A47 Wansford to Sutton Dualling

Scheme Number: TR010039

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6.1 Environmental Statement
Chapter 8 – Biodiversity

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ENVIRONMENTAL STATEMENT
Chapter 8 – Biodiversity

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8. Biodiversity

8.1. Introduction

Highways England (the Applicant) has submitted an application for an order to grant a development consent order (DCO) for the A47 Wansford to Sutton Scheme (hereafter referred to as 'the Proposed Scheme'). The Proposed Scheme comprises the dualling of a section of the A47 between Wansford to Sutton; improvements to the A47 Wansford junction; creation of the A47 Sutton Heath roundabout to replace the Nene Way roundabout; associated side road alterations; and walking, cycling and horse-riding connections.

This section of A47 road is currently unable to cope with the high traffic volume and there are limited opportunities to overtake slower moving vehicles on the single carriageway. The Proposed Scheme aims to reduce congestion related delay, improve journey time reliability and increase the overall capacity of the A47. Full details of the Proposed Scheme are provided in Environmental Statement (ES) Chapter 2 (the Proposed Scheme) (**TR010039/APP/6.1**).

8.1.1. The key elements of the Proposed Scheme include:

- approximately 2.6km of new dual carriageway constructed largely offline of the existing A47, including the construction of two new underpasses
- a new free-flow link road connecting the existing A1 southbound carriageway to the new A47 eastbound carriageway
- a new link road from the Wansford eastern roundabout to provide access to Sacrewell Farm, the petrol filling station and the Anglian Water pumping station
- closure of the existing access to Sacrewell Farm with a new underpass connecting to the farm from the link road provided
- a new slip road from the new A47 westbound carriageway also providing access to the petrol filling station
- a link road from the new A47 Sutton Heath roundabout, linking into Sutton Heath Road and Langley Bush Road
- new junction arrangements for access to Sutton Heath Road and Langley Bush Road
- closure of the existing accesses to the A47 from Sutton Heath Road, Sutton Drift and Upton Road
- new passing places and limited widening along Upton Drift (also referenced as Main Road)
- new walking and cycling routes, including a new underpass at the disused railway

- new safer access to the properties on the A1, north of Windgate Way
- installation of boundary fencing, safety barriers and signage
- new drainage systems including:
  - two new outfalls to the River Nene
  - a new outfall to Wittering Brook
  - extension of the A1 culvert at the Mill Stream
  - realignment and extension of the A47 Wansford Sluice
  - ditch interceptors
  - new attenuation basins, with pollution control devices, to control discharges to local watercourses
- River Nene compensatory flood storage area
- works to alter or divert utilities infrastructure such as electricity lines, water pipelines and telecommunications lines
- temporary compounds, material storage areas and vehicle parking required during construction
- environmental mitigation measures

8.1.2. Under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, the Proposed Scheme is an Environmental Impact Assessment (EIA) development and as such requires submission of an Environmental Statement (ES) presenting the likely significant environmental effects of the Proposed Scheme.

8.1.3. As part of the EIA process, this ES chapter reports the potential significant effects on Biodiversity as a result of the Proposed Scheme. This assessment includes a review of the existing baseline conditions, consideration of the potential impacts and identification of proportionate mitigation and enhancement.

8.1.4. The approach to this assessment follows the methods set out in the EIA Scoping Report (**TR010039/APP/6.5**) which was issued to the Planning Inspectorate in February 2018 and subsequent Scoping Opinion received (March 2018) (**TR010039/APP/6.6**) for the Proposed Scheme, in combination with the most up to date guidance documents and the standards set out in the Design Manual for Roads and Bridges (DMRB) LA 108 Biodiversity and LD 118 Biodiversity design.

8.1.5. The main chapter text is supported by appendices 8.1 to 8.17 (**TR010039/APP/6.3)** and figures (**TR010039/APP/6.2**) which contain:

- Appendix 8.1: Botanical and hedgerow update Survey Report
- Appendix 8.2: Fungi Survey Report
- Appendix 8.3: Terrestrial Invertebrate Survey Report

- Appendix 8.4: Aquatic Invertebrate Survey Report (Sutton Heath)
- Appendix 8.5: Aquatic Invertebrate Survey Report (River Nene)
- Appendix 8.6: Great Crested Newt Survey Report
- Appendix 8.7: Reptile Survey Report
- Appendix 8.8: Breeding Bird Survey Report
- Appendix 8.9: Barn Owl Survey Report
- Appendix 8.10: Wintering Bird Survey Report
- Appendix 8.11: Bat Hibernation Report
- Appendix 8.12: Bat Emergence/Re-entry Survey Report
- Appendix 8.13: Bat Activity Survey Report
- Appendix 8.14: Otter and Water Vole Survey Report
- Appendix 8.15: Confidential Badger Survey Report
- Appendix 8.16: DMRB biodiversity evaluation assessment methodology
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- Figure 8.1: Proposed Scheme
- Figure 8.2: Designated Sites and Priority Habitats
- Figure 8.3: Ecological Constraints
- Figure 8.4: Phase 1 Habitat Map

8.2. Competent expert evidence

8.2.1. The ecological competent expert for this assessment has over 19 years' experience in UK ecological and environmental consultancy, as well as experience of planning and conducting ecological survey work overseas. They are an active member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and sits on their Professional Standards Committee as well as being a Chartered Environmentalist (CEnv) and a Chartered Biologist (CBiol).

8.2.2. They have conducted and produced a wide variety of ecological surveys and reports and they have designed, implemented, and managed mitigation projects for bats, badgers, otters, reptiles and great crested newts (GCN).

8.2.3. They have used their EIA knowledge and professional judgement in identifying the likely significant impacts associated with the Proposed Scheme and providing technical guidance through the assessment.

8.3. Legislation and policy framework

8.3.1. In preparation of this chapter, the following key legislation and policy documentation has been used. For full details of the relevant legislative scope of each document, please see Appendices 8.1 to 8.17.

- National Policy Statement for National Networks (2014) (Section 5.20)
- National Planning Policy Framework (2019) (Section 15)
  - Statement 9 (PPS9): Biodiversity and Geological Conservation (2005) (withdrawn)
  - ODPM 06/2005: Biodiversity and Geological Conservation – Statutory Obligations and their impact within the Planning system.
- Planning Policy (Regional) - The East of England Plan (2008)
  - Policy ENV1: Green Infrastructure
  - Policy ENV3: Biodiversity and Earth Heritage
- Peterborough Local Plan (2019-2036)
  - Policy LP28: Biodiversity and Geological Conservation
  - Policy LP29: Trees and Woodland
- Cambridgeshire Biodiversity Action Plan (BAP)
- Key Legislation (National)
  - Conservation of Habitats and Species Regulations 2017 (as amended)
  - The Wildlife & Countryside Act (WCA) 1981 (as amended)
  - The Countryside and Rights of Way (CRoW) Act 2000 (as amended)
  - The Protection of Badgers Act 1992
  - Hedgerows Regulations 1997
  - The Natural Environment and Rural Communities Act (NERC) 2006 (as amended)
  - Highways England Biodiversity Action Plan (HEBAP) 2015

8.4. Assessment methodology

8.4.1. The assessment of impacts on ecology and nature conservation follows the most recent Highways England standards, contained within the DMRB:

- Ecological survey and design measures – DMRB, LD 118 Biodiversity Design
- Assessing and reporting the effects of highway projects on biodiversity – DMRB, LA 108 Biodiversity (Revision 1)
- Assessment and reporting of the implications on European sites – DMRB, LA 115 Habitats Regulations assessment (Revision 1)

8.4.2. The assessment has also been undertaken in reference to the CIEEM's Ecological Impact Assessment (EcIA) guidance (2018).

8.4.3. The following key stages are involved in the Environmental Impact Assessment:

- The zone of influence of the Proposed Scheme and which important biodiversity resources could be significantly affected (Section 8.6)
- Identification and description of the baseline ecological conditions at the site and likely ecological/biodiversity constraints (Section 8.7)
- Valuation of each individual biological receptor in respect of geographical scale (Section 8.7)
- Identification and characterisation of development activities that may affect biological receptors (Section 8.8)
- Identification of mitigation measures and enhancement opportunities to avoid or reduce the effects, as well as compensation measures where effects cannot be avoided (Section 8.9)
- Identification of enhancement opportunities that would support environmental net gain (Section 8.9)
- Evaluation of the significance of residual effects (nature and scale) (Section 8.10)

8.4.4. Biological receptors are valued based upon their importance at a geographical scale as detailed in Table 1-1 of Appendix 8.16 (taken from DMRB LA 108 Biodiversity). Receptors valued at lower than local value were defined as having negligible value. Only ecological receptors of value (local value or higher), or those which have legal constraints (for example, badger and Invasive Non-native Species (INNS)) were taken forward in the impact assessment process.

8.4.5. Impacts are defined as the changes resulting from an action, and effects are defined as the consequences of these impacts.

8.4.6. The level of impact upon biological receptors is assessed in reference to the standards of DMRB LA 108 Biodiversity, which is detailed in Table 1-2 in Appendix 8.16. Activities that are not considered to have any observable impacts (either positive or negative) upon some ecological receptors were not taken forward in the impact assessment process. The predicted impacts for the Proposed Scheme are presented in Table 8-9 and Table 8-10 prior to the consideration of mitigation.

8.4.7. Professional judgement has been used to predict the level of the impact upon each receptor in accordance with DMRB standards, as set out in LA 108 Biodiversity.

8.4.8. Potential impacts on biodiversity resources are divided into two categories:

- Construction activity impacts: includes those impacts which arise as a result of construction activities which also includes the permanent effects (such as habitat loss).
- Operation impacts: includes those impacts which arise as a result of activities during use of the Proposed Scheme (such as bird mortality though traffic collisions).

8.4.9. Activities during construction and operation of the Proposed Scheme have the potential to result in impacts on biodiversity resources. The level of impact of these activities on the biodiversity resources that have been carried through to assessment are characterised taking account of the following parameters:

- Positive (beneficial) or negative (adverse): a positive impact is a change that improves the quality of the environment or impacts that may halt or slow an existing decline in quality of the environment. A negative impact is a change which reduces the quality of the environment.
- Duration: the duration of an impact (permanent or temporary) is determined in relation to the ecological feature's characteristics and lifecycle.
- Reversibility: an impact is considered to be irreversible (permanent) if it is *"one from which recovery is not possible within a reasonable timescale or for which there is no reasonable chance of action being taken to reverse it".* An impact is considered reversible (temporary) where *"Spontaneous recovery is possible, or which may be counteracted by mitigation"* (CIEEM, 2018).
- Extent: this is defined as the geographical area over which the impact would occur. In relation to sites and habitats, the extent and magnitude would be the same.
- Magnitude: magnitude refers to the 'size' of the impact such as the total area of habitat (extent) or in terms of species, the number of individuals impacted. The description of an impact's magnitude is quantitative where possible.
- Timing and frequency: the number of times an activity occurs which would influence the resulting impacts and the timing of an impact upon the biodiversity resource's life-stages or seasonal behaviour.

8.4.10. Measures to avoid or reduce the impact on biodiversity resources have been considered throughout the development of the Proposed Scheme as part of an iterative process. Mitigation measures have been developed to reduce impacts during both the construction and operation phases as detailed within this chapter.

8.4.11. In accordance with CIEEM guidance, mitigation and design interventions for the Proposed Scheme have been detailed in Section 8.9.

8.4.12. Cumulative impacts of multiple threats or pressures can make habitats and species more sensitive to effects. The cumulative effects of the Proposed Scheme have been considered in combination with all other developments within

a potential Zone of Influence (ZOI) including developments currently in planning, consented, being built, completed or operational.

8.4.13. No in-combination effects have been anticipated with the other A47 corridor improvement schemes due to the distance involved between the Guyhirn junction (40km), North Tuddenham to Easton (97km), Thickthorn Junction (128km) and Blofield to North Burlingham (148km) which are located to the east of the Proposed Scheme. These have been scoped out from further assessment.

8.4.14. The cumulative residual effects of ES chapters 5 to 14 have been considered on each biodiversity resource and reported in Chapter 15 (Cumulative Effects Assessment) (**TR010039/APP/6.1**).

8.4.15. Biodiversity net gains and losses have been assessed by using the Defra metric 2.0, which has informed the proposed mitigation measures to minimise the effects of the Proposed Scheme.

Consultation

8.4.16. Consultation has been undertaken with the following consultees:

- Natural England
- Cambridgeshire Wildlife Trust (CWT)
- Cambridgeshire and Peterborough Environmental Records Centre (CPERC)
- Cambridgeshire Bat Group
- Cambridgeshire Mammal Group
- Northamptonshire Biodiversity Records Centre (NBRC)
- Northamptonshire Bat Group
- Northamptonshire Badger Group

8.4.17. Natural England were asked in March 2021 to comment on the Report to Inform Habitats Regulations. Comments were received in June 2021.

8.4.18. CPERC and NBRC were consulted for records of designated sites and protected and notable species in 2017 and for designated sites again in 2020. Further recorded were sought from the county's bat group, badger and mammal groups.

8.4.19. Consultation was held with the Cambridgeshire Wildlife Trust as a statutory consultee about the loss of habitat on Sutton Meadows North and proposed mitigation to compensate for the loss of this habitat and further enhancement.

8.4.20. Consultation was held with Sacrewell Farm regarding the potential for a water vole mitigation receptor site to be built within their land holding.

Assessment criteria

8.4.21. The relative biodiversity resource importance has been considered within the geographical framework set out in DMRB LA 108, table 3.9 (see Table 1-1 of Appendix 8.16):

- International or European
- National (UK)
- Regional (East of England)
- County (Peterborough)
- Local (Scheme and vicinity).

8.4.22. Reference to DMRB standard LA 108 Biodiversity is used to determine the level of importance of a biodiversity resource, and whether the resource is at a level of importance which should be carried through the assessment stage.

8.4.23. DMRB standard LA 108 Biodiversity states that the importance of designated sites depends on the geographical level to which they are protected. The importance of habitats depends on whether they are listed as priorities for conservation action (such as in the LBAP); their relative naturalness, rarity, size, level of connectedness with other habitats and whether they are threatened by the impacts from Proposed Scheme at a given geographic scale. Included are areas of habitat which meet the definition for designated habitats, but which are not themselves designated. (Appendix 8.16 for full tables from LA 108 Biodiversity).

8.4.24. For species, the importance is determined according to their level of protection and also their relative rarity (for example inclusion in red data lists[1)], population size, how easily they spread/or disperse and whether they are threatened. Included are species at a critical stage of their life cycle and populations of species that form critical parts of the wider population. The category levels of importance are the same as for habitats.

8.4.25. Legally controlled species (that is, Invasive Non-native Species (INNS)) listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) are considered important species because of the legal requirements to control or manage them.

8.4.26. Badgers are considered because of the legal requirements of The Protection of Badgers Act, 1992 (Appendix 8.17 for details of the Act).

[1] Those listed within the IUCN Red Data List and Red Data Book of British Invertebrates (Bratton 1991)

8.4.27. The level of impact is considered in line with DMRB LA 108, which is described in detail in Table 1-2 of Appendix 8.16. Professional judgement will be used to categorise the level of impact of each activity as being 'major', 'moderate', 'minor', 'negligible' or 'no change' and 'adverse' or 'beneficial'.

8.4.28. To summarise, activities during construction and operation of the Proposed Scheme have the potential to result in impacts on biodiversity resources. The level of impact of these activities on the biodiversity resources that have been carried through to assessment are characterised taking account of the following parameters:

- Positive (beneficial) or negative (adverse)
- Duration: the duration of an impact (permanent or temporary)
- Reversibility
- Extent or magnitude
- Timing and frequency

8.4.29. Magnitude of impact refers to size, amount, intensity and volume, as per the CIEEM guidance for EcIA (2018).

8.4.30. The term 'level of impact' has been used in place of 'magnitude' for the purposes of this ES chapter, as stated in the DMRB LA 108 Biodiversity.

8.4.31. The importance of the ecological resource and the level of impact will be used to determine the significance of effects taking account of the matrix in Table 8-1, and professional judgement. Effects that are categorised as Moderate, Large or Very Large are considered significant.

Table 8-1 Significance of effects matrix (LA108 Table 3.13)

Resource Importance	Level of Impact				
	No Change	**Negligible**	**Minor**	**Moderate**	**Major**
International/European	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
National (UK)	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Regional (East of England)	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
County (Peterborough)	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Local (Scheme & vicinity)	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

8.4.32. Mitigation was deemed as being required where one or both of two criteria were met:

- the ecological resource is offered legal protection and a mandatory obligation is imposed to provide measures to ensure that an offence would not be committed.
- where impacts have been identified in the assessment process. Mitigation is proposed (where practicable) at the relevant scale of significance, using the following hierarchy: Avoidance, Mitigation, Compensation, Enhancement.

8.4.33. Residual effects take into consideration committed mitigation and design interventions, and these are assessed and detailed in 8-14.

8.5. Assessment assumptions and limitations

8.5.1. Specific limitations relevant to each survey, such as access constraints, are detailed in the relevant ecology survey results contained within Appendices 8.1 to 8.15. It is not considered that any of these survey specific constraints represent a significant limitation, barrier or data gap to the collation of a robust baseline.

8.5.2. It should be noted that the absence of protected species records from the desk study, as part of the EcIA, and observations of the same during the surveys undertaken does not preclude their presence within the study area (or on-site). There is always the risk of protected species being overlooked either owing to the timing of the survey, the scarcity of the species on-site and limitations to survey methodologies.

8.5.3. Ecological surveys still to be completed include:

- eDNA surveys of ponds that could not be accessed in 2020 (due to the COVID-19 Pandemic and access restrictions) are to be undertaken to establish great crested newt presence or absence. The assessment was done on a precautionary basis therefore, the absence of this is not considered a limitation to the impact assessment.

8.6. Study area

8.6.1. The site is located between Wansford and Sutton where there is currently a section of single carriageway. The area surrounding the Proposed Scheme is predominately arable land, grassland and hedgerows, with pockets of mixed plantation and ancient woodland. The broadly flat, rural landscape is an ancient countryside with a long-settled agricultural character.

8.6.2. The distance over which the Proposed Scheme could affect protected species can vary, due to the variability between biological receptors. The ZOI includes the Proposed Scheme boundary (Figure 2.2 Proposed Scheme)

(**TR010039/APP/6.2**), and the appropriate species-specific areas used for ecological surveys. The zone of influence for each receptor has been established through guidance outlined in CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM 2018), DMRB standards LA 108 Biodiversity and professional judgement. Table 8-2 below details the study areas for each considered biological receptor.

Table 8-2 Zone of influence for each biodiversity resource

Biodiversity resource	Zone of Influence from the Proposed Scheme boundary
International and nationally designated sites (including Special Areas of Conservation (SACs), possible SACs (pSAC), Special Protection Areas (SPAs), potential SPAs (pSPA), Wetlands of International Importance (Ramsar Sites), National Nature Reserves (NNRs) and Sites of Special Scientific Interest (SSSIs)	2km unless connected via a green corridor or hydrologically
SACs designated for bats	30km
Locally designated conservation sites (including Local Nature Reserves (LNRs), Local Wildlife Sites (LWSs and CWSs) and RSPB reserves)	2km
Phase 1 habitat survey	All accessible land within the Proposed Scheme boundary, plus a 250m buffer
Botanical survey (including hedgerow)	All accessible land within the Proposed Scheme boundary
Terrestrial invertebrate	Targeted areas within the Proposed Scheme boundary
Aquatic invertebrate	Targeted areas along the River Nene and Sutton Heath and Bog SSSI
Great crested newt (GCN) *Triturus cristatus*	All standing waterbodies within 500m of the Proposed Scheme boundary
Reptile	All accessible land within the Proposed Scheme boundary, plus a 50m buffer
Breeding bird	All Proposed Scheme boundary land plus a 500m buffer
Barn owl *Tyto alba*	Targeted areas within the Proposed Scheme boundary identified anecdotally during the breeding bird survey and previously undertaken barn owl survey
Wintering bird	All accessible land within the Proposed Scheme boundary, plus a 500m buffer
Fungi	All accessible land within the Proposed Scheme boundary, plus a 50m buffer

Biodiversity resource	Zone of Influence from the Proposed Scheme boundary
Bat roosts – (all species)	All accessible trees and buildings within 50m of the Proposed Scheme boundary
Bat activity – (all species)	All Proposed Scheme boundary land within the footprint of the Proposed Scheme, plus a 500m buffer
Otter	All accessible, suitable habitat within the Proposed Scheme boundary, plus a 250m buffer
Water vole	All accessible, suitable habitat within the Proposed Scheme boundary, plus a 250m buffer
Badger	All accessible land within the Proposed Scheme boundary, plus a 50m buffer
Invasive species	All accessible land within the Proposed Scheme boundary, plus a 250m buffer

8.7. Baseline conditions

8.7.1. The baseline ecological condition of the receptors listed in Table 8-2 within the Proposed Scheme ZOI was determined using established standard methodologies as detailed in full within the appendices for each species.

8.7.2. A list of surveys undertaken to date, including the dates of survey and good practice guidelines employed, is provided in Table 8-3 below.

Table 8-3 Surveys undertaken

Survey	Dates undertaken	Guidance and methodologies
Phase 1 habitat survey and preliminary ecological appraisal (PEA) including invasive species survey	September 2016 April 2017 May 2018 June - July 2020	JNCC's Handbook for Phase 1 habitat survey - a technique for environmental audit (JNCC, 2016) CIEEM's Guidelines for Preliminary Ecological Appraisal (CIEEM, 2017)
Phase 2 Botanical surveys (including hedgerow surveys)	July 2016 July 2017 June 2018 June - July 2020	List of species using dominance DAFOR scale Terrestrial habitats assessed using National Vegetation Classification Hedgerow survey handbook (Defra 2007)
Fungi survey	September – October 2017 October 2020	Watlin R, Fasham M and Dobson D (2005). Fungi in: Hill D, Fasham M, Tucker P, Shewry M and Shaw P (eds) Handbook of Biodiversity Methods Vesterholt (1999) (in Wood and Dunkelman, 2017)
Terrestrial invertebrate survey	July – October 2017	Drake *et al.* (2007)

Survey	Dates undertaken	Guidance and methodologies
	May – August 2020	By visual identification
Aquatic invertebrates and molluscs	July 2017 May 2018 June - August 2020	Drake *et al.* (2007) IJ Killeen and EA Moorkens (2003)
White-clawed crayfish	April – October 2017	Peay (2003)
Great crested newts (GCN)	May – June 2016 May 2020	Biggs *et al.* (2014) English Nature (2001) Oldham *et al.* (2000)
Reptiles	September – October 2017 April – June 2018 July and September – October 2020	Gent and Gibson (2003) Froglife (1999) Advice Sheet 10 Use of refugia to attract reptiles on-site, manual searches of suitable refugia present on-site, checks for signs of reptile activity including sloughed skins, burrows, egg laying sites etc.; and sustained visual observation of banks and other suitable habitat within the site.
Birds - breeding	July 2017 April – June 2018 April – June 2020	Bibby *et al.*, (2000). Gilbert *et al.* (1998). Hardey *et al.* (2013) Birds were recorded by walking, listening and scanning by eye and with binoculars Birds were considered to be breeding if singing, displaying, carrying nest material, nests or young found, repetitively alarmed adults, disturbance displaying, carrying food or in territorial dispute
Barn owl	January 2019 July 2020	Shawyer (2012)
Birds - migratory	September – October 2017 October 2017 – March 2018	Bibby *et al.* (2000) Gilbert *et al.* (1998) As above, Birds were recorded by walking, listening, and scanning by eye and with binoculars All birds were recorded, regardless of the activity/behaviour
Birds - wintering	January – March 2017 January – March 2020	Bibby *et al.* (2000) Gilbert *et al.* (1998) As above, Birds were recorded by walking, listening, and scanning by eye and with binoculars All birds were recorded, regardless of the activity/behaviour
Bat hibernation survey	February 2017 February – March 2018	Collins, J. (ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd edition, Bat Conservation Trust.

Survey	Dates undertaken	Guidance and methodologies
Bat roost appraisals	January 2017 2018 (month(s) unknown) March 2020	Emergence and re-Entry surveys for high roost potential took place three times, for moderate two times, and for low once, in the period described Crossing Point survey specific; Berthinussen and Altringham (2015) Elmeros *et al*. 2016
Bat emergence and re-entry Surveys	July - September 2017 May – October 2018	
Bat activity transect surveys	July – September 2017 May – August 2018 June – September 2020	
Bat activity crossing point surveys	2018 (month(s) unknown) July – August 2020	
Water vole and otter	April and September 2017 May 2018	Standard water vole survey methodologies of Strachan *et al*., (2011) and Dean et al., (2016), searching for field signs including latrine sites, feeding stations, lawns, prints and runways Standard otter survey methodology as identified in the Environment Agency's Fifth Otter Survey of England 2009-2010 (Environment Agency, 2010), and Monitoring the Otter, Chanin, 2003) Surveys involved searching for spraints, footprints, feeding remains, slides and haul-outs, couches and holts
Badgers	January 2017 May 2018 January 2019 March 2020	Standard methodology (Harris *et al*. (1989)) Search for all field signs within the study area. Field signs include setts and other excavations, latrines, prints and paths, hairs, feeding evidence etc.

Designated sites

Statutory

8.7.3. A desk top baseline assessment using online resources (MAGIC) identified statutory designated sites, parcels of ancient woodland, County Wildlife Site (CWSs) and Site of Special Scientific Interest (SSSI) within the ZOI. Some areas of land within the study area may be designated as CWSs in the future due to the diversity of plant species, including some regionally rare specimens. These areas are highlighted within the environmental constraints plan provided in Figure 8.3 (TR010039/APP/6.2).

8.7.4. The desk study identified ten statutory designated sites located within 2km of the Proposed Scheme, or with a direct hydrological connection to the Proposed

Scheme. Some of these designations overlap in location and have been combined where detailed in Table 8-4 below.

Table 8-4 Statutory designated sites

Designated Site	Approximate distance from the Proposed Scheme boundary at closest point (km) and direction	Description and reason for designation
Nene Washes SAC/SPA/Ramsar/SSSI	10km east (16.3km downstream of the site)	The SAC is designated primarily for its populations of spined loach (*Cobitis taenia*), which is an Annex II species. The SPA/Ramsar is designated for its assemblage of breeding and non-breeding birds including Bewick's swan (*Cygnus columbianus*), black-tailed godwit (*Limosa limosa*), pintail (*Anas acuta*), shoveler (*Anas clypeata*), garganey (*Anas querquedula*), gadwall (*Anas strepera*[2]), teal (*Anas crecca*) and wigeon (*Anas penelope*[3]). It has an internationally important wetland bird assemblage and regularly supports at least 20,000 waterfowl. The SSSI is designated for its washland habitat, essential to the survival of nationally and internationally important populations of wildfowl and waders during the breeding season and winter. The ditches hold a rich flora which includes uncommon species of aquatic plants.
Sutton Bog and Heath SSSI	<0.1km north (adjacent to RLB)	Supports two grassland communities which are uncommon in Cambridgeshire: calcareous grassland of the Jurassic limestone type and neutral grassland of the base-poor marsh type.
Wansford Pasture SSSI	0.3km south	Supports two grassland types which are nationally scarce and uncommon in Cambridgeshire: a species-rich flush and Jurassic limestone grassland.
West Abbot's and Lound Woods SSSI	0.5km west	A range of lowland woodland types, including a stand of plateau alderwood which is known from no other ancient woodland in Cambridgeshire. Many of the woodland types are scare in Britain and some typical ancient woodland flora species are recorded.
Old Sulehay Forest SSSI	0.8km south-west	Ancient woodland on calcareous strata, forming part of a group in the north-east area of Rockingham Forest. Ground flora includes a number of rare species in Northamptonshire. Several coppice types are present.
Southorpe Roughs SSSI	1.3km north-east	Supports a very rare habitat in Cambridgeshire: limestone grassland communities of the type associated with Jurassic limestone. The site is an old

[2] Now known as *Mareca stepera* based on a paper based on mitochondrial DNA sequencing study undertaken by Gonzalex, J, Düttmann, H and Wink, M (2009)
[3] Now known as *Mareca Penelope* based on the same paper above

Designated Site	Approximate distance from the Proposed Scheme boundary at closest point (km) and direction	Description and reason for designation
		quarry and two nationally rare plant species are present.
Southorpe Paddock SSSI	1.6km north-east	A nationally scarce limestone grassland community and the site represents on of a very few examples of unimproved grassland on the Jurassic limestone of Eastern England.
Castor Hanglands NNR and SSSI	1.6km north-east	A range of habitat types which are scarce in the Midlands including ancient broadleaved woodland and unimproved grassland and scrub. Some habitats present are scarce in Britain.
Bedford Purlieus NNR and SSSI	1.8km west	Ancient woodland including a variety of woodland community types. Many of the woodland types are restricted nationally to lowland England. Supports a diversity of herbaceous plants and fauna and a range of coppice woodland types.
Castor Flood Meadows SSSI	2.0km south-east	A variety of grasslands present, influenced by the soil water content, are a remnant of once extensive species-rich alluvial grasslands within the River Nene floodplain.

8.7.5. There were no statutory designated sites notified for bats within 30km of the Proposed Scheme.

8.7.6. The Nene Washes SPA, SAC Ramsar sites have been assessed as a biodiversity resource of international importance.

8.7.7. Nene Washes SSSI, Sutton Bog and Heath SSSI, Wansford Pasture SSSI, West Abbot's and Lound Woods SSSI, Old Sulehay Forest SSSI, Southorpe Roughs SSSI, Southorpe Paddock SSSI, Castor Hanglands SSSI, Bedford Purlieus SSSI and Castor Flood Meadows SSSI have been assessed as a biodiversity resource of national importance.

8.7.8. Castor Hanglands NNR and Bedford Purlieus NNR have been assessed as a biodiversity resource of national importance.

Non-statutory

8.7.9. The desk study identified a total of 52 non-statutory designated sites within 2km of the Proposed Scheme detailed in Table 8-5 and Figure 8.2 (TR010039/APP/6.2). This comprised the following:

- A total of 31 County Wildlife Sites (CWSs)

- Six Ancient woodland (consisting 11 parcels) of including semi-natural (ASN) and recently planted (APR)
- One Local Geological Site (LGS)
- Seven Wildlife Trust Reserves (WTRs) and Local Wildlife Sites (LWSs)
- Seven Potential Wildlife Sites (PWSs)

8.7.10. In addition to the above site, the River Nene Nature Improvement Area (NIA) provides an overarching policy framework for landscape scale ecological networks within the River Nene catchment. The NIA has not been assessed directly as all key ecological receptors including statutory and non-statutory sites that form the basis of the NIA are already included for assessment.

8.7.11. One CWS, A47/A1 Interchange Road Verges, which was identified in the Preliminary Environmental Information Report (PEIR) and Design Development Report as being located immediately on or adjacent to the Proposed Scheme was deselected as a CWS in 2017. The site was deselected as it no longer qualified as a CWS due to a lack of abundance of botanical indicator species present.

Table 8-5 Non- statutory designated sites[4]

Designated Site	Approximate distance from the Proposed Scheme boundary at closest point (km) and direction
County Wildlife Sites	
Ailsworth Marsh and Green Lane CWS	1.5km NE
Ailsworth Meadows South CWS	1.4km NE
Barnack Road Verges CWS	1.9km NW
Bushey and Dearden Woods CWS	1.4 NE
Caster Village Meadows CWS	1.3km SE
Castor Hanglands (FC) CWS	0.2km SE
Ermine Street CWS	0.6km S
G Spinney CWS	1.4km N
Hell Corner and Top Field Spinney CWS	On-site (within DCO RLB at west end Upton Drift Rd)
Mill Farm Meadows CWS	1.9km NW
Nene Valley Railway CWS	1km S

[4] Some designated sites have multiple citations so have been duplicated into the appropriate headings.

Designated Site	Approximate distance from the Proposed Scheme boundary at closest point (km) and direction
Normangate River Meadows CWS	1.9km SE
River Nene CWS	On-site
Sibson Flood Meadows CWS	1.1km S
Southorpe Dismantled Railway CWS	1.4km N
Southorpe Mill Bog CWS	1.8km N
Stamford Rd. / Heath Rd. / Ailsworth Rd. / King St. Verges CWS	1.4km NE
Stibbington Pits CWS	<0.1km S (25m)
Sutton / Sibson Flood Meadows CWS	0.9km S
Sutton Dismantled Railway CWS	On-site
Sutton Meadows North CWS	On-site
Sutton Meadows South CWS	0.5km S
Sutton Wood and Beech Spinney CWS	0.7km NW
Upton and Moore Woods CWS	0.6km NE
Upton Manor Ponds and Green Lanes CWS	0.6km SE
Walcot Hall Park CWS	2km N
Water Newton Meadows CWS	1.4km S
Water Newton Pollard Willows CWS	1.3km S
West Wood Meadow CWS	1.8km W
Whitewater Valley CWS	2km NW
Wittering Valley CWS	1.9km NW
Ancient Woodland	
Abbots/Lounds Woods ASN & ARP	0.5km W
Castor Highlands ASN & ARP	1.3km E

Designated Site	Approximate distance from the Proposed Scheme boundary at closest point (km) and direction
Moore / Upton Woods ASN & ARP (2 parcels)	0.6km NE
Old Sulehay Forest ASN	1.2km SW
Sutton Woods ASN	0.6km NW
West Wood ASN (2 parcels)	1.4km W
Local Geological Site	
Thornhaugh Quarry LGS	0.6km W
Wildlife Trust Reserve	
Old Sulehay/Ring Haw WTR	1.1km SW
Standens Pasture WTR	0.4km SW
Stone Pit Quarry WTR	2km SW
Yarwell Dingle WTR	0.9km SW
Yarwell Pond WTR	1.4km SW
Local Wildlife Site	
Standens Pasture LWS	0.4km SW
Stone Pit Quarry LWS	2km SW
Yarwell Gravel Pit LWS,	1.5km SW
Yarwell Mill Lake LWS	2km SW
Yarwell Quarry LWS	2km SW
Potential Wildlife Sites	
Parcel number 753	1km SW
Parcel number 754	1.1km SW
Parcel number 755	1.6km SW
Parcel number 757	0.7km W
Parcel number 758	1.2km SW

Designated Site	Approximate distance from the Proposed Scheme boundary at closest point (km) and direction
Parcel number 759	0.4km SW
Parcel number 760	1.5km SW

8.7.12. Thirty-one of the CWS have been assessed as biodiversity resources of county importance.

8.7.13. The six sites of ancient woodland have been assessed as national importance.

8.7.14. The 14 sites consisting of seven wildlife trust reserves (WTRs) and local wildlife sites (LWSs) and seven potential wildlife sites (PWSs) have been assessed as a biodiversity resource of local importance.

Priority habitats

8.7.15. Within 2 km of the Proposed Scheme habitats of Principal Importance under the NERC Act (2006) Section 41 include; coastal and floodplain grazing marsh, lowland calcareous grassland, lowland meadows, lowland fens, lowland mixed-deciduous woodland, traditional orchards, wood-pasture and parkland, hedgerows, arable field margins, ponds and rivers.

8.7.16. The priority habitats recognised within the Cambridgeshire and Peterborough, and Northamptonshire Biodiversity Action Plans reflect those identified as of Principal Important under Section 41 of the NERC Act as detailed above.

8.7.17. A total of eleven parcels of woodland listed under the Ancient Woodland Inventory (AWI) comprising seven parcels of ancient-semi natural woodland and four parcels of ancient replanted woodland within 2km of the Proposed Scheme. The nearest of these is Abbots/Lounds Wood ancient semi-natural woodland approximately 0.7km north-west of the site. Other named parcels within 2km include Castor Highlands woods, Moore/Upton woods, Old Sulehay Forest, Sutton Woods and West Woods.

Extended Phase 1 habitat survey

8.7.18. An Extended Phase 1 Habitat survey was undertaken in September 2016, in order to assess the ecological importance of the site and determine the requirement for Phase 2 Surveys (Figure 8.4) (TR010039/APP/6.2). Subsequent surveys were undertaken in April 2017 and May 2019 and June-July 2020 to provide updates to the existing information and additional surveys following the Scoping Opinion (**TR010039/APP/6.6**). Habitats identified during the Extended Phase 1 Habitat survey and subsequent updates comprised:

- Woodland

  - Broadleaved semi-natural
  - Broadleaved – plantation
  - Mixed woodland – semi-natural
  - Mixed woodland – plantation
- Scrub
  - Dense/continuous
  - Scattered
- Grassland
  - Neutral unimproved
  - Neutral semi-improved
  - Calcareous grassland – semi-improved
  - Improved grassland
  - Marsh/marshy grassland
- Tall ruderal
- Introduced shrub
- Standing water
- Running water
- Wet modified bog
- Flush and spring – neutral flush
- Swamp
- Marginal and inundation – marginal vegetation
- Boundaries
  - Species-rich intact hedge
  - Species-poor intact hedge
  - Species-poor defunct hedge
  - Species-rich hedge with trees
  - Species-poor hedge with trees
  - Dry ditch
  - Wall
  - Fence
- Arable
- Amenity grassland
- Bare ground
- Buildings

8.7.19. Semi-improved, amenity and improved grassland, tall ruderal, bare ground and dense and scattered scrub have been assessed as a biodiversity resource importance at a negligible level due to being in small patches and of poor species diversity.

Botanical surveys

8.7.20. The site was scoped for botanical interest with initial surveys undertaken in July 2016, followed by updates to the existing information completed in July 2017, June 2018 and June-July 2020. The surveys largely focused on areas where habitat was considered to be of particular botanical interest or priority habitat as identified during the phase 1 habitat surveys.

8.7.21. Dominant plant species were noted, using the DAFOR scale (D = dominant, A= abundant, F= frequent, O= occasional and R= rare, with L=local often used as a prefix to moderate abundance categories). Photographs were taken of habitats and species. Where rare or scarce species of plant were encountered, the location of it was recorded and the species photographed.

8.7.22. Hedgerow surveys were undertaken by recording the number of different species within 30m blocks of hedgerows. Photographs were taken of each habitat and records cross-checked against historic maps to see if they formed long-standing boundary features.

8.7.23. A number of important habitats were identified during the botanical surveys, including unimproved neutral grassland, semi-improved calcareous grassland which are deemed to be of importance at the county level. One unit of unimproved neutral grassland on the eastern side of Sacrewell Farm would be directly affected by the construction of the Proposed Scheme, as would one unit of semi-improved neutral grassland between the A1 and entrance to Sacrewell farm.

8.7.24. Sutton Heath and Bog SSSI supports mire and calcareous grassland habitat which has been evaluated as a biodiversity resource of importance at the national level. There would be no direct impacts on these habitats resulting from the Proposed Scheme.

8.7.25. Woodland units within the Proposed Scheme boundary comprise plantation or secondary woodland, however, are of enhanced value within the site context given the scarcity of woodland cover in Cambridgeshire and have therefore been identified as being of local value. The Proposed Scheme would directly affect two units of mixed plantation woodland.

8.7.26. Four units of species-rich hedgerows with trees or species-rich hedgerow were identified within the Proposed Scheme boundary. One unit of each of these

categories is to be removed as part of the Proposed Scheme. Species-rich hedgerows are considered a priority habitat and important at a county level.

8.7.27. In total, four intact species-poor hedgerows, one, species poor defunct hedgerow and one species-poor hedgerow with trees would be directly affected as part of the Proposed Scheme. These are also considered to be of importance at a local level for the benefit they provide to wildlife.

8.7.28. The botanical assemblages on-site have been assessed as a resource of local level biodiversity importance within the Proposed Scheme boundary. The hedgerows on-site have been assessed as a resource of county importance due to the presence on-site of important hedgerow cited under the Hedgerow Regulation 1997 and being a priority habitat under Section 41 of the NERC 2006.

8.7.29. Full details can be found in Appendix 8.1 (**TR010039/APP/6.3**).

Fungi

8.7.30. The surveys in 2017 located a total of 11 species, all of which were considered common UK species. Further surveys were conducted in October 2020 which identified an area of waxcap grassland outside of the Proposed Scheme boundary at Sacrewell Farm, which was assessed as a biodiversity resource of local importance for grassland fungi. This habitat would not be directly affected by the Proposed Scheme.

8.7.31. Remaining fungi assemblages on-site have been assessed as a resource of negligible level biodiversity importance. Full details can be found in Appendix 8.2 (**TR010039/APP/6.3**).

Terrestrial invertebrates

8.7.32. A total of 81 species were collected during the 2017 surveys. Of these, nine were of conservation concern, two species were designated as Near Threatened (NT), two species were listed on section 41 of the NERC Act. Further surveys were conducted in 2020 at which time a total of 341 invertebrate species were recorded. Of these, 18 were noted as of importance in consideration to their conservation status including phoenix fly (*Dorycera graminum*) which is listed under section 41 of the NERC Act.

8.7.33. The terrestrial invertebrate assembly has been assessed as a biodiversity resource of **local level** importance. Full details can be found in Appendix 8.3 (**TR010039/APP/6.3**).

Aquatic invertebrates

8.7.34. A total of 64 species were identified along the surveyed area of the River Nene during baseline surveys undertaken in 2017, including one regionally notable species. During the 2018 update at least 87 species were identified along the River Nene including five regionally notable, and five locally notable species. The 2020 survey update along the River Nene identified at least 124 taxa of aquatic invertebrate, of which 104 were identified to species. This included three regionally notable, ten locally notable species and two red-list species Musculium transversum and Libellula fulva. The increase in species diversity over the study period has been attributed to improvements in water quality.

8.7.35. An additional survey to assess the importance of aquatic invertebrates at Sutton Hearth and Bogs SSSI was also completed in June and August 2020. At least 62 taxa of aquatic invertebrate were recorded, with 40 identified to species-level. One red-list species (Vertigo moulinsiana) and one species of local biodiversity resource importance (Notonecta maculata) was recorded during surveys.

8.7.36. No aquatic macroinvertebrates that receive specific legal protection by way of Schedule 5 of the Wildlife and Countryside Act (1981) or are listed on Section 41 of the NERC Act (2006) (Table 5.2) as being of principal importance for nature conservation in England were recorded. The aquatic invertebrate assembly has been assessed as a biodiversity resource of local level importance. Full details can be found in Appendix 8.4 and 8.5 (**TR010039/APP/6.3**).

Great crested newt

8.7.37. Targeted great crested newt surveys, including Habitat Suitability Index (HSI assessments and eDNA surveys, undertaken at PCF Stage 1 resulted in negative results for GCN within the 15 waterbodies subject to eDNA.

8.7.38. The most recent surveys, undertaken in 2020 as updates to those surveys undertaken at PCF Stage 1, identified 40 waterbodies within the survey area. Nine waterbodies were scoped out of survey due to being on the far side of the River Nene which acts as a barrier to dispersal. Fourteen waterbodies were found dry, one waterbody no longer existed and a further five waterbodies were scoped out of further survey as they were found unsuitable for great crested newt as they contained running water.

8.7.39. Habitat Suitability Index assessments were undertaken on five waterbodies and eDNA survey was undertaken of four of those waterbodies subject to HSI, as one waterbody was too shallow for survey. In terms of suitability to support great crested newt, the HSI assessments categorised one waterbody as ‘good’, two waterbodies as ‘below average’ and one waterbody as ‘poor’. The eDNA surveys

resulted in negative results for great crested newt and as such the species is considered absent from the four surveyed waterbodies.

8.7.40. Six waterbodies were inaccessible during the 2020 update surveys due to the COVID-19 Pandemic and its associated restrictions preventing access to undertake survey. As such further survey work for GCN is required to confirm the presence or likely absence of great crested newt within the Proposed Scheme boundary.

8.7.41. The GCN assemblage has been assessed as biodiversity resource of county level of importance. Full details can be found in Appendix 8.6 (**TR010039/APP/6.3**). As further surveys are still to be undertaken, this receptor has been scoped in for further assessment until the point were no GCN have been recorded and can be scoped out.

Reptiles

8.7.42. Reptile surveys undertaken at the Site in 2018 and 2020 have identified common lizard in two areas on-site; at a location adjacent to the north-east of the A1/A47 junction and in a field adjacent to the A47 south-east of the Petrol filling station. Common lizards have been confirmed as breeding by the presence of juveniles identified in the 2020 surveys. This population of common lizard on-site is classified as 'low'[5].

8.7.43. The low population of reptiles has been assessed as a biodiversity resource of county importance as although common lizard are listed on the Cambridgeshire and Peterborough Priority Species (CPPS) and on the East of England Priority Species List, the population size reduces its level of importance. Full details can be found in Appendix 8.7 (**TR010039/APP/6.3**).

Birds

Breeding birds

8.7.44. A breeding bird survey was initially undertaken in April to June 2018. In total 70 species were recorded including six species listed on the Birds Directive Annex 1, three on Wildlife & Countryside Act (1981) Schedule 1, 14 species on the red-listed species of conservation concern and 20 species on the amber list.

8.7.45. A follow up survey was undertaken on three occasions (April, May, June) in 2020. In total 84 species were recorded. Of these species recorded within the site:

[5] Based on the criteria outlined in Froglife (1999) Froglife Advice Sheet 10: 'Reptile Survey– an introduction to planning, conducting and interpreting surveys for snake and lizard conservation'.

- 41 species were confirmed as breeding. This was concluded through the identification of recently fledged young, adults visiting the nest and adults carrying food.
- 22 species were considered probable breeders on the site. This was concluded through pair observed in suitable breeding habitat, bird permanently on territories, agitated behaviour, nest building and performing courtship displays.
- 11 species were considered as possible breeding on-site. This was concluded by birds either being observed in suitable breeding habitat or singing males present in suitable habitat.
- 10 species were considered as non-breeders. This includes all birds flying over the site and species which were presumed to still be on migration.

Table 8-6 Total species recorded which cited on European and UK legislation and of conservation concern

Designation	Number of species
Birds Directive	8
Wildlife and Countryside Act	6
NERC	16
BoCC Red List	15
BoCC Amber List	18
LBAP	14
IUCN (Threatened categories)	3

8.7.46. As 84 species were recorded, the overall assemblage of bird species recorded on-site was typical of the range of habitat which dominates the site including hedgerow, woodland, scrub habitat and agricultural habitat.

8.7.47. The breeding bird assemblage has been assessed as a biodiversity resource of regional importance. Full details can be found in Appendix 8.8 (**TR010039/APP/6.3**).

Barn Owl

8.7.48. Ten potential barn owl tree roosts/nest sites were noted during site walkovers.

8.7.49. A barn owl survey was conducted in July 2020 to inspect these potential nesting and roosting sites to determine if barn owl nests (or roosts were present).

8.7.50. Of the ten locations, one confirmed nest site was identified. Additionally, habitat suitability for barn owls was assessed and mapped.

8.7.51. The barn owl assemblage has been assessed as a biodiversity resource of county level importance due to its listing as a species of interest in the Cambridgeshire Biodiversity Action Plan and listing within the Norfolk Biodiversity Action Plans.

8.7.52. Full details can be found in Appendix 8.9 (**TR010039/APP/6.3**).

Wintering birds

8.7.53. Previously, a wintering bird survey was undertaken between October 2017 and March 2018. In total 62 species were recorded including five species listed on the Wildlife & Countryside Act (1981) Schedule 1, 12 species on the red-listed species of conservation concern and 15 species on the amber list.

8.7.54. A follow up survey was undertaken on three occasions (January, February, March) in 2020. In total 71 species were recorded.

Table 8-7 Total species recorded which cited on European and UK legislation and of conservation concern

Designation	Number of species
Birds Directive	8
Wildlife and Countryside Act	6
NERC	16
BoCC Red List	15
BoCC Amber List	18
LBAP	14
IUCN	3

8.7.55. The overall assemblage of bird species recorded on-site was typical of the habitat which dominates the site including hedgerow, woodland, scrub habitat and agricultural habitat.

8.7.56. The wintering bird assemblage has been assessed as a biodiversity resource of regional importance. Full details can be found in Appendix 8.10 (**TR010039/APP/6.3**).

Bats

Bat hibernation

8.7.57. Bat hibernation surveys undertaken in 2019 and 2020, consisting of aerial assessments, internal inspections and automated surveys, identified the following tree and buildings with hibernation potential which are considered possible roosting locations:

- B5 (soprano pipistrelles)
- SB4 ((common and soprano pipistrelles) however these may also have been from alternative roosts nearby including in SB3, SB5 and SB6 which were also identified as having hibernation potential)
- WB60 (common pipistrelles and a bat of the n/s/l group)
- WB91 (common pipistrelles)

8.7.58. The following trees/buildings have been previously identified as having hibernation potential:

- Tree 29
- Tree 33
- WC39
- A1 bridge
- B4

8.7.59. Full details can be found in Appendix 8.11 (**TR010039/APP/6.3**).

Summer bat roosts

8.7.60. Surveys to date have identified the following building/structure roosts:

- Heath House: two soprano pipistrelle day roosts, a maximum of one bat observed in any one survey, identified in 2020 update surveys
- Station House: a soprano pipistrelle maternity roost, a maximum of nine bats observed in any one survey, identified in 2020 update surveys
- In one barn (SB4) at Sacrewell Farm: three common pipistrelle roosts with a maximum of two bats observed using one roost in any one survey with the remaining two roosts potentially used by both bats so they are considered roosts for two bats
- In one barn (SB3) at Sacrewell Farm: one common pipistrelle roost with a maximum of one bat observed during any one survey, however it is considered that the roost could be used by those two bats recorded roosting at SB4 so it is considered a roost for two bats
- In one barn (SB2) at Sacrewell Farm: one soprano pipistrelle roost with a maximum of one bat observed in any one survey
- In one building (SB5) at Sacrewell Farm an unknown summer roost of unknown species within identified in 2020 hibernation surveys
- In Deep Springs House an unknown roost of unknown species identified in 2020 update BRP surveys
- In the A1 bridges Daubenton's maternity roosts in several locations, a minimum of 60 bats, identified in the 2020 update surveys

8.7.61. Tree roosts identified to date include soprano pipistrelle day roosts in two trees and soprano pipistrelle roosts in a further two trees identified in 2018 surveys.

8.7.62. The species recorded during the summer bat roost surveys include6

- Common pipistrelle
- Soprano pipistrelle
- *Pipistrellus sp.*
- Daubenton's
- Noctule
- Brown long-eared
- Myotis sp.
- Barbastelle

8.7.63. Barbastelle are classified as 'rare bats', however, it should be noted that only three individuals were recorded on three different days, at three separate locations. This species is therefore assumed to be part of the wider bat assemblage and is not considered a concern.

8.7.64. Full details can be found in Appendix 8.12 (**TR010039/APP/6.3**).

Bat activity and crossing point survey

8.7.65. Bat activity surveys undertaken in 2020 included transect surveys of the Site as a whole and crossing point surveys of the dismantled railway bridge/A47 crossing. The crossing point surveys of the dismantled railway/A47 crossing concluded that more bat commuting activity was observed above the bridge (over the A47) with multiple species (noctule, common pipistrelle, soprano pipistrelle, Daubenton's brown-long eared and myotis sp.) commuting above. Both species of pipistrelles and one noctule were recorded foraging beneath the bridge.

8.7.66. Activity transect surveys undertaken in 2020 identified a higher level of bat activity to the north of the A47 with fewer registrations recorded during surveys to the south of the A47. Across both transects regular activity was recorded along linear features such as hedgerows and, to the south of the A47, the River Nene. Species recorded include:

- Common pipistrelle
- Soprano pipistrelle
- Noctule

[6] Not all species listed have been confirmed as roosting, some species are likelyto be using the areas as a foraging area or commuting through.

- Daubenton's bat
- Brown long-eared
- Nathusius' pipistrelle
- Leisler's
- *Myotis sp*.
- Brandt's bat
- Serotine
- Big bats (Noctule, Serotine or Leisler's)

8.7.67. Bat surveys undertaken in 2018 also identified Natterer's in addition to those listed above. Full details can be found in Appendix 8.13 (**TR010039/APP/6.3**).

8.7.68. Bats within the study area have been assessed as of county importance value based on the presence of individual rarer species and large numbers of common species and low numbers of nearby roosts.

Otters

8.7.69. The 2017 otter surveys identified 11 potential holt locations within the survey area however no holts were confirmed. The 2018 surveys identified one otter holt on the banks of the River Nene.

8.7.70. Otter activity on Wittering Brook has been confirmed during the 2020 survey through the identification of spraint and feeding remains on the watercourse. Features with otter holt potential (five in total) have been identified on Wittering Brook however none have yet been confirmed as otter holts. One otter laying-up area and one feature with otter holt potential have been identified on the River Nene. Full details can be found in Appendix 8.14 (**TR010039/APP/6.3**).

8.7.71. Otters are a European Protected Species, fully protected by the Wildlife and Countryside Act (1981) as amended and are listed on the East of England and county BAP. Populations are increasing nationally and in Cambridgeshire. The importance of the otter within the site as a resource has been assessed as of county importance biodiversity value.

Water vole

8.7.72. Water vole surveys undertaken in September 2020 has identified a low relative population density of water vole on a 100m stretch of Wittering Brook, identifying a latrine and two sets of footprints. Further potential water vole field signs were recorded on the Brook including potential burrows and one potential latrine. Potential water vole footprints have also been previously recorded on the north bank of the River Nene as an incidental finding. Full details can be found in Appendix 8.14 (**TR010039/APP/6.3**).

8.7.73. Water Vole are fully protected by the Wildlife and Countryside Act (1981) and are listed on the NERC Act (2006) S41, Cambridgeshire Biodiversity Action Plan and the East of England Priority Species List with East Anglia and neighbouring county Norfolk and being a UK stronghold for this species. The water vole assemblage on-site has been assessed as a biodiversity resource of **county importance** level.

Badgers

[redacted]

8.7.76. The badger population on-site has been assessed as a biodiversity resource value at a local importance level. Full details can be found in Appendix 8.15 (**TR010039/APP/6.3**).

Invasive non-native species

8.7.77. Invasive species were recorded on an ad-hoc basis throughout all surveys completed on-site. Those which have been identified on-site and are cited on Schedule 9 of the Wildlife and Countryside Act (1981) in England are:

- Himalayan Balsam (*Impatiens glandulifera*)
- Montbretia (*Crocosmia* x *crocosmiiflora*)
- False virginia creeper (*Parthenocissus inserta*)
- Variegated yellow archangel (*Lamiastrum galeobdolon* subsp. *argentatum*)
- Wall cotoneaster (*Cotoneaster horizontalis*)
- New Zealand pygmyweed (*Crassula helmsii*)
- Canada Goose (*Branta canadensis*)
- Mandarin duck (*Aix galericulata*)
- Grey Squirrel (*Sciurus carolinensis*)

8.7.78. Non-native species not cited within Schedule 9 which have been identified on-site are:

- False-acacia (*Robinia pseudoacacia*)
- Snowberry (*Symphoricarpos spp.*)
- Summer snowflake (*Leucojum aestivum*)
- Northern river crangonyctid (*Crangonyx pseudogracilis*)
- Demon shrimp (*Dikerogammarus haemobaphes*)
- New Zealand mudsnail (*Potamopyrgus antipodarum*)
- Bladder snail (*Physella acuta*)
- Wautier's limpet (*Ferrissia wautieri*)
- Asian clam mussel (*Corbicula fluminea*)
- Zebra mussel (*Dreissena polymorpha*)

Other notable species

8.7.79. Spined loach (Cobitus taenia) and bullhead (Cottus gobio) were noted during the aquatic invertebrate surveys undertaken at sampling sites along the River Nene. Both species are listed under Annex II species under the retained transposing regulations from the Habitats Directive under the Conservation of Habitats and Species Regulations (2017 as amended).

8.7.80. Brown hare (Lepus europaeus) were recorded across the Proposed Scheme in all habitat and are cited on Section 41 of the NERC Act 2006. Hedgehog (Erinaceus europaeus) are likely to be present in suitable habitat and are a NERC Act 2006 S41 species.

8.7.81. European Eel (Anguilla anguilla), which are citied on Section 41 of the NERC Act 2006, are presumed to be present within a stretch of the river Nene south of the Proposed Scheme as eel screens have been installed at the water treatment site towards the eastern extent of the Proposed Scheme.

8.7.82. Records returned from the Cambridgeshire Biological Record Centre identified bullhead and spined loach present in the River Nene, with the most recent records dated 2013. Both species are cited on Section 41 of the NERC Act 2006.

Valuation of ecological receptors

8.7.83. The assessment criteria for the valuation of ecological receptors are detailed in Section 8.4.

8.7.84. A summary of the valuation and level of threat from the Proposed Scheme of ecological receptors is provided in Table 8-8.

Table 8-8 Summary of valuation of ecological receptors

Ecological receptors	Resource importance Valuation
Nene Washes SAC/SPA/Ramsar	International
Site of Special Scientific Interest & National Nature Reserves Nene Washes SSSI, Sutton Bog and Heath SSSI, Wansford Pasture SSSI, West Abbot's and Lound Woods SSSI, Old Sulehay Forest SSSI, Southorpe Roughs SSSI, Southorpe Paddock SSSI, Castor Hanglands SSSI, Bedford Purlieus SSSI and Castor Flood Meadows SSSI, Castor Hanglands NNR, Bedford Purlieus NNR	National
Ancient Woodland (Abbots/Lounds Woods Castor Highlands woods, Moore/Upton woods, Old Sulehay Forest, Sutton Woods and West Woods).	National
Wildlife Trust reserves and local wildlife sites (seven sites) and potential wildlife sites (seven sites)	Local
County Wildlife Sites (31 sites)	County
NERC Act (2006) S41 priority habitats present within the 2km study area: coastal and floodplain grazing marsh, lowland calcareous grassland, lowland meadows, lowland fens, lowland mixed-deciduous woodland, traditional orchards, wood-pasture and parkland, hedgerows, arable field margins, ponds and rivers.	National
Cambridgeshire priority habitats present within the 2km study area; rivers, pond, eutrophic standing water, arable field margins, hedgerows, traditional orchards, wood pasture and parkland, lowland mixed deciduous woodland, lowland calcareous grassland, lowland meadows, coastal and floodplain grazing marsh, lowland fen and reedbed	County
Other habitats within the study area: Semi-improved, amenity and improved grassland, tall ruderal, buildings and hard standing, bare ground, dry ditch, wall, fence, introduced shrub and dense and scattered scrub.	Negligible
Botanical	National
Fungi	Negligible
Terrestrial invertebrates	Local
Aquatic invertebrates	Local
Great-crested newt	County
Reptiles	County
Breeding birds	Regional

Ecological receptors	Resource importance Valuation
Barn owl	County
Wintering birds	Regional
Bats	County
Otters	County
Water vole	County
Badgers	Local (Legal constraints apply)
Invasive species	Negligible (Legal constraints apply)
Other notable species (spined loach, bullhead, brown hare, hedgehog, eel)	County

8.7.85. Ecological receptors which have been assessed as having a resource importance value of county or above have been taken forward for further assessment. INNS and badger have been taken forward, as legal constraints apply.

8.7.86. Further surveys for biodiversity resources that are to be licensed; bat roosts, badger and water vole; will be undertaken as stated in the respective licence method statements to update results. There is likely to be spreading of INNS that would reduce the existing biodiversity in the habitats where they are located.

8.8. Potential impacts

Internationally designated sites

8.8.1. No works are to take place within the Nene Washes SAC/SPA/Ramsar and therefore no direct impacts on these sites are anticipated. Any negative impacts to the designated sites are likely to be through indirect pathways. A Habitats Regulations Screening Assessment (HRA) has been undertaken for the Proposed Scheme to assess the impacts on the Nene Washes SAC/SPA/Ramsar.

8.8.2. The Nene Washes SAC is primarily designated for its populations of spined loach, whilst the SPA and Ramsar sites are designated for their assemblages of breeding and non-breeding birds. The site supports an internationally important wetland bird assemblage and regularly supports at least 20,000 waterfowl.

8.8.3. Key species that could be impacted through displacement, a decrease in air quality, increased sedimentation, reduction in water quality and changes to the baseline flow comprised spined loach, teal and gadwall which have been recorded on-site.

8.8.4. The Report to Inform HRA determined that, without mitigation, there would be no Likely Significant Effects on any of the qualifying features of the Nene Washes SAC/SPA/Ramsar (**TR010039/APP/6.9**). This was primarily down to the distance the site is away from the works (10km overland, 16.3km downstream), whereby any pollution would be highly dissolved or dispersed before reaching the site the impacts would be negligible. In addition, teal and gadwall were found in such small numbers that it is highly unlikely that these individuals are part of the populations within the SPA and Ramsar site and as such it is considered that there would be no impact to the populations as a result of the Proposed Scheme.

8.8.5. Therefore, internationally designated sites have been scoped out of this assessment (for both construction and operation).

Construction (permanent and temporary impacts)

8.8.6. The potential impacts pathways which may arise during the construction stage include:

- Site clearance and the land-take of habitats
- Creation of barriers along habitats decreasing site connectivity and increasing fragmentation
- Physical damage to on-site vegetation from smothering via soil piles
- The damage to root systems
- Changes to soil chemistry
- Increase surface water run off changing hydrological quality through sedimentation
- Damage of watercourses and habitats through accidental spillages of pollutants (chemical)
- The change in natural on-site hydrological flow
- Loss of foraging habitats for breeding and wintering species due to fragmentation of the site and severance of linear features such as hedgerows.
- Increased atmospheric, noise and light pollution during construction
- Noise and visual disturbance resulting in the dissertation of sensitive ecological receptors within and adjacent to the construction footprint
- Direct mortality of local fauna due to site plant collisions or earthworks
- Spreading of invasive species and disease through the movement of plant.

8.8.7. The predicted levels of impact (without mitigation) from construction for the Proposed Scheme are presented in Table 8-9.

Table 8-9 Predicted construction impacts on ecological receptors prior to mitigation

Ecological receptors	Resource importance	Description of impact (Construction)
Site of Special Scientific Interest & National Nature Reserves	National	Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff, water level or drainage changes, sedimentation and accidental spillages.
Ancient Woodland	National	Indirect impacts during construction through increased air pollution.
Wildlife Trust reserves, local wildlife sites and potential wildlife sites.	Local	Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff, water level or drainage changes, sedimentation and accidental spillages.
County Wildlife Sites	County	Direct permanent loss of habitat (land-take) from Sutton Meadows CWS and Sutton Dismantled Railway CWS. Temporary loss of habitat through the creation of a flood storage area and trenching to facilitate the installation of drainage from the attenuation basin into the River Nene Construction of pipeline and headwalls across Sutton Meadows North CWS into River Nene CWS Potential of indirect impacts upon all CWSs/from pollution of habitat from air quality and surface water runoff, water level changes, sedimentation and accidental spillages.
NERC Act (2006) S41 priority habitats	National	Permanent loss of hedgerows, deciduous woodland, lowland calcareous grassland, coastal and floodplain grazing marsh, arable field margins and ponds. Indirect effects on coastal and floodplain grazing lowland fens, lowland meadows, wood-pasture and parkland and rivers from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages,
Cambridgeshire priority habitats	County	Permanent loss of hedgerows and defunct hedgerows, lowland meadow, coastal and floodplain grazing marsh, ponds, lowland fen, and lowland deciduous woodland. Indirect effects on all habitats from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages
Botanical	National	Permanent loss of habitat (other woodland, and good quality neutral grasslands) resulting in decrease in botanical composition. Damage to existing habitat from construction traffic driving over sensitive botanical areas.

Ecological receptors	Resource importance	Description of impact (Construction)
		Indirect effects from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages
Terrestrial invertebrates	Local	Removal of habitat (permanent). Risk of population decline through habitat fragmentation. Habitat degradation through pollution events from dust and accidental spills. Disturbance from light pollution.
Aquatic invertebrates	Local	Removal of habitat (permanent). Risk of mortality of individuals through pollution from accidental spills, changes to water levels and habitat suitability for common aquatic invertebrates. Disturbance from light pollution (temporary).
Great crested Newt (if found in remaining surveys to be completed)	County	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.
Reptiles	County	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.
Breeding birds	Regional	Direct mortality of individuals from site clearance of vegetation during breeding season, disturbance of nesting locations from water, noise and light pollution. Collisions with construction traffic. Loss, obstruction and disturbance of foraging and loafing habitat of breeding individuals from the, streams and river, noise and light pollution leading to abandonment of area.
Barn owl	County	Disturbance of nesting locations from noise and light pollution. Loss of foraging habitat and suitable roosting habitat.
Wintering birds	Regional	Direct mortality of individuals from site clearance of vegetation, disturbance of foraging and loafing locations from river and streams, noise and light pollution. Collisions with construction traffic. Loss, obstruction and disturbance of key foraging and loafing habitat such as cereal crop and wintering crops leading to abandonment of area.
Bats	County	Direct mortality through roost destruction during the removal of two tree roosts and one roost within a building (Old Station House).

Ecological receptors	Resource importance	Description of impact (Construction)
		Disturbance of known bat roosts from noise, vibration and light (temporary). Permanent loss of foraging habitat, severance of commuting routes and foraging areas, resulting in avoidance and abandonment of habitats and roosts. Indirect impacts from lighting, vibration and noise
Otters	County	Direct mortality or injury of individuals from construction traffic and being trapped in excavations. Pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes. Disturbance from noise and light pollution leading to abandonment of foraging areas and resting places (temporary).
Water vole	County	Direct mortality of individuals during vegetation clearance, ditch dredging and realignment, Installation of outfalls and construction of bridge and culverts, collisions from construction traffic, and loss of habitat. This population would incur a pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes. Disturbance from noise and light pollution (temporary).
Badgers	Local (Legal constraints apply)	Permanent loss of a setts and commuting and foraging habitat. Permanent loss from one sett and disturbance to another setts. Disturbance from noise and light levels. Potential of death or injury of individuals from falling in excavations.
Invasive species	Negligible (Legal constraints apply)	Introduction and spread of diseases during construction could result in death of plants and animals (examples: Ash dieback, ranavirus) (permanent). Introduction and assisted spread of invasive species during construction may result in squeezing out of native habitats and species. (temporary)
Other notable species (spined loach, bullhead, brown hare, hedgehog, European eel)	County	Permanent loss of commuting routes and areas of shelter and foraging. Direct mortality of individuals from collisions with construction traffic, entrapment in excavations, disturbance from noise and light pollution of places of shelter leading to abandonment. Pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes.

Operational (permanent impacts)

8.8.8. The impacts associated to the operational stage of the proposed works include:

- Increased air quality and noise levels upon ecological receptors due to increase in use of the road by vehicles
- Barrier effect of new road caused by increased width
- Disturbance of breeding species and their resting places due to light spill
- Mortality of local flora and fauna due to pollution events and spills
- Direct mortality of species due to road traffic collisions (RTC)
- Flood events or drying out of water and wetland habitats

8.8.9. The predicted levels of impact for the Proposed Scheme are presented in Table 8-10.

Table 8-10 Predicted operational impacts on ecological receptors prior to mitigation

Ecological receptors	Resource importance	Description of impact (Operation)
Site of Special Scientific Interest & National Nature Reserves	National	Air quality modelling highlighted an impact of greater than 1% of the lower critical load nitrogen deposition up to 40m north of the Proposed Scheme from Station House (TL 08913 99675). The assessment and evaluation of critical loads during the operational phase can be found in Chapter 5 (Air Quality) section 5.8 and Table 5.17 (**TR010039/APP/6.1**). Indirect impacts during operation from surface water run-off, sedimentation, water level changes and air quality.
Ancient Woodland	National	No direct impacts. Indirect impacts during operation through increased air pollution.
Wildlife Trust reserves, local wildlife sites and potential wildlife sites	Local	No direct impacts Indirect impacts during operation from surface water run-off, sedimentation, water level changes and air quality.
County Wildlife Sites	County	Direct impacts on Sutton Meadows North and Sutton Dismantled Railway through land-take. Indirect impacts on all sites during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.
NERC Act (2006) S41 priority habitats	National	Indirect impacts from pollution of habitat from air quality, surface water runoff, water level changes, sedimentation and accidental spillages.
Cambridgeshire priority habitats	County	Indirect impacts through the pollution of habitats from air quality and surface water runoff, sedimentation, water level changes and air pollution gradually degrading habitats.

Ecological receptors	Resource importance	Description of impact (Operation)
Botanical	National	Indirect impacts upon on botanical composition during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.
Terrestrial invertebrates	Local	Reduction in abundance due to the presence of a psychical barrier which would reduce dispersal of species. Potential risk of mortality of individuals through pollution from air quality and surface water runoff, sedimentation, water level changes and habitat suitability for common aquatic invertebrates. Disturbance from light pollution (permanent).
Aquatic invertebrates	Local	Potential risk of mortality of individuals from pollution from air quality and surface water runoff, sedimentation, water level changes and habitat suitability for common aquatic invertebrates. Disturbance from light pollution (permanent).
Great-crested newt (if found in remaining surveys to be completed)	County	Pollution of breeding ponds from surface water run-off carrying contaminants and pollutants due to increased area of hard-standing. Loss of terrestrial and breeding habitat leading to reduction in abundance. Any newts remaining have less resource by which to increase the population. New road forming a barrier to newt dispersal. Changes to habitat suitability through pollution
Reptiles	County	Reduction in abundance due to the presence of a psychical barrier which would reduce dispersal of species. Changes to habitat suitability for reptiles through air pollution and surface water run-off.
Breeding birds	Regional	Direct mortality of individuals through traffic collisions due to wider junctions and road. Disturbance of nesting locations from noise and light pollution. Water pollution may also affect nesting and feeding for wildfowl species. Degradation of habitat and obstruction and disturbance of foraging and loafing on individuals from water and light pollution leading to abandonment of area.
Barn owl	County	Disturbance of nesting locations from noise and light pollution. Mortality from the increased potential for collisions with traffic. Loss, obstruction and disturbance of foraging habitat of breeding individuals from noise and light pollution leading to abandonment of area.
Wintering birds	Regional	Direct mortality of individuals through traffic collisions due to wider junctions and road.

Ecological receptors	Resource importance	Description of impact (Operation)
		Disturbance of foraging and loafing locations from noise and light pollution. Degradation of habitat and the obstruction and disturbance of foraging and loafing areas from water and light pollution leading to abandonment of area.
Bats	County	Direct mortality through traffic collisions due to wider road. Pollution of water courses could lead to reduction in prey availability. Disturbance for noise, vibration or light spill resulting in permanent avoidance and abandonment of foraging habitats, commuting routes and roosts.
Otter	County	Direct mortality of individuals through traffic collisions due to wider road. Potential risk of mortality of individuals from air pollution and surface water runoff, sedimentation, water level changes and decreased habitat suitability for otters. Disturbance from light pollution (permanent).
Water vole	County	Potential risk of mortality of individuals from air pollution, pollution through increase surface water runoff, sedimentation, water level changes and decreased habitat suitability for water voles. Avoidance and abandonment of burrows due to bridge over whittering brook causing shading. Reduced breeding habitat available would reduce population. Disturbance from light pollution (permanent).
Badger	Local (Legal constraints apply)	Direct mortality of individuals through traffic collisions due to wider junction and new roads. Disturbance from noise and light levels.
Invasive species	Negligible (Legal constraints apply)	No operational impacts anticipated
Other notable species (spined loach, bullhead, brown hare, hedgehog, European eel)	Local	Direct mortality of individuals through traffic collisions due to wider junctions and road. Risk of mortality of individuals from air pollution, surface water runoff, sedimentation, water level changes and reduction in habitat suitability. Disturbance from light pollution (permanent).

8.9. Design, mitigation and enhancement features

8.9.1. This section presents an overview of mitigation measures proposed in response to the impacts identified. The purpose of these measures is to avoid or reduce the

ecological effects associated with the construction and operation of the Proposed Scheme and maximise benefits.

8.9.2. Guidance on best practice in relation to pollution prevention and water management is set out in Construction Industry Research and Information Association (CIRIA) Guidelines ((Soubry (2001), Murnane *et al*. (2006), Charles and Edwards (2015)), and the Environment Agency's approach to groundwater protection (Environment Agency, 2017) and groundwater protection guides (Environment Agency, 2017 a), as required under the Water Framework Directive.

8.9.3. All mitigation would be detailed and implemented as part of the record of environmental actions and commitments (REAC) and in the Environmental Management Plan (EMP). Newly created or enhanced habitats would be managed and monitored for five years after planting.

8.9.4. Mitigation measures employed to reduce the impact of the Proposed Scheme on ecological receptors as outlined in in LA108 (3.14) and LA104 (3.23) have been categorised using a hierarchical system as follows and are detailed in Table 8-11 and 8-12.

- avoidance and prevention: design and mitigation measures to prevent the effect (for example. alternative design options or avoidance of environmentally sensitive sites)
- reduction: where avoidance is not possible, then mitigation is used to lessen the magnitude or significance of effects
- remediation: where it is not possible to avoid or reduce a significant adverse effect, these are measures to offset the effect by compensation or enhancement

Table 8-11 Ecological design and mitigation measures during construction

Ecological receptor	Description of impact (Construction)	Mitigation
Sutton Heath and Bog SSSI	Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff, water level or drainage changes, sedimentation and accidental spillages.	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.
Sutton Meadows North and Sutton Dismantled Railway CWS	Direct permanent loss of habitat (land-take) from Sutton Meadows CWS and Sutton Dismantled Railway CWS. Temporary loss of habitat through the creation of a flood storage area and trenching to facilitate the installation of	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. To compensate the partial loss (approx. 1.2ha) of the Sutton Meadows North CWS, a new area (approx. 2.6ha) of restored species rich

Ecological receptor	Description of impact (Construction)	Mitigation
	drainage from the attenuation basin into the River Nene Construction of pipeline and headwalls across Sutton Meadows North CWS into River Nene CWS	grassland/wild-flower meadow would be established and managed through a bespoke habitat management plan. Trees lost within Sutton Meadow North and Sutton Dismantled Railway CWS would be compensated and further enhancement planting would be undertaken and the remaining ground should be protected from construction vehicles. The temporary lost area of meadow habitat on Sutton Meadow North would be mitigated for by the steps set out below. Where the trench is to be dug through the CWS as part of the installation of drainage from the attenuation basin north of A47, the turf and sub soil must be used in the backfilling to maintain the pre-existing seedbank. Turf strips shall be removed first and stored in situ, and spoil would be stored in-situ on a tarpaulin and bunded to prevent it washing into nearby watercourses. This would then be used in the backfilling. This process will be detailed in the EMP. Once constructed, the new flood storage area within the CWS (TL 08903 99499) east of wittering brook would be planted back to the pre-existing flood meadow habitat similar to Sutton Meadow South CWS.(NVC MG4 habitat).
All other SSSI, NNR sites (as listed in Table 8-4)	Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff, water level or drainage changes, sedimentation and accidental spillages.	Reduction of as much permanent habitat loss as possible has been embedded in the design. Pollution during construction would be mitigated by using best practice methods for pollution prevention and water management. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system. To reduce air pollution, best practice mitigation measures would be included in the EMP as part of the dust management plan which includes ongoing monitoring (**TR010039/APP/7.5**).
Ancient Woodland (as listed in Table 8-4)	Indirect impacts during construction through increased air pollution.	
Wildlife Trust reserves, local wildlife sites and potential wildlife sites	Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff, water level or drainage changes, sedimentation and accidental spillages.	
All other County Wildlife Sites (refer to section 8.7.9 and Table 8-5)	Potential of indirect impacts upon all CWS's from pollution of habitat from air quality and surface water runoff, water level changes, sedimentation and accidental spillages.	Pollution during construction would be mitigated by using best practice methods for pollution prevention and water management. To reduce air pollution, best practice mitigation measures would be included in the EMP as part of the dust management plan which includes ongoing monitoring (**TR010039/APP/7.5**).

Ecological receptor	Description of impact (Construction)	Mitigation
NERC Act (2006) S41 priority habitats	Permanent loss of hedgerows, deciduous woodland, lowland calcareous grassland, lowland meadows, arable field margins and ponds. Indirect effects on coastal and floodplain grazing lowland fens, lowland, wood-pasture and parkland and rivers from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages,	Reduction of as much permanent habitat loss as possible has been embedded in the design. Species poor hedgerows would be gap filled to increase species diversity and quality across the site. Any hedgerow deemed species rich or 'important' would be translocated and not lost. New species rich hedgerows with trees would be planted in addition to areas of deciduous woodland. Meadow grassland would be replanted. Species-rich grassland areas are to be created. All pollution events would be managed though best practice guidance and continually monitored throughout construction as part of the water drainage strategy and dust management plan within the EMP.
Cambridgeshire priority habitats	Permanent loss of hedgerows and defunct hedgerows, lowland meadow, coastal and floodplain grazing marsh, ponds, lowland fen, and lowland deciduous woodland. Indirect effects on all habitats from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages	
Botanical	Permanent loss of habitat (deciduous woodland, and good quality neutral and calcareous grasslands) resulting in decrease in botanical composition. Damage to existing habitat from construction traffic driving over sensitive botanical areas. Indirect effects from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages	Reduction of as much permanent habitat loss as possible has been embedded in the design, Compensation from planting specified above. In addition, the reduction in use of nutrient rich topsoil across the site would enable a more diverse botanical population to colonise newly created bare ground. Where possible construction vehicles should be excluded from driving over species rich grassland. If this is not possible, heavy duty ground protection should be installed to protect the soil and turf. Where any trenching is required in species rich grassland, turf strips shall be removed first and stored in situ, and spoil would be stored in-situ on a tarpaulin and bunded to prevent it washing into nearby watercourses. It would then be reused as part of the backfilling
Terrestrial invertebrates	Removal of habitat (permanent). Risk of population decline through habitat fragmentation. Habitat degradation through pollution events from dust and accidental spills. Disturbance from light pollution.	Reduction of as much permanent habitat loss as possible has been embedded in the design. Compensatory planting in accordance with the measure mentioned on the individual habitats (biodiversity resource) sections in the table above. All pollution events would be managed though best practice guidance and continually monitored throughout construction as part of the water drainage strategy and dust management plan within the EMP.
Aquatic invertebrates	Removal of habitat (permanent). Risk of mortality of individuals through pollution from accidental spills, changes to water levels and habitat suitability for common aquatic invertebrates. Disturbance from light pollution (temporary).	

Ecological receptor	Description of impact (Construction)	Mitigation
Great-crested newt (if found in remaining surveys to be completed)	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	If this species is found present within 500m of the Proposed Scheme in the remaining surveys (that could not be completed due to the COVID-19 Pandemic), then works would need to be undertaken in those parts of the site affected under a Natural England mitigation licence. It would be necessary to find or create suitable receptor sites (either within Proposed Scheme boundary or through landowner agreement) that include both breeding and terrestrial habitat. Newts would be removed from the area of works prior to commencement. Enhancement of the site to encourage this species back into the area includes the creation of tree lines, hedgerows, copses, species-rich grassland and an attenuation pond with associated wetland planting. These will be designed and reported in the REAC and the EMP.
Reptiles	Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	Suitable habitats would be searched by an Ecological Clerk of Works prior to vegetation clearance. If any are found, they would be moved to a safe suitable area. Site clearance (excavation) would commence when reptiles are active during March to October inclusive. Tool-box talks would be given by the on-site ecological clerk of works (ECoW) to contractors. Areas of temporary land clearance would be replanted with native trees and shrubs and species-rich grassland. All excavations to be covered at night or a ramp left in so animals can climb out.
Breeding birds	Direct mortality of individuals from site clearance of vegetation during breeding season, disturbance of nesting locations from water, noise and light pollution. Collisions with construction traffic. Loss, obstruction and disturbance of foraging and loafing habitat of breeding individuals from the, streams and river, noise and light pollution leading to abandonment of area.	Reduction of as much permanent habitat loss as possible has been embedded in the design and where possible, habitat planting would be undertaken before the start of construction to minimise the intervening period between vegetation clearance and the establishment of the new habitat. Timing of vegetation clearance works is to take place outside of the bird nesting season. If it goes into nesting season, the areas to be cleared would be checked by an Ecological Clerk of Works immediately prior to clearance. Any nests or young would be avoided until the birds have fledged. For some species (rook, *Corvus frugilegus*, grey heron, *Ardea cinerea*, etc.) the nesting season does not conform to March – August (inclusive) timeframe and nesting often commenced before March. Therefore, where these have been identified works on tree

Ecological receptor	Description of impact (Construction)	Mitigation
		removal should be completed between September to February. Areas of temporary land clearance would be remediated with native trees and shrubs and species-rich grassland. Bird boxes would be installed on remaining trees at a density of between 10 and 40 nest boxes per hectare Gaps created in hedgerows would be infilled where possible and additional hedgerow, woodland, scrub habitat would be included in the landscape plans to help mitigate the loss of suitable habitat. Disturbance from noise would be mitigated by use of temporary noise barriers, quieter plant, leaving a buffer zone around sensitive receptors and reducing time on noisy activities. Real-time noise monitoring shall be provided on sites where there are sensitive ecological receptors. Vibration would be reduced with early warning, pre-condition surveys, short work durations, and vibration monitoring. Night lighting during construction would be directed away from sensitive features and should not affect these species. Pollution during construction would be mitigated using best practice methods for pollution prevention and water management. Surface water monitoring during construction would also be implemented and will be outlined within the temporary surface water drainage strategy within the EMP. Installation of bird next boxes suitable for tit species, kestrel, sparrowhawk, barn owl and tawny owl should in installed in suitably retained habitat which would help mitigate the loss of existing habitat. Creation of kingfisher nesting banks at the water vole mitigation areas at Sacrewell Farm along with mallard nest tubes.
Barn owl	Disturbance of nesting locations from noise and light pollution. Loss of foraging habitat and suitable roosting habitat.	Creation of areas of rough grassland would be included as part of the landscape plans to mitigate the loss of suitable foraging habitat. This would be set back from the road verge and separated from the road by a shrub belt in order to prevent road casualties. Scattered trees would be planted alongside the new carriageway which would in-directly create low-fly screening enabling barn owl to cross the road at a suitable height. Night lighting during construction would be directed away from sensitive biodiversity resources and Type I foraging habitat. Installation of barn owl boxes no closer than 1km to the Proposed Scheme through

Ecological receptor	Description of impact (Construction)	Mitigation
		landholder agreements would help in enhancing the wider area for the species.
Wintering birds	Direct mortality of individuals from site clearance of vegetation, disturbance of foraging and loafing locations from river and streams, noise and light pollution. Collisions with construction traffic. Loss, obstruction and disturbance (noise and light) of key foraging and loafing habitat such as cereal crop and wintering crops leading to abandonment of area.	Reduction of as much permanent habitat loss as possible has been embedded in the design and where possible, habitat planting would be undertaken before the start of construction to minimise the intervening period between vegetation clearance and the establishment of the new habitat. Areas of temporary land clearance would be remediated with native trees and shrubs and species-rich grassland which would create wintering foraging habitat. Night lighting during construction would be directed away from sensitive biodiversity resources and should not affect these species. All pollution events would be managed through best practice guidance and continued monitoring throughout construction as part of the water drainage strategy and dust management plan within the EMP.
Bats	Direct mortality through roost destruction during removal and permanent loss of two tree roosts and one roost within a building (Old Station House). Disturbance of known bat roosts from noise, vibration and light (temporary). Permanent loss of foraging habitat, severance of commuting routes and foraging areas, resulting in avoidance and abandonment of habitats and roosts. Indirect impacts from lighting, vibration and noise	Disturbance and destruction of bat roosts to be fully mitigated as it requires a Natural England licence. This would include the installation of bat boxes on retained mature trees prior to enabling works and the building of a stone structured bat house to mitigate the loss of the maternity roost at Station House. These works would be supervised by an ecologist accredited under this licence. Disturbance from noise and vibration would be mitigated by deployment of temporary noise barriers, quieter plant and reducing time on noisy activities. Night lighting during construction would be directed away from sensitive features and should not affect this species. Habitat loss and severance from the larger footprint of the new road cannot be mitigated at the start of construction. It would be compensated for as each phase of the road is completed with increased and enhanced tree planting as a remediation measure. Compensatory planting is proposed along the verges of the Proposed Scheme to mitigate the loss of foraging habitats and to shield suitable habitat and roosts from disturbance. Copses of trees and woodland grassland mosaics are proposed along the Proposed Scheme to act as 'stepping-stones' between suitable roosting and foraging habitat. Targeted planting at the dismantled railway underpass have been designed to encourage use by bats to maintain connectivity and enable bats to fly under the existing

Ecological receptor	Description of impact (Construction)	Mitigation
		dismantled railway bridge and under the new A47 and retained 'old' A47. In addition to landscape planting, a 3m environmental barrier would be built to the north and south of the new A47 at TL 08887 99608 and would extend east and west for 270m on each carriageway. This would assist in raising the flight height above the carriageway for those/ bats which do not use the dismantled railway underpass.
Otter	Direct mortality or injury of individuals from construction traffic and being trapped in excavations. Pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes. Disturbance from noise and light pollution leading to abandonment of foraging areas and resting places (temporary).	Construction areas to be fenced off and all excavations to be covered at night or a ramp left in so animals can climb out. Water and air pollution events would be managed though best practice guidance and continually monitored throughout construction as part of the water drainage strategy and dust management plan within the EMP (**TR010039/APP/7.5**). Night lighting during construction would be directed away from sensitive biodiversity resources and should not affect this species.
Water vole	Direct mortality of individuals during vegetation clearance, ditch dredging and realignment, Installation of outfalls and construction of bridge and culverts, collisions from construction traffic, and loss of habitat. This population would incur a pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes. Disturbance from noise and light pollution (temporary).	A Natural England licence would be obtained prior to work taking place in the Wittering Brook. Under this licence, where water vole habitat would be lost through the construction of the road, water voles would be trapped out and translocated by suitably qualified ecologists in springtime to a receptor area. The receptor areas would be located within existing wetland habitat west of Sacrewell Farm pond at TF 07619 00090. This receptor site would have a suitably managed ditch for approximately 380m and two receptor ponds linked by a pipe and open ditch. The receptor site would be managed and enhanced prior to the translocation works to ensure that the habitat can mature so the site is suitable to receive the water voles. Mesh fencing would be erected in the area of Wittering Brook where the water voles have been moved from during the duration of the works there. It would be removed as soon as works have finished in the area. Pollution during construction would be mitigated by using best practice methods for pollution prevention and water management. Surface water monitoring during construction would also be implemented and will be outlined within the temporary surface water drainage strategy within the EMP. Night lighting during construction would be directed away from sensitive features and should not affect these species.

Ecological receptor	Description of impact (Construction)	Mitigation
		Works must be more than 5m from the top of the banks of Whittering Brook if no works directly are in the stream.
Badger	Permanent loss of setts and commuting and foraging habitat. Permanent loss from one sett and disturbance to another setts. Disturbance from noise and light levels. Potential of death or injury of individuals from falling in excavations.	Reduction of as much permanent habitat loss as possible has been embedded in the design. The new road would result in the direct loss of one badger sett and would need permanently excluding prior to works under a licence from Natural England. To compensate for this loss a new badger sett would be built in newly planted woodland habitat west of Deep Springs house (TL 09136 99482). Instead of building a new badger tunnel under the A47 the pre-existing dismantled railway line underpass would be the dedicate crossing point for badger. Along both the northern and southern side of the new A47 specific badger fencing (5km in total) would be installed to guide badgers to this safe crossing point. Signage and Heras fencing would be installed around setts within the RLB which may be disturbed to provide a suitable buffer zone. An ECoW would conduct a toolbox talks for all site personnel (including sub-contractors) prior to commencement of works and supervise works within buffer zones. All excavations to be covered at night or a ramp left in so animals can climb out. Night lighting during construction would be directed away from sensitive features and should not affect this species.
Invasive species	Introduction and spread of diseases during construction could result in death of plants and animals (examples: Ash dieback, ranavirus) (permanent). Introduction and assisted spread of invasive species during construction may result in squeezing out of native habitats and species. (temporary)	The introduction of INNS during construction would be mitigated by implementation of an INNS Management Plan. This would contain knowledge of appropriate treatment methods to ensure that construction proceeds within the legal framework to ensure prevention of spread both within and beyond the Proposed Scheme boundary. The INNS plan will also cover animal biosecurity if necessary. These will be designed and reported in the REAC, and in the EMP.
Other notable species (spined loach, bullhead, brown hare, hedgehog, European eel) (listed in Table 8-8)	Permanent loss of commuting routes and areas of shelter and foraging. Direct mortality of individuals from collisions with construction traffic, entrapment in excavations, disturbance from noise and light pollution of places of shelter leading to abandonment. Pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability	Habitat would be created as described for other species above. Vegetation clearance would be undertaken under the supervision of an ECoW. Tool-box talks would be given by the ECoW and excavations would either be covered at night, or a ramp left in, so animals can climb out.

Ecological receptor	Description of impact (Construction)	Mitigation
	from sedimentation and water level changes.	Construction would take place mainly throughout the daytime, and night lighting would only take place in areas that have had vegetation cleared during the daytime. Night lighting during construction would not affect these species.

Table 8-12 Ecological design and mitigation measures during operation

Ecological receptor	Description of impact (Operation)	Mitigation
Sutton Heath and Bog SSSI	Air quality modelling highlighted an impact of greater than 1% of the lower critical load nitrogen deposition up to 40m north of the Proposed Scheme from Station House (TL 08913 99675). The assessment and evaluation of critical loads during the operational phase can be found in Chapter 5 (Air Quality) section 5.8 and Table 5.17 (**TR010039/APP/6.1**).	No mitigation proposed as alternative design options do not mitigate impact.
Sutton Meadows North and Sutton Dismantled Railway CWS	Indirect impacts on all sites during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.	Attenuation ponds for infiltration would be designed as a SuDS feature to reduce run-off and filter the water from contaminants.
All other sites of SSSI, NNR as listed in Table 8-4,	Indirect impacts during operation from surface water run-off, sedimentation and water level changes.	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.
Ancient Woodland	Indirect impacts during operation from surface water run-off, sedimentation, water level changes and air quality.	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.
Wildlife Trust reserves, local wildlife sites and potential wildlife sites	No direct impacts.	Appropriate drainage system in place including vegetated attenuation ponds to treat run off.
All other County Wildlife Sites (refer to section 8.7.9 and Table 8-5	Indirect impacts on all sites during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.	Appropriate drainage system in place including vegetated attenuation ponds to treat run off. Catchpit chambers would collect any remaining sediment which has not been collected in the planted attenuation basins before it discharges into the River Nene at the headwalls.

Ecological receptor	Description of impact (Operation)	Mitigation
NERC Act (2006) S41 priority habitats	No direct impacts	None required
Cambridgeshire priority habitats	Indirect impacts during operation from surface water run-off, sedimentation, water level changes and air quality.	Appropriate drainage system in place including vegetated attenuation ponds to treat run off.
Botanical	Indirect impacts during operation from surface water run-off, sedimentation, water level changes and air quality on Sutton Meadows North.	Appropriate drainage system in place including vegetated attenuation ponds to treat run off.
Terrestrial invertebrates	Indirect impacts on all sites during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.	Appropriate drainage system in place including vegetated attenuation ponds to treat run off. Woodland planting has been included in the environmental masterplan to reduce the effects of permanent lighting on sensitive ecological receptors. Lighting will be designed with backlight shields and LED bulbs to reduce light spill onto habitats.
Aquatic invertebrates	Indirect impacts from pollution of habitat from air quality, surface water runoff, water level changes, sedimentation and accidental spillages.	
Great-crested newt (if found in remaining surveys to be completed)	Indirect impacts through the pollution of habitats from air quality and surface water runoff, sedimentation, water level changes and air pollution gradually degrading habitats.	The management of created habitat (if required) will be detailed in the EMP (**TR010039/APP/7.5**). Population to be monitored during operation and if required, changes to the EMP can be made (**TR010039/APP/7.5**).
Reptiles	Indirect impacts upon on botanical composition during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.	Appropriate drainage system in place including vegetated attenuation ponds to treat run off. As part of the landscape masterplan suitable habitat would be provided across the Proposed Scheme through hummock landscaping and planting of scrub and rough grassy areas.
Breeding birds	Reduction in abundance due to the presence of a psychical barrier which would reduce dispersal of species.	To minimise risk of mortality to birds, new and continuous habitat in the form of hedgerows, woodland, wetland areas, scattered broadleaved trees to include individual 'parkland' trees and species-rich grassland would be provided on both sides of the road as a refuge. This planting would also aid the visual screening from the road. The management of created habitat will be detailed in the EMP (**TR010039/APP/7.5**). Woodland planting has been included in the environmental masterplan to reduce the effects of permanent lighting in these areas. Lighting will be designed with backlight shields and LED bulbs to reduce light spill onto habitats.

Ecological receptor	Description of impact (Operation)	Mitigation
		Appropriate drainage system in place including vegetated attenuation ponds to treat run off.
Barn owl	Potential risk of mortality of individuals through pollution from air quality and surface water runoff, sedimentation, water level changes and habitat suitability for common aquatic invertebrates. Disturbance from light pollution (permanent).	Woodland planting along the new A47 road would help in decreasing light spill into foraging habitats and would also assist in creating safer road crossing options for barn owls.
Wintering birds	Potential risk of mortality of individuals from pollution from air quality and surface water runoff, sedimentation, water level changes and habitat suitability for common aquatic invertebrates.	Woodland planting has been included in the environmental masterplan to reduce the effects of permanent lighting in these areas. Lighting will be designed with backlight shields and LED bulbs to reduce light spill onto habitats. Appropriate drainage system in place including vegetated attenuation ponds to treat run off. The management of created habitat will be detailed in the EMP.
Bats	Disturbance from light pollution (permanent).	Bat roosts disturbed by construction and bat boxes erected would be monitored during operation. Crossing points and their mitigation in the construction phase to be monitored during operation and if required, mitigation would be altered. These changes will be outlined in the EMP (**TR010039/APP/7.5**). Lighting would be directional, and positioned sympathetically, to minimise light spill and disturbance for sensitive biodiversity resources including foraging bats.
Otter	Pollution of breeding ponds from surface water run-off carrying contaminants and pollutants due to increased area of hard-standing.	Permanent badger fencing systems would be installed in key areas throughout the Proposed Scheme which would indirectly also assist in mitigating for operational traffic mortality on otter. Appropriate drainage system in place including vegetated attenuation ponds to treat run off. Lighting will be designed with backlight shields and LED bulbs to reduce light spill onto habitats which are used by otter and water vole. The new culvert on the Wittering Brook will be designed to have an otter ledge.
Water vole	Potential risk of mortality of individuals from air pollution, pollution through increase surface water runoff, sedimentation, water level changes and decreased habitat suitability for water voles.	Habitat enhancement and an increase in breeding area would be undertaken for this species through the licence and would be sufficiently mature before operational phase. Appropriate drainage system in place including vegetated attenuation ponds to treat run off.

Ecological receptor	Description of impact (Operation)	Mitigation
		Lighting will be designed with backlight shields and LED bulbs to reduce light spill onto habitats which are used by water vole.
Badger	Changes to habitat suitability through pollution	The newly created sett would be monitored during the operational period in accordance with licence requirements. Five kilometres of permanent fencing systems would be installed across the Proposed Scheme to the east and west of the badger tunnel (existing dismantled railway bridge) to mitigate for operational traffic mortality. Although woodland planting would take several years to reach the maturity of the existing woodland, there is suitable quantities of surrounding woodland to enable badgers to remain in the area whilst the newly planted woodland establishes. Lighting will be designed with backlight shields and LED bulbs to reduce light spill onto sensitive habitats.
Invasive species	Reduction in abundance due to the presence of a psychical barrier which would reduce dispersal of species.	None required
Other notable species (spined loach, bullhead, brown hare, hedgehog, European eel) (listed in Table 8-8)	Changes to habitat suitability for reptiles through air pollution and surface water run-off.	New and continuous habitat provided on both sides of the road as a refuge. The dismantled railway underpass retained in the design would provide safe access to the other side of the road. Lighting will be designed with backlight shields and LED bulbs, directional, and positioned sympathetically, to minimise light spill and disturbance for sensitive biodiversity resources including notable habitats. Appropriate drainage system in place including vegetated attenuation ponds to treat run off. Catchpit chambers would collect any remaining sediment which has not been collected in the planted attenuation basins before it discharges into the River Nene at the headwalls.

8.9.5. The type and area of habitat affected during construction is calculated below:

- Broadleaved Semi-Natural Woodland 0.6ha
- Broadleaved plantation 2.3ha
- Mixed semi-natural woodland 1.1ha
- Mixed Plantation Woodland 2.6ha
- Dense continuous scrub 0.8ha
- Parkland broadleaved scattered trees 0.4ha

- Unimproved neutral/calcareous grassland 0.8ha
- Semi-improved neutral grassland 6.5ha
- Improved grassland 6.3ha
- Poor semi-improved grassland 0.1ha
- Arable 30ha
- Scattered trees 27 no.
- Tall ruderal 0.6ha
- Standing water 0.1ha
- Bare ground 0.4ha
- Hedgerow 1939lm

8.9.6. The types and areas of habitat creation and the increases or decreases in size of each habitat are provided in Table 8-13.

Table 8-13 Habitat types and areas to be remediated or enhanced

Habitat type	Habitat loss amount (ha)		Reinstatement or enhancement of habitat amount (ha)	Net gain or loss of habitat type
	Permanent Works	Temporary Works		
Broadleaved Semi-Natural Woodland	0.3	0.2	0	*Net loss of 0.5ha*
Broadleaved plantation	2.3	0.0	3.8	*Net gain of 1.5ha*
Mixed semi-natural woodland	1.1	0.0	0	*Net loss of 1.1ha*
Mixed Plantation Woodland	1.0	1.5	0	*Net loss of 2.5ha*
Dense continuous scrub	0.5	0.0	0.8	*Net gain of 0.3ha*
Parkland broadleaved scattered trees	0.4	0.0	0	*Net loss of 0.4ha*
Unimproved neutral/calcareous grassland	0.2	0.3	26.7	*Net gain of 26.2ha*
Semi-improved neutral grassland	5.4	0.2	0	*Net loss of 5.6ha*
Improved grassland	3.9	2.1	0	*Net loss of 6ha*
Poor semi-improved grassland	0.1	0.0	0	*Net loss of 0.1ha*

Habitat type	Habitat loss amount (ha)		Reinstatement or enhancement of habitat amount (ha)	Net gain or loss of habitat type
	Permanent Works	Temporary Works		
Arable	17.8	9.2	0	*Net loss of 27ha*
Scattered trees (individual)	27	0	90	*Net gain of 63 individual trees*
Tall ruderal	0.2	0.0	0	*Net loss of 0.2ha*
Standing water	0.1	0.0	0.1	*No change*
Bare ground	0.4	0.1	0	*Net loss of 0.5ha*
Hedgerow	516lm	1365lm	6500lm	*Net gain of 4619lm*

8.10. Assessment of likely significant residual effects

8.10.1. An assessment of the residual ecological effects predicted following the implementation of mitigation outlined within Table 8-11 and 8-12 is presented within Table 8-14.

8.10.2. The mitigation section of this report includes all measures which would need to be applied in order to ensure that legal obligations are met with respect to protected habitats and species. As outlined in DMRB standards LA108 Biodiversity where a biodiversity resource falls into more than one category, the highest value categories apply. Therefore, where habitats (e.g. broadleaved woodland) are listed against a number of ecological receptors they have been assessed at the highest importance level.

Table 8-14 Predicted significance of residual effects on biodiversity resources following implementation of mitigation

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
Sutton Heath and Bog SSSI	National	**Construction** Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff, water level or drainage changes, sedimentation and accidental spillages.	Moderate adverse	Temporary	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.	No change	Neutral
		Operation Air quality modelling highlighted an impact of greater than 1% of the lower critical load nitrogen deposition up to 40m north of the Proposed Scheme from Station House (TL 08913 99675). The assessment and evaluation of critical loads during the operational phase can be found in Chapter 5 (Air Quality) section 5.8	Minor adverse	Permanent	No mitigation is proposed to reduce the level of nitrogen deposition from the Proposed Scheme. The habitat within the 40m area which has been flagged as being impacted is continuous deciduous woodland comprising pedunculate oak (*Quercus robur*), and sycamore (*Acer pseudoplatanus*) abundant with hawthorn (*Crataegus spp*) and elder	No change	Neutral

[7] Temporary and permanent impacts are characterised by using knowledge of the nature of the impact of the works. Table 3.11 of LA 108 (Biodiversity) gives further descriptions used to aid this characterisation.

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		and Table 5.17 (**TR010039/APP/6.1**).			(*Sambucus nigra*) understory. As the core grassland habitat which is listed on the citation is approximately 150m further north-east of the affected area, NOx concentrations are not anticipated to appreciably increase. This is evidenced by transect points: 1 SH SSSI 5 – 13 (one transect point equals 10m) (Chapter 5 Air Quality, Table 5.17) which show the results of the modelling from the impact area up to the edge of the core habitat (**TR010039/APP/6.1**). Therefore, there would not be any adverse impacts on the designated site as a result of the Proposed Scheme.		
Sutton Meadows North and Sutton Dismantled Railway CWS	County	**Construction** Direct permanent loss of habitat (land-take) from Sutton Meadows CWS and	Major adverse	Permanent (habitat loss) and temporary (pollution and	All potential pollution pathways would be controlled through the establishing of best practice	Minor beneficial	Slight beneficial

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Sutton Dismantled Railway CWS. Temporary loss of habitat through the creation of a flood storage area and trenching to facilitate the installation of drainage from the attenuation basin into the River Nene Construction of pipeline and headwalls across Sutton Meadows North CWS into River Nene CWS		surface water run-off)	pollution prevention outlined in the EMP. To compensate the partial loss (approx. 1.2ha) of the Sutton Meadows North CWS, a new area (approx. 2.6ha) of restored species rich grassland/wild-flower meadow would be established and managed through a bespoke habitat management plan. Trees lost within Sutton Meadow North and Sutton Dismantled Railway CWS would be compensated and further enhancement planting would be undertaken and the remaining ground should be protected from construction vehicles. The temporary lost area of meadow habitat on Sutton Meadow North would be mitigated for by the steps set out below. Where the trench is to be dug through the		

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
					CWS as part of the installation of drainage from the attenuation basin north of A47, the turf and sub soil must be used in the backfilling to maintain the pre-existing seedbank. Turf strips shall be removed first and stored in situ, and spoil would be stored in-situ on a tarpaulin and bunded to prevent it washing into nearby watercourses. This would then be used in the backfilling. This process will be detailed in the EMP. Once constructed, the new flood storage area within the CWS (TL 08903 99499) east of wittering brook would be planted back to the pre-existing flood meadow habitat similar to Sutton Meadow South CWS.(NVC MG4 habitat). For the reasons set out above the significance of the residual effect on the		

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
					CWS has been set out at slight and not moderate.		
		Operation Indirect impacts on all sites during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.	Minor adverse (Sutton Meadows North and Sutton Dismantled Railway) Moderate adverse (remaining sites)	Permanent	Attenuation ponds for infiltration would be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects from pollution anticipated.	No change	Neutral
All other SSSI and NNR sites (listed in Table 8-4)	National	**Construction** Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff, water level or drainage changes, sedimentation and accidental spillages.	Moderate adverse	Temporary	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.	No change	Neutral
		Operation Indirect impacts during operation from surface water run-off,	Negligible adverse	Permanent	No residual impacts anticipated	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		sedimentation and water level changes.					
Ancient Woodland sites (listed in Table 8-5).	National	**Construction** Indirect impacts during construction through increased air pollution.	Negligible adverse	Temporary	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.	No change	Neutral
		Operation No direct impacts. Indirect impacts during operation through increased air pollution.	Negligible adverse	Permanent	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.	No change	Neutral
Wildlife Trust reserves, local wildlife sites and potential wildlife sites (refer to section	Local	**Construction** Potential of indirect impacts through the pollution of habitat from air quality and surface water runoff,	Moderate adverse	Temporary	All potential pollution pathways would be controlled through the establishing of best practice	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
8.7.9 and Table 8-5)		water level or drainage changes, sedimentation and accidental spillages.			pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.		
		Operation No direct impacts Indirect impacts during operation from surface water run-off, sedimentation, water level changes and air quality.	Negligible adverse	Permanent	No residual impacts anticipated	No change	Neutral
All other County Wildlife Sites (listed in section 8.7.9 and Table 8-5)	County	**Construction** Potential of indirect impacts upon all CWS's from pollution of habitat from air quality and surface water runoff, water level changes, sedimentation and accidental spillages.	Moderate adverse	Temporary	All potential pollution pathways would be controlled through the establishing of best practice pollution prevention outlined in the EMP. Impacts of flood risk would be managed by the implementation of a construction-phase drainage system.	No change	Neutral
		Operation	Moderate adverse	Permanent	Attenuation ponds for infiltration would be	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Indirect impacts on all sites during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.			designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects from pollution anticipated.		
NERC Act (2006) S41 priority habitats	National	**Construction** Permanent loss of hedgerows, deciduous woodland, lowland calcareous grassland, coastal and floodplain grazing marsh, arable field margins and ponds. Indirect effects on coastal and floodplain grazing marsh lowland fens, lowland meadows, wood-pasture and parkland and rivers from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages,	Major adverse (hedgerows, lowland deciduous woodland, lowland calcareous grassland, coastal and floodplain grazing marsh, field margins and ponds. Moderate adverse (all other receptors).	Permanent (habitat loss) and temporary (pollution and surface water run-off)	Compensatory species-rich hedgerow and native woodland planting is to be undertaken which matures slowly. The time lag would take years to reach its full former maturity causing residual effects. Compensatory increased areas of species-rich grassland planting is to be undertaken which matures quickly. This remediation would have beneficial residual effects Attenuation ponds for infiltration would be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No	Moderate adverse (hedgerows, deciduous woodland, coastal and floodplain grazing marsh) Minor beneficial (lowland meadows, lowland calcareous grassland, ponds)	Moderate adverse (hedgerows, deciduous woodland, coastal and floodplain grazing marsh) Slight beneficial (lowland meadows, lowland calcareous grassland, ponds)

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
					residual effects from pollution anticipated. For the reasons set out above, the significance of the residual effect on hedgerows, coastal and floodplain grazing marsh, and deciduous woodland has been set out at moderate and not large and lowland meadows, lowland calcareous grassland, ponds as slight over moderate.		
		Operation Indirect impacts from pollution of habitat from air quality, surface water runoff, water level changes, sedimentation and accidental spillages.	Moderate adverse	Permanent	Attenuation ponds for infiltration would be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects from pollution anticipated.	No change	Neutral
Cambridgeshire priority habitats	County	**Construction** Permanent loss of hedgerows and defunct hedgerows, coastal and floodplain grazing marsh, ponds, lowland fen, and	Major adverse	Permanent (habitat loss) and temporary (pollution and surface water run-off)	Species poor hedgerows would be gap filled to increase species diversity and quality across the site. All pollution events would be managed	Moderate adverse (hedgerows, coastal and floodplain grazing marsh and deciduous woodland)	Slight adverse (hedgerows, coastal and floodplain grazing marsh and deciduous woodland)

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		lowland deciduous woodland. Indirect effects on all habitats from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages			though best practice guidance and continually monitored throughout construction as part of the water drainage strategy and dust management plan within the EMP.	No change (all other habitats)	Neutral (all other habitats)
		Operation Indirect impacts through the pollution of habitats from air quality and surface water runoff, sedimentation, water level changes and air pollution gradually degrading habitats.	Moderate adverse	Permanent	Attenuation ponds for infiltration would be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual impacts from pollution are anticipated and no mitigation would be required.	No change	Neutral
Botanical	County	**Construction** Permanent loss of habitat (other woodland, and good quality neutral grasslands) resulting in decrease in botanical composition. Damage to existing habitat from construction traffic	Major adverse	Permanent (habitats removal) and temporary (light and ground pollution).	Species-rich grassland would be included across the Proposed Scheme as part of the landscape planning. In addition, the reduction in use of nutrient rich topsoil would enable a more diverse botanical population to colonise newly created bare ground. Meadow planting	Minor beneficial	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		driving over sensitive botanical areas. Indirect effects from pollution of habitat, air quality, surface water runoff, water level changes, sedimentation and accidental spillages			would reach maturity quickly. New deciduous woodland would take a long time to reach former maturity. No residual effects from pollution are anticipated. For the reasons set out above, the significance of the residual effect has been set out at neutral and not slight		
		Operation Indirect impacts upon on botanical composition during operation from surface water run-off, sedimentation, water level changes, air pollution gradually degrading habitats.	Minor adverse	Permanent	Attenuation ponds for infiltration will be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects from pollution are anticipated.	No change	Neutral
Terrestrial invertebrates	Local	**Construction** Removal of habitat (permanent). Risk of population decline through habitat fragmentation. Habitat degradation	Minor adverse	Permanent (habitats removal) and temporary (light and ground pollution).	Compensatory planting is included in the landscape design. Any mature trees which are to be removed would be constructed into habitat piles to	Minor beneficial	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		through pollution events from dust and accidental spills. Disturbance from light pollution.			continue to provide suitable habitat for invertebrates. Most invertebrates would benefit from other habitat planting and enhancement No residual effects anticipated from pollution. For the reasons set out above, the significance of the residual effect has been set out at neutral not slight.		
		Operation Reduction in abundance due to the presence of a psychical barrier which will reduce dispersal of species. Potential risk of mortality of individuals through pollution from air quality and surface water runoff, sedimentation, water level changes and habitat suitability for common invertebrates. Disturbance from	Minor adverse	Permanent	Most invertebrates would benefit from other habitat planting and enhancement. Attenuation ponds for infiltration will be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects anticipated from pollution.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		light pollution (permanent).					
Aquatic invertebrates	Local	**Construction** Removal of habitat (permanent). Risk of mortality of individuals through pollution from accidental spills, changes to water levels and habitat suitability for common aquatic invertebrates. Disturbance from light pollution (temporary).	Minor adverse	Permanent (habitats removal) and temporary (light and ground pollution).	Attenuation ponds would be vegetated to help increase habitat for these species. This habitat would mature quickly. For the reasons set out above, the significance of the residual effect has been set out at neutral not slight.	No change	Neutral
		Operation Potential risk of mortality of individuals from pollution from air quality and surface water runoff, sedimentation, water level changes and habitat suitability for common aquatic invertebrates. Disturbance from light pollution (permanent).	Minor adverse	Permanent	Attenuation ponds for infiltration will be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects from pollution are anticipated.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
Great-crested newt (if found in remaining surveys to be completed)	County	**Construction** Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	Major adverse	Temporary	Direct mortality would be avoided by mitigation. If this species found present, suitable breeding and terrestrial habitats would be enhanced and increased under licence either within Proposed Scheme boundary or through landowner agreement. No change in population is predicted.	No change	Neutral
		Operation Pollution of breeding ponds from surface water run-off carrying contaminants and pollutants due to increased area of hard-standing. Loss of terrestrial and breeding habitat leading to reduction in abundance. Any newts remaining have less resource by which to increase the population. New road forming a barrier to newt dispersal.	Major adverse	Permanent	Attenuation ponds for infiltration will be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects from pollution anticipated.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Changes to habitat suitability through pollution					
Reptiles	County	**Construction** Direct mortality of individuals during vegetation clearance and from collisions with construction traffic, entrapment in excavations, disturbance of places of shelter leading to abandonment. Loss of supporting and breeding habitat.	Minor adverse	Temporary	Direct mortality would be avoided by on-site mitigation such as covered working trenches and the presence of an ECoW. Suitable grassland and scrub habitats and hibernacula to be remediated would not take long to mature. No change in population is predicted.	No change	Neutral
		Operation Reduction in abundance due to the presence of a psychical barrier which will reduce dispersal of species. Changes to habitat suitability for reptiles through air pollution and surface water run-off.	Minor adverse	Permanent	No change in population is predicted. Attenuation ponds for infiltration will be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects from pollution anticipated.	No change	Neutral
Breeding birds	Regional	**Construction** Direct mortality of individuals from site	Major adverse	Temporary	Attenuation ponds for infiltration will be designed as a SuDS feature to reduce	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		clearance of vegetation during breeding season, disturbance of nesting locations from water, noise and light pollution. Collisions with construction traffic. Loss, obstruction and disturbance of foraging and loafing habitat of breeding individuals from the, streams and river, noise and light pollution leading to abandonment of area.			run-off and filter the water from contaminants. No residual effects anticipated from pollution. For the reasons set out above, the significance of the residual effect has been set out at neutral not slight.		
		Operation Direct mortality of individuals through traffic collisions due to wider junctions and road. Disturbance of nesting locations from noise and light pollution. Water pollution may also affect nesting and feeding for wildfowl species. Degradation of habitat and obstruction and	Minor adverse	Permanent	Areas of suitable habitat for breeding birds would be compensated for in the landscape design. The installation of nest boxes would mitigate for the loss of nesting sites and would provide additional nesting opportunity during the operational phase whilst the landscape planting is establishing.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		disturbance of foraging and loafing on individuals from water and light pollution leading to abandonment of area.			Although woodland planting would take many years to reach the maturity of the existing woodland, there is suitable quantities of surrounding woodland to enable birds to remain in the area whilst the newly planting woodland are establishing. Nutrient poor habitats adjacent to the roads would help reduce the amount of scrub which would reduce foraging habitat on roadsides, results in a potential decrease in road casualties. Additionally, planting for bat crossing points creates areas of increased vegetation height which would assist birds in maintaining a high fly path across the road. Attenuation ponds for infiltration will be designed as a SuDS feature to reduce run-off and filter the water from contaminants. No residual effects		

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
					anticipated from pollution. For the reasons set out above, the significance of the residual effect has been set out at neutral not slight.		
Barn Owl	County	**Construction** Disturbance of nesting locations from noise and light pollution. Loss of foraging habitat and suitable roosting habitat.	Major adverse	Temporary	No direct impacts on known nesting sites would occur throughout the proposed works. Where suitable rough grassland areas would be lost during the construction, this would be compensated for in the landscape design.	No change	Neutral
		Operation Disturbance of nesting locations from noise and light pollution. Mortality from the increased potential for collisions with traffic. Loss, obstruction and disturbance of foraging habitat of breeding individuals from noise and light pollution leading to	Major adverse	Permanent	Habitat planting along the existing A47 would include tall trees to help encourage birds to fly higher. However, this would take time to mature.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		abandonment of area.					
Wintering birds	Regional	**Construction** Direct mortality of individuals from site clearance of vegetation, disturbance of foraging and loafing locations from river and streams, noise and light pollution. Collisions with construction traffic. Loss, obstruction and disturbance of key foraging and loafing habitat such as cereal crop and wintering crops leading to abandonment of area.	Major adverse	Temporary	There is no change anticipated after mitigation to wintering birds and no residual impacts from pollution	No change	Neutral
		Operation Direct mortality of individuals through traffic collisions due to wider junctions and road. Disturbance of foraging and loafing locations from noise and light pollution.	Minor adverse	Permanent	Within the landscape design this includes berry bearing trees and scrubs except on areas near the A47 where low nutrient planting would be undertaken. Although woodland planting would take several years to reach the maturity of	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Degradation of habitat and the obstruction and disturbance of foraging and loafing areas from water and light pollution leading to abandonment of area.			the existing woodland, there is suitable quantities of surrounding woodland to enable birds to remain in the area whilst the newly planting woodland are establishing. There is no change anticipated after mitigation to wintering birds and no residual impacts from pollution. For the reasons set out above, the significance of the residual effect has been set out at neutral not slight.		
Bats	County	**Construction** Direct mortality through roost destruction during removal and permanent loss of two tree roosts and one roost within a building (Old Station House). Disturbance of known bat roosts from noise, vibration, and light (temporary). Permanent loss of foraging habitat,	Major adverse	Permanent (habitat loss) and temporary (noise and light disturbance)	After mitigation included in the Natural England mitigation licence method statement, residual effects to roosts would be neutral. Disturbance from loss of habitat during construction would not be remediated immediately as there would be a time lag between loss and the	Minor adverse	Slight adverse

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		severance of commuting routes and foraging areas, resulting in avoidance and abandonment of habitats and roosts. Indirect impacts from lighting, vibration and noise			remediated habitats reaching maturity. Disturbance from noise, vibration and light spill is not predicted to cause residual effects. For the reasons set out above, the significance of the residual effect has been set out at slight not neutral.		
		Operation Direct mortality through traffic collisions due to wider road. Pollution of water courses could lead to reduction in prey availability. Disturbance for noise, vibration or light spill resulting in permanent avoidance and abandonment of foraging habitats, commuting routes and roosts.	Major adverse	Permanent	Mortality through traffic collisions is predicted to be less likely once remediated road-side trees and scrub mature. The addition of a 3m high environmental barrier to create a bat crossing point over the A47 would help maintain the current higher bat flight path from the woodland at Station House and encourage bats to fly above traffic reducing road casualties. For the reasons set out above, the significance of the residual effect has	Minor adverse	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
					been set out at neutral not slight.		
Otter	County	**Construction** Direct mortality or injury of individuals from construction traffic and being trapped in excavations. Pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes. Disturbance from noise and light pollution leading to abandonment of foraging areas and resting places (temporary).	Major adverse	Temporary	If a holt is found to be present during pre-construction surveys, mitigation would be included in a Natural England mitigation licence method statement, that would bring residual effects to otter holts to be neutral.	No change	Neutral
		Operation Direct mortality of individuals through traffic collisions due to wider road. Potential risk of mortality of individuals from air pollution and surface	Major adverse	Permanent	Direct mortality would be avoided through the installation of 5km of badger fencing. Attenuation ponds for infiltration would be designed as a SuDS feature to reduce run-off and filter the	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		water runoff, sedimentation, water level changes and decreased habitat suitability for otters. Disturbance from light pollution (permanent).			water from contaminants. No residual impacts from pollution anticipated		
Water vole	County	**Construction** Direct mortality of individuals during vegetation clearance, ditch dredging and realignment, Installation of outfalls and construction of bridge and culverts, collisions from construction traffic, and loss of habitat. This population would incur a pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes. Disturbance from noise and light pollution (temporary).	Major adverse	Temporary	Direct mortality would be avoided by mitigation outlined within the method statement of the water vole licence. Habitat enhancement and an increase of suitable habitat would be undertaken for this species as part of the licence.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Operation Potential risk of mortality of individuals from air pollution, pollution through increase surface water runoff, sedimentation, water level changes and decreased habitat suitability for water voles. Avoidance and abandonment of burrows due to bridge over whittering brook causing shading. Reduced breeding habitat available would reduce population. Disturbance from light pollution (permanent).	Major adverse	Permanent	After mitigation, translocation and habitat creation under a licence from Natural England, no residual effects are predicted once the compensatory habitats have matured to a condition and abundance that is greater than pre-construction. No residual effects from pollution are anticipated.	No change	Neutral
Badger	Local (legal constraints apply)	**Construction** Permanent loss of a setts and commuting and foraging habitat. Permanent loss from one sett and disturbance to another setts. Disturbance from noise and light levels.	Major adverse	Permanent (sett loss) and temporary (excavation risk)	A new badger sett would be created to the west of Deep Springs to mitigate the loss of one sett. The new sett would be within new a woodland planting area This planting would take several years to establish.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Potential of death or injury of individuals from falling in excavations.			The installation of 5km of badger fencing across the Proposed Scheme would help guide individuals to a safe crossing point at the dismantled railway line.		
		Operation Direct mortality of individuals through traffic collisions due to wider junction and new roads. Disturbance from noise and light levels.	Major adverse	Permanent	No residual effects predicted.	No change	Neutral
Invasive species	Negligible (legal constraints apply)	**Construction** Introduction and spread of diseases during construction could result in death of plants and animals (examples: Ash dieback, ranavirus) (permanent). Introduction and assisted spread of invasive species during construction may result in squeezing out of native habitats and species. (temporary)	Major adverse	Permanent (disease) and temporary (INNS)	Mitigation would prevent the introduction of INNS to a negligible level of impact during construction and no change in operation. No residual effects predicted.	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Operation No operational impacts anticipated	No change	N/A	No residual effects predicted.		
Other notable species (spined loach, bullhead, brown hare, hedgehog, European eel) (listed in Table 8-8).	Local	**Construction** Permanent loss of commuting routes and areas of shelter and foraging. Direct mortality of individuals from collisions with construction traffic, entrapment in excavations, disturbance from noise and light pollution of places of shelter leading to abandonment. Pollution risk of mortality of individuals from dust and accidental spills and changes to habitat suitability from sedimentation and water level changes.	Minor adverse	Permanent (loss of habitat) and temporary (all other factors)	No residual effects from pollution predicted. Where works are to be undertaken in water, the ECoW would be present to check for fish. If fish are detected a fish rescue would be required prior to instream works. This has been detailed within the EMP. This mitigation has been designed on a precautionary basis if fish species are present.	No change	Neutral
		Operation Direct mortality of individuals through traffic collisions due to wider junctions and road.	Minor adverse	Permanent	Habitats to be remediated and some suitable habitat for these species would grow back quickly as not totally dependent on mature	No change	Neutral

Ecological receptor and valuation	Importance	Summary of potential impacts	Level of impact pre-mitigation	Impact characterisation [7]	Summary of proposed mitigation/ compensation	Residual impact	Significance of residual effect
		Risk of mortality of individuals from air pollution, surface water runoff, sedimentation, water level changes and reduction in habitat suitability. Disturbance from light pollution (permanent).			trees and hedgerows. Residual effects from barrier of new road and mortality from collisions likely to stay similar to that of the present road. Attenuation ponds for infiltration will be designed as a SuDS feature to reduce run-off and filter the water from contaminants.		

8.10.3. Significant effects, defined as moderate, large or very large in DMRB standard LA108, could be encountered on NERC habitats (hedgerows and deciduous woodland) during the construction phase, although these habitats are being compensated within the landscape mitigation. These habitats take a period of years to establish to reach pre-existing condition.

8.10.4. Slight adverse effects were identified on Cambridgeshire Priority habitats (hedgerows and deciduous woodland) and bats during the construction phase.

8.10.5. Slight beneficial effects were identified on County Wildlife Sites and NERC habitats (lowland meadows, lowland calcareous grassland and pond) during the construction phase. Beneficial effects will arise from the establishment of new areas of species rich grassland, calcareous grassland and wetland habitat and targeted management plans.

8.10.6. All other receptors were assessed as having a neutral significant effect throughout both construction and operation phases.

8.11. Monitoring

8.11.1. All pre and post construction monitoring would be delivered as outlined in the EMP and Operational Landscape Environmental Management Plan (OLEMP) (**TR010039/APP/7.5**).

8.11.2. Monitoring during vegetation clearance and during construction where required would be undertaken by an Ecological Clerk of Works.

8.11.3. A pre-construction badger and otter survey shall be undertaken to assess whether the species have moved within the Proposed Scheme boundary prior to construction and to determine whether further mitigation is required.

8.11.4. Habitats, bird and bat boxes would be monitored and managed for five years after they have been created. Post-development monitoring and reporting would be required for newly created habitats and protected species and would be detailed in the REAC and EMP (**TR010039/APP/7.5**). Subsequent monitoring and reporting requirements will be set out within the OLEMP including potential requirements for remedial action.

8.11.5. Road casualty surveys would be required for five years post construction to assess ongoing impacts on badger, otter and barn owl on the site to assess whether mitigation provided is effective in reducing impacts on these species.

8.11.6. Species to be licensed, bat, water vole and badger would be monitored as part of the respective licences for the requisite length of time after construction completion. Monitoring surveys would be consistent with the methodologies used to inform this assessment for comparisons to be made, and a report should be produced annually. In addition, the bat crossing points (fencing and planting) would be monitored in years one, three and five after operation of the proposed road commences. This is specific bat mitigation separate to licence requirements added to the Proposed Scheme at design stage.

8.12. Summary

8.12.1. This assessment considered European designated site, statutory and non-statutory site, European protected species, species and habitats of principal importance and invasive species. As part of the assessment, the following receptors were scoped out:

- One Local Geological Site
- Seven Wildlife Trust Reserves and Local Wildlife Sites
- Seven Potential Wildlife Sites
- Brown Hare

- Fungi
- Twenty-nine County Wildlife Sites.

8.12.2. The likely significant effects which have been predicted for each ecological receptor are reliant on the mitigation measures within Section 8.9 being implemented.

8.12.3. Although the design has evolved with the aim of avoiding trees where possible and habitat loss kept to the minimum, some areas of trees and other habitats would need to be lost due to the Proposed Scheme.

8.12.4. Species-rich grasslands within the Proposed Scheme would have a slight beneficial level of impact after mitigation as there would be a net gain of more biodiverse grasslands with the introduction of species-rich hay meadow to compensate for the loss of CWS habitat.

8.12.5. The Proposed Scheme is anticipated to have a Neutral effect on-site of Special Scientific Interest & National Nature Reserves.

8.12.6. It is anticipated that there would be a Neutral effect during construction and operation on ancient woodlands, Wildlife Trust reserves, local wildlife sites and potential wildlife sites.

8.12.7. It is anticipated that there would be a slight beneficial effect on the county wildlife site (principally Sutton Meadow North) after the establishment of the new species rich grassland and planting of new feature willows.

8.12.8. The priority habitats of lowland meadows, lowland calcareous grassland and ponds were assessed as being affected at a significance of slight beneficial residual effects.

8.12.9. Deciduous woodland, and hedgerows would have significant moderate adverse residual effects due to the long-time lag to achieve their former maturity.

8.12.10. Protected species that are to be licensed (loss of bat roosts, water vole and badger) would have neutral residual effects. Mitigation within the licence method statements would be required and developed to remove any harm from occurring to them and would have to include increased habitat for them. Bats have a slight adverse residual effect overall, due to the time lag between loss of habitat and the remediated habitats reaching maturity which could lead to traffic mortality.

8.12.11. All other residual effects for construction and operation after mitigation would be neutral or slight adverse which are considered to be not significant for the assessment.

8.13. References

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