacts associated with the temporary loss of water vole habitat at the new crossing point over Trout Beck and its tributary. Potential temporary closure of burrows on Trout Beck and its tributary if present - field surveys have not yet been completed for all route alternatives being considered for this scheme.<br>Disturbance impacts associated with construction activities at previously undisturbed areas of Trout Beck could impact foraging water vole and cause burrows to be abandoned or to collapse. | As per route wide.<br>. | As per route wide. | No LSE are anticipated as per route wide table. |
| Badger (Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which includes pockets of small woodland areas, woodland and scrub edges, open rough grassland areas and predominantly open arable fields with linear boundary features | As per route wide.<br>Crossing points may be identified through further survey. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | including hedgerows, tree lines and dry stone walls.<br>Badger surveys are not complete for all routes, but it is likely setts will be identified in the area. | | | |
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme includes hedgerows, one area of woodland, woodland edges, grassland, open fields, areas of scrub and riparian banks. | As per route wide.<br>Due to this alignment being offline, previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts *(Construction and Operation).* |
| Wintering Birds<br>(Up to National) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes hedgerows, mature trees and grassland with additional impacts associated with watercourses.<br>Habitats around Kirkby Thore were found to support large flocks of lapwing so disturbance impacts on wintering lapwing will be a particular issue. A large flock of over 100 lapwing were recorded in fields to the south west of Long Marton. The flock was recorded | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a national resource therefore a Slight/ Moderate effect is predicted *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | approximately 200m from the Red alternative of this scheme. | | | |
| Breeding Birds (Up to National) | As per route wide.<br>Habitat loss for breeding birds for this scheme includes hedgerows, mature trees and grassland with additional impacts associated with watercourses.<br>Trout Beck (River Eden SSSI) is crossed by the Red alternative of this scheme so disturbance impacts on riverine species will be a particular issue. Whilst no sand martin colonies were recorded, a single kingfisher was recorded along Trout Beck approximately 1000m from where the Red alternative for this scheme crosses Trout Beck.<br>Habitats around Kirkby Thore were found to be of value to ground nesting bird so disturbance impacts on ground nesting birds will be a particular issue. Low numbers of oyster catcher and curlew were recorded in fields across Blue and Red alternatives for this scheme. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a national resource therefore a Slight/Moderate effect is predicted (Operation). |
| Barn Owl (National) | As per route wide.<br>Habitat loss for barn owls for this scheme includes agricultural | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | buildings, tussocky grassland, hedgerows and mature trees. | | | *(Construction and Operation).* |
| Reptiles (Up to County) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians (Up to County) | As per Blue alternative. | As per Blue alternative. | As per Blue alternative. | Potential adverse LSE as per route wide table relating to amphibian species including GCN (Construction and Operation). |
| Fish (Up to International) | As per Blue alternative with additional habitat loss/degradation (shading) associated with the Keld Sike crossing. This alternative also crosses Trout Beck (approximately 1km further upstream than the Blue alternative) and Keld Sike (a tributary of Trout Beck). | As per Blue alternative. | As per Blue alternative. | No LSE anticipated as per route wide table. |
| WCC (Up to International) | As per Blue alternative with additional habitat loss/degradation (shading) associated with the Keld Sike crossing. This alternative also crosses Trout Beck (approximately 1km further upstream than the Blue alternative) and Keld Sike (a tributary of Trout Beck). | As per the Blue alternative. | As per the Blue alternative. | No LSE anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Terrestrial invertebrates (Up to National) | As per the Blue alternative. | As per the Blue alternative. | As per the Blue alternative. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic Invertebrates (Up to National) | As per Blue alternative with additional habitat loss/degradation (shading) associated with the Keld Sike crossing. This alternative also crosses Trout Beck (approximately 1km further upstream than the Blue Alternative) and Keld Sike (a tributary of Trout Beck) with the Keld Sike crossing. | As per the Blue alternative. | As per the Blue alternative. | No LSE anticipated as per route wide table. |
| Macrophytes (Up to International) | As per Blue alternative with additional habitat loss/degradation (shading) associated with the Keld Sike crossing. This alternative also crosses Trout Beck (approximately 1km further upstream than the Blue Alternative) and Keld Sike (a tributary of Trout Beck) with the Keld Sike crossing. There is potential for species loss/ mortality of the Nationally Scarce bryophyte *Porella pinnata* during construction. This species was recorded during surveys of Trout Beck in the vicinity of the proposed red alternative. | As per the Blue alternative. | As per the Blue alternative. Specific protocol to be devised for Porella Pinnata to be incorporated into the EMP for this scheme to avoid or reduce impacts on this species. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |

### Orange alternative

6.9.10 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-11: Temple Sowerby to Appleby Orange alternative - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Eden SAC and River Eden and Tributaries SSSI (International) | As per Blue alternative however this alternative crosses Trout Beck approximately 50m downstream of the existing A66 crossing at Kirkby Thore and approximately 200m upstream of the confluence with the River Eden.<br>This alternative also has a linear construction boundary partly within the SAC/SSSI boundary west of the scheme south of Temple Sowerby. | As per Blue alternative | As per Blue alternative.<br>In addition, aim to avoid further construction works within the SAC/SSSI boundary to the south of Temple Sowerby during further design review. | Potential for major adverse impacts on a resource of International importance, which is a Very Large effect and therefore significant. Potential LSE anticipated relating to habitat loss (*Construction*) and air quality *(Operation).* |
| Temple Sowerby Moss SSSI (National) | This alternative includes a linear construction boundary through the SSSI which is a potential change of footpath use to bridleway, so small-scale direct habitat loss is possible if any construction works are required.<br>There is the potential via ground disturbance mechanisms for indirect ground water impacts to this lowland fen and pollution impacts. | As per Blue alternative.<br>Potential through change of footpath use from public to bridleway that increased footfall and potential disturbance impacts may affect the SSSI negatively (ground compaction, grazing, nutrification through dung deposits).<br>These potential impacts are unlikely to affect the integrity of the resource on a permanent/irreversible basis but may have some effects in the | As per route wide<br>Ensure works to existing footpath areas are the best option in the interests of preservation of the SSSI habitat based on existing value and ecological potential during further design review.<br>The opportunity will be taken to review ecological mitigation design for the SSSI to include potential for enhancement options | Potential for negligible adverse impact on a resource of National importance would be a Slight effect and therefore not significant. No LSE are anticipated in relation to habitat loss/degradation *(Construction).*<br>Potential for major adverse impacts on a resource of National importance would be a Large or Very Large effect |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | absence of mitigation, which may be assessed as a negligible adverse impact. | relating to long-term issues of oil tank leak and the rectification of this issue.<br>Current ecological mitigation design includes buffer planting for the SSSI and an area to compensate for any minor tree loss, if required.<br>Beneficial impacts are not reported at present as ecology mitigation design is not finalised.<br>Construction pollution controls and the sensitive design of works would reduce impacts so as not to affect the integrity of the resource and any effects would be temporary/reversible, so this may be assessed as a negligible adverse impact. | and therefore significant. Potential LSE are possible in relation to air quality (*Operation*). |
| Non-statutory designated sites<br>Chapel Wood CWS (up to International)<br>Ross Wood CWS (National)<br>Dowpits Wood CWS (National)<br>Acorn Bank Woods and Gardens CWS (County) | As per Blue alternative. | As per Blue alternative. | As per Blue alternative. | Potential for major adverse impacts on a resource of up to International importance, which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to habitat loss |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Lyvennet Floodplain CWS (County)<br>Temple Sowerby Shingle Banks, Oglebird Scar, Acorn Bank and Bolton Shingle Bank Sites of Invertebrate Significance<br>(all four invertebrate shingle sites are County level) | | | | (*Construction*) and air quality *(Operation).* |
| Habitats –<br>Chapel Wood<br>(Up to International)<br>Ancient Woodland<br>Deciduous woodland<br>Wet woodland<br>Lowland fen<br>Ponds<br>Hedgerows<br>(Up to National) | As per Blue alternative<br>Losses and/or disturbance to Chapel Wood ancient woodland habitat and soils.<br>Greater potential for losses to scattered semi-mature to mature trees (some likely veteran trees).<br>Priority Habitats in addition to woodland likely affected include lowland fen and wet woodland (Temple Sowerby SSSI) and hedgerow.<br>Greater impacts to areas of historic significance associated with the roman road, that whilst currently in agricultural use and/or unmanaged semi-natural habitats may have ecological potential due to their setting. | As per Blue alternative. | As per route wide and Blue alternative. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats although valuation is higher due to the possible presence of Annex 1 habitats. Therefore, a potential major adverse impact on a feature of International importance may be assessed as a Very Large effect, which is significant. Potential adverse LSE anticipated due to loss and degradation of ancient woodland, subject to design refinement *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Severance of habitats for north-south movements or colonisation at east of scheme, at junctions and partially for Kirkby Thore Village.<br>Changes to hydrology, shading or pollution impacts may negatively affect or result in the loss and disturbance of the following notable plant species: crosswort and devils-bit scabious and to notable riparian species of Ranunculus species (as Annex 1 habitats) and lower plants: liverworts and lichens, or to lower plants or lichen species on rock, wall or tree habitats.<br>Potential for impacts to areas with the following non-native species Himalayan balsam and rhododendron. | | | |
| Rivers/streams (International) | As per route wide table and Blue alternative.<br>Localised loss of riparian and in-channel vegetation associated with the Trout Beck Crossing; this watercourse qualifies as an Annex I habitat: sub-type 2 water course of plain to montane levels with the | As per Blue alternative. | As per Blue alternative. | Potential adverse LSE anticipated as per route wide and River Eden SAC *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. | | | |
| Bats (Roosts)<br>(Regional) | As per route wide.<br>Three structures and 11 trees with moderate to high potential will require demolition as a result of the scheme. (Note: one further residential property scheduled to be demolished has not provided access for the PBRA) | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting)<br>(National) | As per route wide.<br>The scheme contains 18 potential bat crossing points that will be affected by the scheme during construction.<br>Temporary loss of foraging resource during construction. | As per route wide.<br>The scheme contains 18 potential bat crossing points that will be affected by the scheme.<br>Temporary loss of foraging resource until habitat replanting scheme is completed and matures | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts *(Construction and Operation).* |
| Red Squirrel<br>(National) | As per route wide.<br>Habitat loss (temporary and permanent) for red squirrel for this scheme is limited to connecting linear features such as tree lines and hedgerows and the occasional woodland edge and old railway line. | As per route wide. | As per route wide | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts<br>(Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Otter<br>(Up to International) | As per route wide.<br>Direct impacts associated with the temporary loss of otter habitat at the new crossing points on Trout Beck.<br>Disturbance impacts associated with construction activity is likely to impact commuting and foraging otter at Trout Beck and in close proximity to the River Eden. Crossing point immediately south of the existing A66 next to a large working cattle farm so disturbance is likely to be high already, but may cause holts to be temporarily abandoned if present (field surveys have not yet been completed for all alternatives being considered for this scheme). | As per route wide.<br>Potential permanent increased noise, light, vibration and surface water runoff containing pollutants may reduce otter commuting and foraging and could cause habitat fragmentation on Trout Beck due to the previously undisturbed nature of the watercourse.<br>Disturbance from traffic could cause holts nearby to be abandoned | As per route wide | No LSE are anticipated as per route wide table. |
| Water Vole<br>(County) | As per route wide.<br>Direct impacts associated with the temporary loss of water vole habitat at the new crossing point over Trout Beck and its tributary. Potential temporary closure of burrows on Trout Beck and its tributary if present - field surveys have not yet been completed for all route | As per route wide. | As per route wide | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | alternatives being considered for this scheme.<br>Disturbance impacts associated with construction activities at previously undisturbed areas of Trout Beck could impact foraging water vole and cause burrows to be abandoned or to collapse.<br>The River Eden does not provide suitable habitat for water vole. | | | |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which includes pockets of small woodland areas, woodland and scrub edges, open rough grassland areas and predominantly open arable fields with linear boundary features including hedgerows, tree lines and dry stone walls.<br>Badger surveys are not complete for all alternatives, but it is likely setts will be identified in the area. | As per route wide.<br>Crossing points may be identified through further survey. | As per route wide. | No LSE are anticipated as per route wide table. |
| Other Mammal Species<br>Polecat | As per route wide. | As per route wide. | As per route wide table. | Potential adverse LSE as per route wide table due |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme includes hedgerows, woodland edges, grassland, open fields, areas of scrub and riparian banks. | Due to the western extents of this alignment being offline, previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented in this area as a result of operation. | | to habitat loss and fragmentation impacts *(Construction and Operation).* |
| Wintering Birds<br>(Up to National) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes hedgerows, mature trees and grassland with additional impacts associated with watercourses. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a national resource therefore a slight/ moderate effect is predicted *(Operation).* |
| Breeding Birds<br>(Up to National) | As per route wide.<br>Habitat loss for breeding birds for this scheme includes hedgerows, mature trees and grassland with additional impacts associated with watercourses.<br>Trout Beck (River Eden SSSI) is crossed by the Orange alternative of this Scheme so disturbance impacts on riverine species will be a particular | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a national resource therefore a slight/moderate effect is predicted<br>(Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | issue. Whilst no sand martin colonies were recorded, a single kingfisher was recorded along Trout Beck approximately 1.5km from where the Orange alternative for this scheme crosses Trout Beck. | | | |
| Barn Owl<br>(National) | As per route wide.<br>Habitat loss for barn owls for this scheme includes agricultural buildings, tussocky grassland, hedgerows and mature trees. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Reptiles<br>(Up to County) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians<br>(Up to County) | As per Red alternative, but there are localised impacts to Temple Sowerby SSSI with the potential to support great crested newts, this wetland being functionally linked to an area with known records within 500m of the scheme and supports prey species.<br>Differing fragmentation impacts to the west, of this scheme (generally poor GCN habitat) and this scheme avoids the | As per Red alternative but lowered requirement for balancing ponds. | As per Blue alternative. | Potential adverse LSE as per route wide table relating to amphibian species including GCN (Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Blue and Red alternatives fragmentation impacts upon terrestrial habitat within 500m of great crested newt breeding ponds. | | | |
| Fish<br>(Up to International) | As per Blue alternative.<br>This route alternative crosses Trout Beck (approximately 50m downstream of the existing A66 crossing at Kirkby Thore and approximately 200m upstream of the confluence with the River Eden). Impacts as per Blue alternative. | As per Blue alternative. | As per Blue alternative. | No LSE anticipated as per route wide table. |
| WCC<br>(Up to International) | As per Blue Alternative.<br>This route alternative crosses Trout Beck (approximately 50m downstream of the existing A66 crossing at Kirkby Thore and approximately 200m upstream of the confluence with the River Eden). | As per Blue alternative. | As per Blue alternative. | No LSE anticipated as per route wide table. |
| Terrestrial invertebrates<br>(Up to National) | As Blue alternative | As Blue alternative. | As Blue alternative. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic Invertebrates<br>(Up to National) | As per Blue alternative.<br>This alternative crosses Trout Beck (approximately 50m downstream of the existing A66 | As per Blue alternative. | As per Blue alternative. | No LSE anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | crossing at Kirkby Thore and approximately 200m upstream of the confluence with the River Eden). | | | |
| Macrophytes<br>(Up to International) | As per Blue alternative.<br>This alternative crosses Trout Beck (approximately 50m downstream of the existing A66 crossing at Kirkby Thore and approximately 200m upstream of the confluence with the River Eden). | As per Blue alternative | As per Blue alternative. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |

## Appleby to Brough

### Black-Black-Black route

6.9.11 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-12: Appleby to Brough Black-Black-Black route - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Eden SAC and River Eden and Tributaries SSSI (International)<br>Unnamed Tributary of Mire Sike 6.12, | As per route wide.<br>Localised loss of riparian and in-channel vegetation associated with the crossings of tributaries and potential for pollution during construction phase. | As per route wide.<br>The crossings of these watercourses have the potential to impact the natural (fluvial geomorphological) river process which control the quality and | As per route wide.<br>Watercourse crossing design for new crossing points will ensure that current fluvial geomorphological processes and fish are maintained within | Potential for minor adverse impacts on a resource of up to International importance, which is a Moderate or Large adverse effect and therefore significant. Potential LSE |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Cringle Beck, Hayber Beck/Moor Beck, Eastfield Sike, Unnamed Tributary of Lowgill Beck 6.1, Lowgill Beck, Woodend Sike, Yosgill Sike and Unnamed Tributary of Lowgill Beck 6.7-tributaries of River Eden | With the exception of some minor watercourses, these tributaries are considered to be functionally linked to the SAC/SSSI as they support likely qualifying species. These rivers are unlikely (detailed analysis of survey data pending) to qualify as Annex I habitat: sub-type 2 water course of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | distribution of aquatic habitat. This could have indirect impacts on the qualifying species the habitat supports.<br>Proposed new discharges to a number of tributaries which ultimately flow into the River Eden have the potential to adversely impact water quality in the SAC/SSSI.<br>The SAC/SSSI is located over 200m from the ARN for this scheme therefore operational air quality impacts have been ruled out.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | watercourses sustaining notable fish. The potential impacts on habitat upstream and downstream of the crossing location will be assessed and mitigated through appropriate design. The design and assessment of impacts will be informed by detailed hydromorphology modelling, as described in Chapter 14: Road Drainage and the Water Environment.<br><br>The potential effects will therefore be reduced to permanent impacts which do not affect the integrity of the resource. This may be assessed as a minor adverse impact. | anticipated for (*Construction and Operation*). |
| Helbeck and Swindale Woods SAC and Helbeck Wood SSSI and Swindale Wood SSSI (Up to International) | As per route wide.<br>Situated some distance from the A66, within connected landscape. The site is designated for ash-elm woodland habitats on limestone, ancient woodland ground flora and lichen species. There is not expected to be any impacts arising from construction due to | As per route wide.<br>The SAC/SSSI is located over 200m from the ARN. In line with LA 105 DMRB guidelines, no LSE are anticipated from a change in air quality due to distance of the site from the road.<br><br>No change is anticipated. | As per route wide. | No change on a resource of National importance would be a Neutral effect and therefore not significant. No LSE are anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | the distance (over 200m) from the scheme.<br>The SSSIs are designated for a large breeding bird population but due to the distance of the scheme form the SSSIs, it is considered unlikely there would be an impact on the bird assemblage.<br>No change is anticipated. | | | |
| Moor House Upper Teesdale SAC (International) | As per route wide.<br>This is situated some distance from the A66, within connected landscape. The site is designated for its diverse range of upland Annex 1 habitats, including blanket bog, northern hay meadows and limestone grassland. There is not expected to be any impacts arising from construction due to the distance from the scheme.<br>No change is anticipated. | As per route wide<br>The SAC/ SSSI is located over 200m from the ARN. In line with *DMRB LA 105* guidelines, no LSE are anticipated from a change in air quality due to distance of the site from the road.<br>No change is anticipated. | None required. | No change on a resource of National importance would be a Neutral effect and therefore not significant. No LSE are anticipated. |
| North Pennine Moors SPA (which includes North Pennine Moors SAC and Moor House-Upper Teesdale SAC, Moor House and Cross fell SSSI, Upper | As per route wide for birds.<br>The SPA is located 704m to the north of all alternatives for this scheme so there is potential for disturbance impacts on qualifying features (merlin, peregrine, hen harrier and golden plover) using functionally linked land. A peak | As per route wide birds.<br>There may be operational disturbance from increased traffic noise on SPA species using functionally linked land.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the | As per route wide for birds.<br>Once mitigation is taken into account for disturbance of birds on functionally linked land, this impact is expected to be reduced to minor adverse and only be applicable during operation. | Potential for minor adverse impacts on a resource of International importance, which is a Moderate or Large effect and therefore significant. Potential adverse LSE anticipated relating to disturbance (*Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Teesdale SSSI and Appleby Fells SSSI) and adjacent to Helbeck and Swindale Woods SAC.<br>(Up to International) | count of 40 golden plover were identified during wintering bird surveys in February.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | absence of mitigation, which may be assessed as a major adverse impact. | | |
| Appleby Fells SSSI<br>(National) | No direct impacts are likely to this site based on distance.<br>There is not expected to be any impacts arising from construction due to the distance (over 200m) from construction activities.<br>No change is anticipated. | Appleby Woods SSSI is located over 200m from the ARN. In line with *DMRB LA 105* guidelines, no LSE are anticipated from a change in air quality due to distance of the site from the road.<br>No change is anticipated. | None required | No change on a resource of National importance would be a Neutral effect and therefore not significant. No LSE are anticipated. |
| Argill Woods and Pastures SSSI<br>and<br>Augill Valley Pasture SSSI<br>(National) | No direct impacts are likely to either of these sites based on their distances from the scheme.<br>No change is anticipated. | As per route wide<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for where these sites are within 200m of the ARN, potential for detrimental impacts upon sensitive sites, habitats and species within these sites, (loss of or damage to plant species).<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may | As per route wide<br>Further air quality assessment and biodiversity assessment (mapping of sensitive habitats within 200m of the road) is required to ascertain nitrogen deposition (kg per Ha) and further potential for LSE.<br>This remains a major adverse impact until air quality data and mitigation design can confirm otherwise. | Potential for major adverse impacts on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality (*Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | be assessed as a major adverse impact. | | |
| George Gill SSSI (National) | No direct or indirect impacts are likely based on the distance from the scheme.<br>No change is anticipated. | No direct or indirect impacts are likely based on the distance from the scheme. This site is not within the ARN.<br>No change is anticipated. | None required. | No change on a resource of National importance would be a Neutral effect and therefore not significant. No LSE are anticipated. |
| Non-statutory designated sites Sandford Mire CWS (County) | As per route wide.<br>There are no direct impacts anticipated to this site, but adjacent works are within 200m with potential for impacts via pollution sources, from dust, accidental spills or poor drainage connections. Works are situated upstream and uphill of this site, which is designated for its lowland fen therefore sensitive to change.<br>There is the potential for overland or groundwater flow into the mire and potential for pollution of these sources, which may result in impact on peat forming species (Sphagnum mosses).<br>The site also supports protected or otherwise notable plant species and the works have the potential to result in damage to, or loss of these species. | As per route wide.<br>Potential for changes to water quality and quantity from road run-off. These may be adverse or beneficial depending on drainage upgrades and further hydrology assessment is required to confirm.<br>This site is not listed in the air quality modelling outputs as currently supporting a 1% or greater increase in nitrogen from base levels, therefore air quality impacts are not anticipated.<br>The potential impacts on hydrology may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide.<br>Review of hydrological connections and requirements to ensure the water dependent habitats are not subject to impacts from the works and this being used to further guide design development.<br>Monitoring of outfalls into water sources supplying the habitats within this site.<br>Further measures to protect this site from impacts of dust deposition or accidental pollution from construction. | Potential for major adverse impacts on a resource of County importance, which is a Slight or Moderate effect and therefore significant. Potential adverse LSE anticipated relating to hydrology *(Construction and Operation)* and air quality *(Construction only)*. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | There is also the potential for fire risk and potential for this to run along peat seams and damage the site.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | | | |
| Non-statutory designated sites<br>Swindale Woodland CWS<br>Tricklebanks Wood CWS<br>(County) | As per route wide.<br>Both CWS are designated for woodland habitats and lie adjacent watercourses, so may contain wet woodland habitat.<br>Both are within the connected landscape but are situated over 200m from the draft DCO boundary and there is no perceived direct or indirect impact (air quality) as a result on this site.<br>No change anticipated. | As per route wide.<br>Both located over 200m from the ARN. In line with *DMRB LA 105* guidelines, no LSE are anticipated from a change in air quality due to distance of these sites from the road.<br>No change anticipated | None required | No change on a resource of County importance would be a Neutral effect and therefore not significant. No LSE are anticipated. |
| Non-statutory designated sites<br>Helbeck Wood site of invertebrate significance<br>Swindale Wood site of invertebrate significance | As per route wide.<br>All these sites are too great distance from construction activities for direct or indirect impacts.<br>No change anticipated. | As per route wide.<br>Great Musgrave Swindale Beck is located within 200m of the ARN and air quality impacts cannot be ruled out at this stage.<br>The potential impacts of air quality may affect the integrity of the resource on a | As per route wide. | Potential for major adverse impacts on a resource of County importance, which is a Slight or Moderate effect and therefore significant. Potential adverse LSE anticipated relating and air quality *(Operation only)*. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Great Musgrave Swindale Beck Ers (County) | | permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | | |
| Habitats –<br>Yosgill Wood AW (part of Hellbeck Wood SSSI)<br>Swindale Wood AW (part of Swindale Wood SSSI)<br>Howgill Wood AW<br>Cotbers Wood AW<br>Trickle Banks Wood AW<br>Deciduous woodland<br>Hedgerow<br>Ponds<br>Lowland fen<br>Lowland heathland<br>Acid grassland<br>Mire<br>Open mosaic habitats<br>(Up to National) | As per route wide.<br>Potential losses to deciduous woodland, hedgerows, ponds, lowland fen, lowland heathland, acid grassland, mire, open mosaic habitats.<br>Areas of 'islands' created forming fragmentation impacts as a result of junctions, and new alignment forming areas enclosed by road infrastructure. These contain largely farmland habitats but notable species may be present with potential for reduced colonisation and population success.<br>Several AW sites (Yosgill Wood, Swindale Wood, Howgill, Cotbers, Trickle Banks Wood) are present in the connected landscape however these are over 200m in distance from construction activities with negligible potential for significant impacts from air quality or air pollution impacts.<br>Potential for loss, physical damage or pollution impacts to | As per route wide.<br>Persistence of fragmentation impacts caused by widened carriageway and 'islands'.<br>Potential for areas of better connectivity for the priority habitat heathland through appropriate management. To be included in review of proposed ecological mitigation.<br>For both Augill Beck Wood AW and Augill Bridge Wood AW the current stage of air quality modelling has identified a 1% increase in nitrogen for where these sites are within 200m of the ARN, with potential for detrimental impacts upon sensitive sites, habitats and species within these sites, (loss of or damage to plant species). | As route wide.<br>Proposed ecology mitigation includes habitat creation for increased areas of heathland habitats and better management prescriptions, potential for enhancement of open mosaic habitats along heritage railway. Mitigation design is yet to be confirmed.<br>Further air quality assessment and biodiversity assessment (mapping of sensitive habitats within 200m of the road) is required to ascertain nitrogen deposition (kg per Ha) and further potential for LSE. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats *(Construction)* and air quality impacts *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | the following protected and/or otherwise notable plant species marsh stitchwort, bluebell, fly orchid, early-purple orchid, an eyebright species, bird's-eye primrose, bird's-foot sedge, tormentil, common heather, bog asphodel, harebell, blue moor-grass, alpine cinquefoil, alpine penny-cress or to lower plants or lichens.<br>Potential for further spread of giant hogweed on the River Eden and rhododendron within the study area. | | | |
| Rivers/streams (International) | As per route wide.<br>Direct impacts associated with the temporary loss of otter habitat during the expansion of existing crossings over an unnamed Tributary of Mire Sike, Lowgill Beck (including Woodend Sike and Yosgill Sike) and an unnamed tributary of Lowgill Beck and new crossings over Cringle Beck, Moor Beck, Eastfield Sike and one unnamed tributary of Lowgill Beck.<br>Localised loss of riparian and in-channel vegetation associated | As per route wide and River Eden SAC/SSSI impacts listed above. | As per route wide. | Potential adverse LSE anticipated as per route wide and River Eden SAC *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | with the crossings of tributaries to the River Eden (as per River Eden SAC/SSSI above). | | | |
| Bats (Roosts) (Regional) | As per route wide. None of the structures with bat roost potential will be lost as a result of the scheme, however, all six trees with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys. (Construction and Operation) |
| Bat Activity (Foraging and Commuting (National) | As per route wide Fourteen potential crossing points will be affected by construction activities. Temporary loss of foraging resource during construction. | As per route wide Fourteen potential crossing points will be affected by the scheme. Temporary loss of foraging resource until habitat replanting scheme completed and matures. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts. *(Construction and Operation)* |
| Red Squirrel (Up to National) | As per route wide. Temporary and permanent habitat loss for red squirrel for this scheme includes woodland edges, tree lines, hedgerows and loss of a large linear area of suitable woodland located immediately north of the existing A66 carriageway to the western extents of the scheme. | As per route wide. Due to widening of the existing carriageway areas of woodland located north and south of the route which are suitable for red squirrel may become permanently fragmented. | As per route wide. Two potential red squirrel crossing point features (rope bridges) may be necessary for this scheme to ensure suitable woodland habitats remain connected and a safe crossing feature can be used to help reduce the risk of RTAs. This is yet to be confirmed and will be part of the next design review. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts. (Construction and Operation). |
| Otter | As per route wide. | As per route wide. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| (Up to International) | Direct impacts associated with the temporary loss of otter habitat during the expansion of existing crossings over an unnamed Tributary of Mire Sike, Lowgill Beck and an unnamed tributary of Lowgill Beck and new crossings over Cringle Beck, Moor Beck, Eastfield Sike and one unnamed tributary of Lowgill Beck.<br>Disturbance impacts associated with construction activity is likely to impact otter at existing and new crossing points. In particular Moor Beck and Eastfield Sike which have high otter maternity use potential. Disturbance during construction may impact commuting and foraging otter and cause holts to be abandoned if present - field surveys are ongoing. | | Any new crossing points will be bridged over the watercourse or culverts will be built to specifications to allow them to remain suitable crossing points for otter. | |
| Water vole<br>(Up to County) | As per route wide.<br>Direct impacts associated with the temporary loss of water vole habitat during the expansion of existing crossings over an unnamed Tributary of Mire Sike, Lowgill Beck and an unnamed tributary of Lowgill Beck and new crossings over Cringle Beck, | As per route wide.<br>The operational phase could cause an increase in vehicle deposits and surface run off of pollutants which could cause a deleterious impact to foraging habitats. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Moor Beck, Eastfield Sike and one unnamed tributary of Lowgill Beck.<br>Disturbance impacts associated with construction activities could impact foraging water vole and cause burrows to be abandoned or to collapse. | | | |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes areas of woodland, woodland and scrub edges, open rough grassland areas and open arable fields with linear boundary features including hedgerows, tree lines and dry-stone walls which are likely to be used by badger for commuting and foraging purposes.<br>Construction may also lead to minor fragmentation of foraging and commuting habitat.<br>Although locations of badger setts is still unknown for this route alternative, construction may result in permanent and/or temporary closure of existing badger setts if found to be present within or immediately next to the construction areas. | As per route wide.<br>Operation may also result in the permanent closure of existing badger setts if they are found to be present within this alternative alignment. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species for this scheme includes hedgerows, tree lines, areas of woodland, woodland edges, grassland, open fields, areas of scrub and riparian banks. | As per route wide.<br>Due to widening of the existing carriageway habitats suitable for other terrestrial mammal species may become permanently fragmented as a result of operation. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts *(Construction and Operation).* |
| Wintering Birds<br>(Up to International) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes hedgerows, woodland, mature trees and grassland.<br>The North Pennine Moors SPA is located 1.5km to the north of all alternatives for this scheme so there is potential for disturbance impacts on qualifying features (merlin, peregrine, hen harrier and golden plover). A peak count of 40 golden plover were identified during wintering bird surveys in February. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table (Operation). |
| Breeding Birds<br>(Up to International) | As per route wide.<br>Habitat loss for breeding birds for this scheme includes hedgerows, woodland, mature trees and grassland.<br>The North Pennine Moors SPA is located 1.5km to the north of all | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table<br>(Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Alternatives for this Scheme so there is potential for disturbance impacts on qualifying features (merlin, peregrine, hen harrier and golden plover). During the 2020 Arcadis breeding bird surveys, a single peregrine (SPA species, Schedule 1) was observed flying north to south over the current A66 approximately 800m east of the Scheme during the May survey visit. No SPA qualifying species were recorded during the 2021 breeding bird surveys. | | | |
| Barn Owl<br>(Regional) | As per route wide.<br>Habitat loss for barn owls for this scheme includes agricultural buildings, woodland, tussocky grassland, hedgerows and mature trees. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Reptiles<br>(Up to County) | As per route wide | As per route wide | As per route wide | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians<br>(Up to County) | As per route wide.<br>No losses to pond habitats currently identified as supporting great crested newts. Losses to terrestrial habitat for great crested newts. | As per route wide.<br>Potential for a temporal loss in quality of replacement habitat provision, despite additional habitat being created. | As per route wide,<br>Mitigation licensing or District Level Licensing will be required for losses to terrestrial habitats and for measures to | Potential adverse LSE as per route wide table relating to common toad, GCN and other amphibian species.<br>(Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Potential severance impacts to pond used by common toad due to works to create a series of balancing ponds, some within islands of road infrastructure, with resulting potential risk of amphibian mortality.<br>Other severance impacts to generally currently poor-quality habitat for amphibians through the creation of islands surrounded by road infrastructure. | Increased potential for amphibians adjacent to the road alignment, due to colonisation of new pond habitats provided by balancing ponds, potential for population increase followed by mortality. | prevent harm to great crested newt.<br>Potential requirement for amphibian fencing to reduce risk of road traffic impacts. | |
| Fish<br>(Up to International) | As per route wide.<br>There is potential for disturbance of migratory fish as a result of elevated levels of noise/vibration and artificial lighting during the construction of watercourse crossings. | As per route wide.<br>In the absence of appropriate design, the watercourse crossings proposed have the potential to adversely impact fish passage and the natural (fluvial geomorphological) river process which control the quality and distribution of aquatic habitats that are considered to be functionally linked to SAC/SSSI. This could have indirect impacts on fish. | As per route wide.<br>Watercourse crossing design for new crossings will ensure free passage for fish and ensure that current fluvial geomorphological processes, which control the quality and extent of fish habitat, are maintained. | No LSE anticipated as per route wide table. |
| White-Clawed Crayfish (WCC)<br>(Up to International) | As per route wide. | As per route wide. | As per route wide.<br>WCC survey data is pending and will be used to confirm detail of mitigation required, but it is expected that all impacts will be mitigated. | No LSE anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Terrestrial invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. Terrestrial invertebrate survey data is pending and will be used to confirm detail of mitigation required, but it is expected that all impacts will be mitigated. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation)* |
| Aquatic invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. Aquatic invertebrate survey data is pending and will be used to confirm detail of mitigation required, but it is expected that all impacts will be mitigated. | No LSE anticipated as per route wide table. *(Construction and Operation)* |
| Macrophytes (Up to International) | As per route wide. | As per route wide. | As per route wide. Macrophyte survey data is pending and will be used to confirm detail of mitigation required, but it is expected that all impacts will be mitigated. | Potential adverse LSE anticipated as per route wide table. (Construction and Operation). |

Blue alternative (central section)

6.9.12 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-13: Appleby to Brough Blue alternative - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Eden SAC and River Eden and Tributaries SSSI (International)<br>Helbeck and Swindale Woods SAC and Helbeck Wood SSSI and Swindale Wood SSSI<br>Moor House Upper Teesdale SAC and SSSI<br>North Pennine Moors SPA<br>Helbeck and Swindale Woods SAC<br>Appleby Fells SSSI (Up to International)<br>George Gill SSSI | As per Black-Black-Black alternative.<br>This alignment crosses the same watercourses as the Black-Black-Black route with two additional crossings of Moor Beck. In the vicinity of the Warcop Training Centre, the Blue alternative is located further away from Moor Beck and its floodplain. | As per Black-Black-Black alternative. | As per Black-Black-Black alternative. | All designated sites have the same LSE conclusions as for Black-Black-Black route. |
| Non-statutory designated sites<br>Sandford Mire CWS (County) | As per Black-Black-Black route, but with a smaller area of impacts immediately adjacent for a balancing pond. | As per Black-Black-Black route. | As per Black-Black-Black route. | All designated sites have the same LSE conclusions as for Black-Black-Black route. |
| Swindale Woodland CWS (County) | As per Black-Black-Black route. | | | |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Tricklebanks Wood CWS (County) | | | | |
| Helbeck Wood site of invertebrate significance<br>Swindale Wood site of invertebrate significance<br>Great Musgrave Swindale Beck Ers (County) | As per Black-Black-Black route. | | | |
| Habitats –<br>Yosgill Wood AW (Hellbeck Wood SSSI)<br>Swindale Wood AW (Swindale Wood SSSI)<br>Howgill Wood AW<br>Cotbers Wood AW<br>Trickle Banks Wood AW<br>Deciduous woodland<br>Hedgerow<br>Ponds<br>Lowland fen<br>Lowland heathland<br>Acid grassland<br>Mire | As per Black-Black-Black route, though greater losses to improved grassland, arable and mixed semi-natural woodland than Black alternative, smaller losses are to poor semi-improved grassland, semi-natural broad-leaved woodland, bare ground, marshy grassland, buildings, scattered trees, eutrophic standing water, dense scrub, broad-leaved plantation, amenity grassland and non-ruderal habitat.<br>Impacts to linear habitats are greatest to fences with further large impacts to species-poor defunct hedge/hedge and trees, | As per Black-Black-Black route. | As per Black-Black-Black route | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats *(Construction)* and air quality *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Open mosaic habitats (Up to National) | wall, species-poor intact hedge, running open water, species-rich hedge and trees, bare ground. Impacts on Priority Habitats are as per Black-Black-Black alternative. | | | |
| Rivers/streams (International) | This alignment is broadly consistent with the Black-Black-Black alternative with respect to its interaction with watercourses though there are lower impacts to more natural channel/areas of Moor Beck. Therefore the potential impacts are as per Black-Black-Black route. | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE anticipated as per route wide and River Eden SAC |
| Bats (Roosts) (Regional) | As per route wide. None of the structures with bat roost potential will require demolition as a result of the scheme. All six trees with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting) (National) | As per route wide Fourteen potential crossing points will be affected by construction. Temporary loss of foraging resource during construction. | As per route wide Fourteen potential crossing points will be affected by the scheme. Temporary loss of foraging resource until habitat replanting scheme completed and matures. | As per route wide | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Red Squirrel<br>(Up to National) | As per route wide.<br>Temporary and permanent habitat loss for red squirrel for this scheme includes woodland edges, tree lines, hedgerows and loss of two large linear areas of suitable woodland, both located immediately north of the existing A66 carriageway with one at the western extents of the scheme and the other at the eastern extents of the scheme. | As per route wide.<br>Due to widening of the existing carriageway areas of woodland located north and south of the route which are suitable for red squirrel may become permanently fragmented as a result of operation. | As per route wide<br>Two potential red squirrel crossing point features (rope bridges) may be necessary around the centre of this scheme to ensure suitable woodland habitats remain connected and a safe crossing feature can be used to help reduce the risk of RTAs. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |
| Otter<br>(Up to International) | As per Black-Black-Black route | As per Black-Black-Black route | As per Black-Black-Black route | No LSE are anticipated as per route wide table. |
| Water Vole<br>(Up to County) | As per Black-Black-Black route | As per Black-Black-Black route | As per Black-Black-Black route | No LSE are anticipated as per route wide table. |
| Badger<br>(Local) | As per Black-Black-Black route | As per Black-Black-Black route | As per Black-Black-Black route | No LSE are anticipated as per route wide table. |
| Other Terrestrial Mammal species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per Black-Black-Black route oute | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Wintering Birds (Up to International) | As per Black-Black-Black route. Whilst no SPA qualifying species were recorded during the winter bird surveys in close proximity to the Blue alternative, the areas of farmland the route passes through have the potential to support wintering golden plover and flocks were identified elsewhere across the scheme. | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE as per route wide table *(Operation).* |
| Breeding Birds (Up to International) | As per Black-Black-Black route. Whilst no SPA qualifying species were recorded during the breeding bird surveys in close proximity to the Blue alternative, the areas of open grassland this route passes through have the potential to support ground nesting birds such as golden plover, indeed four curlews and 22 meadow pipits were found to be associated with the Blue alternative for this scheme. | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE as per route wide table (Operation). |
| Barn Owl (Regional) | As per route wide. Habitat loss for barn owls for this scheme includes agricultural buildings, woodland, tussocky | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE as per route wide table *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | grassland, hedgerows and mature trees. | | | |
| Reptiles<br>(Up to County) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians<br>(Up to County) | As per route wide.<br>Impacts largely as per Black-Black-Black route, though greater potential losses to terrestrial habitat for great crested newts (works in 150m of wetland area with general breeding activity).<br>Fewer balancing ponds required. | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE as per route wide table relating to GCN and other amphibian species<br>(Construction and Operation). |
| Fish<br>(Up to International) | As per route wide.<br>The potential impacts are as per Black-Black-Black route. This alignment has two additional crossings of Moor Beck, however, in the vicinity of the Warcop Training Centre, the Blue alternative is located further away from Moor Beck and its floodplain. | As per route wide.<br>The potential impacts are as per Black-Black-Black route but this alignment has two additional crossings of Moor Beck so greater potential for impact. | As per Black-Black-Black route | No LSE anticipated as per route wide table. |
| White-Clawed Crayfish (WCC)<br>(Up to International) | As per route wide. | As per route wide. | As per route wide. | No LSE anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Terrestrial invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | No LSE anticipated as per route wide table *(Construction and Operation).* |
| Macrophytes (up to International) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table (Construction and Operation). |

## Orange alternative (eastern section)

6.9.13 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-14 Appleby to Brough Orange alternative - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| River Eden SAC and River Eden and Tributaries SSSI (International) Helbeck and Swindale Woods SAC and Helbeck Wood SSSI and Swindale Wood SSSI | As per Black-Black-Black route This alignment crosses the same watercourses as the Black-Black-Black alternative with an additional new crossing of Lowgill Beck and Unnamed Tributary of Lowgill Beck 6.7. | As per Black-Black-Black route, however this alternative has increased habitat degradation (shading) associated with these crossings as it is fully offline. | As per Black-Black-Black route | All designated sites have the same LSE conclusions as for Black-Black-Black route. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Moor House Upper Teesdale SAC and SSSI<br>North Pennine Moors SPA<br>Helbeck and Swindale Woods SAC<br>Appleby Fells SSSI<br>George Gill<br>(Up to International) | This alternative has increased habitat degradation (shading) associated with these crossings as it is fully offline. The Orange alternative crosses a more natural section of river with a wide riparian corridor that is well-connected to the low-lying floodplain therefore greater potential for construction phase impacts through habitat loss, pollution and disturbance. | | | |
| Non-statutory designated sites<br>Sandford Mire CWS<br>(County) | As per Black-Black-Black route but with a smaller area of impacts immediately adjacent for a balancing pond. | | As per Black-Black-Black route<br>As per Black-Black-Black route<br>As per Black-Black-Black route | All designated sites have the same LSE conclusions as for Black-Black-Black route. |
| Swindale Woodland CWS<br>(County)<br>Tricklebanks Wood CWS<br>(County) | As per Black-Black-Black route | | | |
| Helbeck Wood site of invertebrate significance<br>Swindale Wood site of invertebrate significance<br>Great Musgrave Swindale Beck Ers<br>(County) | As per Black-Black-Black route | | | |
| Habitats –<br>Yosgill Wood AW (Hellbeck Wood SSSI) | As per Black-Black-Black route<br>Moderate losses to improved grassland and arable with lower losses to hardstanding, coniferous | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE anticipated as per route wide table due to loss of Priority |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Swindale Wood AW (Swindale Wood SSSI)<br>Howgill Wood AW<br>Cotbers Wood AW<br>Trickle Banks Wood AW<br>Deciduous woodland<br>Rivers<br>Hedgerow<br>Ponds<br>Lowland fen<br>Lowland heathland<br>Acid grassland<br>Mire<br>Open mosaic habitats<br>(Up to National) | plantation, semi-improved grassland and marshy grassland, minor losses also to a number of habitats including buildings, mixed and broad-leaved plantation, broad-leaved woodlands, lichen/ bryophyte heath, tall ruderal, dense scrub, spoil heaps, bare ground, mixed woodland, scattered trees and eutrophic standing open water.<br>Impact on Priority Habitats is as per Black-Black-Black route, though with greater shading impacts to Lowgill Beck. | | | Habitats *(Construction)* and air quality *(Operation).* |
| Rivers/streams<br>(International) | As per River Eden and Tributaries SSSI and SAC entry above | As per Black-Black-Black route | As per Black-Black-Black route | Potential adverse LSE anticipated as per route wide and River Eden SAC *(Construction and Operation).* |
| Bats (Roosts)<br>(Regional) | As per route wide.<br>One structure will require demolition as a result of the scheme. All five trees with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting)<br><br>(National) | As per route wide<br>Fourteen potential crossing points will be affected by construction. | As per route wide<br>Fourteen potential crossing points will be affected by the scheme. | As per route wide | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Temporary loss of foraging resource during construction. | Temporary loss of foraging resource until habitat planting scheme completed and matures. | | *(Construction and Operation).* |
| Red Squirrel<br>(Up to National) | As per Black-Black-Black route. Another smaller area of suitable woodland is also directly impacted and permanently lost to the south of the existing A66 carriageway in the eastern extents of the alignment. | As per Black-Black-Black route. | As per Black-Black-Black route. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |
| Otter<br>(Up to International) | As per Black-Black-Black route. Of note, this scheme creates a new crossing point over Lowgill Beck that is currently undisturbed and is highly suitable otter habitat. | As per Black-Black-Black route. | As per route wide | No LSE are anticipated as per route wide table. |
| Water vole<br>(Up to County) | As per Black-Black-Black route, however with additional crossing of unnamed tributaries of Lowgill Beck and the crossing of Lowgill Beck is at a currently undisturbed location. | As per Black-Black-Black route. | As per route wide | No LSE are anticipated as per route wide table. |
| Badger<br>(Local) | As per Black-Black-Black route Greater potential for habitat fragmentation around the offline section of route located at the far eastern extents of the scheme where the route alignment is located south of the existing A66 carriageway. | As per Black-Black-Black route, with greater potential for fragmentation associated with Orange offline alternative. | As per route wide | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Although locations of badger setts are currently unknown for this route alternative, construction may result in permanent and/or temporary closure of existing badger setts if found to be present within or immediately next to the construction areas. | | | |
| Other Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per Black-Black-Black route. | As per Black-Black-Black route.<br>In addition, the small section of offline route at the far eastern extents of the scheme is located on previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented. | As per route wide | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts (*Construction and Operation*). |
| Wintering Birds<br>(Up to International) | As per Black-Black-Black route.<br>Whilst no SPA qualifying species were recorded during the winter bird surveys in close proximity to the Orange alternative for this scheme, the areas of farmland the alternative passes through have the potential to support wintering golden plover and flocks were identified elsewhere across the scheme. | As per Black-Black-Black route. | As per route wide | Potential adverse LSE as per route wide table (*Operation*). |
| Breeding Birds<br>(Up to International) | As per Black-Black-Black route.<br>Whilst no SPA qualifying species | As per Black-Black-Black route. | As per route wide | Potential adverse LSE as per route wide table (Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | were recorded during the breeding bird surveys in close proximity to the Orange alternative for this scheme, the areas of open grassland the alternative passes through have the potential to support ground nesting birds such as golden plover, indeed 12 oystercatchers were found to be associated with this alternative. | | | |
| Barn Owl<br>(Regional) | As per route wide.<br>Habitat loss for barn owls for this scheme includes agricultural buildings, woodland, tussocky grassland, hedgerows and mature trees. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table<br>*(Construction and Operation)* |
| Reptiles<br>(Up to County) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table<br>*(Construction and Operation)* |
| Amphibians<br>(Up to County) | As per Black-Black-Black route, but provision of new balancing pond to the east of the scheme is within less suitable habitat for amphibians and appears less well connected to surrounding habitat. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table relating to amphibian species including GCN.<br>(Construction and Operation) |
| Fish<br>(Up to International) | As per Black-Black-Black route. However, there is additional habitat degradation (shading) as a result of the offline crossings of Low Gill Beck and Unnamed Tributary of Lowgill Beck 6.7. | As per Black-Black-Black route.<br>In the absence appropriate crossing design, the offline crossing of Low Gill Beck | As per route wide. | No LSE anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | could adversely affect fish passage and fluvial geomorphological processes. | | |
| White-Clawed Crayfish (WCC)<br>(Up to International) | As per route wide. | As per route wide. | As per route wide. | No LSE anticipated as per route wide table. |
| Terrestrial invertebrates<br>(Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates<br>(Up to National) | As per route wide.<br>As per Black-Black-Black route. | As per route wide.<br>As per Black-Black-Black route. | As per route wide.<br>As per Black-Black-Black route. | No LSE anticipated as per route wide table *(Construction and Operation).* |
| Macrophytes<br>(up to International) | As per route wide.<br>As per Black-Black-Black route. | As per route wide.<br>As per Black-Black-Black route. | As per route wide.<br>As per Black-Black-Black route. | Potential adverse LSE anticipated as per route wide table (Construction and Operation). |

## Bowes Bypass

6.9.14 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse
- Red Squirrel: Red squirrel has been scoped out due to the absence of historical biological records within 2km, the lack of suitable habitat being present within the survey area. Furthermore, no evidence has been collected during initial terrestrial mammal surveys to indicate their presence (paragraph 6.6.137). Consequently, red squirrel has been scoped out of the assessment for this scheme.

Table 6-15: Bowes Bypass - likely significant effects

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Designated Sites<br>North Pennine Moors SAC (International) | As per route wide.<br>There are no direct impacts anticipated on this site, although a proposed mitigation area for reptiles is at 35m, this includes provision of habitats consistent with the SAC designation that would also support reptile species.<br>There are the potential indirect air pollution impacts (noxious/ deposition) and the presence of sensitive habitats and further sensitive species (plants, lower plants and lichens) as receptors within this site.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide.<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for where this site is within 200m of the ARN, potential for detrimental impacts upon sensitive sites, habitats and species within this site.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide<br>Further air quality assessment and biodiversity assessment (mapping of sensitive habitats within 200m of the road) is required to ascertain nitrogen deposition (kg per Ha) and further potential for LSE.<br>Precautionary mitigation provision may need to include creation of additional habitat over 200m from the ARN.<br>Due to the uncertainty of air quality impacts and mitigation, the potential impact level cannot be reduced after mitigation so potential for major adverse impacts remains. | Potential for major adverse impacts on a resource of International importance, which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality (*Construction and Operation).* |
| North Pennine Moors SPA (which includes North Pennine Moors SAC and Moor House-Upper Teesdale SAC, Moor House and Cross fell SSSI, Upper Teesdale SSSI and Appleby Fells SSSI) and | As per route wide.<br>The North Pennine Moors SPA is located outside the Draft DCO Boundary directly north at the western extent of this Scheme so there is potential for disturbance impacts on qualifying features (merlin, peregrine, hen harrier and golden plover). | As per route wide birds.<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for where this site is within 200m of the ARN, potential for detrimental impacts upon | As per route wide for birds.<br>Once mitigation is taken into account to reduce disturbance of birds on functionally linked land and replace habitat, this impact is expected to be reduced to minor adverse. | Potential for major adverse impacts on a resource of International importance, which is a Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| adjacent to Helbeck and Swindale Woods SAC.) (International) | Potential degradation through air quality on the sensitive habitats which the qualifying bird species require to sustain their populations.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | sensitive sites, habitats and species within this site, (loss of or damage to plant species) which indirectly may affect bird species, as the qualifying features, through changes to prey availability or to foraging, resting or nesting habitats.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | Further air quality assessment and biodiversity assessment (mapping of sensitive habitats within 200m of the road) is required to ascertain nitrogen deposition (kg per Ha) and further potential for LSE.<br>Precautionary mitigation provision may need to include creation of additional habitat over 200m from the ARN.<br>Potential air quality impacts which may cause degradation of habitat within the SPA remains a major adverse impact until air quality data and mitigation design can confirm otherwise. | (*Construction and Operation).*<br>See birds section for LSE relating to birds. |
| Bowes Moor SSSI (National) | As per route wide birds and habitats.<br>Site designated for its moorland (and other) bird species potential for disturbance impacts on the bird assemblage associated with the site.<br>The site also supports upland habitats of heathland, moorland and blanket bog. | As per route wide birds.<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for where this site is within 200m of the ARN, potential for detrimental impacts upon | As per route wide birds and habitats.<br>Once mitigation is taken into account to reduce disturbance of birds on functionally linked land and replace habitat, this impact | Potential for major adverse impacts on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | There is the potential through indirect air pollution impacts (noxious/ deposition) and the presence of sensitive habitats and further sensitive species (plants, lower plants and lichens) as receptors within this site.<br>The potential impacts relating to disturbance and air quality may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | sensitive sites, habitats and species within this site, (loss of or damage to plant species) which indirectly may affect the bird assemblage through changes to prey availability or to foraging, resting or nesting habitats.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | is expected to be reduced to minor adverse.<br>Further air quality assessment and biodiversity assessment (mapping of sensitive habitats within 200m of the road) is required to ascertain nitrogen deposition (kg per Ha) and further potential for LSE. Precautionary mitigation provision to include creation of additional habitat over 200m from the ARN.<br>Potential air quality impacts which may cause degradation of habitat within the SSSI. This remains a major adverse impact until air quality data and mitigation design can confirm otherwise. | (*Construction and Operation).* |
| Kilmond Scar SSSI (National) | As route wide<br>This site is situated at too great a distance for direct or indirect impacts.<br>No change anticipated. | As route wide<br>No air quality affects anticipated.<br>No change anticipated. | None required | No change on a resource of National importance, which is a Neutral effect and therefore not significant. No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Non-Statutory Designated Sites | There are no non-statutory sites within 1km. | N/A | N/A | N/A |
| Habitats-<br>Deepdale Wood AW<br>Deciduous woodland<br>Hedgerows<br>Upland heathland<br>Blanket bog<br>Upland hay meadows<br>Lowland calcareous grassland<br>Purple moor-grass and rush pasture<br>Ponds<br>(Up to National) | As per route wide<br>Majority of losses to improved grassland, hardstanding, with lower losses to poor semi-improved grassland, broad-leaved plantation, buildings, arable, tall ruderal, dense scrub, bare ground, mixed plantation, running water, semi-improved neutral grassland and amenity grassland.<br>Losses to linear habitats are mainly to fence, wall and arable habitat with moderate losses to species-poor defunct hedge and hedge and trees, species-poor intact hedge, dry ditch, species-rich hedge and trees, bare ground, species-rich intact hedge, tree lines, running open water and standing open water.<br>There are no AW within 2km.<br>Within the habitats listed above are the following Priority Habitats which may be subject to impacts of loss, degradation, shading or pollution (noxious or deposition) these include: deciduous woodland and hedgerows (loss, ground compaction and pollution). Upland heathland, blanket bog, upland hay meadows, lowland calcareous grassland, purple moor-grass and rush | As route wide.<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for Deepdale AW where this site is within 200m of the ARN, potential for detrimental impacts upon sensitive sites, habitats and species within this site. | As per route wide.<br>Pre-construction checks for locations of notable plant species such as orchids and advice for avoidance and/or translocation where required/feasible.<br>Further air quality assessment and biodiversity assessment (mapping of sensitive habitats within 200m of the road) for Deepdale AW is required to ascertain nitrogen deposition (kg per Ha) and further potential for LSE.<br>Precautionary mitigation provision to include creation of additional habitat over 200m from the ARN where required/feasible. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats *(Construction and Operation)*.<br>Potential adverse LSE anticipated for Deepdale Wood AW as a result of air quality impacts upon sensitive habitats and species (*Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | pasture (all potential for pollution through air deposition/ noxious), rivers (pollution),<br>ponds (air pollution).<br>The protected and or otherwise notable plant species recorded are for a 1km areas and therefore may be present within the works areas and subject to negative impacts of loss or damage or pollution impacts. Exact locations are unknown for common heather, early purple orchid (*Orchis mascula*), good-King-Henry (*Blitum bonus henricus*), tormentil, marsh ragwort (*Jacobaea aquaticus*), Welsh poppy (*Meconopsis cambrica*), harebell, and the endemic species perennial flax (*Linum perenne* ssp. *anglicum*). | | | |
| Rivers/streams<br>(Local) | As per route wide.<br>Only Unnamed Tributary of River Greta 7.3 is crossed, however the alignment falls entirely within a section of the watercourse that is already culverted for approximately 600m.<br>Therefore, no aquatic habitat will be affected by the alignment, and potential impacts are limited to those associated with construction-related pollution. | As per route wide.<br>The existing culvert is significant in length and is considered likely to be a barrier to migration for aquatic species. | As per route wide.<br>The next design review will examine whether replacement culverts can be built or adaptations made to facilitate the movement of fish should they be recorded during surveys. This is yet to be confirmed so is not reported as a beneficial effect. | As per route wide table however rivers/streams on this scheme are of Local value. Minor adverse impacts on a Local value resource may be assessed as Neutral or Slight therefore not significant. No LSE are anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Bats (Roosts)<br>(Regional) | As per route wide.<br>Seven structures with bat roost potential are scheduled for demolition and all eight trees with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting)<br>(National) | As per route wide.<br>Four potential crossing points will be affected by construction.<br>Temporary loss of foraging resource during construction. | As per route wide.<br>Four potential crossing points will be affected by the scheme.<br>Temporary loss of foraging resource until habitat replanting scheme completed and matures | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts *(Construction and Operation).* |
| Otter<br>(Up to County) | As per route wide.<br>There are no above ground watercourse crossing points associated with this scheme and therefore no temporary or permanent habitat loss.<br>Disturbance impacts associated with construction activities within 250m of the River Greta could impact otter commuting and foraging. No holt features were identified within 250m of the scheme. | As per route wide.<br>Permanent increased noise, light, vibration and surface water runoff containing pollutants within 250m of the River Greta may reduce otter commuting and foraging | As per route wide. | No LSE are anticipated as per route wide table. |
| Water Vole<br>(Up to County) | As per route wide.<br>Disturbance impacts associated with construction activities within 100m of the unnamed tributary of River Greta could impact foraging water vole and | As per route wide.<br>The operational phase could cause an increase in vehicle deposits and surface run off of | As per route wide | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | cause burrows to be abandoned or to collapse. | pollutants which could cause a deleterious impact to foraging habitats. | | |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which is limited to small areas of woodland and scrub, field boundaries and some open rough grassland areas. | As per route wide.<br>Small areas of woodland, scrub, rough grassland and field boundaries including hedgerows suitable for badger foraging and commuting will be lost to the permanent footprint of this scheme. | As per route wide. | No LSE are anticipated as per route wide table. |
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme includes tree lines, hedgerows, grassland, open fields, areas of scrub and riparian banks. | As per route wide.<br>Due to widening of the existing carriageway suitable habitats may become permanently fragmented. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts (*Construction and Operation*). |
| Wintering Birds<br>(Up to International) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes upland fringe habitats, hedgerows, woodland, mature trees and grassland with additional impacts associated with small watercourses.<br>The North Pennine Moors SPA is located outside the Draft DCO Boundary directly north at the western | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table. Valuation is higher for this scheme so predicted effect is a minor adverse effect on a International resource therefore a moderate/large effect is predicted (*Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | extent of this Scheme so there is potential for disturbance impacts on qualifying features (merlin, peregrine, hen harrier and golden plover). During the January wintering bird surveys, the following SPA qualifying species were recorded: 15 golden plovers and one merlin. | | | |
| Breeding Birds<br>(Up to International) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes upland fringe habitats, hedgerows, woodland, mature trees and grassland with additional impacts associated with small watercourses.<br>The North Pennine Moors SPA is located outside the Draft DCO Boundary directly north at the western extent of this Scheme so there is potential for disturbance impacts on qualifying features (merlin, peregrine, hen harrier and golden plover). During the January wintering bird surveys, one golden plover was recorded on the southern edge of the SPA. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table (*Operation*). |
| Barn Owl<br>(Regional) | As per route wide.<br>Habitat loss for barn owls for this scheme includes agricultural buildings, woodland, tussocky grassland, hedgerows and mature trees. | As per route wide. | As per route wide | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Reptiles<br>(Up to County) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Historic records for common lizard and adder within connective habitats for this scheme mean that currently losses to terrestrial habitat may result in loss of reptile populations and/or fragmentation impacts as a result of islanded areas surrounded by road infrastructure. | Potential for permanent severance of migratory routes for adder and fragmentation (isolation) of populations within islanded areas of road infrastructure. | | *(Construction and Operation).* |
| Amphibians<br>(Up to County) | As per route wide.<br>Great crested newt present from historic records, survey results pending. Connected to the A66 road verge via suitable terrestrial habitats provided by the quarry periphery and hedgerows or stone walls and/or by the disused rail corridor.<br>Disturbance to terrestrial habitats. | As per route wide.<br>Beneficial effects anticipated due to changes in the largely agricultural habitats for amphibians and for a new balancing pond which may be colonised by amphibians. | As per route wide. | Potential adverse LSE as per route wide table relating to amphibian species including GCN *(Construction and Operation).* |
| Fish<br>(Up to Local) | As per route wide.<br>Unnamed Tributary of River Greta 7.3 may not support fish due its modified state and natural barriers identified immediately upstream of the River Greta. This will be confirmed following fish surveys and eDNA sampling.<br>Only Unnamed Tributary of River Greta 7.3 is crossed, however the alignment falls entirely within a section of the watercourse that is already culverted for 600m.<br>Therefore, potential impacts to fish are limited to those associated with construction-related pollution. | As per route wide.<br>The existing culvert is significant in length and is considered likely to be a barrier to migration for aquatic species. | As per route wide.<br>Replacement culverts will be built to facilitate the movement of fish should they be recorded during surveys. However, | No LSE anticipated as per route wide table although valuation if lower, so there are potential for negligible adverse impacts on a resource of Local importance which is a Neutral effect and therefore not significant. No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| White-Clawed Crayfish (WCC)<br>(Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Neutral or Slight effect and therefore not significant. No LSE anticipated. |
| Terrestrial invertebrates<br>(Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates<br>(Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Neutral or Slight effect and therefore not significant. No LSE anticipated. |
| Macrophytes<br>(up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Neutral or Slight effect and therefore not significant. No LSE anticipated. |

## Cross Lanes to Rokeby

### Black Route

6.9.15 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-16: Cross Lanes to Rokeby Black route - likely significant effects (Biodiversity)

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Kilmond Scar SSSI (National) | This site is situated at too great a distance for direct impacts.<br>No change anticipated. | No change anticipated. | None required. | No change on a resource of National importance, which is a Neutral effect and therefore not significant. No LSE anticipated. |
| Brignall Banks SSSI (National) | This site is situated at too great a distance for direct impacts.<br>No change anticipated. | No change anticipated. | None required. | No change on a resource of National importance, which is a Neutral effect and therefore not significant. No LSE anticipated. |
| Non-Statutory Designated sites Thorsgill Wood LWS (National) | As per route wide.<br>This site is situated at too great a distance for direct impacts.<br>There is the potential through indirect air pollution impacts (noxious/deposition) and the presence of sensitive habitats and further sensitive species (plants, lower plants and lichens) as receptors within this site.<br>These potential impacts may affect the integrity of the resource on a | As per route wide.<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for where this site is within 200m of the ARN, potential for detrimental impacts upon sensitive sites, habitats and species within this site.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in | As per route wide.<br>Further air quality assessment and biodiversity assessment is required to ascertain nitrogen deposition (kg per Ha) and further potential for LSE.<br>Precautionary mitigation provision may need to include creation of | Potential for major adverse impacts on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality (*Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | the absence of mitigation, which may be assessed as a major adverse impact. | additional habitat over 200m from the ARN.<br>Due to the uncertainty of air quality impacts and mitigation, the potential impact level cannot be reduced after mitigation so potential for major adverse impacts remains. | |
| Rokeby Park and Mortham Wood LWS (National) | As per route wide.<br>This site is designated for parkland woodland and pasture with mature trees (a Priority Habitat and potential ancient woodland). There is the potential for works to access Rokeby Hall from the A66, further east on the northern verge to result in losses of mature tree habitats. In addition, there may be effects of windthrow, compaction or pollution upon these valued parkland trees.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | As per route wide. | As per route wide.<br>Further design reviews will aim to avoid the parkland habitat and mature or veteran trees, including their root protection zones.<br>If this is not possible, mitigation may include translocation of deadwood habitat and ancient woodland soils.<br>Due to the irreplaceable nature of this habitat type, the level of impact cannot be decreased at this time. | Potential for major adverse impacts on a resource of National importance, which is a Large or Very Large effect and therefore significant. Potential adverse LSE anticipated relating to air quality (*Construction and Operation).* |
| Teesbank Woods, Rokeby LWS (National) | This site is situated at too great a distance for direct or indirect impacts.<br>No change anticipated. | No change anticipated. | None required. | No change on a resource of National importance, which is a Neutral effect and therefore not significant. No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Habitats<br>Church Wood (potential ancient woodland),<br>'Jack Wood' Ancient Woodland,<br>Thorsgill Wood Ancient Woodland,<br>Waterfall Wood Ancient Woodland,<br>Teesbank Plantation Ancient Woodland,<br>Mill Wood Ancient Woodland,<br>Notable sycamore trees,<br>Priority Habitats:<br>Deciduous woodland,<br>Traditional orchard,<br>Upland hay meadow,<br>Lowland calcareous grassland,<br>Good quality semi-improved grassland (Up to National) | As per route wide.<br>Within this scheme, habitat losses include primarily arable and improved grassland, with lower losses to other habitats including poor semi-improved grassland, semi-natural broad-leaved woodland, bare ground, broad-leaved plantation, mixed semi-natural woodland, tall ruderal, buildings, semi-improved neutral grassland, amenity grassland, standing open water, scattered trees, other acid natural rock exposure and coniferous plantation.<br>The following Priority Habitats are negatively affected: losses and damage to two areas of deciduous woodland to the west of the alternative and five to the east (of which Church Plantation is suspected ancient woodland habitat).<br>For linear habitats there are large losses to species-poor defunct hedge, species-rich intact hedge, species-poor hedge and trees and eutrophic running open water. Moderate losses are to dry ditch, species-rich hedge and trees, species-poor intact hedge, bare ground and tree lines and running open water. Smaller losses are to wall, species-rich defunct hedge and scattered scrub. | As per route wide.<br>Persistent fragmentation impacts for species within islands.<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for where Grahams Hill/Jack Wood Ancient Woodland, Thorsgill Wood Ancient Woodland and Waterfall Wood Ancient Woodland site are within 200m of the ARN, potential for detrimental impacts upon sensitive sites, habitats and species within this site. | As per route wide.<br>Further design review to limit impacts upon ancient woodland and mature trees.<br>Seed harvesting or translocation of any protected or notable plant species within 'islands'.<br>Precautionary mitigation provision may need to include creation of additional habitat over 200m from the ARN. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats, and possible Ancient Woodland along with air quality impacts (*Construction and Operation*).<br>Potential adverse LSE anticipated for Thorsgill Wood and Waterfall Wood AW as a result of air quality impacts upon sensitive habitats and species (*Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | This route also has minor severing habitat losses for water connections for balancing ponds within ancient woodland habitat at Jack Wood Ancient Woodland, and loss of five mature sycamore trees (notable trees), removing the ecological potential for these trees to become ancient or veteran<br>Islands are created at two sets of junctions (both within junctions and between existing and new alignment), with losses and severance impacts to hedgerows and watercourses. Intact hedgerows with trees are severed to the west of the alternative and defunct hedge and trees to the east.<br>There are potential habitat degradation impacts from air quality (deposition) at Grahams Hill/Jack Wood Ancient Woodland and Waterfall Wood Ancient Woodland. Thorsgill Wood AW is 448m north and no direct or indirect impacts are anticipated.<br>None of the protected or notable species recorded in the local area are currently identified as affected by the scheme, but works are in close proximity to an area of suspected treated giant hogweed on Tutta Beck. | | | |
| Rivers/streams | As per route wide. | As per route wide. | As per route wide. | As per route wide table however rivers/streams on |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| (Local) | Habitat degradation (shading) associated with new watercourse crossings.<br>With the exception of Tutta Beck, the watercourses crossed by the Black route are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of man-made barriers that restrict the movement of aquatic species. | The crossing of Tutta Beck has the potential to adversely impact fish passage and the natural (fluvial geomorphological) river process which control the quality and distribution locally.<br>In the absence of mitigation, proposed new discharges to Tutta Beck has the potential to adversely impact water quality. | The crossing design for Tutta Beck yet to be confirmed and will examine ways to avoid impacts on river processes.<br>The next design review will also examine whether replacement culverts can be built or adaptations made to facilitate the movement of fish should they be recorded during surveys.<br>This is yet to be confirmed so is not reported as a beneficial effect. | this scheme are of Local value. Minor adverse impacts on a Local value resource may be assessed as Neutral or Slight therefore not significant. No LSE are anticipated. |
| Bats (Roosts)<br>(Regional) | As per route wide.<br>No structures with bat roost potential will require demolition as a result of the scheme however all 16 trees with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting)<br>(National) | As per route wide.<br>Seven potential crossing points will be affected by construction.<br>Temporary loss of foraging resource during construction. | As per route wide.<br>Seven potential crossing points will be affected by the scheme.<br>Temporary loss of foraging resource until habitat replanting scheme completed and matures. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts<br>*(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Red Squirrel<br>(Up to National) | As per route wide.<br>Temporary and permanent habitat loss for red squirrel for this scheme includes woodland edges, tree lines, hedgerows and partial loss of a pocket of woodland located at the western extents of the scheme.<br>A thick tree line located immediately adjacent to the south of the existing A66 carriageway is also to be permanently lost at the far eastern extents of the scheme. | As per route wide.<br>Due to widening of the existing carriageway areas of woodland located north and south of the route which are suitable for red squirrel may become permanently fragmented.<br>Temporary loss of foraging resource until habitat replanting scheme completed and matures. | As per route wide.<br>A potential red squirrel crossing point feature (rope bridge) may be necessary around the east of this scheme to ensure suitable woodland habitats remain connected and a safe crossing feature can be used to help reduce the risk of mortality related to road traffic collisions. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |
| Otter<br>(Up to County) | As per route wide.<br>Direct impacts associated with the temporary loss of otter habitat at the new crossing points on Tutta Beck.<br>Disturbance impacts associated with construction activity is likely to impact commuting and foraging otter and may cause holts to be temporarily abandoned if present (field surveys have not yet been completed for all alternatives being considered for this scheme). Of note, this scheme creates a new crossing point over Tutta Beck that is currently undisturbed | As per route wide.<br>Potential permanent increased noise, light, vibration and surface water runoff containing pollutants may reduce otter commuting and foraging and could cause habitat fragmentation on Tutta Beck due to the previously undisturbed nature of the watercourse. Disturbance from traffic could cause holts nearby to be abandoned. | As per route wide. | No LSE are anticipated as per route wide table. |
| Water Vole<br>(Up to County) | As per route wide.<br>Direct impacts associated with the temporary loss of water vole habitat at the new crossing points on Tutta Beck | As per route wide. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | and an existing crossing point on an unnamed tributary of Manyfold Beck.<br>Disturbance impacts associated with construction activities could impact foraging water vole and cause burrows to be abandoned or to collapse if present - field surveys have not yet been completed for all route alternatives being considered for this scheme. | | | |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which includes areas of woodland, woodland edge, scrub, field boundaries and some open rough grassland areas.<br>Badger surveys are not complete for all routes but it is likely setts will be identified in the area. | As per route wide.<br>Crossing points may be identified through further survey. | As per route wide. | No LSE are anticipated as per route wide table. |
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme includes tree lines, hedgerows, woodland edges, grassland, open fields, areas of scrub, riparian banks and small areas of woodland. | As per route wide.<br>Due to the eastern extents of this alignment being offline, previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented in this area as a result of operation.<br>Due to widening of the existing carriageway suitable habitats may become permanently | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts (*Construction and Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | fragmented as a result of operation. | | |
| Wintering Birds (Up to County) | As per route wide.<br>Habitat loss for wintering birds for all Alternatives of this scheme include hedgerows, woodland, mature trees and grassland with other impacts associated with residential areas and small watercourses.<br>This scheme alternative dissects a number of open farmland field of value to wintering bird species, surveys recorded 850 wintering lapwing and 679 wintering golden plovers. | As per route wide. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Breeding Birds (Up to County) | As per route wide.<br>Habitat loss for breeding birds for this scheme includes hedgerows, woodland, mature trees and grassland with other impacts associated with residential areas and small watercourses. | As per route wide. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Barn Owl (Regional) | As per route wide.<br>Habitat loss for barn owls for this scheme includes agricultural buildings, woodland, tussocky grassland, hedgerows and mature trees. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Reptiles<br>(Up to County) | As per route wide.<br>Historic records for slow-worm and adder for this scheme mean that currently losses to terrestrial habitat may result in loss of reptile populations and/or fragmentation impacts as a result of islanded areas surrounded by road infrastructure. | As route wide including:<br>Potential for permanent severance of migratory routes for adder and fragmentation (isolation) of populations within islanded areas of road infrastructure. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians<br>(Up to County) | As per route wide.<br>No pond habitats are lost through this scheme, but works are adjacent to five ponds, of which four have had surveys completed (common frog present in one). Results are pending for the remaining three ponds.<br>Currently there is still the potential for impacts upon amphibians through direct (terrestrial habitat loss) or indirect (dust/pollution) habitat impacts as a result of the works.<br>There is the potential for fragmentation impacts for areas within islands of the road network. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table relating to all amphibian species (Construction and Operation). |
| Fish<br>(Local) | As per route wide.<br>With the exception of Tutta Beck, the watercourses crossed by this scheme are minor and are considered unlikely to support (surveys pending) notable and/or protected fish as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of and man-made barriers | As per route wide. | As per route wide.<br>The next design review will examine whether replacement culverts can be built or adaptations made to facilitate the movement of fish should they be recorded during surveys. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of Local importance which is a Neutral effect and therefore not significant. No LSE anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | that restrict the movement of aquatic species. | | | |
| White-Clawed Crayfish (WCC) (Up to County) | As per route wide. No desk study records for WCC were recorded within 2km of this Scheme. WCC surveys and eDNA sampling will be undertaken in 2021 to confirm presence/absence. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |
| Terrestrial invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per routewideroute wide table *(Construction and Operation).* |
| Aquatic invertebrates (Up to NationalCounty) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. No LSE anticipated as per route wide table. *(Construction and Operation)* |
| Macrophytes (up to InternationalCounty) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated.Potential adverse LSE anticipated as per route wide table. *(Construction and Operation).* |

Blue (Cross Lanes) alternative junction

6.9.16 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-17: Cross Lanes to Rokeby Blue (Cross Lanes) alternative - likely significant effects (Biodiversity)

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Statutory sites (National) | As for Black route | | | |
| Non-statutory sites (Local) | As for Black route | | | |
| Habitats<br>Church Wood (potential AW),<br>Rokeby Park (potential AW),<br>'Jack Wood' AW,<br>Thorsgill Woods AW,<br>Waterfall Wood AW,<br>Teesbank Plantation AW,<br>Mill Wood AW,<br>Notable sycamore trees,<br>Priority Habitats:<br>Deciduous woodland,<br>Traditional orchard,<br>Upland hay meadow,<br>Lowland calcareous grassland,<br>Good quality semi-improved grassland<br>(Up to National) | Broadly as for Black route, but specific to this alternative are significantly more loss and severance at the western end of the scheme to deciduous woodland, hedgerows and semi-improved grassland, with the creation of a wider barrier for colonisation and whilst more localised to the eastern end of the scheme there are many small 'islands' created within road infrastructure.<br>This Blue alternative also differs from the Black by avoiding the five mature sycamore trees, noting other semi-mature trees are likely present within hedges, woodland and parkland habitats. In addition to lowered impacts to Church Plantation deciduous woodland/ potential ancient woodland. | As per Black route<br>Persistent fragmentation impacts for species within islands. | As per Black route | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats, and losses to irreplaceable ancient woodland at Jack Wood, potential ancient woodland (Church Wood and Rokeby Park), and mature trees along with air quality impacts (*Construction and Operation*).<br>Potential adverse LSE anticipated for Waterfall Wood AW as a result of air quality impacts upon sensitive habitats and species (*Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Rivers/streams (Local) | As per route wide With the exception of Punder Gill (which has not been surveyed in the vicinity of the proposed crossing, but is expected to consist of similar habitats to those recorded in the surveyed section of Tutta Beck), watercourses crossed by the Blue alternative are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of and man-made barriers that restrict the movement of aquatic species.<br>Habitat degradation (shading) associated with new watercourse crossings. | As per route wide<br>The crossing of Punder Gill has the potential to adversely impact fish passage and the natural (fluvial geomorphological) river process which control the quality and distribution locally.<br>Proposed new discharges to Tutta Beck have the potential to adversely impact water quality. | As per route wide.<br>The crossing design for Punder Gill is yet to be confirmed and will examine ways to avoid impacts on river processes.<br>The next design review will also examine whether replacement culverts can be built or adaptations made to facilitate the movement of fish should they be recorded during surveys.<br>This is yet to be confirmed so is not reported as a beneficial effect. | As per route wide table however rivers/streams on this scheme are of Local value. Minor adverse impacts on a Local value resource may be assessed as Neutral or Slight therefore not significant. No LSE are anticipated. |
| Bats (Roosts) (Regional) | As per route wide.<br>No structures with bat roost potential will require demolition as a result of the scheme however all 20 trees with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting)<br><br>(National) | As per route wide.<br>Eight potential crossing points will be affected by the scheme.<br>Temporary loss of foraging resource until habitat replanting scheme completed and matures | As per route wide.<br>Eight potential crossing points will be affected by the scheme.<br>Temporary loss of foraging resource until habitat replanting scheme completed and matures | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts *(Construction and Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Red Squirrel<br>(Up to National) | As per route wide.<br>Temporary and permanent habitat loss for red squirrel for this scheme includes woodland edges, tree lines, hedgerows and partial loss of a pocket of woodland located at the western extents of the scheme.<br>A thick tree line located immediately adjacent to the south of the existing A66 carriageway is also to be permanently lost at the far eastern extents of the scheme. | As per route wide.<br>Due to widening of the existing carriageway areas of woodland located north and south of the route which are suitable for red squirrel may become permanently fragmented as a result of operation. | As per route wide.<br>A potential red squirrel crossing point feature (rope bridge) may be necessary around the east of this scheme to ensure suitable woodland habitats remain connected and a safe crossing feature can be used to help reduce the risk of RTAs. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |
| Otter<br>(Up to County) | As per route wide.<br>Direct impacts associated with the temporary loss of otter habitat during the expansion of existing crossing points over Punder Gill, Manyfold Beck and an unnamed tributary of Tutta Beck, and new crossing points on an unnamed tributary of Punder Gill and Tutta Beck.<br>Disturbance impacts associated with construction activity is likely to impact commuting and foraging otter and may cause holts to be temporarily abandoned if present (field surveys have not yet been completed for all alternatives being considered for this scheme) at existing and new crossing points. Of note, this scheme creates a | As per route wide.<br>Permanent increased noise, light, vibration and surface water runoff containing pollutants may reduce otter commuting and foraging and could cause habitat fragmentation on Tutta Beck due to the previously undisturbed nature of the watercourse. Disturbance from traffic could cause holts nearby to be abandoned. | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | new crossing point over Tutta Beck that is currently undisturbed. | | | |
| Water Vole<br>(Up to County) | As per route wide.<br>Direct impacts associated with the temporary loss of water vole habitat during the expansion of existing crossing points over Punder Gill, an unnamed tributary of Manyfold Beck, Manyfold Beck and an unnamed tributary of Tutta Beck, and new crossing points on an unnamed tributary of Punder Gill and Tutta Beck.<br>Disturbance impacts associated with construction activities could impact foraging water vole and cause burrows to be abandoned or to collapse if present - field surveys have not yet been completed for all alternatives being considered for this scheme. | As per route wide. | As per route wide. | No LSE are anticipated as per route wide table. |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which includes areas of woodland, woodland edge, scrub, field boundaries and some open rough grassland areas. | As per route wide.<br>Crossing points may be identified through further survey. | As per route wide. | No LSE are anticipated as per route wide table. |
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for | As per route wide.<br>Due to the eastern extents and western extent of this alignment being offline, previously undisturbed suitable | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Deer<br>Hedgehog<br>(Up to County) | this scheme includes tree lines, hedgerows, woodland edges, grassland, open fields, areas of scrub, riparian banks and small areas of woodland. | habitats (predominantly open arable fields) will become permanently fragmented in this area as a result of operation. Due to widening of the existing carriageway suitable habitats may become permanently fragmented as a result of operation. | | (*Construction and Operation*). |
| Wintering Birds<br>(Up to County) | As per Black route<br>Whilst no SPA qualifying species were recorded during the winter bird surveys in close proximity to the Blue alternative, the areas of farmland the route passes through have the potential to support wintering golden plover. | As per Black route | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Breeding Birds<br>(Up to County) | As per Black route. | As per Black route. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Barn Owl<br>(Regional) | As per Black route. | As per Black route. | As per route wide. | Potential adverse LSE as per route wide table |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | *(Construction and Operation).* |
| Reptiles<br>(Up to County) | As per route wide.<br>As Black route, but greater area of habitats affected to the west, connected to the historic adder record. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians<br>(Up to County) | As per route wide.<br>As per Black route, but two of the ponds where survey results are pending are closer to the alignment. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Fish<br>(Local) | As per route wide with the exception of Punder Gill, the watercourses crossed by the Blue alternative are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of and man-made barriers that restrict the movement of aquatic species. | As per route wide. | As per route wide.<br>The next design review will also examine whether replacement culverts can be built or adaptations made to facilitate the movement of fish should they be recorded during surveys. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of Local importance which is a Neutral effect and therefore not significant. No LSE anticipated. |
| White-Clawed Crayfish (WCC)<br>(Up to County) | As per route wide.<br>No desk study records for WCC were recorded within 2km of this Scheme. WCC surveys and eDNA sampling will be undertaken in 2021 to confirm presence/absence. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | therefore not significant. No LSE anticipated. |
| Terrestrial invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates (Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |
| Macrophytes (up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |

### Red (Rokeby) alternative

6.9.17 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Pine marten
- Hazel dormouse

Table 6-18: Cross Lanes to Rokeby Red (Rokeby) alternative - likely significant effects (Biodiversity)

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Statutory sites (National) | As per Black route | | | |
| Non-statutory sites (Local) | As per Black route | | | |
| Habitats<br>Church Wood (potential AW),<br>Rokeby Park (potential AW),<br>'Jack Wood' AW,<br>Thorsgill Woods AW,<br>Waterfall Wood AW,<br>Teesbank Plantation AW,<br>Mill Wood AW,<br>Notable sycamore trees,<br>Priority Habitats:<br>Deciduous woodland,<br>Traditional orchard,<br>River,<br>Upland hay meadow,<br>Lowland calcareous grassland,<br>Good quality semi-improved grassland<br>(Up to National) | As per route wide<br>Habitat losses under this route are listed generally for all alternatives with the Black route above.<br>Specific to this alternative are significantly lower loss of all habitats as described in the Black route, but greater impacts to the eastern end of the scheme including loss of and severance to ancient woodland at Church Wood, loss and severance to Jones Wood AW, loss of Priority Habitats of seven areas of deciduous woodland, hedgerows and semi-improved grassland, along with one larger island created between the existing and new alignments of the A66 and two<br>small 'islands' created within road infrastructure.<br>This Red alternative also differs from the Black route by potential for impacts to a reduced number of, but at least one of the five mature sycamore trees, noting other semi-mature trees are | As per Black route | As per route wide and Black route, though additional mitigation required to retain seed bank where possible for potential ancient woodland at crossing point. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats, and possible Ancient Woodland along with air quality impacts (*Construction and Operation*).<br>Potential adverse LSE anticipated for Waterfall Wood AW as a result of air quality impacts upon sensitive habitats and species (*Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | likely present within hedges, woodland and parkland habitats. | | | |
| River/streams (Local) | As for Black route<br>No additional watercourses are affected by the Orange alternative. | As for Black route | As for Black route | No additional LSE caused by this alternative, as Black route. |
| Bats (Roosts) (Regional) | As per route wide.<br>No structures with bat roost potential will require demolition as a result of the scheme however all six with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting) (National) | As per route wide.<br>Five potential crossing points will be affected by construction.<br>Temporary loss of foraging resource during construction. | As per route wide.<br>Five potential crossing points will be affected by the scheme.<br>Temporary loss of foraging resource until habitat replanting scheme completed and matures | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts *(Construction and Operation).* |
| Red Squirrel (Up to National) | As per route wide.<br>Temporary and permanent habitat loss for red squirrel for this scheme includes woodland edges, tree lines, hedgerows and partial loss of a pocket of woodland located at the western extents of the scheme.<br>A thick tree line located immediately adjacent to the south of the existing A66 carriageway is also to be permanently lost at the far eastern extents of the scheme. | As per route wide.<br>Due to widening of the existing carriageway areas of woodland located north and south of the route which are suitable for red squirrel may become permanently fragmented as a result of operation. | As per route wide.<br>A potential red squirrel crossing point feature (rope bridge) may be necessary around the east of this scheme to ensure suitable woodland habitats remain connected and a safe crossing feature can be used to help reduce the risk of RTAs. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts (Construction and Operation). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Otter<br>(Up to County) | As for Black route<br>There are no new crossing points associated with this alternative. | As for Black route | As per route wide. | No LSE are anticipated as per route wide table. |
| Water vole<br>(Up to County) | As for Black route<br>There are no new crossing points associated with this alternative. | As for Black route | As per route wide. | No LSE are anticipated as per route wide table. |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which includes areas of woodland, woodland edge, scrub, field boundaries and some open rough grassland areas. | As per route wide.<br>Areas of woodland, scrub, rough grassland and field boundaries including hedgerows suitable for badger foraging and commuting (especially at the eastern extents of the scheme) will be lost to the permanent footprint of this scheme. | As per route wide. | No LSE are anticipated as per route wide table. |
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme includes tree lines, hedgerows, woodland edges, grassland, open fields, areas of scrub, riparian banks and small areas of woodland. | As per route wide.<br>Due to the eastern extents of this alignment being offline, previously undisturbed suitable habitats (predominantly open arable fields) will become permanently fragmented in this area as a result of operation.<br>Due to widening of the existing carriageway suitable habitats may become permanently fragmented as a result of operation. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts (*Construction and Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Wintering Birds (Up to County) | As for Black route<br>Whilst no SPA qualifying species were recorded during the winter bird surveys in close proximity to the Red alternative for this scheme, the areas of farmland the alternative passes through have the potential to support wintering golden plover. | As for Black route | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Breeding Birds (Up to County) | As for Black route | As for Black route | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Barn Owl (Regional) | As for Black route | As for Black route | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Reptiles (Up to County) | As Black option, but smaller area of habitats affected connected to the historic adder record. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians (Up to County) | As per Black option | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | (Construction and Operation). |
| Fish (Local) | As for Black route. | As for Black route. | As for Black route. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of Local importance which is a Neutral effect and therefore not significant. No LSE anticipated. |
| White-Clawed Crayfish (WCC) (Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |
| Terrestrial invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates (Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | therefore not significant. No LSE anticipated. *(Construction and Operation).* |
| Macrophytes (Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |

## Stephen Bank to Carkin Moor

6.9.18 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Statutory Designated Sites – there are no statutory designated sites within the Zone of Influence for this scheme.
- Pine marten
- Hazel dormouse

Table 6-19: Stephen Bank to Carkin Moor - likely significant effects (Biodiversity)

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Non-statutory sites<br>Stephen Bank Road Verge (De-notified LWS) (Local) | As per route wide.<br>This site has been de-notified due to overgrown habitats, it is still possible the seed bank is viable and removal of this cover during works may expose the rich seed bank underneath, there is also the potential for loss to this rich seed bank if the soils are moved elsewhere or buried. | As per route wide.<br>Loss of ecological potential of this site.<br>The current stage of air quality modelling has identified a 1% increase in nitrogen for where this site | As per route wide.<br>Pre-construction checks of seed bank viability to inform soil management and re-use of soils within ecology mitigation areas. | Potential for major adverse impacts on a resource of Local importance, which is a Slight effect and therefore not significant. No LSE are anticipated. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Direct loss of approximately half the site and potential habitat degradation for remaining due to air quality (deposition) and pollution incidents associated with construction.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | is within 200m of the ARN, potential for detrimental impacts upon sensitive sites, habitats and species within this site.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | Mitigation measures to protect retained habitat will reduce the likelihood of pollution incidents but the permanent loss and air quality impacts remain a major adverse impact. | |
| Aske Estate Woodlands LWS (Local) | As per route wide.<br>This site is at too great a distance for direct or indirect impacts.<br>No change anticipated. | As per route wide.<br>No change anticipated. | None required. | No change on a resource of Local importance is a Neutral effect and therefore not significant. No LSE anticipated. |
| Ravensworth Park and Castle Fetch LWS (Local) | As per route wide.<br>This site is at too great a distance for direct or indirect impacts.<br>No change anticipated. | As per route wide.<br>This site is within 200m of the ARN but no (<1%) increase in N deposition is predicted.<br>No change anticipated. | None required. | No change on a resource of Local importance is a Neutral effect and therefore not significant. No LSE anticipated. |
| Habitats – Deciduous woodland Hedgerows Reedbed | As per route wide.<br>Greatest habitat losses are to arable, improved grassland, poor-semi-improved grassland and hardstanding (89ha) and species-poor defunct hedge, eutrophic running water and species-rich | As per route wide.<br>Temporal loss of habitats, time taken for recovery of hedgerow and woodland habitats. | As route wide.<br>Long term habitat management to maintain reedbed and manage invasive species. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats (*Construction and Operation*). |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Good quality semi-improved grassland<br>(Up to National) | hedge and trees and species-poor intact hedge (5000m)<br>Within the above is loss of: 9ha deciduous woodland, 1ha reedbed, 1ha good quality semi-improved grassland, loss of hedgerows and shading of watercourses.<br>Fragmentation of watercourses and severance of woodland habitats by main carriageway. Further fragmentation caused by new alignment at junctions and between areas of new and prior A66 alignment.<br>In terms of degradation, Ancient Woodland and sensitive habitats are located over 200m from the draft DCO boundary however the Priority Habitat reedbed is within the construction boundary. In line with LA 105 DMRB guidelines, air quality impacts on aquatic habitats can be scoped out.<br>Ground disturbance and soil movements of marginal habitats with Himalayan balsam and possible cause of further spread.<br>Potential for loss of the following species due to ground disturbance, shading or compaction: bluebell (woodland habitats), or corn spurrey (arable habitats), or lesser spearwort and crossword (marginal habitats), or to field mouse-ear, devil's-bit scabious, harebell and tormentil (neutral, calcareous and acidic grasslands). | Potential loss of reedbed habitat to woodland planting and/or natural habitat progression. | | |
| Rivers/streams<br>(Local) | As per route wide.<br>Habitat degradation (shading) associated with the five watercourse crossings. Proposals include | As per route wide | As per route wide. | As per route wide table however rivers/streams on this scheme are of Local |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | new crossing points on three unnamed tributaries of Holme Beck, Mains Gill and an expansion of an existing crossings on another unnamed tributary of Holme Beck.<br>The watercourses crossed by this scheme are minor and are considered unlikely to support (surveys pending) notable and/or protected aquatic species as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of and man-made barriers that restrict the movement of aquatic species. | | | value. Minor adverse impacts on a Local value resource may be assessed as Neutral or Slight therefore not significant. No LSE are anticipated. |
| Bats (Roosts)<br>(Regional) | As per route wide.<br>No structures with bat roost potential will require demolition as a result of the scheme however all 36 trees with moderate to high potential to support roosting bats will require clearance. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting)<br><br>(National) | As per route wide.<br>Seven potential crossing points will be affected by construction.<br>Temporary loss of foraging resource during construction. | As per route wide.<br>Seven potential crossing points will be affected by the scheme.<br>Long term loss of foraging resource until woodland habitat replanting scheme completed and matures | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys and possible fragmentation impacts *(Construction and Operation).* |
| Red Squirrel<br>(Up to National) | As per route wide.<br>Potential habitat loss (permanent) for red squirrel for this scheme includes four areas of woodland and woodland edges as well as connecting tree | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and possible fragmentation impacts |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | lines and hedgerows (if proposed surveys determine red squirrels to be present at this scheme). | | | (Construction and Operation). |
| Otter<br>(Up to County) | As per route wide.<br>Direct impacts associated with the temporary loss of otter habitat at the new crossing points on three unnamed tributaries of Holme Beck, Mains Gill and an expansion of an existing crossings on another unnamed tributary of Holme Beck.<br>Disturbance impacts associated with construction activity is likely to impact commuting and foraging otter. No holt and/or resting features were identified within 250m of this scheme. | As per route wide. | As per route wide. | No LSE are anticipated as per route wide table. |
| Water Vole<br>(Up to County) | As per route wide.<br>Direct impacts associated with the temporary loss of water vole habitat at the new crossing points on three unnamed tributaries of Holme Beck, Mains Gill and an unnamed tributary of Cottonmill Beck and its associated reed bed, and an expansion of an existing crossing on another unnamed tributary of Holme Beck.<br>Disturbance impacts associated with construction activities could impact foraging water vole and cause burrows to be abandoned or to collapse if present. | As per route wide. | As per route wide. | No LSE are anticipated as per route wide table. |
| Badger<br>(Local) | As per route wide.<br>Habitat loss for badger for this scheme includes foraging and commuting habitat which includes | As per route wide.<br>The section of offline route of the scheme is located on previously undisturbed | As per route wide. | No LSE are anticipated as per route wide table. |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | areas of woodland, woodland edge, scrub, field boundaries and open arable field areas. | suitable habitats (predominantly open arable fields and pockets of woodland) will become permanently fragmented as a result of operation. | | |
| Other Terrestrial Mammal Species<br>Polecat<br>Brown hare<br>Deer<br>Hedgehog<br>(Up to County) | As per route wide.<br>Habitat loss includes hedgerows, tree lines, areas of woodland, woodland edges, grassland, open fields, areas of scrub and riparian banks. | As per route wide.<br>The section of offline route of the scheme is located on previously undisturbed suitable habitats (predominantly open arable fields and pockets of woodland) that will become permanently fragmented as a result of operation. | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts (*Construction and Operation*). |
| Wintering Birds<br>(Up to County) | As per route wide.<br>Habitat loss for wintering birds for this scheme includes hedgerows, woodland, mature trees and grassland with impacts associated with watercourses. | As per route wide. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Breeding Birds<br>(Up to County) | As per route wide.<br>Habitat loss for breeding birds for this scheme includes hedgerows, woodland, mature trees and | As per route wide. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | grassland with impacts associated with watercourses. | | | adverse effect on a county resource therefore a Neutral or Slight effect is predicted which is not significant. No LSE anticipated. |
| Barn Owl (Regional) | As per route wide. Habitat loss for barn owls for this scheme includes agricultural buildings, woodland, tussocky grassland, hedgerows and mature trees. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Reptiles (Up to County) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians (Up to County) | As per route wide. Great crested newts are likely to use the habitats within the construction area. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table relating to amphibian species including GCN (Construction and Operation). |
| Fish (Local) | As per route wide. The watercourses crossed by this scheme are minor and are considered unlikely to support (surveys pending) notable and/or protected fish as habitats are either unsuitable, ephemeral or disconnected to the wider catchment as a result of | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of Local importance which is a Neutral effect and therefore |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | and man-made barriers that restrict the movement of aquatic species.<br>This will be confirmed in 2021 following fish surveys and eDNA sampling. | | | not significant. No LSE anticipated. |
| White-Clawed Crayfish (WCC) (Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |
| Terrestrial invertebrates (Up to National) | As per route wide. | As per route wide. | As per route wide. | Potential adverse LSE anticipated as per route wide table *(Construction and Operation).* |
| Aquatic invertebrates (Up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |
| Macrophytes (up to County) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower, so there are potential for negligible adverse impacts |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | | | on a resource of County importance which is a Slight or Neutral effect and therefore not significant. No LSE anticipated. |

## A1(M) Junction 53 Scotch Corner

6.9.19 The following biodiversity receptors have been scoped out of the assessment for this scheme:

- Rivers/streams – none present.
- Pine marten
- Hazel dormouse
- Water vole – no suitable habitat present.
- Otter – no suitable habitat present.
- Red squirrel –scoped out due to the absence of historical biological records within 2km, the lack of suitable habitat being present within the survey area. Furthermore, no evidence has been collected during initial terrestrial mammal surveys to indicate their presence.
- Badger – no badger setts or signs identified during field surveys.
- Fish – no suitable habitat present.
- White-clawed crayfish – no suitable habitat present.
- Aquatic invertebrates – no suitable habitat present.
- Macrophytes – no suitable habitat present.

Table 6-20: A1(M) Junction 53 Scotch Corner - likely significant effects (Biodiversity)

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Statutory Sites<br>Black Scar Quarry SSSI<br>(National) | As per route wide.<br>This is a geological SSSI but as a non-designatory feature has broad-leaved woodland habitat.<br>Based on the distance of this site from the works, there are no direct impacts and likely no indirect impacts that affect qualifying features.<br>No change anticipated. | As per route wide.<br>Based on the distance of this site from the works, there are no direct impacts and likely no indirect impacts that affect qualifying features.<br>No change anticipated. | None required. | No change on a resource of Local importance is a Neutral effect and therefore not significant. No LSE anticipated. |
| Pallet Hill LWS<br>(Local) | As per route wide.<br>Based on the distance of this site from the works, there are no direct impacts and likely no indirect impacts that affect qualifying features.<br>No change anticipated. | As per route wide.<br>This site is within 200m of the ARN and subject to a 1% increase in N dep. Therefore, there is potential for air quality impacts.<br>These potential impacts may affect the integrity of the resource on a permanent/irreversible basis in the absence of mitigation, which may be assessed as a major adverse impact. | Mitigation measures to protect retained habitat will reduce the likelihood of pollution incidents but the permanent loss and air quality impacts remain a major adverse impact. | Potential for major adverse impacts on a resource of Local importance, which is a Slight effect and therefore not significant. No LSE are anticipated. |
| Limekiln Wood Site of Importance for Nature Conservation<br>(County)<br>and Limekiln Ancient Woodland<br>(National) | This site is 8.7km from this scheme and only included due to being 200m from the ARN. No direct or indirect impacts are anticipated.<br><br>No change anticipated. | This site is within 200m of the ARN and subject to a 1% increase in N dep. Therefore there is potential for air quality impacts.<br><br>These potential impacts may affect the integrity of the resource on a permanent / irreversible basis in the absence of mitigation, | Further air quality assessment and mitigation design is required but there may be a need for further mitigation areas to offset air quality impacts related to habitat degradation. Permanent loss and air quality impacts remain a major adverse impact. | Potential for major adverse impacts on a resource of up to National importance, which is a Large or Very Large effect and therefore significant. Potential LSE are anticipated relating to air quality *(Operation).* |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | | which may be assessed as a major adverse impact. | | |
| Habitats – Deciduous woodland Hedgerow Poor semi-improved grassland (Up to National) | As per route wide. Habitat loss is restricted to broad-leaved plantation, hedgerow and poor semi-improved grassland (1.5ha). Within the above is loss of 0.2ha deciduous woodland (Priority Habitat) within the A1(M) and A66 junction. No fragmentation impacts anticipated. Ground disturbance and soil movements of marginal habitats with the invasive species: Yellow Archangel (*L.galeobdolon* subsp. *argentatum*), Hollyberry, cotoneaster, montbretia, and rhododendron, which may cause further spread of these species. Currently there are no losses anticipated to protected or otherwise notable species requiring conservation. | As per route wide. | As per route wide. Further design review will aim to avoid or reduce the loss of Priority woodland habitat and further surveys will aim to confirm the status of the woodland. | Potential adverse LSE anticipated as per route wide table due to loss of Priority Habitats (*Construction and Operation*). |
| Bats (Roosts) (Regional) | As per route wide. No structures or trees with bat roost potential will require demolition/felling as a result of the scheme although surveys are ongoing. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table subject to ongoing surveys (Construction and Operation). |
| Bat Activity (Foraging and Commuting) (National) | As per route wide. No potential bat crossing points have been identified in relation to the draft DCO boundary for this scheme. | As per route wide. Loss of foraging resource until habitat replanting scheme matures due to woodland habitat. | As per route wide. Temporary brash piles to maintain connectivity may | Potential adverse LSE as per route wide table subject to ongoing surveys and possible |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| | Temporary loss of foraging and possible commuting resource during construction. | | be required during construction. | fragmentation impacts *(Construction and Operation).* |
| Other Terrestrial Mammal Species<br>*Polecat*<br>*Brown hare*<br>*Deer*<br>*Hedgehog*<br>(Up to County) | As per route wide.<br>Habitat loss (temporary and permanent) for other terrestrial mammal species including deer, polecat, brown hare and hedgehog for this scheme is limited to small areas of tree lines, hedgerows, woodland edges, field edges and roadside verge. | N/A | As per route wide. | Potential adverse LSE as per route wide table due to habitat loss and fragmentation impacts *(Construction*). |
| Wintering Birds<br>(Up to Local) | As per route wide.<br>Limited habitat loss for wintering birds for this scheme includes small losses of hedgerows, woodland, mature trees and grassland. | N/A | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a local resource therefore a Neutral/Slight effect is predicted, which is not significant.<br>No LSE are predicted. |
| Breeding Birds<br>(Up to Local) | As per route wide.<br>Limited habitat loss for breeding birds for this scheme includes small losses of hedgerows, woodland, mature trees and grassland. | N/A | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a local resource therefore a Neutral/Slight effect is predicted, which is not significant.<br>**No LSE are predicted.** |

| Receptor | Potential Impacts (Construction) | Potential Impacts (Operation) | Design, Mitigation and Enhancement Measures | Likely Significant Effect Following Mitigation? |
|---|---|---|---|---|
| Barn Owl (Regional) | As per route wide.<br>Limited habitat loss for barn owls for this scheme includes woodland, tussocky grassland and hedgerows. | N/A | As per route wide. | Potential adverse LSE as per route wide table *(Construction*). |
| Reptiles (Up to County) | As per route wide.<br>Common reptiles may use disturbed grassland and woodland edge habitat. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table *(Construction and Operation).* |
| Amphibians (Up to County) | As per route wide.<br>No pond habitats are affected - however due to one pond within study area requiring further survey potential for impact to great crested newt is still a possibility. | As per route wide. | As per route wide. | Potential adverse LSE as per route wide table relating to amphibian species including GCN<br>(Construction and Operation). |
| Terrestrial invertebrates (Local) | As per route wide. | As per route wide. | As per route wide. | As per route wide table although valuation is lower for this scheme so predicted effect is a minor adverse effect on a local resource therefore a Neutral/Slight effect is predicted, which is not significant.<br>No LSE are predicted. |

## 6.10 Monitoring

### Route wide

6.10.1 Ongoing ecological monitoring will be required for a range of biodiversity resources in order to measure the success of habitat creation, enhancement and mitigation measures. Botanical survey and / or invertebrate sampling may be required to monitor extent and quality of habitats across the scheme and gauge successful establishment and ongoing management requirements of habitats.

6.10.2 The use of underpasses and crossing points by the intended species will also be monitored in case adaptations are required to encourage their use. Camera traps are likely to be deployed to assess the use of the crossing points for badger, otter, water vole, red squirrel and other terrestrial mammals, reptiles and amphibians, along with standard surveys to identify signs of these species/groups.

6.10.3 Where protected species licences are required, there will a legal requirement to carry out specific monitoring to understand whether mitigation was successful and/or whether remedial action is required. Monitoring under licence is likely to be required for great crested newts, bats, otters, badgers, water vole and red squirrel.