M54 to M6 Link Road

TR010054

Volume 6

6.1 Environmental Statement

Chapter 8 – Biodiversity

Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

October 2020

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M54 to M6 Link Road

Development Consent Order 202( )

6.1 Environmental Statement

Chapter 8 Biodiversity

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8 Biodiversity

8.1 Introduction

8.1.1 This chapter assesses the potential biodiversity impacts associated with the construction and operation of the Scheme, following the methodology set out in LA 108 Biodiversity (Ref 8.1) and using the Guidelines for Ecological Impact Assessment in the UK and Ireland (Ref 8.2) (referred to as the 'CIEEM guidelines'). This chapter summarises the regulatory and policy framework related to biodiversity, details the methodology followed for the assessment and describes the existing environment in the area surrounding the Scheme.

8.1.2 This chapter of the Environmental Statement (ES) has been prepared by competent experts with relevant and appropriate experience. The technical lead for the biodiversity assessment has 13 years of relevant experience and has professional qualifications as summarised in Appendix 1.1 [TR010054/APP/6.3].

8.2 Legislative and policy framework

Legislation

8.2.1 The following legislation is of direct relevance to the assessment of biodiversity, and is set out in further detail in Appendix 8.1 [TR010054/APP/6.3]:

- The Conservation of Habitats and Species Regulations 2017 (Ref 8.3).
- The Ramsar Convention 1971 (Ref 8.4).
- Wildlife and Countryside Act 1981 (Ref 8.5).
- The Countryside and Rights of Way Act 2000 (Ref 8.6).
- Natural Environment and Rural Communities Act 2006 (Ref 8.7) (NERC Act) Section 40 and 41.
- The Protection of Badgers Act 1992 (Ref 8.8).
- The Hedgerows Regulations 1997 (Ref 8.9).
- The Salmon and Freshwater Fisheries Act 1975 (as amended) (Ref 8.10).
- Wild Mammals (Protection) Act 1996 (Ref 8.11).

Planning policy

8.2.2 The primary basis for deciding whether or not to grant a Development Consent Order (DCO) is the National Policy Statement for National Networks (NPSNN)[1] (Ref 8.12) which sets out policies to guide how DCO applications would be decided and how the impacts of national networks infrastructure should be considered. Table 8.1 identifies the NPSNN policies relevant to the biodiversity assessment and where in this ES chapter information is provided to address these policy requirements.

[1] Although other policies can have weight as relevant and important matters in decision making. See Case for the Scheme for more information [TR010054/APP/7.2].

Table 8.1: NPSNN policies relevant for the biodiversity assessment

NPSNN para.	Requirement of the NPSNN	Location where information addresses policy requirements
4.22	Prior to granting a Development Consent Order, the Secretary of State must, under the Habitats Regulations, consider whether it is possible that the project could have a significant effect on the objectives of a European site, or on any site to which the same protection is applied as a matter of policy, either alone or in combination with other plans or projects.	Refer to Habitat Regulations Assessment (HRA) report [TR010054/APP/6.9] and Section 8.9 'Assessment of likely significant effects'.
4.23	Applicants are required to provide sufficient information with their applications for development consent to enable the Secretary of State to carry out an Appropriate Assessment if required. This information should include details of any measures that are proposed to minimise or avoid any likely significant effects on a European site. The information provided may also assist the Secretary of State in concluding that an appropriate assessment is not required because significant effects on European sites are sufficiently unlikely that they can be excluded.	Refer to HRA report [TR010054/APP/6.9] and Section 8.9 'Assessment of likely significant effects'.
5.22	Where the project is subject to EIA [Environmental Impact Assessment] the applicant should ensure that the environmental statement clearly sets out any likely significant effects on internationally, nationally and locally designated sites of ecological or geological conservation importance (including those outside England) on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity and that the statement considers the full range of potential impacts on ecosystems.	Refer to Section 8.9 'Assessment of likely significant effects'.
5.23	The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.	Refer to Section 8.8 'Design, mitigation and enhancements'.
5.24	The Government's biodiversity strategy aims to halt overall biodiversity loss; support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people. This aim needs to be viewed in the context of the challenge of climate change.	Refer to Section 8.8 'Design, mitigation and enhancements' and Appendix 8.2 Biodiversity Metric Calculations [TR010054/APP/6.3].
5.25	Development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. Where significant harm cannot be avoided or mitigated, as a last resort, appropriate compensation measures should be sought.	Refer to Chapter 3: Assessment of Alternatives and Section 8.8 'Design, mitigation and enhancements'.
5.26	In taking decisions, the Secretary of State should ensure that appropriate weight is attached to designated sites of	Refer to Section 8.3 'Assessment

NPSNN para.	Requirement of the NPSNN	Location where information addresses policy requirements
	international, national and local importance, protected species, habitats and other species of principal importance (HPIs and SPIs) for the conservation of biodiversity, and to biodiversity and geological interests within the wider environment.	methodology' and Section 8.6 'Baseline conditions'.
5.27	The most important sites for biodiversity are those identified through international conventions and European Directives. The Habitats Regulations provide statutory protection for European sites. The National Planning Policy Framework states that the following wildlife sites should have the same protection as European sites: potential Special Protection Areas and possible Special Areas of Conservation; listed or proposed Ramsar sites; and sites identified, or required, as compensatory measures for adverse effects on European sites, potential Special Protection Areas, possible Special Areas of Conservation and listed or proposed Ramsar sites.	Refer to Section 8.3 'Assessment methodology' and Section 8.6 'Baseline conditions'.
5.28	Many Sites of Special Scientific Interest (SSSIs) are also designated as sites of international importance and will be protected accordingly. Those that are not, or those features of SSSIs not covered by an international designation, should be given a high degree of protection. All National Nature Reserves are notified as SSSIs.	Refer to Section 8.3 'Assessment methodology' and Section 8.6 'Baseline conditions'.
5.29	Where a proposed development on land within or outside a SSSI is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), development consent should not normally be granted. Where an adverse effect on the site's notified special interest features is likely, an exception should be made only where the benefits of the development at this site clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs.	Refer to Section 8.6 'Baseline conditions' and Section 8.9 'Assessment of likely significant effects'.
5.31	Sites of regional and local biodiversity and geological interest (which include Local Geological Sites, Local Nature Reserves [LNR] and Local Wildlife Sites [LWS] and Nature Improvement Areas) have a fundamental role to play in meeting overall national biodiversity targets, in contributing to the quality of life and the well-being of the community, and in supporting research and education. The Secretary of State should give due consideration to such regional or local designations. However, given the need for new infrastructure, these designations should not be used in themselves to refuse development consent.	Refer to Section 8.6 'Baseline conditions', Section 8.8 'Design, mitigation and enhancements' and Section 8.9 'Assessment of likely significant effects'.
5.32	Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. The Secretary of State should not grant development consent for any development	Refer to Section 8.6 'Baseline conditions', Section 8.8 'Design, mitigation and

NPSNN para.	Requirement of the NPSNN	Location where information addresses policy requirements
	that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need for and benefits of the development, in that location, clearly outweigh the loss. Aged or veteran trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided. Where such trees would be affected by development proposals, the applicant should set out proposals for their conservation or, where their loss is unavoidable, the reasons for this.	enhancements', and Section 8.9 'Assessment of likely significant effects'.
5.33	Development proposals potentially provide many opportunities for building in beneficial biodiversity or geological features as part of good design. When considering proposals, the Secretary of State should consider whether the applicant has maximised such opportunities in and around developments. The Secretary of State may use requirements or planning obligations where appropriate in order to ensure that such beneficial features are delivered.	Refer to Section 8.8 'Design, mitigation and enhancement'.
5.34	Many individual wildlife species receive statutory protection under a range of legislative provisions.	Refer to Section 8.8 'Design, mitigation and enhancements' and Section 8.10 'Assessment of likely significant effects'.
5.35	Other species and habitats have been identified as being of principal importance for the conservation of biodiversity in England and Wales and therefore requiring conservation action. The Secretary of State should ensure that applicants have taken measures to ensure these species and habitats are protected from the adverse effects of development. Where appropriate, requirements or planning obligations may be used in order to deliver this protection. The Secretary of State should refuse consent where harm to the habitats or species and their habitats would result, unless the benefits of the development (including need) clearly outweigh that harm.	
5.36	Applicants should include appropriate mitigation measures as an integral part of their proposed development, including identifying where and how these will be secured. In particular the applicant should demonstrate that: • during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works; • during construction and operation, best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised (including as a consequence of transport access arrangements); • habitats will, where practicable, be restored after construction works have finished;	Refer to Section 8.8 'Design, mitigation and enhancements'.

NPSNN para.	Requirement of the NPSNN	Location where information addresses policy requirements
	• developments will be designed and landscaped to provide green corridors and minimise habitat fragmentation where reasonable; • opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals, for example through techniques such as the 'greening' of existing network crossing points, the use of green bridges and the habitat improvement of the network verge.	
5.38	The Secretary of State will need to take account of what mitigation measures may have been agreed between the applicant and Natural England and/or the MMO, and whether Natural England and/or or the MMO has granted or refused, or intends to grant or refuse, any relevant licences, including protected species mitigation licences.	Refer to paragraph 8.3.31 to 8.3.32, the Consultation Report [TR010054/APP/5.1] and Appendix 8.3: Letters of No impediment [TR010054/APP/6.3].

8.2.3 Other relevant policies have been considered as part of the biodiversity assessment where these have informed the identification of receptors and resources and their sensitivity; the assessment methodology; the potential for significant environmental effects; and required mitigation. These policies include:

- National Planning Policy Framework (NPPF) (Ref 8.13): Section 15 paragraphs 170-177 Conserving and enhancing the Natural Environment (including protection and enhancement of biodiversity; provision of measurable net gain for biodiversity; and creating/ maintaining coherent ecological networks). In relation to biodiversity, the NPPF contains similar provisions to the NPSNN although a key difference is the removal of references to “avoiding net loss of biodiversity” and the inclusion of “minimising impacts and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures”. The NPPF has weight as a relevant and important matter when making a decision on the DCO application.
- National Planning Practice Guidance for the Natural Environment (Ref 8.14) provides context to the NPPF and advises on how the consideration of biodiversity can inform planning decisions.
- South Staffordshire Council Local Plan Core Strategy (Ref 8.15) and Site Allocations Document (Ref 8.16) are also relevant and important matters in decision making and contain the following policies that seek to protect and enhance the natural environment.
  - EQ1 Protecting, Enhancing and Expanding Natural Assets
  - EQ2 Cannock Chase Special Area of Conservation
  - EQ7 Water Quality

Other guidance

8.2.4 Other guidance and strategies that have informed the assessment include (more detail is provided within Appendix 8.1 [TR010054/APP/6.3]):

- Standing advice from Natural England and Department for Environment Food and Rural Affairs (DEFRA) (Ref 8.17).
- UK Post-2010 Biodiversity Framework (Ref 8.18).
- Biodiversity 2020, A strategy for England's wildlife and ecosystem services (Ref 8.19).
- Staffordshire Biodiversity Action Plan 2001 (SBAP) (Ref 8.20).
- Enhancing Biodiversity Across the West Midlands 2008 (Ref 8.21).
- Highways England Road Investment Strategy (Ref 8.22).
- Highways England Biodiversity Plan 2015 (Ref 8.23).

8.3 Assessment methodology

General approach

8.3.1 The biodiversity assessment has been undertaken as follows:

- Define the study area for the assessment, which considers the Zone of Influence (ZoI) of the Scheme[2]. The ZoI is the area over which ecological features may be affected by biophysical changes because of the Scheme and associated activities.
- Undertake desk and field-based assessments in 2018 and 2019 for designated sites, habitats and species to determine the ecological baseline for the Scheme within the Study Area;
- Determine the nature conservation importance of each ecological feature recorded during the desk and field-based assessments to determine which of those features are of conservation importance and could potentially be affected by the Scheme. These features are referred to as Important Ecological Features (IEF);
- Assess the potential impacts on IEFs because of the Scheme;
- Design suitable avoidance and mitigation measures to address potential impacts;
- Determine the significance of any residual effects and design suitable compensation measures to address significant residual effects; and,
- Identify opportunities for biodiversity enhancements where possible to do so within the limitations of the DCO.

[2] The 'zone of influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries.

8.3.2 Key methodology documents of relevance to the biodiversity assessment are as follows:

- LA 108 Biodiversity (Ref 8.1) has been used to guide the approach to the assessment of impacts and effects on ecological features.
- LA 104: Environmental Assessment and Monitoring (Ref 8.24).
- LA 105: Air Quality (Ref 8.60)
- LA 118 Biodiversity design (Ref 8.25).
- The CIEEM guidelines (Ref 8.2) have been referenced in the assessment to supplement the guidance and criteria applied from the DMRB.

Establishing baseline conditions

8.3.3 Establishment of the baseline environment has involved reference to existing data sources, consultation with statutory bodies and other organisations, and fieldwork surveys.

Desk study

8.3.4 A desk study has been undertaken to identify nature conservation designations and protected and notable habitats and species (ecological features) potentially relevant to the Scheme. Data search information has been obtained from:

- Staffordshire Ecological Record Centre (SERC);
- Ecological records centre for Birmingham and the Black Country (EcoRecord);
- Multi agency geographic information for the countryside (MAGIC) website; and
- Joint Nature Conservation Committee (JNCC) website.

8.3.5 Data obtained from the above organisations has been supplemented by information obtained from web-based resources, assessments published by third parties, and other documents, such as county atlases.

8.3.6 In addition, previous ecological survey reports for the Scheme, undertaken in 2015 to inform the options selection process, have been reviewed (Ref 8.56, 8.57, 8.58).

8.3.7 Other information sources referenced as part of the baseline review are 1:25,000 and 1:10,000 scale Ordnance Survey mapping, three-dimensional topographical data, and aerial photography available in the public domain.

Fieldwork

8.3.8 Field surveys have been undertaken by qualified and experienced ecologists between 2018 and 2020, the purpose of which is to identify, record and map habitats and protected and notable species within the study areas defined in Section 8.5.

8.3.9 The scope of the following field surveys has been established through the desk study and through consultation with Natural England, Staffordshire County Council and the Environment Agency, and taking account of good practice guidance for the species or species groups where this exists. For further details refer to the appendices in Volume 3 of the ES [TR010054/APP/6.3]:

- Extended phase 1 habitat survey (including non-native invasive plant species) and phase 2 habitat surveys (National Vegetation Classification surveys) and habitat condition assessments in line with Chief Highway Engineer Memorandum 422/18 (Ref 8.26) – reported in Appendix 8.4 Designated Sites and Habitats [TR010054/APP/6.3].
- Badger surveys – reported in Appendix 8.5 [TR010054/APP/6.3] (CONFIDENTIAL).
- Barn owl surveys – reported in Appendix 8.6 [TR010054/APP/6.3] (CONFIDENTIAL).
- Bat surveys – reported in Appendix 8.7 [TR010054/APP/6.3].
- Breeding bird surveys – reported in Appendix 8.8 [TR010054/APP/6.3].
- Wintering bird surveys – reported in Appendix 8.9 [TR010054/APP/6.3].
- Otter and water vole surveys – reported in Appendix 8.10 [TR010054/APP/6.3].
- Great crested newt (GCN) surveys – reported in Appendix 8.11 (2018/19 surveys) and Appendix 8.15 (2020 surveys) [TR010054/APP/6.3].
- Reptile surveys – reported in Appendix 8.12 [TR010054/APP/6.3].
- Terrestrial invertebrate surveys – reported in Appendix 8.13 [TR010054/APP/6.3].
- Aquatic invertebrates, fish and aquatic macrophytes surveys – reported in Appendix 8.14 [TR010054/APP/6.3].

Importance (value) of ecological features

8.3.10 The importance (value) of ecological features (comprising designated sites, habitats, species assemblages and populations of species) has been assessed with reference to their:

- nature conservation status (which relates to rarity and threat status);
- conservation value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations); and
- legal status (i.e. whether they are afforded protection under legislation).

8.3.11 Other characteristics considered to contribute to the importance of ecological features include, but are not limited to:

- fragility;
- size;
- habitat diversity;
- potential value;
- typicalness;
- position with the ecological/geological unit;
- recorded history;
- naturalness; and
- intrinsic appeal.

8.3.12 Importance is determined based on the following geographical contexts:

- International (Europe).
- National (England).
- Regional (West Midlands).
- County (Staffordshire).
- Local (South Staffordshire; Shareshill and Hilton).
- Negligible (less than Local).

8.3.13 The importance of features does not necessarily equate directly to their sensitivity. For example, an ecological feature of high conservation importance may comprise a robust ecosystem which is resilient to effects caused by external factors and is therefore not highly sensitive. Conversely, an ecological feature may be highly sensitive to change but widespread or abundant at the geographic scale considered and therefore the population within the study area may not be important at that scale.

8.3.14 The criteria applied in the assessment to determine importance are presented in Table 8.2 and have been taken from LA 118 (Ref 8.25), with additional criteria applied from the more recent CIEEM guidelines (Ref 8.2) where appropriate.

Table 8.2: Criteria to determine ecological importance

Importance criteria	
International or European importance	
Sites	Sites including: 1) European sites: a) Sites of Community Importance (SCIs); b) Special Protection Areas (SPAs); c) potential SPAs (pSPAs); d) Special Areas of Conservation (SACs); e) Candidate or possible SACs (cSACs or pSACs); f) Wetlands of International Importance (Ramsar sites). 2) Biogenetic Reserves, World Heritage Sites (where recognised specifically for their biodiversity value) and Biosphere Reserves. 3) areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
Habitats	N/A
Species	Resident, or regularly occurring, populations of species which can be considered at an international or European level where: 1) the loss of these populations would adversely affect the conservation status or distribution of the species at an international or European scale; or 2) the population forms a critical part of a wider population at this scale; or 3) the species is at a critical phase of its life cycle at an international or European scale.
UK or national importance	
Sites	Sites including: 1) Sites of Special Scientific Interest (SSSIs) or Areas of Special Scientific Interest;

Importance criteria	
	2) National Nature Reserves; 3) National Parks; 4) Marine Protected Areas including Marine Conservation Zones; or 5) areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such.
Habitats	Habitats including: 1) areas of UK BAP priority habitats; 2) habitats included in the relevant statutory list of priority species and habitats; and 3) areas of irreplaceable habitats including: • ancient woodland; • ancient or veteran trees; • blanket bog; • limestone pavement; • sand dunes; • salt marsh; • lowland fen. 4) areas of habitat which meet the definition for habitats listed above but which are not themselves designated or listed as such.
Species	Resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: 1) the loss of these populations would adversely affect the conservation status or distribution of the species at a UK or national scale; or 2) the population forms a critical part of a wider population at this scale; or 3) the species is at a critical phase of its life cycle at a UK or national scale.
Regional importance	
Sites	Designated sites (non-statutory) including heritage coasts.
Habitats	Areas of habitats identified (including for restoration) in regional plans or strategies (where applicable).
Species	Species including: 1) resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: • the loss of these populations would adversely affect the conservation status or distribution of the species at a regional scale; or • the population forms a critical part of a wider regional population; or • the species is at a critical phase of its life cycle; 2) Species identified in regional plans or strategies.
County or equivalent authority importance	
Sites	Wildlife / nature conservation sites designated at a county (or equivalent) level including: 1) Local Wildlife Sites (LWS); 2) Local Nature Conservation Sites (LNCS); 3) Local Nature Reserves (LNRs); 4) Sites of Importance for Nature Conservation (SINCs); 5) Sites of Nature Conservation Importance (SNCIs); 6) County Wildlife Sites;

Importance criteria	
Habitats	Areas of habitats identified in county or equivalent authority plans or strategies (where applicable).
Species	Species including: 1) resident, or regularly occurring, populations of species which can be considered at an international, European, UK or national level where: a) the loss of these populations would adversely affect the conservation status or distribution of the species at a county or unitary authority scale; or b) the population forms a critical part of a wider county or equivalent authority area population, e.g. metapopulations; or c) the species is at a critical phase of its life cycle. 2) Species identified in a county or equivalent authority area plans or strategies.
Local importance	
Sites	Wildlife / nature conservation sites designated at a local level including: 1) LWS; 2) (LNCS); 3) LNRs; 4) SINCs; 5) SNCIs; 6) Sites of Local Nature Conservation Importance (SLNCIs).
Habitats	Areas of habitat considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal, or genetic exchange.
Species	Populations / communities of species considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal or genetic exchange.

8.3.15 Where a feature has more than one level of importance, its overriding importance is that of the highest level. The importance of ecological features identified within the assessment is evaluated and presented as part of the baseline conditions reported within in Section 8.6.

Characterisation of Ecological Impacts

8.3.16 Impacts on ecological features resulting from the Scheme have been characterised by taking into consideration the following aspects, where applicable:

- Positive (beneficial) or negative (adverse) impact.
- Duration (e.g. permanent/temporary).
- Reversibility (e.g. irreversible/reversible).
- Extent/magnitude.
- Frequency and timing.

8.3.17 In relation to the complexity of an impact:

- A direct impact is a direct consequence of the Scheme, or a particular activity, including physical loss or gain of a habitat, or direct mortality of individuals or populations.

- An indirect impact occurs via an intermediary or as a result of an impact pathway, for example impacts on air quality or water leading to changes in habitats or the populations of species they support.
- The impacts arising from different activities can act in combination within the Scheme to affect habitats and species populations.
- A cumulative impact can arise from the combination of several development projects acting simultaneously or in succession.

8.3.18 The magnitude of impact has been defined using the generic impact criteria and ratings presented in Chapter 4: Environmental Assessment Methodology, Table 4.2.

8.3.19 Impacts on biodiversity arising from construction and operation of the Scheme are reported separately. A further assessment is made, where relevant, in the design year (15 years after construction) to report the contribution that certain types of mitigation measure would have on these impacts once established and fulfilling their intended function, for example replacement hedgerows.

8.3.20 The greatest impacts on ecological sites, habitats and species are generally attributed to those arising from construction, with the removal of habitats to construct the Scheme.

8.3.21 Impacts arising from the operational phase are those associated with the operation and use of the Scheme. For example, these could be the impacts of vehicle lighting, noise and air pollution arising from traffic travelling on new or improved sections of road within the Scheme, and those associated with any road lighting incorporated into the design of the Scheme.

8.3.22 The identification of impacts on ecological features during either construction or operation takes account of the relevant embedded and standard mitigation measures, and compensation measures, described in Section 8.8.

Significance of effects

8.3.23 The process of identification has been guided by the CIEEM guidelines (Ref 8.2), which state that:

"For the purpose of ecological impact assessment, a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'…or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity)".

8.3.24 Effects have been reported in relation to the geographic scale at which they are significant i.e. from International to below Local level as summarised within Table 8.3. The categories of significance applied in the assessment are taken from LA 118 (Ref 8.25), as shown in Table 8.4.

Table 8.3: Level of impact descriptive criteria

Level of impact/ change		Typical description
Major	Adverse	1) Permanent/irreversible damage to a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	1) Permanent addition of, improvement to, or restoration of a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Moderate	Adverse	1) Temporary/reversible damage to a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource.
	Beneficial	1) Temporary addition of, improvement to, or restoration of a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource.
Minor	Adverse	1) Permanent/irreversible damage to a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
	Beneficial	1) Permanent addition of, improvement to, or restoration of a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
Negligible	Adverse	1) Temporary/reversible damage to a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
	Beneficial	1) Temporary addition of, improvement to, or restoration of a biodiversity resource; and 2) the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource.
No change		No observable impact, either positive or negative

Table 8.4: Significance of effects matrix

Resource importance	Level of impact				
	No change	**Negligible**	**Minor**	**Moderate**	**Major**
International or European importance	Neutral	Slight	Moderate or large	Large or very large	Very large
UK or national importance	Neutral	Slight	Slight or moderate	Moderate	Large or very large
Regional importance	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
County or equivalent authority importance	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
Local importance	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Nitrogen deposition

8.3.25 Potential impacts and effects on designated sites, ancient woodland and veteran trees through changes in air qualiy have been assessed following DMRB Guidance LA105 [Ref 8.60], with the methodology summarised as follows:

- Calculate the nitrogen deposition for the Do Minimum (without Scheme) and the Do Something (with Scheme) scenarios.
- If the total (Scheme plus background deposition) nitrogen deposition in the Do Something scenario is less than the critical load at a site, it is not significant. Otherwise continue analysis.
- If the change in nitrogen deposition is less than 1% of the (lower bound of the) critical load, it is not significant. Otherwise continue analysis.
- Identify whether the change in nitrogen deposition could lead to the loss of one species (taking into account the air quality attribute for the site).
- For most sites the air quality attribute will be set to ‘restore’ and the lowest change in nitrogen deposition which would bring about a loss of one species regardless of background nitrogen deposition should be used.
- The lowest change in nitrogen deposition which would bring about the loss of one species is habitat dependent. Where information is not available for the habitat in question, the habitat with the lowest change in nitrogen deposition likely to lead to the loss of one species, excluding nutrient impoverished sand dunes, should be used. This habitat is either Upland Heath TU 2009 or Lowland Heath TU 2009, both of which are listed at 0.4 kg N ha^{-1} yr^{-1}.

- Therefore if the change in nitrogen deposition is less than 0.4 kg N ha^{-1} yr^{-1}, for all habitats apart from nutrient impoverished sand dunes, it is not significant. Otherwise continue analysis.;
- Conduct site investigation and identify whether there are species located in the area which could be lost due to the identified nitrogen deposition change. If there are not, it is not significant. Otherwise continue analysis. To this end, aerial photography was examined to determine whether habitats may be present within the boundary of the designated site, but not within the relevant zone where deposition exceeds 0.4 kg N ha^{-1} yr^{-1}.
- Finally, if a project air quality action plan can mitigate the impact of the project such that the loss of one species is not triggered, it is not significant. Otherwise the impact is significant.

8.3.26 For the purposes of this sensitivity test therefore the two important indicators for significance are whether the change in nitrogen deposition exceeds 1% of the critical load, and further, whether it is ≥0.4 kg N ha^{-1} yr^{-1}.

8.3.27 The assessment of potential impacts and effects are presented in this chapter, as well as document reference AS-059/8.2, 'DMRB Updates and the Impact on the DCO Application'[3], which should be read in conjunction with this chapter.

Application of biodiversity metric

8.3.28 A Habitat Metric Calculation exercise has been undertaken and is provided in detail at Appendix 8.2 [TR010054/APP/6.3]. Biodiversity units have been determined using the metric calculation published by Natural England, referred to as The Biodiversity Metric 2.0 (Ref 8.26 and 8.27).

8.3.29 The calculation considers habitat losses through construction of the Scheme within the Scheme boundary, and the effects of temporary land-take within habitats (for instance land used for construction that would subsequently be restored to its former use upon completion of the works) compared against the restoration and compensation measures provided.

Scoping response

8.3.30 The proposed scope of the biodiversity assessment is detailed in the EIA Scoping Report (Ref 8.28) submitted to the Inspectorate on 11 January 2019. An overview of the Inspectorate's scoping opinion in relation to biodiversity effects is presented in Table 8.5. Where the assessment has been undertaken in accordance with the scoping opinion point, a response and the relevant ES section is provided; where an alternative approach has been agreed with the relevant stakeholders, an explanation is provided.

[3] AS-059/8.2 is a technical note which considers the updates to the DMRB air quality and noise and vibration methodology (first published in November 2019) and whether the change in methodlogy would alter the results of the ES. This included new methodology LA 105 for the assessment of impacts from nitrogen deposition on ecological receptors.

Table 8.5: Scoping opinion and response

Scoping Opinion	Where addressed in the ES
The Inspectorate	
The Scoping Report does not provide evidence to explain how impact pathways from the Proposed Development to these receptors can be ruled out. For example, potential effects resulting from impacts to air quality are considered relevant to the Cannock Chase SAC but no equivalent information is given with regards to the receptors identified here. The inspectorate does not agree that consideration of these impacts to the receptors identified should be scoped out of the assessment. The ES should assess impacts to these receptors where significant effects are likely to occur.	Full details provided in the HRA report [TR010054/APP/6.9] and summarised in Section 8.7 of this chapter. The screening assessment confirmed that there are no likely significant effects identified as a result of the Scheme on any internationally designated sites.
The Scoping Report does include evidence demonstrating that barn owl do not forage towards or within the draft DCO boundary and that severance effects are considered unlikely. However, the Scoping Report does not provide a conclusion regarding impact causing disturbance on the nest site (e.g. from noise or lighting) or the risk of increased mortality through traffic collisions. The Inspectorate does not agree to scope these matters out of the ES and requests that the ES make an assessment of these impacts to barn owl populations, where significant effects could occur.	Survey data provided in Appendix 8.6 [TR010054/APP/6.3] and assessment of impacts and mitigation requirements provided in Section 8.7 and 8.8 of this chapter. This includes an assessment of impacts as a result of noise, lighting and mortality from traffic collisions.
The Scoping Report and supporting appendices provide evidence demonstrating an absence of these species and species groups from the draft DCO boundary study area(s). The Inspectorate is content that significant effects are therefore unlikely and agrees to scope these out from the assessment in the ES.	An extension to the order limits and consideration of 2018 survey coverage resulted in these species being scoped in for full assessment as part of the ES. Refer to Sections 8.4 and 8.5.
The ES should provide a clear description to describe and explain which designated sites have been included in the assessment. The ES should ensure that any figures depicting the designated sites discussed in the ES are clear and robust.	See Appendix 8.4 [TR010054/APP/6.3] for details of desk study. Sections 8.3, 8.5 and 8.6 describe the methodology, study area and results of the desk study respectively in relation to designated sites.
Every effort should be made to ensure that any figures supporting the ES are accurate and that they include the relevant features which form part of the assessment. Figures in the ES should include a clear distinction between the different features presented.	Figures accompanying this chapter [TR010054/APP/6.2] and all figures associated with the Appendices to this chapter [TR010054/APP/6.3] address these points.
The Inspectorate would expect to see a section in the ES detailing all the potential impacts considered, before an explanation of how these relate to the individual ecological features present within the receiving environment. The description in the ES should distinguish between impacts during construction and operation.	Potential impacts and how these relate to ecological features have been considered -see Section 8.7 of this chapter.

Scoping Opinion	Where addressed in the ES
The Scoping Report does not consistently indicate whether road mortality impacts to bats will be assessed. For the avoidance of doubt, the Inspectorate considers that this matter should form part of the assessment and advises that the ES clearly assess these impacts.	Potential road mortality impacts on bats are scoped into the assessment and have been assessed and are documented in Section 8.7 of this chapter.
The Inspectorate encourages the Applicant to make effort to avoid impacts on ancient woodland where possible. The Inspectorate considers that replanting and soil translocation should be undertaken in accordance with the mitigation hierarchy (referenced in Chapter 5 of the Scoping Report).	The Scheme has been designed to avoid impacts on ancient woodland as far as possible. See Section 8.7 of this chapter for an assessment of impacts on this receptor.
The inspectorate would expect to see evidence of consultation with the relevant consultation bodies in the ES. The Inspectorate encourages the Applicant to use effective consultation to inform the assessment, in particular in effort to agree the baseline assessment, the methodology, and mitigation measures.	See paragraphs 8.3.31 to 8.3.32 the Consultation Report [TR010054/APP/5.1] and Appendix 8.3: Letters of No impediment [TR010054/APP/6.3].
The ES should be based on robust and comprehensive information any limitations to data collection and the implications for the assessment should be described and explained in the ES.	Refer to Section 8.4 Assessment methodology.
Appropriate cross-reference should be made in the ES where these assessments have informed one another.	ES Chapter 8: Biodiversity summarises all of the scoping, consultation and baseline studies.
Natural England	
No specific comments.	N/A
Staffordshire County Council	
We agree with the broad conclusions of this section regarding species and habitat surveys to be scoped in and scoped out, with the following comments: Hedgerow assessment is scoped in – this should use the HEGS [Hedgerow Evaluation and Grading System] methodology as it is more reliable in Staffordshire than the Hedgerow Regulations.	See Section 8.6 of this chapter for details of species that have been scoped in. A HEGs assessment has been undertaken.
We cannot find a reference to assessment of veteran trees in their own right, rather than as bat roost potential, which is covered. This should be included and may indicate the need to have additional terrestrial invertebrate assessment.	Refer to Arboricultural Impact Assessment Report, Appendix 7.1 [TR010054/AP/6.3] for the location of veteran trees. No veteran trees will be directly affected by the Scheme.
Lesser horseshoe bat is now found further north in the county than previously understood and data searches will not necessarily pick this up. All bat surveys should now consider this species.	The bat survey methodologies encompassed all species potentially present. See Section 8.6 of this chapter.
At paragraph 9.6.2 we remain concerned about possible effects on Lower Pool and Brookfield Farm Local Wildlife Sites (also known as SBIs) through permanent loss of	An assessment of impacts on Lower Farm and Brookfield Farm LWSs and ancient woodland

Scoping Opinion	Where addressed in the ES
habitat. This may also apply to woodlands that have not yet been confirmed as ancient. If avoidance is not possible, then mitigation effort should be excellent, including translocation and habitat creation with appropriate long-term aftercare. This also applies to indirect effects such as those mentioned for Oxden Leasow [Whitgreaves wood] Wood.	including Oxden Leasow (also known as Whitgreaves Wood)is included within Section 8.7 of this chapter and detailed mitigation measures are provided in section 8.8.
At paragraph 9.7.4 the inclusion of possible enhancement measures is welcome. It would be particularly helpful to have a pond / pond created that precludes use for fishing and can act as an offline white-clawed crayfish refuge for a local population that is under threat.	A total of 12 ecology ponds have been incorporated into the design which will preclude fishing; however, will not be suitable for a white-clawed crayfish refuge as field ponds are typically too shallow and too warm in summer. It is not possible within the limitations of the Scheme to provide a new waterbody suitable for white-clawed crayfish. New habitat creation is covered in Sections 8.8 and 8.9 of this chapter.
At paragraph 9.8.3 the intention to comply with the avoid – mitigate - compensate hierarchy is welcomed. A biodiversity metric should also be employed to demonstrate that the scheme achieves net gain in line with NPPF. This should use realistic timescales and target conditions for any compensation habitat, for example the target time for new woodland to achieve reasonable condition should be 30+ years.	A Biodiversity Metric Calculation has been undertaken. See Appendix 8.2 [TR010054/APP/6.3]
Environment Agency	
Salmonid spawning season from 1st October to 31st May inclusive for salmonid rivers and any works on existing barriers to Eel Migration would be required to improve eel migration under the Eels (England and Wales) Regulations 2009.	This has been considered - see Section 8.6 of this chapter.
Although the initial surveys have not found signs of water vole and otter these are highly mobile species so any crossings should include measures to allow their movement.	A full suite of water vole and otter surveys has been completed - see Section 8.6 of this chapter. Surveys undertaken in 2019 have confirmed that water vole and otter are present on Latherford Brook (Watercourse 5). An open span bridge will be included at this crossing point so movement of otter and water vole will be uninhibited.
We note mitigation measures such as dust suppression and replacement wildlife ponds are proposed as part of the scheme. If water is required for these purposes, then depending on the source of water and volumes required, abstraction or impoundment licences may be required from us.	Noted.

Scoping Opinion	Where addressed in the ES
Hilton Parish Council	
A detailed assessment of the affect the proposal will have on the ancient woodland situated in Dark Lane.	The woodland at Dark Lane has been confirmed not to be ancient; however, a detailed assessment of impacts is provided in Section 8.7 of this chapter.

Consultation

8.3.31 Consultation with Natural England, the Environment Agency and the County Ecologist at Staffordshire County Council has been undertaken following their responses and throughout the assessment process.

8.3.32 The Preliminary Environmental Information (PEI) Report for this Scheme (Ref 8.29) was published in May 2019 as part of the statutory consultation. The PEI Report presented the environmental information collected, together with the preliminary findings of the assessment of likely significant environmental effects of the Scheme at the time. Comments received during public consultation and the associated responses, are detailed within the Consultation Report [TR010054/APP/5.1].

8.4 Assessment assumptions and limitations

Scheme design and limits of deviation

8.4.1 The assessment has been based on the Scheme description detailed within Chapter 2: The Scheme, and has taken into account the maximum lateral and vertical limits of deviation defined on the Works Plans [TR010054/APP/2.4] in order to establish a realistic worst-case assessment scenario.

8.4.2 This scenario has identified and reported the effect that the maximum lateral and vertical limits of deviation would realistically give rise to. This has, for example, taken into account the potential for the Scheme to be brought into closer proximity to ecological features.

8.4.3 Notwithstanding any potential deviation, all biodiversity mitigation measures described in Section 8.8 would still be deliverable within the maximum limits of deviation and would still fulfil their intended function.

Baseline survey data

8.4.4 The assessment has been based on the baseline conditions recorded at the time of undertaking field surveys (noting seasonal variations).

8.4.5 In all cases, the use of third-party data within this assessment has been supported by an appraisal of the likely current baseline conditions. This includes verification of the current extent and condition of habitats in order to evaluate any risk of change in the baseline ecological information, and therefore the validity of the third-party data relied upon in the assessment. This is considered to be a proportionate and reasonable approach for evaluating any potential impacts, developing mitigation measures, and assessing the likelihood of significant effects.

8.4.6 The desk study and ecological baseline data collected from floral and faunal surveys presented within Section 8.6 is considered to be sufficient to provide a robust assessment of the likely significant effects of the Scheme.

8.4.7 Access to the majority of the study areas (refer to Table 8.6 for definition) was provided over the course of 2018, 2019 and 2020; however, some landowners refused access for the duration of the survey seasons in both 2018, 2019 (refer to Figure 8.4 for Landowner Access [TR010054/APP/6.2]) and 2020 (refer to Figure 8.35 [TR010054/APP/6.2]. Where no access was granted the assessment has followed a precautionary approach using existing information on the ecological feature both from the desk study and results of the field survey on adjacent land within the local area, publicly available aerial imagery and professional judgement based on knowledge and experience of similar schemes.

8.4.8 Species specific limitations are set out in the relevant appendices, 8.5 to 8.15 [TR010054/APP/6.3]; and despite the limitations identified the available survey data combined with the existing desk-based information and precautionary approach is considered sufficient to inform the ecological impact assessment.

Impact assessment and mitigation

8.4.9 The impact assessment has been based on the information obtained and evaluated at the time of reporting and reflects the Scheme design and the maximum likely extents of land take required for its construction and operation, taking account of the limits of deviation (see Chapter 2: The Scheme and illustrated on the Works Plans [TR010054/APP/2.4]).

8.4.10 Where data and information are unavailable or incomplete, as outlined above, a precautionary approach has been taken in relation to the potential importance of ecological features and therefore the limitations encountered in relation to the gathering of survey data are not considered to have affected the findings of the ecological impact assessment.

Habitat loss (permanent and temporary)

8.4.11 The assessment has assumed that all habitats within the limits of deviation of the highway and associated structures of the Scheme would likely be permanently lost through its construction.

8.4.12 Within the remainder of the land within the Scheme boundary, there would be temporary loss of habitats for construction compounds which are subsequently re-instated to previous type and condition. There would also be permanent losses where habitats are removed and better quality habitats created, such as in ecological mitigation and compensation measures, which include some of the site compound areas.

8.4.13 The assessment has assumed that temporary acquisition of land would not result in the removal of trees and hedgerows, except where essential access is required. The majority of boundary features (hedgerows) would be retained with minimum stand-off distances of 5 m. Essential access would involve the removal of no more than 10 m length of hedgerow at each hedgerow crossed.

8.5 Study area

8.5.1 A number of study areas have been defined and applied in the assessment, based on the consideration of the likely ZOI of the Scheme on ecological features. Study area definition is informed using a combination of professional judgement, good practice guidance where that exists, Highways England guidance (Ref 8.1) and guidance contained within the CIEEM guidelines (Ref 8.2), which define the zone of influence as: "…*the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities*".

8.5.2 In defining individual study areas, consideration is given to the geographic location, nature and scale of the Scheme. This references the areas of temporary and permanent land take and limits of deviation defined on the Works Plans [TR010054/APP/2.4], the location and scale of construction compounds, and areas of land identified for environmental mitigation and compensation measures.

Desk study

8.5.3 Table 8.6 presents the study areas applied in the desk study to identify nature conservation sites, protected and notable species, habitats and controlled weed species. Distances are measured from the Scheme boundary unless otherwise stated.

Table 8.6: Study areas applied in the desk study

Ecological Feature	Study Area
International statutory nature conservation designations	30 km for sites designated for bats 2 km for other sites 200 m of the affected road network (ARN[4])
National statutory nature conservation designations	2 km 200 m of the ARN
Local statutory nature conservation designations	
Non-statutory nature conservation designations	
Ancient woodland and veteran trees	
Priority habitats	Within or adjacent to the Scheme boundary
Barn owl	5 km
Protected or notable species	2 km
Controlled weed species	1 km

[4] The methodology for determining the extent of the ARN is set out in Chapter 5: Air Quality, paragraph 5.5.2. This methodology was revised in DMRB LA 105: Air Quality. Any changes to the ARN were identified as part of the air quality sensitivity testing presented in pre-examination document AS-059/8.2, 'DMRB Updates and the Impact on the DCO Application'.

Field surveys

8.5.4 Table 8.7 presents the study areas applied to field surveys. Further details regarding the definition of these study areas are presented in the associated survey reports within Appendix 8.4 to Appendix 8.15 [TR010054/APP/6.3].

Table 8.7: Study areas applied to field surveys

Field survey	Study area
Extended Phase 1 habitat survey (including invasive plant species)	An extended Phase I habitat survey was undertaken in April and May 2018 and was updated in July 2019. As a minimum the habitat survey area covered all accessible locations located within 50 m of the Scheme, as illustrated on Figure 8.3 [TR010054/APP/6.2]. See Appendix 8.4 for further information [TR010054/APP/6.3].
Phase 2 vegetation surveys	National Vegetation Classification surveys were undertaken within the site on areas of woodland; Hedgerow Grading System surveys were undertaken of all hedgerows likely to be directly affected by the Scheme. Habitat condition surveys were also undertaken See Appendix 8.4 [TR010054/APP/6.3].
Badger	In accordance with published guidance (Ref 8.25), all badger surveys completed in 2018 included accessible habitat within and up to 250m of the Scheme boundary, as illustrated on Figures 8.6 and 8.7 (CONFIDENTIAL) [TR010054/APP/6.2]. Update badger surveys were undertaken in 2019 to confirm status of setts previously recorded and any new setts in areas previously inaccessible within 250 m of the Scheme boundary. See Appendix 8.5 (CONFIDENTIAL) for further information [TR010054/APP/6.3].
Barn owl	500 m from the Scheme boundary as illustrated on Figure 8.8 (CONFIDENTIAL). A reduction in the field survey area from 1.5 km (the standard method for barn owl assessments for linear schemes) to 500 m was adopted for the Scheme upon evaluation of the existing major road network (M6, M6 Toll, M54 and A460) surrounding the Scheme and lack of prime dispersal habitat / connectivity of such habitat. See Appendix 8.6 for further information [TR010054/APP/6.3].
Bats	All accessible trees and structures in and within 100 m of the Scheme boundary were assessed for their suitability for roosting bats in 2018 and 2019. This was followed by a programme of emergence/re-entry surveys, and tree climbing where appropriate. Bat activity surveys (walked transects and automated static detector surveys) were undertaken within and where access allowed, adjacent to the Scheme boundary in 2018 and 2019, as illustrated on Figures 8.15 and 8.16 [TR010054/APP/6.2]. Crossing point surveys, in line with published guidance (Ref 8.30) were conducted in five locations within the Scheme boundary in 2019, as illustrated on Figure 8.16 [TR010054/APP/6.2]. These were selected based on where identification of potential commuting routes (suitable linear connections) are likely to be severed by the Scheme. The study areas used are appropriate based on the records received from the desk study, the lack of bat designations locally, the nature, quality and condition of habitats present and on account of the location of the Scheme boundary, which is surrounded by a busy road network. This may not be a complete barrier

Field survey	Study area
	to bats, however, is likely to reduce impacts of the Scheme on bats in the wider landscape. See Appendix 8.7 for further information [TR010054/APP/6.3].
Breeding Birds	Breeding bird surveys were conducted in 2018 and 2019, the study area for which included the Scheme boundary and a 250 m buffer, as illustrated on Figure 8.19 [TR010054/APP/6.2]. See Appendix 8.8 for further information [TR010054/APP/6.3].
Wintering Birds	Wintering bird surveys were conducted in the 2018/19 season, the study area of which comprised all suitable habitat (fields and waterbodies) within and (waterbodies) adjacent to and up to 250 m from the Scheme boundary, as illustrated on Figure 8.22 [TR010054/APP/6.2]. See Appendix 8.9 for further information [TR010054/APP/6.3].
Otter and Water Vole	The study area included suitable aquatic and terrestrial habitat within the Scheme boundary and up to a 100 m buffer. For otter, a 100 m buffer was chosen as it is the minimum recommended protection zone between a known otter breeding site and a development (Ref 8.59). The study area included watercourses and large waterbodies, as well as terrestrial habitat where this was over 1 ha in size, situated within 100 m of suitable aquatic habitat, and within 100 m of the Scheme boundary as illustrated on Figure 8.25 [TR010054/APP/6.2]. For water vole, the study area included suitable habitat within the Scheme boundary and all suitable habitat up to 100 m from the Scheme boundary to account for potential disturbance to water vole. See Appendix 8.10 for further information [TR010054/APP/6.3].
Great Crested Newt	Waterbodies within 500m of the Scheme boundary (as recommended by the GCN Mitigation Guidelines (Ref 8.31)) have been assessed for their potential to support GCN, and whether they would be affected by the Scheme, through desk and field-based studies. See Appendix 8.11 and Appendix 8.15 for further information [TR010054/APP/6.3].
Reptiles	Presence/ absence surveys were conducted in 2018 and 2019.The study area included accessible areas of suitable reptile habitat within and immediately adjacent to the Scheme boundary. See Figure 8.30 [TR010054/APP/6.2] and Appendix 8.12 for further information [TR010054/APP/6.3].
Terrestrial Invertebrates	Terrestrial invertebrate surveys were conducted within and immediately adjacent to the Scheme boundary where access permitted within habitats identified as suitable to support an important invertebrate assemblage. See Figure 8.31 to 8.33 [TR010054/APP/6.2] and Appendix 8.13 for further information [TR010054/APP/6.3].
Aquatic Invertebrates, Fish and Aquatic Macrophytes	The study area covered those waterbodies and watercourses likely to be impacted by the Scheme. This resulted in six watercourses for fish and two watercourses being surveyed for aquatic macroinvertebrates that cross the Scheme boundary. The surveys also covered four waterbodies for fish, seven waterbodies for aquatic macroinvertebrates, and four waterbodies and two watercourses for white-clawed crayfish. See Figure 8.34 [TR010054/APP/6.2] and Appendix 8.14 for further information [TR010054/APP/6.3].

8.6 Baseline conditions

Nature conservation designations

Statutory international nature conservation designations

8.6.1 Figure 8.1 [TR010054/APP/6.2] shows all statutory international nature conservation designations within 30 km. This shows that there are no statutory international nature conservation designations within 2 km of the Scheme boundary. In addition, none of the sites identified within 30 km of the Scheme boundary are designated for bats, and none are located within 200 m of the ARN.

8.6.2 The Habitats Regulations Assessment: No Significant Effects Report, is presented in a standalone report [TR010054/APP/6.9].

Statutory national nature conservation designations

8.6.3 Statutory national nature conservation sites within 2 km of the Scheme or within 200 m of the ARN identified during the desk study are summarised in Table 8.8, the locations of which are illustrated on Figure 8.2 and Figure 5.2 [TR010054/APP/6.2].

Table 8.8: Statutory national nature conservation designations within 2 km of the Scheme boundary or within 200 m of the ARN

Designation	Reason(s) for designation	Importance (reasoning)	Relationship to the Scheme
Stowe Pool and Walk Mill Clay Pit SSSI	Two waterbodies that have historically supported large and healthy populations of white-clawed crayfish.	National (SSSI)	The site is 1.5 km north-east from the Scheme boundary. The northern edge of the Scheme just falls within the 2 km impact risk zone that requires road schemes to consult with Natural England. Located to the north of the M6 Toll and east of the M6, there are significant major barriers between the site and the Scheme.
Four Ashes Pit SSSI	Designated for its geological interest a sequence of sands and gravels, overlain by till lying on top of Triassic Sandstone bed rock	National (SSSI)	The site is approximately 4.1 km north-west of the Scheme boundary and is located at its closest point approximately 7 m from the ARN.
Chasewater and the Southern Staffordshire Coalfield Heaths SSSI	Wet and dry lowland heath, fens and oligotrophic (nutrient-poor) standing open water habitats. Also supports two nationally scarce vascular plant species: floating water-plantain *Luronium* *natans* and round-leaved wintergreen *Pyrola rotundifolia*	National (SSSI)	The site is approximately 7.5 km east of the Scheme boundary and is located at its closest point approximately 38 m from the ARN.

Designation	Reason(s) for designation	Importance (reasoning)	Relationship to the Scheme
Belvide Reservoir SSSI	Large reservoir located within agricultural land particularly important as a wintering site for shoveler *Anas clypeata.* It also supports large numbers of moulting and wintering water-birds and is noted for its breeding birds and ability to attract a great variety of migrants and rare Vagrants.	National (SSSI)	The site is approximately 9.5 km north-west of the Scheme boundary and is located at its closest point approximately 1 m from the ARN.

Statutory local nature conservation sites

8.6.4 The desk study has confirmed that there is a single LNR approximately 1.4 km east of the Scheme boundary. Wyrley and Essington Canal is designated for a variety of wildlife habitats, including open water, dry canal bed, wet grassland, scrub and woodland which supports bird and invertebrate species, some of which are included on the Staffordshire Biodiversity Action Plan. The LNR is also designated as a SBI and therefore is considered to be of county ecological importance.

8.6.5 One additonal LNR, Rough Wood Chase was identified as part of the air quality sensitivity testing presented in pre-examination document AS-059/8.2, 'DMRB Updates and the Impact on the DCO Application'. Rough Wood Chase LNR is located adjacent to the M6, south of Junction 10a within 200 m of the ARN though greater than 2 km from the Scheme boundary. This site includes the largest oak woodland in Walsall and supports protected species such as GCN.

Non-statutory nature conservation designations

8.6.6 Non-statutory nature conservation designations within 2 km of the Scheme boundary identified during the desk study are summarised in Table 8.9, along with justification for scoping in or out of the assessment, and are illustrated on Figure 8.2 [TR010054/APP/6.2] and discussed in Appendix 8.4 [TR010054/APP/6.3].

8.6.7 Table 8.9 includes all designated sites, as well as potential designations that are believed by Staffordshire County Council to meet relevant criteria, but which are yet to be assessed and formally adopted.

Table 8.9: Non-statutory nature conservation designations within 2 km of the Scheme

Designation	Reason(s) for designation	Importance (reasoning)	Relationship to the Scheme
Lower Pool SBI and LWS	A large ornamental pool with both emergent and floating vegetation.	County (LWS)	Within the Scheme boundary. The Scheme would have a direct impact on this LWS and it is therefore scoped in for further assessment.

Designation	Reason(s) for designation	Importance (reasoning)	Relationship to the Scheme
Brookfield Farm (north-east of), Shareshill, SBI and LWS	An area of wet woodland comprising alder and willow carr that is drying out in some areas of the site. Sycamore is common in the drier parts of the wood. Part of which is classified as ancient woodland (see below).	County (LWS) National (ancient woodland)	Within the Scheme boundary. The Scheme would cross the western end of the SBI and it is therefore scoped in for further assessment.
Coven Heath SBI and LWS	A small area of remnant wet heathland.	County (LWS)	0.2 km north-west of the Scheme boundary but separated from any earthworks by the A449 and the railway line therefore impacts are not anticipated and it is scoped out of further assessment.
Keeper's Wood, Hilton Park SBI and LWS	Mature mixed deciduous/conifer plantation.	County (LWS) National (ancient woodland)	0.35 km east of the Scheme boundary. The site is linked to the Scheme through arable farmland and hedgerows; however, it is not hydrologically linked or within 200 m of the ARN, therefore impacts are not anticipated and it is scoped out of further assessment.
Westcroft Farm (land north of), Bushbury, SBI and LWS	A linear strip of alder/crack willow woodland along the stream with sycamore abundant in the canopy away from the stream. Hazel (*Corylus avellana*) frequents the understorey throughout the woodland, with scattered elder and holly (*Ilex aquifolium*).	County (LWS)	Approximately 1.1 km south of the Scheme boundary. There may be some limited connectivity to the Scheme via hedgerows and arable fields; however, the M54 acts as a barrier to the majority of the Scheme therefore impacts are not anticipated and it is scoped out of further assessment.
Hatherton Reservoir, Cheslyn Hay SBI and LWS	Reservoir with high quality water and diverse emergent and submerged vegetation.	County (LWS)	1.3 km north-east of the Scheme boundary. A large industrial estate, quarry and the M6 act as major barriers between the site and the Scheme boundary and there are no identified hydrological or hydrogeological connections therefore impacts are not anticipated and it is scoped out of further assessment.

Designation	Reason(s) for designation	Importance (reasoning)	Relationship to the Scheme
Wyrley and Essington Canal SBI and LWS	Variety of wildlife habitats, including open water, dry canal bed, wet grassland, scrub and woodland which supports bird and invertebrate species, some of which are included on the Staffordshire Biodiversity Action Plan.	County (LWS)	The site is approximately 1.4 km east of the Scheme boundary and does not have any connectivity to the Scheme boundary therefore impacts are not anticipated and it is scoped out of further assessment.
Hatherton Bridge (by) Hatherton SBI and LWS	Rough semi-improved field with many ruderal species.	County (LWS)	The site is approximately 1.6 km north west of the Scheme and is separated from the Scheme boundary by Great Saredon Road therefore impacts are not anticipated and it is scoped out of further assessment.
Pennymore Hay Farm, Four Ashes SBI and LWS	An area of remnant species rich marsh that has been damaged by tipping.	County (LWS)	The site is approximately 1.8 km north west of the Scheme boundary but the A496 is a major barrier and there is no direct connectivity to the Scheme therefore impacts are not anticipated and it is scoped out of further assessment.
Moseley Hall SNCI	Mature semi-natural and amenity woodland along course of Waterhead Brook and large former mill pond.	County (SNCI)	Approximately 0.5 km south of the Scheme boundary. There may be some limited connectivity to the Scheme via hedgerows and arable fields; however, the M54 acts as a barrier to the majority of the Scheme therefore impacts are not anticipated and it is scoped out of further assessment.
Northycote Farm Parkland SNCI	Mature parkland with areas of recent planted woodland and strip of diverse semi-natural woodland along course of Waterhead Brook.	County (SNCI)	Approximately 0.8 km south of the Scheme boundary. There may be some limited connectivity to the Scheme via hedgerows and arable fields; however, the M54 acts as a barrier to the majority of the Scheme therefore impacts are not anticipated and it is scoped out of further assessment.

Designation	Reason(s) for designation	Importance (reasoning)	Relationship to the Scheme
Northycote Farm Coppice SNCI	Small broad-leaved coppice woodland.	County (SNCI)	Approximately 1.1 km south of the Scheme boundary. There may be some limited connectivity to the Scheme via hedgerows and arable fields; however, the M54 acts as a barrier to the majority of the Scheme therefore impacts are not anticipated and it is scoped out of further assessment.
The Hag retained Biodiversity Alert Site (BAS)	Woodland dominated by sycamore, with some oak and much hawthorn around the edges. Within the wood is a very steep-sided pond without emergent vegetation.	Local (BAS)	0.08 km south of the Scheme boundary. There is arable land, hedgerows and woodland connecting the BAS to the Scheme; however, the distance from earthworks is over 350 m. There are no hydrological links between the site and the Scheme therefore impacts are not anticipated and it is scoped out of further assessment.
Saredon Hall Farm (south-east of_ retained BAS	An area of oak woodland with a small pond. Much of the wood is impenetrable with bramble *Rubus* sp. and nettle *Urtica dioica*. Additionally, there is a small pond to the south of the wood, fringed by glaucous sedge *Carex flacca*, reedmace *Typha* sp. and broad-leaved pondweed *Potamogeton natans* in the water.	Local (BAS)	0.3 km north of the Scheme boundary. The M6 Toll acts as a significant major barrier between the site and the Scheme boundary therefore impacts are not anticipated and it is scoped out of further assessment.
Westcroft retained (woods north of) BAS	A mixed wood containing mainly pedunculate oak *Quercus robur*, sycamore and Scots pine *Pinus sylvestris*. The understorey is dominated by elder and hawthorn *Crataegus monogyna*.	Local (BAS)	0.5 km south of the Scheme boundary. The site is to the south-west of the southern section of the Scheme. There is a large industrial park which is considered a significant barrier between the site and the Scheme therefore impacts are not anticipated and it is scoped out of further assessment.
Hatherton Branch Canal BAS	The section of canal between the M6 and Oak Lane.	Local (BAS)	Approximately 1 km north of the Scheme boundary with potential connectivity via hedgerows and arable fields. There are no hydrological links to the Scheme boundary.

Designation	Reason(s) for designation	Importance (reasoning)	Relationship to the Scheme
Lodge Hill (north-east of) BAS	A small damp depression at the edge of an arable field.	Local (BAS)	Approximately 1.2 km north-east of the Scheme boundary. The M6 Toll, the M6 and the A4601 are major barriers and there are no hydrological links therefore impacts are not anticipated and it is scoped out of further assessment.
Hatherton Pines retained BAS	An area of plantation coniferous woodland, situated between the two Hatherton Pools. The area of most importance is the grassland between the plantations which has a rich flora due to poor soil conditions, including kidney vetch (*Anthyllis vulneraria*) and bilberry (*Vaccinium myrtillus*).	Local (BAS)	Approximately 1.3 km north-east of the Scheme boundary. The M6 Toll, the M6 and the A4601 are major barriers and there are no hydrological links therefore impacts are not anticipated and it is scoped out of further assessment.
Ashmore Lodge, Essington (disused mineral railway line), Retained BAS	An old dismantled mineral line now covered by neutral grassland with some wooded areas.	Local (BAS)	Approximately 1.3 km south of the Scheme boundary and the M54 and Bognop Road are major barriers therefore impacts are not anticipated and it is scoped out of further assessment.
Essington Pools retained BAS	As well as the open water there are two areas of woodland, an area of tall planting and amenity grassland. The amenity grassland is regularly mown.	Local (BAS)	Approximately 1.4 km south-east of the Scheme boundary. The village of Essington is a major barrier and there are no hydrological links therefore impacts are not anticipated and it is scoped out of further assessment.

8.6.8 An additonal 62 locally designated sites including LWS in Shropshire, Site of Importance for Nature Conservation (SINC) and Site of Local Importance for Nature Conservation (SLINC) in Birmingham and the Black Country, and SBI and BAS in Staffordshire were identified as part of the air quality sensitivity testing undertaken in June 2020, presented in pre-examination document AS-059/8.2, 'DMRB Updates and the Impact on the DCO Application'. These sites are all located within 200 m of the ARN. For further details on these sites refer to AS-059/8.2

Ancient woodland and veteran trees

8.6.9 Areas of ancient woodland that are listed on the ancient woodland inventory, and that have been identified through surveys undertaken to support the assessment within 2 km of the Scheme boundary and 200 m of the ARN are listed in Table 8.10. Full descriptions of Brookfields Farm and Oxden Leasow (Whitgreaves Wood)

ancient woodlands, which are within the Scheme boundary, are presented in Appendix 8.4: Designated sites and habitats [TR010054/APP/6.3] with a summary provided in Table 8.10.

Table 8.10 : Ancient woodland within 2 km of the Scheme boundary

Name	Category	Importance (reasoning)	Description (where surveyed) and relationship to the Scheme
Brookfields Farm	Ancient and Semi-Natural Woodland	National*	Broadleaved semi-natural woodland belt with a diverse age structure and well developed understorey and ground layer. Within the Scheme boundary and within 200 m of the ARN.
Oxden Leasow (Whitgreaves wood)	Ancient and Semi-Natural Woodland	National*	Broadleaved semi-natural woodland supporting nine plant species indicative of ancient woodland. Within the Scheme boundary and within 200 m of the ARN.
Beech Head	Ancient and Semi-Natural Woodland	Assumed National**	340 m east of the Scheme boundary. Located to the south of the M54, which is a major barrier between Beech Head and the Scheme. No pathways to the receptor.
Keeper's Wood	Ancient and Semi-Natural Woodland/Ancient Re-planted woodland	Assumed National**	712 m east of the Scheme boundary. The site is linked to the Scheme through arable farmland and hedgerows.
Spring Coppice	Ancient and Semi-Natural Woodland	Assumed National**	1 km east of the Scheme boundary. Located between the two carriageways of the M54 therefore there are major barriers between Spring Coppice and the Scheme.
Burns Wood (west)	Ancient and Semi-Natural Woodland	Assumed National**	1.4 km east of the Scheme boundary split by the M6. The western parcel is linked to the Scheme through arable farmland and hedgerows; however, the eastern parcel is separated from the Scheme boundary by the M6.
Burns Wood (East) Wakeman's Wood and Warstone Belt	Ancient and Semi-Natural Woodland	Assumed National**	1.6 km east and within 200m of the ARN.
Essington Wood	Ancient and Semi-Natural Woodland	Assumed National**	1.8 km east and within 200m of the ARN.

Name	Category	Importance (reasoning)	Description (where surveyed) and relationship to the Scheme
* meets a number of criteria for which an LWS would be designated due to the presence of ancient woodland, indicator species, ancient woodland is also a HPI. This is based on field surveys undertaken to support the assessment. ** assumed National importance in line with LA 108 (Ref 8.1). No survey undertaken.			

8.6.10 Six additional ancient woodland sites were identified as part of the air quality sensitivity testing undertaken in June 2020, presented in pre-examination document AS-059/8.2, 'DMRB Updates and the Impact on the DCO Application'. These sites are all located within 200 m of the ARN but outside of the 2 km desk study search area. Further details on these sites are provided in AS-059/8.2.

Habitats

Habitats of Principal Importance

8.6.11 There are multiple blocks of woodland noted as HPIs on the priority habitat inventory within the desk study area, primarily associated with the statutorily designated sites and roadside vegetation. The locations of these are shown on Figure 8.5 [TR010054/APP/6.2] and they are considered to be of local ecological importance.

8.6.12 The field study area is dominated by arable and grazed improved and poor semi-improved grassland fields. Both plantation and semi-natural woodland is present and largely associated with the SBIs described above. The habitats present within the field study area and their ecological importance are summarised in Table 8.11. The locations of these habitats are illustrated on Figure 8.3 [TR010054/APP/6.2]. Full habitat descriptions, condition assessments and evaluation are presented in Appendix 8.4 [TR010054/APP/6.3].

Table 8.11: Summary of habitats and associated ecological importance within the study area

Habitat	Summary Description, Distinctiveness and Condition (TN numbers refer to Target Notes on Figure 8.3)	Importance (reasoning)
Cultivated/ disturbed land - arable	TN7, TN16, TN38, TN47, TN59, TN60, TN69, TN76 Arable fields with a variety of crop cover at the time of survey including wheat, barley, oat, clover and maize. Low distinctiveness and poor condition.	Negligible (common and widespread and offers little to the local biodiversity resource)
Improved grassland	TN13, TN18, TN21, TN24, TN42, TN55, TN83 Improved grassland dominated by perennial rye grass *Lolium perenne*. Closely grazed/cut to a short sward. Low distinctiveness and poor condition.	Negligible (common and widespread and offers little to the local biodiversity resource)

Habitat	Summary Description, Distinctiveness and Condition (TN numbers refer to Target Notes on Figure 8.3)	Importance (reasoning)
Poor semi-improved grassland	TN3, TN4 TN9, TN19, TN28, TN30, TN45, TN50, TN62, TN64, TN66, TN67 Poor semi-improved grassland dominated by common species and closely sheep or horse grazed or subject to cutting regime. Low distinctiveness and poor condition.	Negligible (common and widespread and offers little to the local biodiversity resource)
Broadleaved woodland – semi-natural	TN26 and TN51 Woodland parcels to west and east of Scheme boundary dominated by alder *Alnus glutinosa* with frequent ash, pedunculate oak, crack willow *Salix fragilis* and goat willow *Salix caprea.* Good ground flora. High distinctiveness and moderate condition. TN79 in the south of the Scheme boundary with abundant grey poplar *Populus* × *canescens*, goat willow, sycamore, and dominant crack willow and alder with occasional ash. Good ground flora. High distinctiveness and moderate condition. TN2 Linear woodland lining a track with good species diversity of high distinctiveness and good condition. TN12 Parcel of woodland adjacent to M6 with moderate diversity but indicating some levels of disturbance. High distinctiveness and moderate condition.	Local (Does not meet LWS/SBI selection criteria for woodland that would indicate county importance or demonstrate ancient woodland indicators but have good species diversity and of inherent ecological importance. Some indicating evidence of disturbance (litter/damage) e.g. TN12; hence parish. Not replaceable in the short to medium term.)
	TN43 and TN48 Within Scheme boundary and dominated by oak, alder, ash and occasional holly with a diverse ground flora. High distinctiveness and good condition. Within Brookfield Farm SBI.	County (By virtue of its designation as SBI and likely to meet qualifying criteria in terms of NVC type – wet woodland – and woodland score. Good species diversity and of inherent importance not replaceable in the short to medium term).
Broadleaved woodland – plantation	Several parcels of broadleaved woodland plantation: • TN6 Dominated by ash *Fraxinus excelsior* with frequent goat willow *Salix caprea,* hawthorn *Crataegus monogyna,* blackthorn *Prunus spinosa.* Medium distinctiveness and good condition.	Local (Does not meet LWS/SBI selection criteria for woodland that would indicate county importance or demonstrate ancient woodland indicators. Of inherent ecological importance that is not replaceable in the short to medium term.)

Habitat	Summary Description, Distinctiveness and Condition (TN numbers refer to Target Notes on Figure 8.3)	Importance (reasoning)
	• TN36 Embankment to road dominated by pedunculate oak *Quercus robur,* beech *Fagus sylvatica* with frequent sycamore *Acer pseudoplatanus*. High distinctiveness and medium condition. • TN72 Adjacent to A460 dominated by common lime *Tilia europaea* abundant pedunculate oak and occasional holly *Ilex aquifolium* and rare ash. High distinctiveness and good condition. • TN82 Adjacent to A460 dominated by sycamore with abundant ash and occasional holly. High distinctiveness and moderate condition. • TN84 Embankment woodland adjacent to M54 dominated by filed maple *Acer campestre* with occasional oak, sycamore, hazel *Corylus avellana* and frequent ash. High distinctiveness and moderate condition. • TN86 and TN87 Embankment woodland adjacent to A460/M54 junction dominated by ash and sycamore with abundant hazel and elder and sparse field layer. High distinctiveness and moderate condition.	
Mixed woodland - plantation	TN57 Mixed plantation with variable understorey of rhododendron and poor field layer dominated by holly, yew *Taxus baccata* sycamore with occasional oak and rarely Scot's pine and European larch *Larix decidua*. Unable to classify into NVC community type on account of poor understorey and ground flora. High distinctiveness and moderate condition. Within Lower Pool SBI.	County (By virtue of its designation within Lower Pool SBI, however survey and assessment against SBI selection criteria (Ref 8.32) indicates it would not meet the criteria for designation. Potential for improved management and control of rhododendron would likely improve its importance. Of inherent ecological importance that is not replaceable in the short to medium term)
	TN70 Woodland of low species diversity associated with large waterbodies. Dominated by Scot's pine with weeping willow *Salix*	Local (Does not meet LWS/SBI selection criteria for woodland that would indicate county importance or demonstrate

Habitat	Summary Description, Distinctiveness and Condition (TN numbers refer to Target Notes on Figure 8.3)	Importance (reasoning)
	babylonica, alder, goat willow and crack willow with good ground flora. Medium distinctiveness and moderate condition.	ancient woodland indicators. Of inherent ecological importance and provides connectivity between other habitats. Not replaceable in the short to medium term.)
	TN85 Roundabout of M54/A460 junction species include scots pine *Pinus sylvestris* and ash (not surveyed in detail due to highways safety). Medium distinctiveness and moderate condition	Local (Does not meet LWS/SBI selection criteria for woodland that would indicate county importance or demonstrate ancient woodland indicators. Of some inherent ecological importance that is not replaceable in the short to medium term but fragmented and isolated from all other habitats due to location on motorway junction.)
Intact hedge - native species-rich*	TN1, TN14, TN15, TN23, TN27, TN31, TN41 Continuous hedgerows of varying structure, some containing trees and with good species diversity supporting five to nine woody species. High distinctiveness and good condition.	Local (HPI and SBAP habitat that form continuous network of habitat linking to and between other habitats of ecological importance. Good species diversity. Not replaceable in the short term.)
Defunct hedge - native species-rich*	TN5, TN10, TN20, TN22, TN68, TN75 Gappy hedgerows of varying structure, some containing trees and with good species diversity. Some adjacent to continuous sections of species rich hedgerow. High distinctiveness and moderate condition.	Local (HPI and SBAP habitat with some inherent importance but no longer forming continuous network of habitat. Good species diversity. Not replaceable in the short term.)
Intact hedge – native species - poor*	TN8, TN11, TN25, TN29, TN35, TN39, TN40, TN53, TN54, TN61, TN65, TN71 Continuous hedgerows of varying structure, some containing trees and with low species diversity supporting less than five woody species. High distinctiveness and vary between low and moderate condition.	Local (HPI and SBAP habitat that form continuous network of habitat linking to and between other habitats of ecological importance although in isolation have low species diversity. Not replaceable in the short term.)
Tree line and trees	Individual tree lines (e.g. TN81) and scattered trees of inter alia pedunculate oak, ash, alder, crack willow, sycamore, horse chestnut *Aesculus hippocastanum* and common lime. Largely associated with hedgerows (e.g.TN11), ponds (e.g. TN63, TN74, TN77 and TN78). There are eight veteran trees identified within the Scheme	Local (Semi-mature to mature native trees of inherent importance to local biodiversity and not replaceable in the short to medium term.) County (Over mature and veteran trees of inherent importance to local biodiversity

Habitat	Summary Description, Distinctiveness and Condition (TN numbers refer to Target Notes on Figure 8.3)	Importance (reasoning)
	boundary. Refer to Arboricultural Impact Assessment Report, Appendix 7.1 [TR010054/AP/6.3] for full details and Figure 8.3 [TR010054/APP/6.2] for the locations.	and not replaceable in the medium to long term.)
Intact hedge – non-native	TN80 – non-native hedgerow	Negligible (Little inherent ecological importance, common in the locality.)
Defunct hedge - native* species-poor	TN17, TN34, TN37 - Gappy hedgerows of varying structure and with low species diversity. High distinctiveness and poor to moderate condition.	Negligible (Minimal inherent ecological importance, common in the locality and not connected to the wider ecological network.)
Other tall herb and fern - ruderal	Tall ruderal vegetation comprising common and widespread species such as nettle *Urtica dioica,* cleavers *Galium aparine,* meadowsweet *Filipendula ulmaria,* and rosebay willowherb *Chamaerion angustifolium.* Largely associated with field margins and adjacent to watercourses and standing water (TN46, TN49, TN77 and TN78).	Negligible (Minimal inherent ecological importance, common and widespread in the locality. Replaceable in the short term.)
Standing water	Several ponds and lakes across the study area (see Figure 8.3 [TR010054/APP/6.2]). including fishing lakes and field/woodland ponds. All high distinctiveness, with individual ponds of poor, moderate or good condition.	Local (HPI and SBAP habitat that forms part of wider ecological network of habitat of ecological importance although in isolation are of varied quality and condition with variable levels of disturbance (fishing lakes) and species diversity. See also the great crested newt section below, regarding qualification for SBIs under that amphibian criteria.)
Running water	Running water most notably Latherford Brook (Watercourse 5) in the north of the Scheme boundary and Watercourse 2 in the south.	Local (HPI and SBAP habitat that form continuous network of habitat linking to and between other habitats of ecological importance. Good species diversity. Not replaceable in the short term.)
*Following a desk based review of historic mapping, and in combination with the results of the field surveys, one hedgerow (TN27) has characteristics of being an ancient hedgerow (is shown as a boundary feature on historic mapping and is species rich) though the evidence is not conclusive. Further details on the ancient hedgerow assessment are provided in Appendix 8.16 [TR010054/APP/6.2].		

8.6.13 There are six veteran trees within the Scheme boundary (T211, T214, T221, T227, T226 (prominent) and T137) refer to Appendix 7.1: Arboricultural Impact Assessment [TR010054/APP/6.3] for further details.

8.6.14 An additional 12 veteran trees were identified as part of the air quality sensitivity testing undertaken in June 2020, presented in pre-examination document AS-059/8.2, 'DMRB Updates and the Impact on the DCO Application'. These sites are all located within 200 m of the ARN but are outside the Scheme boundary. Further details on these veteran trees is provided in AS-059/8.2.

Protected and notable species

Badger

8.6.15 Due to the confidential nature of badger sett information, the full details of the badger survey and assessment data are presented in a confidential report within Appendix 8.5 [TR010054/APP/6.3] (CONFIDENTIAL).

8.6.16 In summary, there are a number of badger records provided for the study area, but not within the Scheme boundary see Figure 8.6 (CONFIDENTIAL) [TR010054/APP/6.2].

8.6.17 The surveys identified two main setts formed by two separate clans, along with one active outlier sett and a number of disused outlier setts. The distance between the main setts (19 km) indicated two clans. In addition to setts a number of latrines and runs were recorded across the survey area. Refer to Figure 8.7 (CONFIDENTIAL) [TR010054/APP/6.2].

8.6.18 Badgers are a common and widespread species and are afforded protection due to historical issues of persecution rather than because of their conservation status. However, due to their intrinsic appeal and role in an ecosystem the population present within the Scheme boundary is of Local ecological importance.

Barn owl

8.6.19 A total of 22 barn owl records were returned from the 2019 SERC data search from within 5 km of the Scheme and in the last ten years, with the closest record to the Scheme recorded within the western end of the Scheme boundary, where the M54 meets the A449 Stafford Road. Refer to Figure 8.9 (CONFIDENTIAL) [TR010054/APP/6.2]. There were 68 pairs of barn owl in Staffordshire (Ref 8.33) in 2017; however, the Staffordshire Barn Owl Action Group confirmed that there are no known barn owl nesting sites within the study area.

8.6.20 The Stage 1 on-site scoping surveys of the study area (refer to Figure 8.8 (CONFIDENTIAL) [TR010054/APP/6.2]) undertaken in 2018 and 2019 to identify and record habitat features of the landscape which are broadly suited to barn owl identified a total of 12 trees (T1 – T12) and 10 buildings (B1 – B10) requiring further assessment. Refer to Appendix 8.6 CONFIDENTIAL [TR010054/APP/6.3] and Figure 8.10 (CONFIDENTIAL) [TR010054/APP/6.2] for details and locations.

8.6.21 Stage 2 investigative field surveys to determine which of the habitat features identified in the Stage 1 survey offer potential nest sites, roost sites and habitats for foraging and movement were undertaken on T1 – T10 and B1 – B6. T11 and T12

could not be surveyed due to health and safety restrictions and B7 – B10 were not accessible for detailed survey. Of those trees and buildings surveyed, no current or historical signs of barn owl were recorded and therefore barn owl are considered likely absent from these features.

8.6.22 Although T11 and T12 could not be surveyed, barn owl is considered to be absent from these two trees, based on the limited potential identified in the Stage 1 assessment and the results of other Stage 2 surveys.

8.6.23 Anecdotal evidence provided by a landowner indicates that barn owls may be roosting in B7 therefore, for Buildings B7 – B10, although access was not possible, it is assumed that barn owls could be present. Barn owls were observed during the 2018 bat activity surveys, commuting over a small section of the study area, from B7, to foraging grounds in the wider environment (north of the M6). All recorded flight routes in 2018 were northwards, not towards the Scheme boundary.

8.6.24 During subsequent tree climbing surveys for bats, a barn owl roost site was identified in a tree which had not been subject to Stage 2 survey work (T13, refer to Figure 8.8 (CONFIDENTIAL) [TR010054/APP/6.2] for location).

8.6.25 Whilst small areas of 'Type 1' optimal habitat for barn owl is present within the survey area, the majority of habitat within the survey area is sub-optimal (either Type 2, or Type 3 habitat) for barn owl. The survey area is limited to small patches of unimproved or semi-improved heterogeneous grassland as well as field margins, drainage ditches and hedgerows that provide limited foraging habitat (refer to Figure 8.11 (CONFIDENTIAL) [TR010054/APP/6.2]). The remaining habitats within the survey area are considered unsuitable for foraging barn owl, including arable farmland, woodland and urban areas.

8.6.26 Due to the isolated nature of the Scheme, as a result of the surrounding major road network, combined with low quantity of suitable habitat, there is little opportunity for barn owl to utilise the Scheme boundary for foraging or dispersal.

8.6.27 Barn owl interest is assessed as being of no more than Local importance.

Bats

8.6.28 The full details of the desk study and surveys in respect of bats are presented in Appendix 8.7 [TR010054/APP/6.3] and are summarised below.

8.6.29 The desk study indicates the presence of at least six bat species within the desk study area namely common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat *Plecotus auritus*, noctule *Nyctalus noctula,* Leisler's bat *Nyctalus leislerii* an unidentified myotis *Myotis* sp. and unidentified bat species. This includes roosts for long eared and common pipistrelle bat. MAGIC Interactive map does not hold records of granted European Protected Species (EPS) licences for bats within the desk study area.

8.6.30 All accessible trees within the study area were subject to a ground level preliminary bat roost assessment (PBRA). 208 trees within the study area were identified as having low, moderate or high potential to support roosting bats (see Figure 8.14 [TR010054/APP/6.2]). Other trees with roosting potential are likely to be present but

could not be accessed for survey due to access restrictions for health and safety (e.g. highways land) or due to landowners refusing access.

8.6.31 128 trees were identified for aerial inspection surveys (moderate and high potential trees) and aerial surveys were conducted on 92 of these trees, with lack of access preventing surveys of five of them and 31 being unsuitable or unsafe to climb.

8.6.32 The aerial inspection surveys identified two roosts within the Scheme boundary, namely:

- a confirmed noctule (from DNA analysis) day roost within a mature pedunculate oak *Quercus robur* tree (T112) within Lower Pool SBI; and
- a likely *Pipistrelle* sp. (based on observed droppings size and shape – none could be reached for collection and analysis) day roost within a rowan *Sorbus aucuparia* tree (T70) within Lower Pool SBI.

8.6.33 Roosts could be present in the trees that were unsafe/unsuitable for aerial inspection and low potential trees not surveyed may also sporadically support occasional/transitional individual day roosts. Although evidence was not found at the time of survey, moderate and high potential trees surveyed could also support transitional day roosts. Based on the known occurrence of summer bat roosts within trees and the species known in the immediate landscape, a precautionary approach is to be taken with an assumption of additional day roosts of common species being likely to be present in trees within the Scheme boundary.

8.6.34 Hibernation surveys of the trees are yet to be conducted so the level of use of trees in the winter is not confirmed. However again a precautionary approach has been taken in respect of hibernation. An assessment of the moderate and high potential trees surveyed through aerial inspection has been conducted to determine their likely suitability to be used for hibernation. Of the trees subject to aerial surveys at least 28 were found to have potential to support hibernation. Using the number of summer tree roosts found as a reference guide a precautionary approach is to be taken in respect of hibernation and is to be assumed that a small number of these trees are used for hibernation by bats.

8.6.35 29 structures were identified within the study area as requiring assessment for bat roosting potential. Access was possible for full PBRA surveys to 17 of these structures. Roost identification surveys were conducted in 2018 and updated (where access allowed) in 2019.

8.6.36 Roosts have been identified within seven buildings in the survey study area (see Figure 8.17 [TR010054/APP/6.2]) which are set out in Table 8.12 below. All the roosts are day roosts of individual or low numbers of individual non-breeding bats.

Table 8.12: Bat roosts recorded outside of the Scheme boundary

Feature number (Appendix 8.7)	Species	Number of individuals in Day Roost	Distance from Scheme boundary
1	Common pipistrelle	2	87 m
	Soprano pipistrelle	1	

Feature number (Appendix 8.7)	Species	Number of individuals in Day Roost	Distance from Scheme boundary
	Brown long-eared bat	1	
2a/b	Common pipistrelle	2	21 m
	Brown long-eared bat	1	
5	Common pipistrelle	2	52 m
6	Brown long-eared	1	41 m
11	Common pipistrelle	Unknown – old droppings – low numbers of dropping indicate day roost	17 m
12	Common pipistrelle	2	21 m
21	Common pipistrelle	2	70 m

8.6.37 In the case of building 11, access was provided in 2019 to allow the initial PBRA surveys, when a number of scattered bat droppings were recorded. These were not collected at the time given the intention to conduct detailed emergence/re-entry roost identification surveys, however access was then rescinded by the landowner, preventing any further surveys being conducted. Based on the size and shape of the droppings seen they appear to be from a pipistrelle bat and were old, rather than fresh droppings. A precautionary approach is to be taken however with an assumption made that a pipistrelle day roost of low numbers (< 5) is present within building 11.

8.6.38 Given the low conservation significance of the roosts described above (Ref 8.34), being non-breeding of low numbers of individuals of common and widespread species, they are of no more than Local importance.

8.6.39 In addition to the above records, an incidental record of likely brown long-eared bats was recorded within a building 29 m to the east of the Scheme boundary (building 18 - see Appendix 8.7 [TR010054/APP/6.3] for further details). Access permission was not provided to allow detailed PBRA or nocturnal surveys of the building, however during a meeting at the house, surveyors observed an accumulation of droppings on an external windowsill and heard audible socialising by bats. The dropping shape and appearance indicate they were of long-eared bat. The range of grey long-eared bat *Plecotus austriacus* does not extend much further north than south and south western coastal counties (Ref 8.35) and there are only records of brown long-eared bats in the vicinity; hence they are assumed to be brown long-eared bat. Given the number of droppings and audible squeaks heard in the core season, a precautionary approach is to be taken with an assumption that the building supports a brown long-eared bat maternity roost.

8.6.40 The maternity roost is of moderate conservation status (Ref 8.34) being a breeding roost of a common and widespread species. Guidance (Ref 8.36) indicates maternity roosts even of common species can be valued at county importance. Staffordshire's

qualifying criteria (Ref 8.32) for designation as an SBI (hence county importance) requires presence of a significant population of a notable species (one with five or less maternity roosts in the county). Brown long-eared bat is a common and widespread species, centred largely on England and Wales, although the Great Britain population is in decline (Ref 8.37). It is widespread and frequent in the county of Staffordshire (Ref 8.38).

8.6.41 The roost is of a common and widespread species that is not considered notable in the county (*Pers. Comm*. Jonathan Groom, Staffordshire Wildlife Trust). There is no definitive list of 'notable' species for Staffordshire and no definition of 'significance' of a population (*Pers. Comm* Rachel Fryer Staffordshire Wildlife Trust). Given brown long-eared bat are considered a common and widespread species, are 'frequent' in Staffordshire (Ref 8.38) and no significant levels of activity by the species was recorded (see below), the brown long-eared bat roost is not of county importance but of Local importance.

8.6.42 Transect activity surveys results are summarised on Figure 8.18 [TR010054/APP/6.2] and detailed results are provided at Appendix 8.7 [TR010054/APP/6.3]. In summary:

- A minimum of seven species were recorded across the Scheme boundary (common and soprano pipistrelle, Brandt's bat *Myotis brandtii*, Daubenton's bat *Myotis daubentonii*, unidentified *Myotis*, brown long-eared bat, noctule and Leisler's bat), with highest species diversity (six species) in Transect 5, Transects 2 and 3 recording five species and Transects 1, 4 and 6 recording four species.
- The most frequently recorded species across all transects are common and soprano pipistrelles, the latter having the highest levels of activity.
- During the surveys, activity was centred around woodland edge, aquatic habitat (ponds and lakes and watercourses – particularly watercourse 5 – Latherford Brook) and along hedgerow/tree lines, with noctules also recorded utilising open fields.

8.6.43 Static detector locations are shown on Figure 8.15 [TR010054/APP/6.2] and surveys recorded:

- A minimum of ten species across the Scheme boundary including common and soprano pipistrelle, noctule, Leisler's bat, serotine *Eptesicus serotinus,* Natterer's bat *Myotis nattererii*, Daubenton's bat, whiskered bat *Myotis mystacinus*, Brandt's bat and brown long-eared bat.
- Most activity recorded was low to moderate levels of foraging by common and soprano pipistrelles across the areas surveyed, with some areas supporting higher levels of foraging activity such as woodland edge and aquatic habitats within and adjacent to Lower Pool SBI.
- Most activity was associated with the wet mature woodland at Shareshill SBI and woodland and aquatic habitat at Lower Pool SBI. Specifically, static locations at Latherford Brook (Watercourse 5), and within Lower Pool SBI were the areas of highest activity.

- Low numbers of *Myotis* bats recorded foraging and commuting across habitats within the Scheme boundary with increased levels of foraging (largely by Daubenton's bat) recorded when associated with wet mature woodland at Shareshill SBI, open water at the fishing lakes (pond 57 and pond 28).
- Low numbers of noctule (foraging and commuting) and very low numbers of Leisler's bat (commuting). Static locations to the south and east of Lower Pool SBI recorded foraging by noctule in open fields, with foraging activity also associated with aquatic habitat in the north of the Scheme boundary, associated with pond 64 and Latherford Brook (Watercourse 5).
- Very low levels of foraging and commuting by brown long-eared bat, with Latherford Brook (Watercourse 5) again an area of higher activity.

8.6.44 Bat Activity Indices (BAI – bat passes per hour) for the static locations are described in detail in Appendix 8.7 [TR010054/APP/6.3] however in summary scores for all locations gave rise to a BAI of 0.13 (very low activity) to 6.26 (low activity). Soprano pipistrelle is the most recorded bat species across all locations, with the highest levels of activity recorded at static location 18 (within Lower Pool SBI). This indicates the importance of the aquatic and woodland edge habitats in the Scheme boundary to bats.

8.6.45 Crossing point surveys indicate that none of the points surveyed support significant commuting routes for large numbers of bats. Preliminary surveys indicated that points A, C and D did not require the full crossing point surveys, with fewer than 10 bats recorded passing at these points. Species recorded at these locations are noctule, common and soprano pipistrelle and Daubenton's bat, but no more than 4 passes by any species were recorded at these locations (detailed survey results provided at Appendix 8.7 [TR010054/APP/6.3]).

8.6.46 Detailed crossing point surveys were conducted at crossing points B and E, with detailed survey results provided at Appendix 8.7 [TR010054/APP/6.3]. A summary of the surveys is provided at Table 8.13 and as shown no definitive or likely important commuting routes were identified. None of the locations support significant numbers of bat passes with consistent directions of travel or indicate significant importance for commuting bats. Common and soprano pipistrelle bats are the most commonly recorded at both locations, however the majority of the activity recorded is foraging over the feature (particularly at location B where a lake is present) rather than using the habitat as a linear feature to move through the landscape. However given the height of the passes of these species they are at highest risk of collision.

Table 8.13: Species and height of passes at crossing point locations B and E

Crossing Point Location	Species recorded and maximum number of passes recorded across any surveys with indication of commuting behaviour observed			Minimum and maximum height of passes (m)
B	Daubenton's	1		Not seen
	Noctule	1		Not seen
	Brown long-eared	1		Not seen

Crossing Point Location	Species recorded and maximum number of passes recorded across any surveys with indication of commuting behaviour observed			Minimum and maximum height of passes (m)
	Common pipistrelle	9	Largely not seen or recorded foraging over lake	2 – 5
	Soprano pipistrelle	8	Largely recorded foraging over lake	1 – 7
E	Noctule	5	Largely not seen, 2 passes seen commuting north to east	Not seen
	Brown long-eared	1		Not seen
	Common pipistrelle	12	Largely not seen, four passes north to south and one south to north. Foraging over woodland.	5 – 10
	Soprano pipistrelle	10	Largely not seen – also foraging over woodland.	2 – 6
	Myotis sp.	1	Not seen	Not seen
	Unidentified	2	Not seen	Not seen

8.6.47 The activity and crossing point surveys have identified the core areas of habitat of most importance to bats within the study area are the woodland edge, marshy grassland, intact and continuous hedgerows and tree lines and wetland habitats including watercourses and ponds. These areas support low to moderate numbers of largely common species, particularly common pipistrelle (a SBAP species) and soprano pipistrelle and noctule (both SPIs and noctule also a SBAP species). However, an additional seven species have been recorded using the site for commuting and low-level foraging in low numbers (including brown long-eared bat – a SPI).

8.6.48 Application of the S. Wray et al. approach (Ref 8.36) to valuing bats in Ecological Impact Assessment applies a score based on species rarity, numbers of bats, roosts, and characteristics of foraging and commuting habitat. The scores for the transect data is shown in Table 8.14.

Table 8.14: Commuting and Foraging Values through application of the S. Wray method

Species	National rarity[5]	Number of bats[6]	Site/nearby roost potential[7]	Type & complexity of linear features[8]	Total score[9]	Value
Commuting (Transect data)						
Common pipistrelle	2	10	3	3	18	Local
Soprano pipistrelle	2	10	3	3	18	Local
Noctule/*Nyctalus* sp.	5	10	3	3	21	County
Myotis sp.	5	10	3	3	21	County
Plecotus sp.	2	5	3	3	14	Local
Leislers bat	5	5	3	3	17	Local
Nyctalus/Etic	5	5	3	3	17	Local
Foraging (Transect data)						
Common pipistrelle	2	10	4	3	19	Local
Soprano pipistrelle	2	20	4	3	29	County
Noctule/*Nyctalus* sp.	5	5	4	3	17	Local
Myotis sp.	5	10	4	3	22	County

8.6.49 The foraging and commuting areas identified are scored as local importance (score of 18) to county importance (score of 29).

8.6.50 The qualifying criteria for designation as an SBI in Staffordshire (Ref 8.32) requires the presence of a significant population of a notable species (one with five or fewer maternity roosts in the county. The significance of a population has not been defined (*Pers. Comm* SWT) and would depend on the species and likewise there is no definitive list of notable species for the county.

[5]National rarity: 2= Common, 5= Rarer, 20= Rarest (Ref 8.36).
[6]Number of bats 5= Individual bats, 10= Small number of bats, 20= Large number of bats (Ref 8.36).
[7]Nearby roost potential: 1= None, 3= Small number, 4= Modertate number/Not known, 5= Large number of roosts or close to an SSSI for the species, 20= Close to or within a SAC for the species (Ref 8.36).
[8]Type & complexity of linear features: 1= Absence of linear features, 2= Unvegetated fences and large field sizes, 3= Walls, gappy or flailed hedgerows, isolated wellgrown hedgerows, and moderate field sizes, 4= Well-grown and well-connected hedgerows, small field sizes, 5= Complex network of mature well-established hedgerows, small fields and rivers/streams
[9] Total score: 1 – 10= Not Important, 11 – 20= District, Local or Parish, 21 – 30= County, 31 – 40= Regional, 41 – 50= National, Over 50= International (Ref 8.36).

8.6.51 In the context of commuting noctule (considered uncommon in Staffordshire – Ref 8.38) and unidentified Myotis recorded, the score is just into the 'county' value of 21. However as demonstrated by the crossing point surveys, no significant commuting routes across the Scheme boundary were identified and behaviour recorded does not infer the presence of significant roosts nearby. In the case of soprano pipsitrelle foraging value was considered high, giving rise to county value, albeit, data does not indicate that this was by a significant number of individuals, but rather consistent foraging by a low to moderate number of individuals. No significant roost of soprano pipistrelle has been identified in the study area. Soprano pispitrelle is considered to be uncommon in Staffordshire (Ref 8.38).

8.6.52 On balance, based on the values of the species across the study area the assemblage of bats utilising the study area is of Local importance.

Breeding birds

8.6.53 Records of 86 protected or notable bird species recorded within 2 km of the Scheme boundary and from within the last ten years, were returned from the desk study and are shown on Figure 8.20 [TR010054/APP/6.2]. A full list of species recorded is provided in Appendix 8.8, Annex A [TR010054/APP/6.3]. The list includes casual records of species which are not likely to breed within the study area. Of these 86 species:

- 14 are listed on Annex 1 of the EU Birds Directive;
- 24 are listed on Schedule 1 of the Wildlife and Countryside Act, 1981;
- 27 are listed as a species of principal importance under Section 41 of the NERC Act;
- 33 species are included in the Birds of Conservation Concern Red List;
- 37 species are included on the Birds of Conservation Concern Amber List; and
- 12 species are included as a priority species in Staffordshire.

8.6.54 The full details of breeding bird surveys are presented in Appendix 8.8 [TR010054/APP/6.3].

8.6.55 A total of 57 species were recorded during the survey of breeding birds in 2018 and 2019. Of these 57 species, breeding territories of 32 species were confirmed and records of a further 13 species were probably or possibly on breeding territories within the survey area at the time of the surveys, resulting in a breeding bird assemblage of 45 species. Records relating to the remaining 12 species are of non-breeding species. Table 8.1515, sets out the habitat features of interest to breeding birds.

Table 8.15: Key ornithological features of habitat within the survey area

Broad habitat type	Key ornithological features
Waterbodies	Small waterbodies, predominantly in the northern section of the Scheme boundary. Supports breeding species associated with wetland features, such as mallard and greylag goose.

Broad habitat type	Key ornithological features
Arable farmland	The predominant habitat type occurring across the survey area and wider landscape. Supports breeding species of conservation concern, including skylark, found throughout. Individual species of conservation interest, but limited species abundance and diversity.
Scrub and hedgerows	Frequently occurring habitat across the study area of varying quality. Supports breeding species such as yellowhammer, dunnock and song thrush. Individual species of conservation interest, but limited species abundance and diversity.
Mature trees and woodland	Restricted parcels of woodland and individual trees scattered throughout the study area. Supports breeding species such as green woodpecker, as well as species often found in scrub and hedgerows. Individual species of conservation interest, but limited species abundance and diversity.

8.6.56 A summary of the breeding and conservation status of the 57 species recorded during the survey, with the numbers of breeding territories identified (or thought likely in the case of probable records) for species of conservation concern is provided in Table 4.1 of Appendix 8.8 [TR010054/APP/6.3].

8.6.57 Evaluation of the breeding species assemblage and numbers recorded during surveys, with respect to criteria for selection of SBIs in Staffordshire (as detailed in Appendix 8.8 [TR010054/APP/6.3]) shows that the survey area:

- does not support a breeding population of a species included in Schedule 1 of the Wildlife and Countryside Act (1981, as amended);
- does not support a breeding population of any rare or scarce breeding bird species in Staffordshire;
- is not of significant importance for breeding *Hirundines* (swallow and related species) and does not support colonial nesting species;
- supports a population of lapwing, but is not a significant 'colony' for the species in a Staffordshire context; and
- does not support a breeding assemblage with a value equal to, or exceeding, the indices of representative habitats within the survey area:
  - woodland (a species score of 22); and
  - open water (a species score of nine).

8.6.58 Using the scoring system for selection of biological SSSIs (Ref 8.39), the assemblage scores are well below that required for selection and supports the evaluation that the habitats present within the survey area support associated breeding assemblages of no more than Local ecological importance.

Wintering birds

8.6.59 See paragraph 8.6.49 for the summary of all birds with desk study records within 2 km of the Scheme boundary.

8.6.60 The full details of wintering bird surveys are presented in Appendix 8.9 [TR010054/APP/6.3]. A total of 59 species were recorded during the survey. A total of 15 species of conservation concern (Red listed and/or SPI and/or SBAP priority

species) utilise habitats within the survey area during the winter: lapwing, herring gull, skylark, grey wagtail, dunnock, song thrush, mistle thrush, fieldfare, redwing, starling, house sparrow, bullfinch, linnet, reed bunting and yellowhammer. Inclusion on the Red List or as a SPI does not mean that these species are particularly rare, rather that they have been demonstrated to have undergone declines in numbers and/or range in recent years. Table 8.16 sets out the habitat features of interest to wintering birds.

Table 8.16: Key ornithological features of habitat within the survey area

Broad Habitat Type	Key Ornithological Features
Waterbodies	Small waterbodies, predominantly in the northern section of the Scheme. Supports wintering species associated with wetland features, such as Mallard and Greylag Goose.
Arable farmland	The predominant habitat type occurring across the survey area and wider landscape. Supports wintering species of conservation concern, including Skylark and Yellowhammer found throughout. Individual species of conservation interest, but limited species abundance and diversity.
Scrub / hedgerows	Frequently occurring habitat across the survey area of varying quality. Supports wintering species such as Yellowhammer, Linnet, Dunnock and Song Thrush. Individual species of conservation interest, but limited species abundance and diversity.
Mature trees / woodland	Restricted parcels of woodland and individual trees scattered throughout the study area. Supports wintering species such as Green Woodpecker, as well as species often found in scrub / hedgerows. Individual species of conservation interest, but limited species abundance and diversity.

8.6.61 Of these 59 bird species, 23 species recorded during the survey meet at least one of a range of criteria relating to conservation importance. In summary:

- None of the species recorded within the survey area are listed on Annex I of the EC Birds Directive.
- A total of 11 priority species, included as SPI on the NERC list, were recorded within the survey area.
- Twelve species, included on the Birds of Conservation Concern (BoCC) Red List and 11 species, included on the BoCC Amber list, were recorded within the survey area.
- Seven species, listed as action plan species in Staffordshire, were recorded within the survey area.

8.6.62 The remaining bird assemblage is considered to be typical for the habitat types present within and adjacent to the study area and the nature conservation value of the breeding bird assemblage on site is considered to be of no greater than Local ecological importance with respect to species associated with scrub, hedgerow, pond and farmland habitats. The assemblage would not qualify under the SBI selection criteria.

Otter and water vole

8.6.63 The full details of otter and water vole surveys are presented in Appendix 8.10 [TR010054/APP/6.3].

8.6.64 The desk study did not identify any otter or water vole records within the Scheme boundary, but both species are known to be present within the wider area, primarily associated with the Staffordshire and Worcestershire Canal and Saredon Brook to the north and to the east of the M6 respectively. Surveys in 2015 did not record either species (Ref 8.56).

8.6.65 The nearest otter records are present to the north (adjacent to Scheme boundary), south-west (0.2 km), west (0.15 km), and north-west (0.2 km) of the Scheme boundary. The nearest water vole records are present to the north (1.4 km), east (0.4 km), south (1.1 km), and south-west (1.3 km) of the Scheme boundary.

8.6.66 Prior to 2019 surveys commencing, anecdotal evidence provided by a landowner within the Scheme boundary indicated that water vole are present on Latherford Brook (Watercourse 5) and the adjacent fishing pond (Pond 64).

8.6.67 In 2019, presence/ absence otter and water vole surveys were carried out, with 47 waterbodies and five watercourses within the study area screened in for habitat suitability assessment (HSA). Otter surveys also included all suitable terrestrial habitat within the study area. No access was possible at 18 waterbodies as landowners did not give permission for access. Partial access only was possible at Watercourse 6. A total of 29 waterbodies and five watercourses had access for surveys; of these, HSA was undertaken at 25 waterbodies (additional four waterbodies were found to be absent), with partial HSA undertaken at five watercourses where access allowed.

8.6.68 Eight waterbodies and three watercourses are considered suitable to support otter and one waterbody and one watercourse are considered suitable to support water vole.

8.6.69 Otter and water vole presence is confirmed within Latherford Brook (Watercourse 5) during 2019 surveys, with evidence of otter (spraint, jelly, footprints, and a dead juvenile otter) and evidence of water vole (footprints, droppings, and one location with burrows/ feeding remains) present. One potential otter holt is present at the eastern extent of the Scheme boundary; situated over 200 m away from the footprint of the Scheme.

8.6.70 Water vole burrows and feeding remains are present at Latherford Brook 5 at the eastern extent of the Scheme boundary; none within the footprint of the Scheme.

8.6.71 For locations of the otter and water vole field signs refer to Figure 8.27 [TR010054/APP/6.2].

8.6.72 As otter presence is confirmed at Latherford Brook, due to the large home range of the species, presence of transient/ foraging otter is assumed within other surveyed and un-surveyed suitable habitat within and up to 100 m from the Scheme boundary. One potential otter holt (unaffected by the works) is present at Latherford Brook. Holts are presumed absent from the large fishing lakes with high levels of

disturbance. However, holt presence is possible within suitable habitat where access was not possible.

8.6.73 Based on the frequency of the water vole latrines per 100 m of bankside habitat at Latherford Brook, the population density is estimated to be low.

8.6.74 Based on the 2019 survey results the populations for both species utilising the habitats within and up to 100 m from the Scheme boundary is likely to be small.

8.6.75 According to SERC, otter is a common species in the county, with wide distribution in suitable habitat and frequent records. Based on otter's conservation status and in light of the site selection criteria for LWS in Staffordshire, the otter population with potential to be affected by the Scheme is considered to be of County ecological importance.

8.6.76 According to SERC, water vole is listed as a common but declining species, with fairly good distribution in suitable habitat in the county. As the species is common but declining in Staffordshire, the population with potential to be affected by the Scheme is considered to be of County ecological importance.

Hazel dormouse

8.6.77 In 1996, following the first Great Nut Hunt, Bright and Morris concluded that hazel dormice were likely to be extinct in Staffordshire (Ref 8.41). Subsequent surveys and monitoring programmes over the past 20 years have shown that there are a very small number of remnant dormouse populations in the north and west of Staffordshire, mostly along the border with Shropshire where dormice are more widely distributed. Hazel dormouse is now considered to be an exceptionally rare species in Staffordshire (Ref 8.41). No record of the species within 2 km of the Scheme boundary was returned from the desk study and the Scheme is situated in the south of Staffordshire, within a triangle of land bordered by the existing A460, M54 and M6, all of which are considered to be major barriers to hazel dormouse and which isolate the Scheme boundary from the wider landscape. In addition, the habitat within and up to 100 m of the Scheme boundary consists mostly of improved and species poor semi-improved grassland, with poorly connected pockets of semi-natural broad-leaved woodland.

8.6.78 Consultation with the Staffordshire County Council has confirmed that hazel dormouse can be scoped out of further assessment.

Great crested newt

8.6.79 GCN records were provided for nine different locations within 2 km of the Scheme boundary. The closest is for a single adult approximately 581 m east of the Scheme boundary in 2007. The records comprise small and medium populations with a maximum peak count of 26 recorded 1.18 km east of the Scheme boundary in 2015. Full details of the GCN desk study and surveys undertaken in 2019 are presented in Appendix 8.11 [TR010054/APP/6.3] and Figures 8.28 and 8.29 [TR010054/APP/6.2].

8.6.80 There is a total of 137 waterbodies present within and up to 500 m from the Scheme boundary. Of these waterbodies a total of 34 were found to require further survey to

confirm the presence or likely absence of GCN. Other waterbodies were found to be absent (15 waterbodies), dry (five waterbodies), have been screened out (30 waterbodies) or scoped out (32 waterbodies) or were not accessible at the time of survey (21 waterbodies).

8.6.81 Field surveys recorded populations of GCN in three waterbodies located within 500 m of the Scheme boundary as illustrated on Figure 8.29 [TR010054/APP/6.2] and detailed below. For each of these waterbodies, a population size class assessment survey could not be completed, and medium population sizes have therefore been assumed. This population size assessment is considered to be a relevant assumption for the Scheme given the population size results provided as part of the desk study, for which the maximum peak count recorded was 26, which comprises a medium population:

- Waterbody 34 (151 m east of Scheme boundary) returned a positive eDNA result although no GCN were recorded during the presence/ likely absence surveys, likely as a result of survey limitations.
- Waterbody 52 (234 m south of Scheme boundary) returned a positive eDNA result. No presence/ likely absence surveys were undertaken owing to survey limitations.
- Waterbody 128 (127 m south of Scheme boundary) recorded a positive eDNA result and GCN were recorded during the presence/ likely absence surveys, with a peak count of 8 adults recorded, during the four survey visits undertaken. Full population surveys were not completed, and survey timings were sub-optimal.

8.6.82 All inaccessible waterbodies (21 waterbodies) are outside of the Scheme boundary itself; however, as a precaution it has been assumed that these waterbodies each support a medium population of GCN. In addition, for those waterbodies (six waterbodies) where surveys were incomplete, a medium population of GCN has also been assumed. GCN are likely absent from the remaining 25 waterbodies recording a negative eDNA result.

8.6.83 Eleven GCN metapopulations have been identified, where GCN are confirmed or assumed to be present. A medium population size is assumed for each metapopulation, as detailed in Appendix 8.11 [TR010054/APP/6.3].

8.6.84 In light of the selection criteria for designation of BAS, LWS in Staffordshire, the GCN metapopulations recorded are considered to be of County ecological importance.

2020 GCN Survey Results

8.6.85 A total of 32 waterbodies were identified for survey in spring 2020 in an effort to fill in any gaps in the 2019 survey data. These surveys included those waterbodies where access was not possible in 2019, waterbodies which were dry in 2019 or additional waterbodies identified after the 2019 survey season (waterbodies 29 and 70). Full details of the GCN surveys undertaken in 2020 are presented in Appendix 8.15 [TR010054/APP/6.3] and Figure 8.36 [TR010054/APP/6.2].

8.6.86 Of those 32 waterbodies, 12 could not be accessed to undertake a Habitat Suitability Index survey due to a lack of landowner permission and one further waterbody had access revoked prior to the eDNA survey (refer to Figure 8.36 [TR010054/APP/6.2]).

8.6.87 Of those 19 waterbodies accessed, six waterbodies were found to be dry with no suitability for breeding GCN and two had water levels too low to sample. eDNA surveys were undertaken at a total of 11 waterbodies identified as offering suitability to support GCN and holding sufficient water for samples to be collected. No GCN were recorded during the 2020 eDNA surveys. It is therefore likely that the species is absent from these waterbodies. As a result it is considered that four of the eleven GCN metapopulations (3, 5, 7 and 9) identified in Appendix 8.11 [TR010054/APP/6.3] are not present.

8.6.88 A total of 13 waterbodies could not be accessed for eDNA surveys in 2020 due to a lack of landowner permission and COVID-19 concerns. Under the precautionary principle GCN are still assumed to be present in those waterbodies that could not be surveyed in either 2019 or 2020.

8.6.89 Following the results of the 2019 and 2020 surveys, seven GCN metapopulations have been identified, where GCN are confirmed or assumed to be present. A medium population size is assumed for each metapopulation, as detailed in Appendix 8.11 [TR010054/APP/6.3] and Appendix 8.15 [TR010054/APP/6.3].

8.6.90 In light of the selection criteria for designation of BAS, LWS in Staffordshire, the GCN metapopulations recorded are each considered to be of County ecological importance.

Reptiles

8.6.91 The full details of the reptile surveys undertaken are presented in Appendix 8.12 [TR010054/APP/6.3].

8.6.92 A single desk study record for common lizard *Zootoca vivipara* was identified within 2 km of the Scheme boundary. No records for other reptile species were identified.

8.6.93 Large sections of the habitat within the Scheme boundary comprise intensively farmed arable fields and grazed improved grassland which is sub-optimal for reptiles; however, the areas of suitable reptile habitat were surveyed during the 2018 and 2019 season. The areas covered by the surveys are shown on Figure 8.30, [TR010054/APP/6.2].

8.6.94 No reptiles were recorded during the 2018 or 2019 surveys. Given the absence of reptiles in the field surveys and the limited nature of the desk study records provided it is concluded that reptiles are likely absent from the Scheme boundary and are scoped out of further assessment.

Terrestrial invertebrates

8.6.95 The full details of the terrestrial invertebrate surveys undertaken are presented in Appendix 8.13 [TR010054/APP/6.3].

8.6.96 No records of notable terrestrial invertebrates were returned from SERC or EcoRecord within 2 km of the Scheme boundary.

8.6.97 Seventeen sample sites were chosen that represented the best available potential terrestrial invertebrate habitats within and immediately adjacent to the Scheme boundary (see Appendix 8.13 [TR010054/APP/6.3] and Figures 8.31 to 8.33 [TR010054/APP/6.2] for more detail).

8.6.98 The sites were subject to a combination of sweep netting and intercept trapping.

8.6.99 Several rare/scarce and specialist species were recorded associated with decaying wood, open short sward grassland and stream and river margin, and fungal fruiting bodies habitats, primarily associated with the ancient woodland and SBIs within the Scheme boundary. See Table 4.1 of Appendix 8.13 [TR010054/APP/6.3] for more details.

8.6.100 The evaluation within Appendix 8.13 [TR010054/APP/6.3] has been updated in line with LA 118 (Ref 8.25) for this chapter and the overall terrestrial invertebrate assemblage is considered to be of Local ecological importance.

8.6.101 Habitats outside of the sample areas (predominantly arable) are assessed as being of negligible importance.

Aquatic invertebrates, fish and aquatic macrophytes

8.6.102 Historical fish, macroinvertebrate and white-clawed crayfish data was not available for any of the waterbodies within 2 km of the Scheme boundary, except for historical angling data reporting the stocking of carp, perch and roach in Tower House Pool and Lower Pool.

8.6.103 Fish surveys undertaken during 2019 found that Watercourses 4 and 6 provide poor habitat for fish, and no notable fish species were recorded. See Appendix 8.14 [TR010054/APP6.3] and Figure 8.34 [TR010054/APP/6.2] for further detail.

8.6.104 Bullhead are present in Watercourses 2, 3, 5a and 5b, while brown trout were present in Watercourse 5b. These watercourses provide suitable habitat for these notable species. Bullhead is listed on Annex II of the EC Habitats Directive, and brown trout is a species of principal importance.

8.6.105 The habitat at Watercourse 5a supports a diverse range of common fish, none of which are notable.

8.6.106 Tower House Pool (Pond 23), Lower Pool (Pond 28) and Brookfield Farm Ponds 1 (Pond 57) and 2 (Pond 56) all contain a diverse assemblage of coarse fish (carp, perch and roach) as expected for a fishing pond. This has been established by eDNA survey in 2019. While these fish contribute to the overall biodiversity and value of the water bodies, they are not protected or notable species.

8.6.107 Chubb Ponds 1 (Pond 31) and 2 (Pond 32), Brookfield's Fishery (Pond 60) and Brookfield Farm Pond 3 (Pond 55) were not surveyed for fish; however, it is expected as they are fishing ponds with similar habitat to those listed above that the species present will be coarse fish, and therefore not protected or notable species.

8.6.108 Watercourses 2, 3, 5a and 5b are considered to be of local importance in relation to fish due to the confirmed presence of bullhead and brown trout. The remaining watercourses and ponds are considered to be of negligible importance in relation to

fish due to the presence of common and widespread species, which have likely been stocked in the case of the fishing ponds.

8.6.109 Macroinvertebrate survey results for each watercourse/waterbody are summarised as follows.

- Watercourse 2 – a high diversity of macroinvertebrates comprising mostly common species, except for the blackfly *Simulium reptans*, considered 'Local' (Conservation Score 5) under the CCI index; however, this species does not have any statutory designation. Watercourse 2 was categorised as moderate overall quality.
- Watercourse 5a – a high diversity comprising mostly common species, except for the Caddisfly *Athripsodes bilineatus* considered 'Local' under the CCI, however it does not have any statutory designation. Watercourse 5a categorised as moderate overall quality.
- Brookfield Farm Ditch – a low diversity comprising mostly of common species, with no rare or notable species. This ditch was assessed as being of low quality.
- Tower House Pool (Pond 23) and Lower Pool (Pond 28) - a high diversity comprising common species, with no rare or notable species. This waterbody was categorised as moderate quality.
- Chubb Ponds 1 (Pond 31) and 2 (Pond 32) – a moderate diversity comprising mostly common species, including the lesser water boatman, water stick insect and meniscus midge, however these species are widespread throughout England and do not have any statutory designation. These ponds were assessed as high quality.
- Brookfields Fishery (Pond 60) – a moderate diversity comprising mostly common species, with the presence of the lesser water boatman *Sigara iactans* (RDB least concern). This species has only been recorded in 19 hectads (1990 – 2013) but is considered under-recorded and an establishing native species, and therefore has no statutory designation. This water body was assessed as high quality.
- Brookfield Farm Pond 1 (Pond 57)– low macroinvertebrate diversity comprising mostly of common species, with the presence of the lesser water boatman as above. This water body was assessed as of high quality.
- Brookfield Farm Ponds 2 (Pond 56) and 3 (Pond 55) - moderate diversity comprising mostly of common species with no rare or notable species. These water bodies were assessed as moderate quality.

8.6.110 Targeted eDNA, trapping and hand search surveys did not record any evidence for the presence of white-clawed crayfish in Tower House Pool (Pond 23), Lower Pool (Pond 28), Brookfield Farm Ponds 1 (Pond 57) and 2 (Pond 56), and watercourses 2 and 5a.

8.6.111 The ponds and watercourses within the Scheme boundary have been shown to support common and widespread species of no more than local value and are

therefore considered to be of no more than Local importance for aquatic invertebrates.

8.6.112 Macrophyte assemblage is considered typical for a fishing pond with no rare or notable species for Tower House Pool, Chubb Pond 1 (Pond 31) and 2 (Pond 32), Brookfields Fishery (Pond 60) and Brookfield Farm Ponds 1 (Pond 57) and 2 (Pond 56).

8.6.113 Brookfield Farm Pond 3 (Pond 55) – The fringed water-lily was recorded in this water body. This species is native to the fens of East Anglia and the Thames basin, hence its Nationally Scarce Designation. However, it is widely naturalised outside its native range and is therefore likely to be introduced in this area, and of least concern.

8.6.114 Aquatic macrophyte surveys have identified common and widespread species, and no protected or notable species. Although the macrophyte assemblage enriches the biodiversity of the ponds and watercourses, it is considered of negligible value in the national context.

Other Fauna/Flora

8.6.115 There were no desk study records provided for brown hare *Lepus europaeus* or hedgehog *Erinaceus europaeus* within the Scheme boundary. The habitats present do not indicate that the area within the Scheme boundary would be of particular importance for brown hare, due to roads and scattered development and therefore any population present would not be considered of more than Local importance.

8.6.116 Although there are no desk study records for hedgehog within the Scheme boundary, the woodland blocks and hedgerow network do offer suitable habitat for hedgehog although the surrounding roads would be considered to act as a barrier. Any population of hedgehog present would be considered to be of Local importance.

8.6.117 Incidental records of toad *Bufo bufo* and smooth newt *Lissotriton vulgaris* were recorded during the GCN and reptile survey work.

Controlled weed species

8.6.118 Japanese knotweed *Fallopia japonica* is present within the Scheme boundary around Brookfield Farm, Tower House Farm and Pond 23, around Pond 27 and around Pond 96. Furthermore, Himalayan balsam *Impatiens glandulifera* is present along Latherford Brook (Watercourse 5), Watercourse 3, and rhododendron *Ericaceae* sp. is present within the understorey of the woodland in Lower Pool SBI and Canadian waterweed *Elodea canadensis* was present within the Lower Pool waterbodies. Montbretia *Crocosmia x. crocosmiiflora* was identified in Chubb Pond (Pond 31).

8.6.119 Given these species are invasive and non-native, they are not considered to be of ecological importance.

Summary Evaluation

8.6.120 A summary of the protected and notable species evaluation is set out in Table 8.17.

Table 8.17: Protected and notable species evaluation summary

Species	Importance
Badgers	Local
Barn owl	Local
Bats	Local
Breeding birds	Local
Wintering birds	Local
Otter	County
Water vole	County
GCN	County
Reptiles	Negligible
Terrestrial invertebrates	Local
Aquatic inverts	Local
White-clawed crayfish	Negligible
Fish	Local

Future baseline

8.6.121 As detailed in Chapter 4: Environmental Assessment Methodology, in order to identify the effects of the Scheme on environmental features, it is important to understand the baseline at the year of construction commencement and at the year the Scheme becomes operational. The baseline conditions for these years may be different to the current conditions and such changes could alter the sensitivity of existing environmental receptors, as well as introduce new sensitive biodiversity receptors.

8.6.122 Professional judgement based on knowledge and experience of similar schemes, has been used to predict the natural and man-made influences that are likely to change the baseline conditions recorded within the assessment from 2018/2019, through the construction period (2021 to 2024), to the opening of the Scheme in 2023.

Construction year baseline (2021)

8.6.123 The baseline details as reported in the sections above describe the biodiversity features as they were in the years that the surveys and desk top baseline studies were undertaken (2018– 2019). Preliminary works associated with the Scheme are anticipated to start in Autumn 2021, subject to securing a DCO (refer to Chapter 2: The Scheme).

8.6.124 The majority of the land that would be impacted by the Scheme (and in its vicinity) comprises existing highway infrastructure (the M54, the M6 and the existing alignment of the A460), agricultural land, woodland, and surrounding residential areas in Featherstone and Shareshill. Environmental baseline conditions within the

Scheme boundary are not anticipated to change significantly by 2021 from the conditions as detailed above.

8.6.125 However, as detailed in Chapter 15: Assessment of Cumulative Effects, several development projects are ongoing, or are planned, that have the potential to change baseline conditions in the local area outside the Scheme boundary. Whilst these are not likely to significantly change baseline conditions within the biodiversity study area, the following key changes are anticipated by the construction baseline year (2021) (the number in brackets refers to the development numbers as detailed in Appendix 15.1 [TR010054/APP/6.3]):

- 19/00300/OUT (c. 2.6km east of the Scheme boundary) - development at Landywood Lane, Great Wyrley 250 dwellings, a new vehicular access, car park, open space, allotments. hard and soft landscape details and all other ancillary and enabling works Development ID 11).
- 18/00107/FUL (c. 1.8 km south-east of the Scheme boundary) - Existing building (Old Mitre public house) demolished. Proposed residential development to form nine apartments, with associated parking (Development ID 5).
- 16/00487/OUT (c. 1.1km south-east of the Scheme boundary) - The erection of approximately 210 dwellings with ancillary parking, private amenity space, a convenience store, allotments, site infrastructure and landscaping (Development ID 7).

8.6.126 It is anticipated that the various developments as detailed above would not significantly change the prevailing environmental conditions within the Scheme boundary, nor baseline conditions within the defined biodiversity study area.

8.6.127 In terms of habitats and flora species, the biodiversity baseline is unlikely to change significantly by 2021, unless any large-scale changes in management practices occur. The transient and mobile nature of certain fauna species such as, badgers, birds, bats, otters and potentially water vole (mink is present on Latherford Brook so could impact water vole populations) is acknowledged (although low risk) and, therefore, pre-construction surveys would be required in order to confirm construction year baseline conditions (refer to Section 8.8).

Opening year baseline (2024)

8.6.128 It is not possible to accurately predict baseline environmental conditions for the year of Scheme opening (2024). However, it is anticipated that baseline conditions in the vicinity of the Scheme and within the associated biodiversity study area would largely be the same as at 2021, although most of the developments as detailed in Appendix 15.1 [TR010054/APP/6.3] are anticipated to have been completed by 2024. In addition, urban pressures associated with an increased population may result in the further expansion of the built environment.

8.6.129 Planned future developments have been taken into consideration during the assessment. For example, changes in future traffic baseline flows have been modelling both with and without the Scheme taking into account future development patterns. Modelling outcomes have been used to determine the potential effect of

Scheme opening on the environment surrounding the Scheme e.g. noise, air quality, severance, water quality effects, biodiversity. Assessment of in-combination effects with climate change have also been taken into consideration (refer to Chapter 14: Climate).

8.6.130 In terms of habitats and flora species, the biodiversity baseline will change by 2024, as the Scheme will be operational and much of the new habitats will be establishing and whilst there will be a greater balance of higher quality habitats than present (arable and species poor grassland replaced by species rich grassland) their interest will not have developed fully. Consequently, opportunities for all fauna species will continue though it is unlikely to be at levels above the current situation until the habitats develop further.

8.7 Potential impacts

8.7.1 Mitigation measures incorporated into the Scheme design and measures to be taken to manage Scheme construction are set out in Section 8.8. Prior to implementation of defined mitigation measures, the introduction of new highways infrastructure and the modification of existing highway components associated with construction and operation of the Scheme could potentially result in (beneficial and adverse) impacts on biodiversity during construction and operation.

Construction

8.7.2 Impacts on ecological features, in the absence of mitigation, during construction of the Scheme would include:

- habitat loss – direct impacts associated with changes in land use resulting from the Scheme, for example temporary works associated with site clearance, and permanent land take associated with the installation of drainage infrastructure and earthworks;
- fragmentation of populations or habitats – direct impacts due to the Scheme dividing a habitat, group of related habitats, site or ecological network, or the creation of partial or complete barriers to the movement of species, with a consequent impairment of ecological function;
- disturbance – direct impacts resulting from a change in normal conditions (light, noise, vibration, human activity) that result in individuals or populations of species changing behaviour or range;
- habitat degradation – direct or indirect impacts resulting in the reduction in the condition of a habitat and its suitability for some or all of the species it supports, for example changes in chemical water quality or changes in surface flow or groundwater; and
- species mortality – direct impacts on species populations associated with mortalities due to construction activities, for example site clearance.

Operation

8.7.3 Impacts on ecological features during the operational phase of the Scheme are likely to include:

- species mortality and fragmentation – direct impacts on species populations associated with mortalities from collisions with vehicles, and potentially from pollution incidents or management practices;
- habitat degradation – direct impacts associated with the operation of new road lighting and vehicles using new and/or improved sections of road, for example increased light, noise and emissions leading to a reduction of habitat quality on identified ecological features; and
- disturbance – indirect impacts arising from changes in human activity, including use of public rights of way that could lead to changes in animal behaviour, for example changes in roosting behaviour or nesting success or introduction of fish or invasive species to newly created waterbodies.

8.8 Design, mitigation and enhancement measures

Embedded mitigation

8.8.1 The Scheme has been designed, as far as possible, to avoid and minimise impacts and effects on ecological features through the process of design-development (refer to Chapter 3: Assessment of Alternatives), applying good design principles in line with LA 118 Biodiversity Design (Ref 8.25). Embedded mitigation defined within the DMRB as 'Design measures which are integrated into a project for the purpose of minimising environmental effects' is reported as part of the Scheme description in Chapter 2: The Scheme.

Essential mitigation

Construction

8.8.2 Construction of the Scheme would be subject to measures and procedures as defined within the Outline Environmental Management Plan (OEMP) for the Scheme [TR010054/APP/6.11]. This includes a range of measures to mitigate potential impacts on ecological habitats, protected species and the water environment, which accord with legal compliance and good practice guidance. The measures outlined within the OEMP would be developed into a Construction Environmental Management Plan (CEMP) by the selected construction contractor and would be implemented during the Scheme construction phase. Measures which would be included within the CEMP includes measures to minimise dust deposition, air pollution, pollution incidents, light spillage and noise and vibration which would all assist in minimising impacts upon biodiversity receptors. The following avoidance/ mitigation measures have been included and where applicable described in the OEMP.

Designated and non-designated sites

8.8.3 The following mitigation measures would be put in place to reduce the effects of potentially significant Scheme construction phase impacts on designated and non-designated sites (where applicable):

- **Pollution prevention control measures**. Water pollution prevention control measures and standard best practice measures to control construction dust and noise would be implemented during the construction phase via the CEMP (refer to Chapter 5: Air Quality; Chapter 11: Noise and Vibration; Chapter 13: Road Drainage and the Water Environment; and the OEMP [TR010054/APP/6.11]).
- **Ancient woodland** is an irreplaceable habitat and therefore the loss of this habitat cannot be mitigated. It is assumed that works within 15 m of ancient woodland could result in its loss due to compaction of tree roots and soil. This 'loss' would be compensated for at a ratio of 7:1 by area as agreed with Natural England. The woodland planting would be provided adjacent to an existing area of ancient woodland (within Brookfield Farm LWS and SBI). The location of the land identified for these compensation measures is illustrated on the Environmental Masterplan on Figures 2.1 to 2.7 [TR010054/APP/6.2]. In addition, habitat improvement to Oxden Leasow (Whitgreaves wood) to be agreed with Natural England and the National Trust will be undertaken. The risk of damage (direct and dust depostition impacts) to retained trees and hedgerows will be mitigated by implementation of protection measures included in BS5837: 2012 (Ref 8.42), which include fencing boundaries of working areas with appropriate standoffs where required to protect both above-ground vegetation and roots.
- **Habitat creation.** New woodland planting, new standing water habitats, new marshy and wet grassland and species-rich grassland are being created in response to the impacts to Lower Pool LWS and SBI and Brook Fieldfarm LWS and SBI sites.

Habitats

8.8.4 The following mitigation measures would be put in place to reduce the effects of potentially significant Scheme construction phase impacts on ecological habitats:

- **Pollution prevention control measures.** Water pollution prevention control measures and standard best practice measures to control construction dust and noise would be implemented during the construction phase via the CEMP (refer to Chapter 5: Air Quality; Chapter 11: Noise and Vibration; Chapter 13: Road Drainage and the Water Environment; and the OEMP [TR010054/APP/6.11]).
- **Management of invasive plant species.** Invasive plant species would be managed according to an Biosecurity Management Plan as documented within the OEMP [TR010054/APP/6.11]. Treatment and control would be undertaken by an approved specialist contractor. Pre-construction surveys would be undertaken to inform the Management Plan. This would be implemented

through the CEMP, thus ensuring there would be no adverse impacts associated with the spread of invasive plant species during Scheme construction. The Scheme has the potential to generate a beneficial effect where invasive plant species are locally eradicated.

- **Watercourses.** The proposed crossing of Latherford Brook is an open span structure that will ensure the retention of habitats and a natural channel, bank and proposed mammal ledge post construction works, which will maintain connectivity for aquatic and riparian species and allow passage of otter and other mammals during high flow. Enhancements of retained watercourses would also be undertaken. This would include some or all of; reducing artificial bank face profile, reducing non-native invasive plant species on banks, planting of riparian and channel margin vegetation, reducing sedimentation of channel bed, and improving channel morphotype richness.
- **Soft landscaping targeting creation of priority habitats.** Areas identified within Scheme boundary for soft-landscaping would be used to contribute to the replacement of those priority habitats lost to Scheme construction, specifically broadleaved woodland and species-rich semi-improved neutral grassland (refer to Figures 2.1 to 2.7 [TR010054/APP/6.2]).
- **Species-poor grassland**. Species-poor semi-improved grassland areas within the Scheme boundary would be replaced with species-rich grassland as part of the landscape design (where highway constraints do not prevail) (refer to Figures 2.1 to 2.7 [TR010054/APP/6.2]).
- **Retention of felled trees as ecological feature within the landscape**. Timber from felled trees would be used to provide dead wood habitats for saproxylic (dead wood loving) species, with some placed in the understory of woodland blocks to enhance woodlands. Felled trees would be retained on site as whole boughs and trunks, and if practicable some whole trunks stood up in the sun (half buried for stability).
- **Protection of retained trees and woodland**. Retained trees would be protected as per British Standard BS: 5837 Trees in relation to design, demolition and construction – Recommendations.
- **Waterbodies**. Those waterbodies to be lost (seven fully lost and two partially lost) during construction would be replaced with eight new ecology ponds (an approximate 1:1 ratio)
- **Habitat creation**. The Environmental Masterplans Figures 2.1 to 2.7 [TR010054/APP/6.2]) show the range of habitat creation and mitigation measures that will address direct habitat loss to the Scheme.

Species

8.8.5 The following mitigation measures would be in place to reduce the effect of potentially significant Scheme construction impacts on ecological species (refer to the Environmental Masterplan on Figure 2.1 to 2.7 [TR010054/APP/6.2]):

- **Pollution prevention control measures and standard construction mitigation**. Water pollution prevention control measures in accordance with

Construction Industry Research and Information Association (CIRIA) guidance documents C532 (Ref 8.43), C650 (Ref 8.44), and C648 (Ref 8.45); and standard best practice measures to control construction dust and noise would be implemented during the construction phase via the CEMP (refer to Chapter 5: Air Quality; Chapter 11: Noise and Vibration; Chapter 13: Road Drainage and the Water Environment; and the OEMP [TR010054/APP/6.11]).

- **Protective fencing.** The use of fencing, where necessary, to prevent access to retained important habitat, protect habitat, avoid accidental damage, and avoid species mortality (including areas to which species have been temporarily displaced);
- **Ecological Clerk of Works (ECoW).** the supervision of construction works by an ECoW or a suitably qualified person, where works have the potential to impact on protected species, designated sites or other important ecological features. The ECoW would also ensure that all standard measures and methods detailed within the appointed Contractor's CEMP, including monitoring surveys, are adhered to;
- **Badgers**. The Scheme avoids wherever possible the loss of badger setts; however, one outlier would be lost together with impacts upon foraging habitat. The defined badger mitigation strategy would be implemented in line with Natural England licensing requirements (refer to Appendix 8.3: Letter of No Impediment for badger [TR010054/APP/6.3]); which includes exclusion of badgers from sett to be lost between July and November.

  Pre-construction badger surveys would be undertaken to determine baseline conditions remain the same as currently recorded and if any changes to badger distribution are identified then the Natural England licence and mitigation measures required would be updated accordingly.

  Standard best practice measures during construction including covering excavations or leaving them with suitable egress and safe storage of chemicals would be implemented to minimise the potential of injury to badgers during the construction phase.

  The Scheme design has minimised the loss of badger foraging habitat within known badger territory ranges. However, in compiling the landscape design as detailed in Figures 2.1 to 2.7 [TR010054/APP/6.2]), appropriate planting has been incorporated into the design to account for where losses of badger foraging resources have occurred.
- **Bats (roosting).** Mitigation would be in line with Natural England EPS licence requirements (refer to Appendix 8.3: Letter of No Impediment for bats [TR010054/APP/6.3]; and Section 8.9 (Assessment of likely significant effects) for details. Measures would be implemented to minimise construction impacts on bats as per Highways England guidance in LA 118 (Ref 8.25) e.g. appropriate timing of works under Natural England EPS mitigation licence where applicable.

  Pre-construction surveys would be undertaken of all trees to be felled with bat roosting potential to confirm roost status of the confirmed noctule and

pipistrelle roosts and confirm the presence of any new/transitional roosts to be lost within the Scheme boundary or outside the Scheme boundary that may be subject to disturbance. The nature of these surveys would depend on the timing of felling, age and nature of data held and the roost potential of the trees. Any mitigation required would be implemented to minimise impacts in accordance with the Natural England licence.

The installation of bat boxes on retained trees within the Scheme boundary within the locality of the confirmed and assumed roosts being lost would be undertaken to mitigate for confirmed and assumed roosting features lost, including for assumed hibernating bats. Additional bat boxes would be installed across the Scheme on retained trees to mitigate for the potential roost features lost. Such provisions would mitigate for the loss of confirmed and potential roost sites due to Scheme construction.

- **Bats (foraging and commuting).** To compensate for habitat losses due to the Scheme, the landscape design includes the creation of habitats of value to foraging and commuting bats, using recommended plant species within Highways England guidance in LA 118 (Ref 8.25). Linear habitat features, including hedgerows, have been incorporated into the landscape design (refer to the landscape design on drawings Figures 2.1 to 2.7 [TR010054/APP/6.2]) to mitigate for habitats lost and ensure ecological connectivity within and across the Scheme, and into the wider landscape.

  Measures would be implemented during the construction phase to minimise impacts on foraging and commuting bats – this includes keeping lighting to a minimum by limited night-time working and reducing lighting within habitats of value to bats. The site compounds would be occupied at all times for the security of the plant, equipment, and materials within it. As such, the compounds would be lit as required during hours of darkness. Lighting would be directional, and positioned sympathetically, to minimise light spill.
- **Breeding birds**: avoiding undertaking vegetation clearance and structure demolitions during the core bird breeding season (March to August, inclusive). Where this is not possible, measures necessary to avoid harm to birds and their nests would be implemented, as appropriate, under the supervision of the ECoW, with checks regularly carried out prior to and during construction to identify any active nests.

  Deterring birds from nesting in construction working areas, where appropriate, through either physical means to prevent establishment of nests (such as prior coppicing or pruning of vegetation) or other legal means of disturbance (such as the regular ploughing of soils or falconry). These measures would be implemented under the advice and supervision of a suitably experienced ecologist, and would not be used where there is considered to be a risk of disturbance to the active nests of Schedule 1 bird species.
- **Otter and Water vole**: Otter have been recorded on Latherford Brook (Watercourse 5). Otter presence is therefore assumed in suitable habitat within the Scheme (with one potential holt present within the Scheme boundary;

unaffected by the works), therefore pre-construction surveys would be undertaken to confirm any changes in their distribution.

Water vole have been recorded on Latherford Brook (Watercourse 5), with one burrow location identified within the Scheme; unaffected by the works. A Natural England licence to trap water vole would not be required, unless pre-construction surveys undertaken to confirm any changes in water vole distribution confirm that new burrows exist within the works area. In such case, the defined water vole mitigation strategy would be implemented in line with Natural England licensing requirements and include use of proposed ecology ponds as receptor and trapping/ fencing as required. If pre-construction surveys do not confirm the presence of water vole, vegetation clearance would be done under precautionary working methods.

The culverting proposed within the Scheme would result in the loss of some foraging habitat; however, replacement habitat has been incorporated into the Scheme.

- **GCN:** The Scheme, avoids impacts to confirmed or assumed GCN ponds (waterbodies 34, 52 and 128 which support known populations would all be retained) and important GCN habitat. Mitigation for the loss of suitable terrestrial habitat would be in line with Natural England licence requirements (refer to Appendix 8.3: Letter of No Impediment (LONI) for GCN [TR010054/APP/6.3]; and Section 8.9 (Assessment of likely significant effects) for details. It should be noted that Appendix 8.3: Letter of No Impediment for GCN [TR010054/APP/6.3 is based on version 1 of the Environmental Masterplan (Figure 2.1 to 2.7 of the ES [APP-057 to 63/6.2] and 2019 survey results only. As such, several waterbodies assumed to support GCN and referred to in the method statement to support the LONI have been shown in 2020 to not support GCN. Mitigation for these waterbodies has been removed from the Environmental Masterplan. Natural England has confirmed that these changes do not require an updated LONI to be issued.
  Measures would be implemented to minimise construction impacts on GCN as per Highways England guidance in LA 118 (Ref 8.25).

  Pre-construction surveys would be undertaken to confirm the status of GCN populations to be affected by the proposals and any mitigation required would be implemented to minimise impacts in accordance with the Natural England licence, including trapping and translocation, where required, within the appropriate season for GCN.

  Mitigation measures would be appropriate to each metapopulation, to be updated based on pre-construction survey results, dependent on the implementation programme, the quality of the habitats being affected, scales of impact and the availability of other habitats to the GCN population. Where impacts would be minimal, some works would be undertaken outside of Natural England licensing, to be determined by precautionary working methods. Mitigation measures would include habitat management, use of exclusion/drift/ring fencing to control dispersal, trapping and translocation of

GCN, hand searches and soft destructive searches of vegetation prior to clearance.

Eight ecology ponds would be created to compensate for the loss of waterbodies within the Scheme boundary. These ecology ponds would provide suitable breeding habitat for local GCN populations, including those known to be present in waterbodies 34, 52 and 128. Suitable terrestrial habitat, including woodland, species-rich grassland, hedgerow and GCN hibernacula would be created to compensate for losses required during construction.

- **Terrestrial Invertebrates**: The loss of invertebrate habitat would be mitigated for by the creation of new woodland, wetland and species-rich grassland habitats, along with retaining and providing dead wood habitats.
- **Aquatic invertebrates, fish and aquatic macrophytes:** The Scheme design includes a highway drainage system (refer to the Road Drainage Strategy in Appendix 13.2 [TR010054/APP/6.3]). As part of this system, multiple attenuation ponds would be created as well as 12 ecology ponds. In addition, ditch habitat is to be created to compensate for the loss of riparian habitats to culverts and all features would develop into ecological habitats of benefit to aquatic macroinvertebrates. Fish translocation would be undertaken on ponds being lost, where necessary.

Operation

8.8.6 The Environmental Masterplan (Figures 2.1 to 2.7 [TR010054/APP/6.2]) illustrates the essential biodiversity mitigation and compensation that have been incorporated to meet specific species and habitat requirements within the wider framework of other environmental measures for landscape, visual and the water environment.

8.8.7 Newly created and retained habitats would be subject to a detailed 5-year Landscape and Ecological Management Plan (LEMP) (as outlined in the OEMP [TR010054/APP/6.11]) for Scheme specific maintenance, with routine management and maintenance to follow for 30 years after completion of the Scheme and set out in a future HEMP (as outlined in the OEMP) designed to maximise biodiversity.

Designated sites, non-designated sites and habitats

8.8.8 The following mitigation measures would be in place to reduce the effect of potentially significant Scheme operational impacts on designated, non-designated sites and habitats:

- **Management of operational highway run-off:** Highway runoff from the operational Scheme runoff would be collected and managed in accordance with the Road Drainage Strategy (Appendix 13.2 [TR010054/APP/6.3]).
- **Ancient woodland** within 200 m of the ARN may be subject to impacts through increased nitrogen deposition as a result of changes to traffic flows. This would not result in loss of the woodland, but could lead to changes in species composition within the affected woodland. Where this is the case, compensatory replacement woodland habitat would be provided at a ratio of 1:1 by area.

Species

8.8.9 The following mitigation measures would be in place to reduce the effect of potentially significant Scheme operational impacts on ecological species:

- **Bats (roosting, foraging and commuting):** The Scheme lighting has been designed to minimise impacts on bats. The length of the Scheme would be unlit with new lighting limited to the junctions with the M54 and M6, where artificial lighting is already present on the existing road network, or in areas that have been confirmed as not offering significant importance to commuting or foraging bats such as open areas of arable or improved grassland (e.g. in the location of the two new roundabouts to the north of junction 1 of the M54).

  Management and maintenance of linear features and other habitats of value to foraging and commuting bats included within the landscape design (as detailed in Figures 2.1 to 2.7 [TR010054/APP/6.2]) will ensure the value of these habitats to bats is maximised in the long term. Careful design of the landscaping at known bat activity hot spots and flyways has been undertaken. Mitigation for **terrestrial invertebrates** in relation to the loss of woodland comprises a combination of the establishment of new woodland and the retention of deadwood habitat.
- **Barn owl:** Planting of habitats included within the landscape design (as detailed in Figures 2.1 to 2.7 [TR010054/APP/6.2]) as well as fencing has been incorporated to reduce potential collision risks to barn owl as a result of the Scheme.
- **Badger and otter:** Mammal tunnels (and associated guide fencing) and otter ledges would be installed at three locations, which are shown on Figures 2.1 to 2.7 [TR010054/APP/6.2], to aid the safe crossing of the road by badgers and other animals, and to mitigate the risks of increased mortality of wildlife once the road becomes operational and used by traffic. In addition, the open span structure at Latherford Brook would retain connectivity along the Latherford Brook corridor.
- **Aquatic and riparian species:** Highway runoff from the operational Scheme runoff would be collected and managed in accordance with the Road Drainage Strategy (Appendix 13.2 [TR010054/APP/6.3] – also refer to Chapter 13: Road Drainage and the Water Environment). Such measures would manage the quantity and quality of highway runoff to the benefit of all aquatic species.

Enhancement measures

8.8.10 Excluding the ancient woodland compensation planting, which has been addressed as described above, the Scheme would achieve no net loss in biodiversity, which by definition is the mitigation rather than enhancement of biodiversity on the site as a whole. However, the Scheme would achieve improvements to specific habitats as part of this overall objective and Highways England will seek to achieve further enhancements where possible outside the DCO process.

8.9 Assessment of likely significant effects

8.9.1 The prediction of impacts and the assessment of effects has taken account of the mitigation measures and the compensation measures identified within Section 8.8.

8.9.2 Impacts and effects on biodiversity are reported for both the construction and operational phases of the Scheme and are presented first under the headings of designated sites (international, national and other), then habitats, and finally species. The effects of all of the impacts are considered individually and then collectively for each of the biodiversity features assessed.

Construction

Designated sites of international importance

8.9.3 Due to the distance separating the Scheme from the identified designated sites of international importance, the assessment has concluded that there will be no direct or indirect impact pathways during the construction phase. Natural England have confirmed their agreement with this conclusion (see standalone report [TR010054/APP/6.9]). Accordingly, there is considered to be no change to designated sites of international importance resulting in an effect of neutral significance.

Designated sites of national importance

8.9.4 There would be no direct impacts on the Stowe Pool and Walk Clay Mill SSSI as a result of the Scheme construction, as it lies approximately 1.5 km away from the Scheme boundary.

8.9.5 In addition, given the distance involved and as there is no hydrological connectivity from the Scheme boundary to the sites that comprise the SSSI, it would not be at risk from other indirect construction impacts (e.g. surface water run-off) due to the lack of impact pathways identified. Therefore, there is considered to be no change to designated sites of national importance resulting in an effect of neutral significance.

Designated sites of county importance

8.9.6 There would be no direct impacts on the Wyrley and Essington Canal LNR as a result of the Scheme construction, as it lies approximately 1.4 km away from the Scheme boundary.

8.9.7 In addition, given the distance involved and as there is no hydrological connectivity from the Scheme boundary to the site, it would not be at risk from other indirect construction impacts (e.g. surface water run-off) due to the lack of impact pathways identified. Therefore, there is considered to be no change to designated sites of local importance resulting in an effect of neutral significance.

Non-statutory designated sites

8.9.8 As outlined in Table 8.9, impacts are not anticipated on the majority of non-statutorily designated sites given the distances involved, lack of connectivity to the Scheme boundary and habitats within it and major barriers separating them from the Scheme. Details on the sites that would be affected by the Scheme are provided below.

8.9.9 The direct loss of soils which support these LWS is assessed in Chapter 9: Geology and Soils, Section 9.9.

Lower Pool LWS and SBI

8.9.10 Construction of the Scheme would result in the direct, unavoidable and irreversible loss of woodland and standing water habitats within Lower Pool LWS and SBI. The impact would comprise the permanent loss of 2.04 ha (32.3 %) of woodland and 0.46 ha (7.3%) of standing water comprising a total of 39.6 % of the of the LWS and SBI boundary. The woodland is not ancient and although it is designated as part of the SBI is characterised as broadleaved/ mixed plantation with a variable species-poor ground layer, which is absent in places (see Appendix 8.4 [TR010054/APP/6.3]). The standing water comprises an ornamental fishing lake shaded by surrounding woodland. It is not considered suitable to support GCN and no field signs for water vole/otter were recorded. The surveys undertaken (details provided in Appendix 8.4 [TR010054/APP/6.3]) have therefore confirmed that although the site is designated as an LWS and SBI, it is not currently meeting the criteria for this selection for woodland, ponds or habitat mosaic.

8.9.11 However, Lower Pool LWS and SBI is an important ecological feature within the Scheme boundary and given the extent of the land take proposed the Scheme would have an adverse impact on the ecological function and integrity of the habitats.

8.9.12 These habitat losses would be compensated for by a total of 6.29 ha of habitat creation, in the form of 4.84 ha of woodland planting and 0.57 ha of standing water surrounded by 0.78 ha of grassland. These habitats would be connected to the retained LWS and SBI habitats by species rich grassland proposed on the road embankments, tree and hedgerow planting at the base on the embankments and hedgerow planting along Hilton Lane. Furthermore, a diversion of Watercourse 3 under the Scheme and an associated mammal tunnel will provide additional connectivity. This ratio of habitat compensation to loss is considered appropriate given the importance of the LWS and the length of time it takes new woodland planting to establish.

8.9.13 Over the long term, the created woodland would be managed to have variety in structure, as well as abundant standing and fallen deadwood. Hedgerows would be subject to relatively infrequent, rotational management to maximise biodiversity. The grassland would be managed by mowing and removal of arisings to avoid increased soil fertility, and/or grazing, which will maximise species diversity. The proposed waterbodies would be designed and managed to maximise ecological benefits through the creation of a variety of wet habitats, including permanent standing water of varying depths and some marginal areas which would be occasionally dry. In addition, improvements to the retained woodland including removal of invasive species and selective clearance would be undertaken.

8.9.14 Given the Lower Pool LWS and SBI is not currently meeting the criteria for SBI selection, the above measures are considered to mitigate the habitat loss proposed and would result in the improvement of the retained habitats.

8.9.15 Through the application of standard mitigation measures detailed in the OEMP [TR010054/APP/6.11] during construction, potential indirect impacts on water supply or quality at Lower Pool LWS and SBI associated with accidental pollution or changes in the rate, amount and quality of waste supply would be avoided or reduced. However, whilst Chapter 13: Road Drainage and the Water Environment has identified the SBI as a water dependant ecological site, it is founded on clay-rich substrate restricting any connectivity with groundwater (paragraph 13.6.62 in Chapter 13: Road Drainage and the Water Environment) and will be unaffected by any change in groundwater levels. Therefore, any proposed monitoring of groundwater levels (paragraphs 13.8.8 to 13.8.9 in Chapter 13) is not required for Lower Pool LWS and SBI. Taking into account the proposed habitats would take some time (functioning well developed scrub within 15 years and mature woodland within 30 + years) to establish, the Scheme is considered to have a moderate adverse impact on the LWS (effects of slight significance) in the medium term (10-30 years years), reducing to an effect of neutral significance in the long term (beyond 30 years) once habitats are established.

Brookfield Farm, Shareshill LWS and SBI

8.9.16 Construction of the junction linking the Scheme and the M6 would result in the direct, unavoidable and irreversible loss of approximately 0.71 ha of woodland comprising 15% of the LWS and SBI boundary. None of the woodland to be lost is considered to be ancient. However, work would be required within 15 m of 0.029 ha of the ancient woodland and is therefore considered to be lost as Natural England guidance advises a 15 m buffer from ancient woodland is required for all development works (Ref 8.46). Further detail on ancient woodland is provided in the relevant section below.

8.9.17 The Scheme would cross Latherford Brook (Watercourse 5) by a 10 m wide single span structure approximately 30 m in length which could result in a temporary loss of up to 71 m of existing channel during construction as some construction works to the margins of the primary channel will be required to install the new bridge abutments and wingwalls. Latherford Brook channel is approximately 1 – 2 m wide and supports both otter and water vole and impacts in relation to these species are outlined in the relevant section below. The permanent loss of woodland habitat and temporary loss of habitats in and adjacent to Latherford Brook along the 70 m stretch affected has the potential to adversely impact upon the integrity of the LWS and SBI habitats and as the Scheme goes through the LWS and SBI boundary, has the potential to lead to habitat fragmentation.

8.9.18 However, the majority of the LWS and SBI habitats would be retained and unaffected by the Scheme. To compensate for the loss of woodland habitat, excluding the ancient woodland, 2.54 ha of additional woodland habitat is proposed surrounding the LWS and SBI to the east of the Scheme and connecting to the SBI to the west of the Scheme as well as 0.39 ha of standing water immediately to the south. Species rich grassland and hedgerows are also proposed on the Scheme embankments. This ratio of habitat compensation to loss is considered appropriate given the importance of the LWS and the length of time it takes new woodland planting to establish.

8.9.19 The open span structure proposed would ensure that the channel of Latherford Brook is retained in the medium to long term and there would be no permanent loss of brook habitat as a result of the Scheme and habitat connectivity would be retained. Proposed habitats would be managed as outlined above for Lower Pool and some minor improvements to the retained LWS and SBI habitat would be undertaken including selective scrub clearance and tree clearance where necessary.

8.9.20 Given the majority of the LWS and SBI habitats are being retained, the habitat creation proposed is considered to mitigate the habitat loss, excluding ancient woodland (see below). Furthermore, the incorporation of the open span structure would ensure that habitat connectivity is retained between both sections of the LWS and SBI on either side of the Scheme.

8.9.21 Taking into account the proposed habitats would take some time (functioning well developed scrub within 15 years and mature woodland within +30 years) to establish, the Scheme is considered to have moderate negative adverse impact on the LWS/SBI, resulting in an effect of slight significance in the medium term (10-30 years), reducing to an effect of neutral significance in the long term (beyond 30 years) once habitats are fully established. The exception is the permanent loss of ancient woodland, which is discussed separately, below.

8.9.22 The LWS/SBI supports habitats that rely on the water supply. Method statements would be prepared as part of the CEMP to protect watercourses during construction. These would include details of protection of retained habitats, details of ecological supervision, timing of works and control of water levels. These would also incorporate requirements in relation to protected species present (otter and water vole).

8.9.23 Through the application of standard mitigation measures detailed in the OEMP [TR010054/APP/6.11] during construction, potential indirect impacts on water supply or quality at associated with accidental pollution or changes in the rate, amount and quality of waste supply would be avoided or reduced. However, whilst Chapter 13: Road Drainage and the Water Environment has identified the SBI as a water dependent ecological site, the Scheme will be constructed on an embankment within the SBI and therefore impacts to groundwater are not anticipated (paragraph 13.6.63 in Chapter 13). Therefore, any proposed monitoring of groundwater levels (paragraphs 13.8.7 to 13.8.8 in Chapter 13) is not required for Brookfield Farm, Shareshill LWS and SBI.

8.9.24 Given work would be undertaken directly to the watercourse there may be some minor adverse impacts, resulting in an effect of neutral significance.

8.9.25 The magnitude of impact of pollution or hydrological change upon all other non-statutory sites would be negligible, resulting in an effect of neutral significance.

Ancient woodland

8.9.26 At Oxden Leasow (Whitgreaves wood) there would be no direct loss of ancient woodland as a result of the Scheme. However, construction work would take place within the standard 15 m buffer zone which totals 0.32 ha therefore this area is assumed as a loss, of the ancient woodland, as outlined above as a result of

disturbance including light and noise. Within the Brookfield Farm LWS and SBI Woodland, no woodland would be directly lost, but there is an assumed loss of 0.029 ha as a result of work being required within 15 m buffer zone of the ancient woodland.

8.9.27 This would result in a total loss of ancient woodland of 0.349 ha. This loss would be compensated for by replacement planting on a ratio of 7:1 (2.44 ha of woodland) within the immediate vicinity of the Brookfields Farm LWS and SBI woodland which has been agreed with Natural England. The location of the land identified for these compensation measures is illustrated on Figures 2.1 to 2.7 [TR010054/APP/6.2]. In combination with the compensatory planting, conservation led management of both ancient woodlands would seek to develop and improve upon the woodland structure.

8.9.28 The NPSNN (Ref 8.12) acknowledges ancient woodland to be an irreplaceable habitat because of the long continuity of woodland cover, which means that even woodland sites which have been replanted are important as part of the resource. Its loss cannot be fully compensated by new planting. Many of the species of ancient woodland have poor ability to colonise from areas of existing ancient woodland and into separate new habitats, and this may even be the case after the periods of decades that are required for planted trees to develop on a new site.

8.9.29 Although there would be no severance of woodland habitat at Oxden Leasow (Whitegeaves Wood), the loss of woodland west of the Brookfields Farm ancient woodland as a result of the Scheme could have indirect effects on the quality of the habitat of adjacent retained woodland as it may become more exposed to light and inclement weather.

8.9.30 This exposure may cause further damage and result in the growth of more vigorous species rather than those that favour stable conditions. However, the additional woodland planting proposed immediately adjacent to the retained woodland is considered to minimise this process in the long term once habitats have established.

8.9.31 It is recognised that ancient woodland with its long history and complexity of habitat cannot be replicated, and certainly not within 15 years. Even when the measures incorporated into the Scheme are taken together (comprising minimising loss of ancient woodland, increased (non-ancient) woodland area through new planting and improvements in management of retained woodland) the losses of ancient woodland from these two areas represent a reduction in the overall extent of this irreplaceable habitat resulting in a major adverse impact, which is an effect of large significance.

Habitats

8.9.32 The construction of the Scheme would result in both losses and gains of habitat. The permanent habitat gains are those classified as habitats created as part of the Scheme. Table 8.18 provides a summary of all habitat losses and gains within the Scheme boundary. It does not correspond to the total area of land required for the Scheme because it does not include highway or other built infrastructure.

Table 8.18: Habitat losses and gains

Existing habitat	Habitat loss (ha and linear km)	Importance	New habitat (Figures 2.1 to 2.7)	Habitat gain (ha and linear km)	Net permanent gain (ha and linear km)
Cultivated/disturbed land - arable	31.65	Negligible	N/A	N/A	-31.65
Improved grassland (including amenity)	25.45	Negligible	Amenity grassland	5.22	-20.23
Poor semi-improved grassland	2.50	Negligible	Semi-improved neutral grassland	38.20	+35.70
Broadleaved woodland – semi-natural	1.18	Local and County	N/A	N/A	-1.18
Broadleaved woodland – plantation (including recently felled)	16.73	Local	Broadleaved plantation*	15.3	-1.43
Mixed woodland - plantation	2.76	Local and County	N/A	N/A	-2.76
Intact hedge - native species-rich	1.47	Local	Intact hedge - native species-rich	7.20	+5.73
Intact hedge – native species - poor	1.57	Local	N/A	N/A	- 1.57
Defunct hedge	0.36	Local	N/A	N/A	-0.36
Tree line and trees	0.00	Local	N/A	N/A	0.0
Other tall herb and fern - ruderal	0.36	Negligible	N/A	N/A	-0.36
Standing water	1.22	Local	Standing water	2.4	+1.18
Running water	0.32	Local	Running water	0.41	+0.9
* Does not include 3.31 ha woodland planting undertaken for loss of ancient woodland, 4.94 ha woodland planting to compensate for loss of Lower Pool LWS/SBI, and 2.04 ha woodland planting to compensate for the loss of Brookfields Farm LWS/SBI.					

8.9.33 There would be no loss of broad-leaved semi-natural woodland outside the designated site boundaries; however, the Scheme would result in the loss of 16.73 ha of broadleaved plantation and mixed plantation woodland, the majority of which is associated with roadside planting along the existing M54, M60 and A460 and is less than 30 years old. This loss of woodland would be mitigated for through

the creation of 15.3 ha of native woodland within the Scheme boundary. Woodland would be subject to a detailed 5-year LEMP (as set out in the OEMP [TR010054/APP/6.11]) for Scheme specific maintenance, with routine management and maintenance to follow for 30 years after completion of the Scheme and set out in a future HEMP (based on the outline in the OEMP) designed to maximise biodiversity including selective thinning, retention of deadwood and creation of rides or glades through coppicing all of which would contribute to increased structural diversity.

8.9.34 Given that the majority of the woodland loss is associated with smaller areas of roadside plantation woodland of lower nature conservation significance, the area of woodland planting proposed would result in no change to woodland habitat, which is of neutral significance.

8.9.35 There are seven veteran trees identified within the Scheme boundary (refer to Arboricultural Impact Assessment Report, Appendix 7.1 [TR010054/AP/6.3] for full details and the locations); however, all will be retained and protected during construction therefore no changes to veteran trees are anticipated, resulting of effects of neutral significance.

8.9.36 The Scheme would result in a loss of 25.45 ha of improved and amenity grassland, and 2.50 ha of poor semi-improved grassland. This loss of grassland would be mitigated for through the creation of 38.20 ha of species-rich grassland primarily along the new road verges, within roundabouts and to replace some adjacent arable habitats as illustrated on Figures 2.1 to 2.7 [TR010054/APP/6.2]. Proposed grassland would comprise a species rich grassland mix. These grasslands will be subject to long term management, which will seek to maintain a diverse, species rich sward.

8.9.37 Therefore, given the area of habitat to be created, once established (within 10 years) the new grassland will result in a minor beneficial impact which is of slight significance.

8.9.38 The Scheme would result in the loss or partial loss of nine waterbodies 23, 25, 26, 28 (partial), 29, 56 (partial), 57, 65 and 73 during construction, the locations of which are shown in Figure 8.29.

8.9.39 The loss of waterbodies will be compensated for by a total of eight ponds and marginal wetland habitat that would be created as illustrated on the Environmental Masterplan Figure 2.1 to 2.7 [TR010054/APP/6.2]. These ponds would be in addition to those required for the Scheme drainage and designed to maximise ecological benefit including creation of permanent and semi-permanent standing water, undulating margins and planted with native species. Given the poor quality of the majority of the ponds to be lost (i.e. large fishing lakes with a lack of variation and species diversity) it is considered that their loss would be mitigated for once the proposed ponds are established.

8.9.40 Therefore, given the area of habitat to be created, once established the new waterbodies would result in a minor beneficial impact, which is an effect of slight significance.

8.9.41 Within the constraints of the Scheme, mitigation for the loss of running water habitats includes a total of 408 m of watercourse habitat (exceeding the 323 m of watercourses that would be culverted). This includes 32 m of new ditchcourse to Watercourse 2, 280 m to Watercourse 3, and 96 m to Watercourse 4. Although not proposed with ecological benefit as a primary function, ditches would be designed to provide ecological benefit as a secondary function. Where new ponds discharge to the local stream network they would be connected by new ditches rather than pipes. This avoids the need for engineered outfalls, extends existing green corridors, and provides greater connectivity with the proposed treatment and attenuation ponds. All ditches would be carefully designed so that the final form avoids a uniform cross section and maximises biodiversity opportunities. As well as the ditches, additional watercourse habitat will be created as a result of existing watercourse realignment required to accommodate the Scheme. Detailed realignments have not been designed at this stage therefore, final lengths are not known; however, a minimum of 46mof Watercourse 2 is required so has been included within the assessment. Realignments will also be designed to provide ecological benefit as a secondary function.

8.9.42 Enhancements of retained watercourses would also be undertaken. This would include some or all of; reducing artificial bank face profile, reducing non-native invasive plant species on banks, planting of riparian and channel margin vegetation, reducing sedimentation of channel bed, and improving channel morphotype richness. Therefore, given the area of habitat to be created and enhanced once established the new watercourse lengths would result in a negligible impact, which is an effect of neutral significance.

8.9.43 The Scheme would result in the loss of approximately 3.4 km of hedgerows (this loss does not include TN27, the hedgerow with ancient characteristics). It is reasonable to anticipate that partial losses from any individual hedgerow may affect its ecological function, such as the hedgerow's ability to support associated flora. Losses from any hedgerows of less than 20 m[10] are considered unlikely to affect the conservation status of these hedgerows and constitute negligible adverse impacts, resulting in an effect of neutral significance.

8.9.44 Losses from hedgerows that exceed 20 m (see Table 8.19) can result in adverse effects including habitat fragmentation; however, the losses of all hedgerows that exceed 20 m would be mitigated through the planting and long term management of 7.20 km of native, species-rich hedgerow. The hedgerows would be managed for biodiversity as part of the Highways England soft estate. Once established, this would constitute a minor beneficial impact, resulting in an effect of slight significance. Refer to Figure 8.3 [TR010054/APP/6.2] for hedgerow locations.

8.9.45 For the purposes of the assessment, hedgerows in the central part of the northern site compound (TN20, TN22, and TN23) have been assumed to be lost to ensure a worst case assessment but it may be possible for them to be retained.

[10] 20 m is the distance (or gap) set out within the Hedgerow Regulations 1997 (Ref 8.9) to define two separate hedgerows, i.e. two rows of bushes separated by a linear distance of 20 m are considered to be separate hedgerows.

Table 8.19: Extent of hedgerow loss

Extent of Hedgerow Loss		Hedgerows Affected
90 – 100% lost		TN1, TN20, TN22, TN23, TN39, TN40, TN41, TN75
<90% lost	More than 20 m	TN10, TN11, TN14, TN29, TN35, TN37, TN68, TN71
	Less than 20 m	TN8

8.9.46 The risk of damage (direct and dust depostition impacts) to retained trees and hedgerows will be mitigated by implementation of protection measures included in BS5837: 2012 (Ref 8.42), which include fencing boundaries of working areas with appropriate standoffs where required to protect both above-ground vegetation and roots. Therefore, the impact of disturbance from indirect impacts to all retained habitats would be negligible adverse, resulting in an effect of neutral significance.

8.9.47 The implementation of standard mitigation measures relating to the control and management of dust (refer to Section 8.8) would reduce, as far as practicable, impacts to the sensitive vegetation of retained habitats. Therefore, the impact of increased dust during construction upon to all habitats would be negligible adverse, resulting in an effect of neutral significance.

8.9.48 Standard mitigation measures (see Section 8.8) applied during construction will avoid potential impacts on retained habitats from any changes in the rate, amount or quality of surface water runoff. Accordingly, the impact on retained habitats would be negligible adverse, resulting in an effect of neutral significance.

8.9.49 The retained/created habitats that will be present over and above what is existing (broad-leaved plantation, standing water, semi-improved grassland, running water and most notably native species-rich intact hedgerow), will increase in quantum by 80.59% as a result of the Scheme.

8.9.50 The Biodiversity Metric Calculations (Appendix 8.2 [TR010054/APP/6.3]) show that following completion of the Scheme, total biodiversity units would be marginally higher, with an area based gain of 2.21% of units, a linear based gain of 29.01% and a gain of 2.23% of river based units (assuming enhancement of 200 m of retained watercourse of river based units. The Scheme is within the range -5 % to +5 % for river and area based habitats (woodland, grassland etc.) which can be classed as no net loss in accordance with Table 11.9 of CIRIA C776a Good practice principles for development (Ref 8.47), and can be classed as achieving a net gain in linear (hedgerow) habitats.

Badger

8.9.51 Badgers are common and widespread and are protected from persecution rather than for nature conservation. Information on potential impacts on badgers is reported in a separate confidential document (see Appendix 8.5 [TR010054/APP/6.3] (CONFIDENTIAL)). In summary, the potential impacts to badgers during

construction comprise habitat loss, direct mortality, disturbance and habitat fragmentation.

8.9.52 No main setts would be lost to accommodate the Scheme. One outlier sett would be permanently lost to the Scheme. A Natural England licence would be obtained to legally shut down the outlier sett therefore mortality would be highly unlikely. A draft licence has been submitted and agreed to by Natural England (refer to Appendix 8.3: Letters of No Impediment [TR010054/APP/6.3]). Standard best practice working methodologies as outlined in the OEMP [TR010054/APP/6.11] and Appendix 8.5 [TR010054/APP/6.3] (CONFIDENTIAL) would be implemented to minimise this risk of direct mortality.

8.9.53 Measures provided in the Scheme design, including three badger tunnels, fencing and strategic planting, and habitat creation (see Section 8.8) would ensure that Residual effects on badgers are negligible and of neutral significance.

Barn owl

8.9.54 No known nest sites or roost sites would be lost to the construction of the Scheme. The loss of low value habitat that is isolated between the existing road network and offers little in the way of opportunity for barn owl foraging, would be replaced by habitats of higher value.

8.9.55 The noise assessment (refer to Chapter 11: Noise and Vibration) shows that during construction, noise levels at the barn owl roost site (T13, refer to Figure 8.8 (CONFIDENTIAL) [TR010054/APP/6.2] for location) would be no more than 2 dB higher than existing ambient levels which would not result in any impact to barn owls if present.

8.9.56 The buildings that could not be accessed (B7 – B10, refer to Figure 8.10 for locations [TR010054/APP/6.2]). would not be directly affected by proposals; however, there is potential that they could support barn owl so subject to access surveys would be undertaken on these buildings to confirm the presence or absence of barn owl prior to construction.

8.9.57 If barns owls were to be present in these buildings (refer to Figure 8.10 for locations) [TR010054/APP/6.2])., disturbance to these nest sites as a result of the Scheme would not be anticipated because:

- B7 is located 186 m west of the Scheme boundary and will be screened from the Scheme boundary by an existing retained mature hedgerows (TN25) and retained vegetation immediately adjacent to the east of B7;
- B8 is located 347 m east of the Scheme boundary and is screened from the Scheme boundary by existing mature tree lines, woodland blocks and hedgerows outside the Scheme boundary;
- B9 is located 900 m east of the Scheme boundary and is screened from the Scheme boundary by multiple woodland blocks including Keeper's Wood and woodland planting around Hilton Hall; and
- B10 is located approximately 90 m west of any works within the Scheme boundary and is screened from work by two mature tree lines.

8.9.58 Barn owl presence in these locations in the absence of survey data has been assumed and although no direct impacts to the nesting sites are anticipated, mitigation for barn owls using the landscape within the Scheme boundary has been incorporated including planting of habitats (as detailed in Figures 2.1 to 2.7 [TR010054/APP/6.2]). Detail of the operational impact assessment is provided in paragraphs 8.9.112 to 8.9.113.

8.9.59 Residual effects on barn owls during construction are, therefore, considered to be negligible and of neutral significance.

Bats

8.9.60 The potential impacts of construction upon bats relate to habitat loss, disturbance (from noise, vibration and light) and habitat fragmentation.

8.9.61 Construction of the Scheme would result in the direct loss of two known bat roosts and additional assumed day roosts and potential hibernation roosts within trees within the Scheme boundary. These are however of low conservation significance, being day roosts rather than maternity roosts. Day roosts are less important to the local bat population than maternity roosts as individual bats tend to have several day roosts and vary usage according to conditions.

8.9.62 Bats can make transitory use of suitable tree roost sites and as such there is a risk that trees supporting features that are suitable for bats may become occupied in the future.

8.9.63 Definitive evidence that noise can result in disturbance to bats is limited (Ref 8.48), although studies of bats that use gleaning when hunting have indicated that elevated noise levels can affect foraging success (Ref 8.49 and Ref 8.50). In the UK this is applicable to brown long-eared bats. In terms of roosting, there is no direct evidence that noise can affect a bats ability to roost and indeed roosts have been recorded in road bridges and industrial buildings subject to high noise levels. In the case of the Scheme boundary, there is existing road noise on account of the proximity of the M54, M6 and A460 and the projected noise assessment indicates that the risk of construction noise levels above ambient levels is expected to be generally low for roosts associated with buildings B1, B2a and B2b. At B18 (the assumed maternity long-eared roost), construction noise is anticipated to exceed the existing ambient by up to 6 dB, and at B11 (pipistrelle day roost) construction noise levels are anticipated to be up to 19 dB above existing ambient levels. On balance, given the level and temporary duration of the elevated levels of construction noise (above the existing ambient for up to 10 months at B18 and up to 22 months at B11), it is unlikely that they would result in significant effects such as to result in abandonment of the roosts present. There is some risk of disturbance to foraging long-eared and other bat species within retained woodland within or close to the Scheme boundary. However, given this would be temporary and suitable alternative foraging habitat exists to the immediate east around Hilton Hall, further from the construction noise, it is unlikely to adversely impact upon bats survival or the functionality of the known roosts.

8.9.64 Construction would result in the loss of some habitats that may be used by the long-eared bat maternity roost. Bat activity surveys do not indicate that these habitats are used by high numbers of long-eared bats; however, given the nature of long-eared bat calls they are often missed or not recorded. Nevertheless, the habitats in closest proximity and immediately surrounding the maternity roost offer optimal opportunities. Optimal woodland and woodland edge habitats which connect to the wider area are largely retained. Compensatory planting and habitat creation have been designed to offer optimal bat foraging opportunities with a mosaic of woodland, hedgerows, species-rich grassland and wetland. This has been located to maximise opportunities for known bats where possible. Although there is a recognised lag time in habitat creation (especially with for example woodland planting), the intermediate habitat creation while it matures to targeted condition is likely to still provide some foraging opportunities. The retained habitat close to the roost, along with the habitat compensation will ensure that quality foraging and commuting habitat will be available to the bats occupying the roost and their conservation status is unlikely to be affected.

8.9.65 Impacts would therefore be negligible, resulting in an effect of neutral significance.

8.9.66 Overall the bat activity associated with the habitats within the study area is low to moderate and typical of the habitats present. Most activity is by common and widespread species, although a range of species (up to nine) are present. Bat activity is likely to be limited by the existing fragmentation of the study area from the wider landscape with the presence of the M54, M6 and A460 that enclose the /immediate landscape. Nevertheless, this makes the bats present potentially more susceptible to further fragmentation effects and loss of habitat, given the restrictions to their dispersal into the wider landscape.

8.9.67 The Scheme would largely result in the loss of habitats associated with the lower levels of bat activity including open fields of arable and poor semi-improved grassland. However, the Scheme would also result in the loss of some habitats that have higher levels of bat activity, including woodland and wetland associated with Lower Pool SBI and LWS, woodland edge and riparian habitats associated with Latherford Brook (Watercourse 5). Overall the direct losses from the foraging and commuting habitat that is more regularly used by the local bat population are localised.

8.9.68 The loss of woodland, wetland and severance of hedgerows would lead to the fragmentation of interconnected habitat that is used by the local bat population. Levels of bat activity are low to moderate, with highest levels of activity and highest numbers of species associated with woodland edge and wetland habitats associated with Lower Pool and Brookfield Farm SBI and LWSs.

8.9.69 The effects on the larger, stronger-flying bat species, such as *Nyctalus* sp., is likely to be less as these bats are capable of crossing open areas.

8.9.70 Activities resulting in increased levels of noise, vibration or light can lead to bats abandoning roosts or displacing them from foraging and commuting habitat. Bats are susceptible to disturbance impacts, particularly during the sensitive hibernation and maternity period.

8.9.71 The majority of the construction phase will be conducted during the day hence would not be anticipated to affect foraging or commuting bats. However, some discrete areas do require construction activities at night for example construction of certain bridges and junctions where traffic management measures are required (see Chapter 2: The Scheme). Although the exact timing of these is not known, preliminary work schedules (as set out in the OEMP for the Scheme [TR010054/APP/6.11]) indicate they are unlikely to be conducted in the core season for bats (May to August inclusive) and are unlikely to extend beyond one or two consecutive evenings at a time. These are largely in areas where habitat clearance will have been conducted in advance and in the instance of areas in proximity to existing junctions are in locations where bat activity is low. Bats may be displaced from foraging in areas immediately adjacent to these work areas due to elevated noise or lighting for these discrete locations. However, given the majority of works is conducted outside the core season and measures will be taken to minimise light spill through the use of directional hoods and cowls, temporary impacts are not considered to be significant to the local bat population.

8.9.72 Sufficient data has been collected to rule out the likely presence of a high conservation status roost, so known roosts outside the Scheme boundary in the study area are roosts of low conservation significance, which are likely to be transitory. Indirect impacts on these roosts as a result of noise and vibration during construction are unlikely to result in significant adverse effects on the FCS of the local populations of the common species found roosting (common and soprano pipistrelle and brown long-eared bat).

8.9.73 Pre-construction surveys would be carried out as best practice prior to felling of any trees with potential to support roosting or hibernating bats to be lost to construction works. The timing and nature of these surveys (methods and number of surveys) would depend on the bat roosting potential of a tree, the results and age of pre-existing survey data held for a tree and the time of year felling would take place.

8.9.74 Any trees identified with confirmed roosts would be subject to an appropriate Natural England EPS derogation licence prior to felling. Where precautionary felling methods are required, this would comprise section felling by experienced arborists under the supervision of an appropriately licensed bat worker. If bats are confirmed to be present at any time, at locations not already covered by the Natural England EPS derogation licence, then works in that location would be halted until consultation with Natural England confirms that works can proceed.

8.9.75 Loss of the four confirmed (noctule and pipistrelle) and assumed day roosts (common species) and three assumed hibernation roosts (common species) in trees will be compensated for through the erection of three bat boxes for every roost loss. In line with the Natural England licence this will includes 21 bat boxes including five Schwegler 1FD, 4 Schwegler 1FF, 3 Schwegler 2FN and nine Schwegler 1FW. Any additional work conducted under licence would also require the provision of alternative roosting opportunities, the nature of which would depend on the size and status of roost but would likely be in the form of bat boxes.

8.9.76 The measures detailed above would be sufficient to ensure that should bat roosts be present, the conservation statusof the local bat population would be maintained. Creation of new potential roosting locations (bat boxes) are also proposed within the Scheme boundary to provide overall habitat enhancement including up to 50 bat boxes of various designs, as required by the conditions of the Natural England EPS derogation licence for bats, to offer a range of opportunities for bats in retained and newly created habitats of value to bats.

8.9.77 Within the Scheme boundary 2.4 ha of standing water, 38.2 ha of species rich grassland and 22.28 ha of woodland habitat would be created. These would form a network with existing habitats of importance to bats within the wider study area including those habitats that link to known roosts. In addition, retained habitats of importance within the Scheme boundary (notably woodlands and wetland associated with the SBIs) would be subject to improvement through appropriate infilling/planting and more favourable management.

8.9.78 There would be temporary minor adverse impacts to bats during the construction phase in advance of the design year and immediately after completion, due to the time taken for habitats created to meet target condition. Where possible, advance planting immediately on commencement of the preliminary works to the construction phase will be conducted (to be linked into the requirements for other fauna where possible, for example GCN receptor sites) to minimise the temporary impact. However other long term habitat creation areas are still likely to offer enhanced opportunities for foraging and commuting in advance of reaching target condition.

8.9.79 Once replacement habitat has established and improvement works to retained habitats have commenced the magnitude of impact of bat habitat loss and gain during construction would be negligible adverse impact in the design year on this species assemblage of Local importance (an effect of neutral significance).

8.9.80 Standard construction working measures detailed in the OEMP [TR010054/APP/6.11] would reduce any disturbance impacts as a result of construction activity to levels that are acceptable for the nearby residential properties. This also includes measures to avoid light-spill upon retained boundary habitats that may be used for foraging or commuting. The magnitude of impact relating to possible disturbance impacts would be negligible (an effect of neutral significance).

8.9.81 Connectivity around the margins of the Scheme and into the wider landscape would be maintained, for example, by the wider hedgerow network, watercourses and habitat creation. As illustrated on Figures 2.1 to 2.7 [TR010054/APP/6.2] the mix of proposed native woodland, species rich grassland and wetland created would provide corridors of connecting habitat north-south along the Scheme and into the wider landscape. This includes linear habitat to encourage crossing of the Scheme across two bridge locations at Hilton Lane and the accommodation bridge to the north. These are in locations where the road is in cutting (the Scheme will pass below Hilton Lane at 6m below current ground level and the new bridge is to be 1.7 m above existing ground level giving a difference of 7.7 m – the accommodation bridge will be 4m above ground level) therefore avoiding potential collision risk associated

with this crossing. This will provide access to the areas of newly created habitats to the west of the Scheme including woodland, wildlife ponds and species rich grassland. This also includes the potential for connection over the existing A460 to the west through improved habitat along the eastern side of the A460. These would maintain and improve upon the linkages to the retained areas of habitat, including those known to be regularly used by bats, and would therefore further reduce the impact of fragmentation impacts upon the local bat population. At Latherford Brook (Watercourse 5) the Scheme rises to 8.5 m above existing ground level on a clearspan bridge located over the brook and as such bats would continue to be able to move between retained and newly created foraging habitats to the west and east of the Scheme associated with the brook.

8.9.82 Temporary loss of foraging habitats will be off-set by the establishment of habitats that link to adjacent features used by bats. By the design year, the established habitats would reduce the magnitude of impact to negligible (an effect of neutral significance).

8.9.83 Overall the Scheme would result in a negligible impact on bats (an effect of neutral significance) during the construction period.

Breeding and wintering birds

8.9.84 The direct loss of breeding habitat used by farmland birds is unavoidable for a development of this nature. Based on the survey results, it is estimated that the following breeding territories of notable bird species would be lost; one dunnock, five skylark, two song thrush and one lapwing (see Appendix 8.8 [TR010054/APP/6.3]).

8.9.85 The removal of hedgerow (3.4 km), grassland (27.95 ha) and arable farmland (31.65 ha) within the Scheme would reduce the availability of breeding habitat and the winter foraging resource that is available for birds. The farmland birds (skylark) and scrub specialists (dunnock) would be displaced from their current breeding territories during construction. The farmland in the area surrounding the Scheme boundary is similar to that associated with land that would be taken by the Scheme, and it is likely these species would continue to be present in these surrounding habitats.

8.9.86 The losses of farmland, hedgerow and scrub habitat would have an adverse impact upon some individual species that are present in greater numbers (dunnock, skylark, song thrush).

8.9.87 The direct loss of habitat used by wintering birds would result in the displacement of species into the surrounding area. Given the common and widespread nature of the species present it is considered that this impact would be negligible on the local population (an effect of neutral significance).

8.9.88 Without mitigation, there is the potential for direct mortality of breeding birds through clearance of vegetation.

8.9.89 Retained habitat near to the Scheme boundary may be temporarily degraded during construction in terms of its suitability for nesting and wintering birds. Noise levels would increase overall, and some are likely to be irregular in occurrence, meaning that birds are less likely to become habituated to them, habituation is more likely

where there is frequent or continuous noise or activity. Visual disturbance may also reduce the suitability of habitat; however, this is likely to impact only a limited number of ground-nesting bird species, for example skylark, and some wintering birds. It is relevant that the Scheme is already adjacent to existing major roads (i.e. the M54 and M6 motorways and A460).

8.9.90 Throughout the period of construction, uncovered topsoil mounds and temporarily fallow areas of farmland within the Scheme boundary would provide opportunities for nesting and foraging birds, which would also reduce the magnitude of the impact of habitat loss upon individual species. Furthermore, the breeding and wintering habitat provided by the hedgerow, scrub and grassland lost during construction would be more than adequately off-set through the replacement of these habitats as an integral part of the Scheme's green infrastructure, which includes 7.2 km hedgerow, and 43.42 ha grassland. Given both the low abundance of both breeding territories and over-wintering birds present and also the provision of replacement habitats, in the design year the Scheme would result in minor beneficial impacts, resulting in an effect of slight significance upon all other breeding and wintering bird species present.

8.9.91 Direct mortality of breeding birds would be avoided through the working methods set out in the OEMP [TR010054/APP/6.11], which would restrict vegetation clearance activities to outside of the breeding bird season, where possible, and would provide protection for birds and their nests throughout the construction period. Therefore, through the appropriate timing of works and/or the avoidance of harm/disturbance to active nests, the impact of direct mortality to all breeding bird species would be negligible, resulting in an effect of neutral significance.

Otter and water vole

8.9.92 The Scheme crosses the Latherford Brook (Watercourse 5) where otter and water vole presence has been confirmed during 2019 surveys. The potential impacts during construction work on otter and water vole relate to potential killing of protected species by unmitigated work, habitat loss/ fragmentation, adverse impacts on commuting/ dispersing individuals, loss of places of shelter, loss of foraging habitat, and disturbance during construction as a result on in-channel works and clearance of vegetation. There would be temporary loss of habitat during construction that would be reinstated post-construction and habitat improvement measures such as new grassland and tree planting are proposed at Watercourse 5.

8.9.93 Although no otter holts or water vole burrows were identified during 2019 surveys within the footprint of the works area, access was restricted in some areas so absence in these areas cannot be ruled out and, as habitat is suitable and both species are mobile (with large home ranges in the case of otter), they could utilise currently unoccupied sections of Latherford Brook in future.

8.9.94 Pre-construction surveys will be undertaken to confirm absence of holts and burrows within the works area. If holts/ burrows are not identified, works would be carried out in such a way that connectivity would be retained for as long as possible prior to works. This would be achieved by scheduling in-channel and bank terrestrial vegetation removal immediately prior to works commencement (with a pre-strimming

survey for signs of burrows holts in the works area) rather than de-vegetating large areas in advance of works. Habitats away from the works area would be enhanced to make them more suitable for both species by additional in-channel and bank planting to create new foraging resource and shelter.

8.9.95 If otter holts are identified within the footprint of the works area during pre-construction surveys, a Natural England EPS licence would be required, with artificial holt creation required, as well as improvements of retained habitat and post-construction re-creation of connectivity. If water vole burrows are identified within the footprint of the works area during pre-construction surveys, a Natural England site-specific conservation licence would be required, with water vole capture and translocation.

8.9.96 The new ecology pond situated on the western side of the Scheme boundary, as illustrated on Figures 2.1 to 2.7 [TR010054/APP/6.2] would be used as a water vole receptor area. The pond would be made suitable for water vole by new planting to create foraging habitat and to provide cover. Alternatively, other waterbodies or watercourses within the Scheme boundary could be used as a receptor area, subject to agreement with landowners/ Natural England. Any waterbody used as a receptor site would have to be free of mink and enhanced to be made suitable for water vole in advance of the translocation (likely 9-18 months prior to translocation) to ensure the habitat is sufficiently mature to provide foraging and cover opportunities. Waterbodies used as receptor sites would also have to be sufficiently large to hold a small water vole population, with suitable aquatic and terrestrial connectivity to other suitable mink-free waterbodies.

8.9.97 During the construction works between March 2021 and 2024 there would be temporary loss of foraging/ shelter habitat and temporary loss of connectivity along Latherford Brook between the eastern and western extent of the Scheme. The loss of connectivity could impact otter and water vole dispersal to the retained habitat within the Scheme as well as the dispersal of individuals into the wider area. Passage for both species would be retained during construction, details of which would be included in the method statement for the open span bridge construction across Latherford Brook.

8.9.98 The temporary loss of habitat suitable for foraging and shelter is unlikely to have a significant impact on otter due to the large home range of the species. It could however temporarily affect individual water voles as well as the small water vole population present at the Latherford Brook, particularly as the colony territory of the species is small. However, suitable foraging and shelter habitat exists to the east and west of the Scheme that could be utilised by both species during the construction phase, and the habitat would be improved by new planting post-completion, resulting in new foraging and shelter opportunities.

8.9.99 Impacts on otter and water vole are assessed as negligible, resulting in an effect of neutral significance.

Great crested newt

8.9.100 There are three known GCN populations (waterbodies 34, 52, and 128) within 500 m of the Scheme boundary and 15 waterbodies with assumed populations (nine were inaccessible for surveys and six had incomplete survey data) (see Figure 8.29 and Figure 8.35[TR010054/APP/6.2]). As a result, seven GCN metapopulations have been identified within 500 m of the Scheme boundary, each considered to be of up to County ecological importance.

8.9.101 The potential impacts to GCN as a result of the Scheme are considered to be direct mortality and loss of terrestrial habitat. These impacts are summarised for each of the eight GCN metapopulations in Table 8.20.

8.9.102 Owing to the intended programme of works, update surveys will be undertaken in advance of submitting the final Natural England EPS licence. These surveys would aim to confirm the presence or likely absence of GCN in ponds that couldn't be accessed in 2019 or 2020, or where survey results are incomplete.

8.9.103 The Scheme boundary is dominated by arable habitat, improved grassland which offers minimal opportunities for GCN and linear roadside plantation woodland, with greater opportunities for GCN. The majority of vegetation clearance represents temporary damage. High value terrestrial GCN habitat, including species rich grassland (38.20 ha), woodland habitat (22.28 ha) and hedgerows (7.2 km), as well as ecology ponds (eight ponds) created as part of the Scheme would provide a higher proportion of optimal habitats andcould increase the carrying capacity for GCN and also for the expansion of existing metapopulations following construction of the Scheme. In addition, retained habitats of importance within the Scheme boundary (notably woodlands and wetland associated with the SBIs) would be subject to improvement through appropriate infilling/planting and more favourable management.

8.9.104 A Natural England EPS licence will be sought to allow for the clearance of GCN aquatic and terrestrial habitat that is necessary to undertake construction of the Scheme, where required. The approach to this mitigation is detailed as part of a draft Natural England EPS derogation licence (refer to Appendix 8.3: Letter of No Impediment [TR010054/APP/6.3]).

8.9.105 Following the implementation of best working practices to reduce the risk of mortality, including the adoption of a Natural England licence, the impacts upon GCN during the construction period would be negligible (an effect of neutral significance).

Table 8.20: GCN impact assessment

Metapopulation number	Waterbodies within Metapopulation (Bold = Confirmed presence)	Min. distance from Scheme boundary	Metapopulation size class assessment	Impacts *(Distant habitat >250 m from GCN pond, intermediate 50-250 m from GCN pond, core <50 m from GCN pond)*	Mitigation
1	106, 107	419 m	Assumed medium population	No direct impacts to GCN waterbodies. Minimal, temporary damage to distant terrestrial habitat. No fragmentation to GCN dispersal.	Appropriate control measures will be determined by precautionary working methods, non-licensable.
2	1	77 m		No direct impacts to GCN waterbodies. Loss and damage of intermediate habitat, comprising broadleaved woodland of high value and arable habitat of low value to GCN. No fragmentation to GCN dispersal.	Habitat management, use of exclusion fencing to control dispersal, hand searches and soft destructive searches of vegetation prior to clearance.
				No direct impacts to GCN waterbodies. Loss and damage to intermediate and distant habitat, comprising broadleaved woodland, of high value to GCN. No fragmentation to GCN dispersal.	
4	8, 9, **128**	244 m	Medium population		
6	**34, 52**	151 m	Medium population	No direct impacts to GCN waterbodies. Loss and damage to distant habitat, including habitats of high and low value to GCN. No fragmentation effects anticipated to have potential to impact the favourable conservation status of GCN.	As per metapopulations 2 – 4.
					None required.

Metapopulation number	Waterbodies within Metapopulation (Bold = Confirmed presence)	Min. distance from Scheme boundary	Metapopulation size class assessment	Impacts *(Distant habitat >250 m from GCN pond, intermediate 50-250 m from GCN pond, core <50 m from GCN pond)*	Mitigation
8a	70, 108	30 m	Assumed medium population	No direct impacts to GCN waterbodies or terrestrial habitats.	
8b	65, 76, 110	0 m		Waterbody 65 would be destroyed as a result of the Scheme. Loss and damage to core, intermediate and distant habitat, predominantly of low value to GCN. No fragmentation to GCN dispersal.	Habitat management, use of exclusion/drift/ring fencing to control dispersal, trapping and translocation of GCN to designated receptor sites, including proposed ecology ponds, hand searches and soft destructive searches of vegetation prior to clearance.
				No direct impacts to GCN waterbodies. Minimal, loss and damage to intermediate and distant habitat, comprising predominantly low and moderate value GCN habitat. No fragmentation to GCN dispersal.	As per metapopulation 1.
10	87, 88, 114	11 m		No direct impacts to GCN waterbodies. Loss and damage to core, intermediate and distant habitat of high and low value to GCN. No fragmentation to GCN dispersal	As per metapopulations 2 – 4.

Terrestrial invertebrates

8.9.106 Construction impacts relate primarily to the loss of habitats that are most suitable for terrestrial invertebrates, namely areas of woodland and poor semi-improved grassland.

8.9.107 The loss of habitats will be mitigated by the creation of woodland and species-rich grassland. Timber from felled trees would be moved to adjacent areas and allowed to decay rather than being removed from the site. A number of larger tree trunks would be stood up in the sun (i.e. half buried) to provide different dead wood habitat. A number of removed root plates from felled trees stood facing the sun would be installed as short-term habitat for aculeate Hymenoptera and would gradually rot and weather down and the provide opportunities for other species.

8.9.108 Species-rich grassland would be on nutrient poor sub-soil wherever practicable to allow slower, natural colonisation with more open areas.

8.9.109 Overall, impacts on terrestrial invertebrates are assessed as negligible, resulting in an effect of neutral significance.

Aquatic invertebrates, fish and aquatic macrophytes

8.9.110 The Scheme would result in the loss of Tower House Pool (Pond 23), Brookfield Farm Pond 1 (Pond 57), five un-named ponds (25, 26, 29, 65 and 73) and the partial loss of Lower Pool (Pond 28) and Brookfield Farm Pond 2 (Pond 56), as well as loss of 323 m of watercourse (218 m of Watercourse 2, 55 m Watercourse 3 and 50 m Watercourse 4) and assumed temporary loss of up to 71 m of Watercourse 5 (Latherford Brook).

8.9.111 Construction activities may result in the direct mortality and disturbance of fish due to watercourse diversion and culverting, habitat loss and degradation adversely affecting macroinvertebrates primarily in Watercourse 2 and Watercourse 5 (Latherford Brook), loss of common aquatic macrophytes in Tower House Pool and Lower Pool. There are however several similar waterbodies within the surrounding landscape that are expected to perform a similar ecological function and the loss of these ponds is unlikely to undermine the existing species assemblages.

8.9.112 Habitat loss is localised, however, river diversions and shortening of channels during the construction of culvert on Watercourse 2 could result in temporary reduction of flow in the downstream reaches, reducing the volume of water within the channel, reducing connectivity, decreasing water quality and increasing sedimentation. A box culvert would allow connectivity and flow through the culverted reach, furthermore, introducing gravels to encourage pool-riffle-run sections will provide a variety of habitat just downstream of the culvert within the Scheme boundary and will balance out the potential habitat disturbance in the culverted area.

8.9.113 Construction of the proposed culverts would require in-channel works that may potentially lead to indirect impacts from pollution incidents and siltation from runoff into the river during the construction phase, leading to degradation of habitats. Furthermore, the partial removal of Lower Pool and Brookfield Farm Pond 2 may result in a reduction in water quality and increased sediment during construction, and reduction in water quality that could adversely affect fish, macroinvertebrates

and aquatic macrophytes by reductions in dissolved oxygen or direct physical impacts. However, standard working practices during construction, would ensure that pollution and siltation effects are controlled.

8.9.114 Mitigation, as documented in the OEMP [TR010054/APP/6.11], would be put in place during construction, including fish rescues and translocation to ponds such as Chubb Ponds 1 (Pond 31) and 2 (Pond 32) or downstream of works within the same watercourse during watercourse diversions, to remove fish from the works areas. This would prevent injury and disturbance to fish during construction.

8.9.115 To mitigate for fragmentation, there will be an open span bridge at Latherford Brook (Watercourse 5) wide enough for the watercourse to flow naturally. An open span bridge would reduce the risk of flooding and increase light penetration compared to a culvert.

8.9.116 To mitigate for habitat loss, aquatic habitat creation and replacement measures incorporated into the Scheme have focused on the creation of new ponds including five attenuation ponds which will provide habitat for macroinvertebrates and aquatic macrophytes. A total of 408 m of watercourse habitat is to be created connecting the attenuation ponds to the watercourse which would compensate for the loss of riparian habitats to culverts and would develop into ecological habitats of benefit to fish.

8.9.117 In addition, a further eight ecology ponds and marginal wetland habitats, several of which would be created in advance of waterbody loss, would also be created. These ponds would not be stocked with fish and would be designed to maximise ecological benefit including creation of permanent and semi-permanent standing water, undulating margins, and planting with native species.

8.9.118 Therefore, the impact upon the local fish, macroinvertebrates and aquatic macrophytes during the construction period is considered to be negligible resulting in an effect of neutral significance.

Other Fauna

8.9.119 There is potential for other fauna such as hedgehog and brown hare to be present within the Scheme boundary and therefore to be killed or injured during construction of the Scheme, particularly during vegetation clearance as well as a risk of habitat fragmentation during construction.

8.9.120 Standard best practice working method as outlined in the OEMP would be implemented to minimise the risk to other fauna species, such as hedgehog and brown hare during construction.

8.9.121 Habitat loss and fragmentation to accommodate the Scheme would be mitigated for through the proposed woodland, hedgerow and grassland creation (see Figures 2.1 to 2.7 [TR010054/APP/6.2]). It is considered unlikely that the Scheme would adversely impact upon the conservation status of other fauna within the Scheme area therefore overall impact on other fauna is considered to be negligible, resulting in an effect of neutral significance.

Operation

Designated sites

8.9.122 There are no statutory international nature conservation designations within 2 km of the Scheme, no such sites designated for bats lie within 30 km of the Scheme and no such sites are located within 200 m of the ARN for the Scheme therefore no operational impacts on internationally designated sites are anticipated and no mitigation is required, resulting in neutral effects.

8.9.123 The HRA: No Significant Effects Report, is presented in a standalone report [TR010054/APP/6.9].

Designated sites of national importance

8.9.124 None of the nationally designated sites identified have hydrological or hydrogeological links to the Scheme boundary and therefore no adverse effects from Scheme run-off during operation are anticipated and no mitigation is required, resulting in neutral effects.

8.9.125 Nitrogen deposition can change species composition, reduce species richness and increase plant production, with the greatest impact being on nutrient poor ecosystems and species (such as lichens and bryophytes) (Ref 8.51).

8.9.126 The Air Pollution Information System (APIS) (Ref 8.51) states that the critical load relates to the quantity of pollutant deposited from air to the ground, whereas the critical level is the gaseous concentration of a pollutant in the air.

8.9.127 Four Ashes Pit is designated for its geological interest and does not have any receptors that are sensitive to air quality therefore no effects are anticipated.

8.9.128 The air quality assessment as presented in Chapter 5: Air Quality demonstrates the following:

- **Belvide Reservoir SSSI**: The implementation of the Scheme would result in a reduction in Nitrogen deposition of up to 0.2 kg N/ha/yr within the SSSI. This would not result in any perceptible change and therefore an effect of neutral significance would be anticipated.
- **Stowe Pool and Walk Mill Clay Pit SSSI**: The implementation of the Scheme would result in an increase in Nitrogen deposition of up to 0.3 kg N/ha/yr within the SSSI.

  The maximum change in Ndep is +0.3 kg N/ha/yr (up to 10 m from the ARN) (+0.2 kg N/ha/yr/ up to 40 m from the ARN).

  For freshwater bodies and fresh watercourses there are no robust assessment thresholds for critical loads available on APIS (Ref 8.51) and most freshwater bodies are phosphate-limited (i.e. phosphorus is the naturally scarce nutrient that controls eutrophication, rather than nitrogen which is naturally relatively abundant in most lowland freshwater systems). As the predominant habitat type is listed as standing open water and canals (Ref 8.51), the change has been assessed against the higher end of critical load range for this habitat type

(10 kg N/ha/yr) as the lower end of the range is intended for oligotrophic lakes with little agricultural input that are often limited by nitrogen.

Up to 40 m from the ARN, the site will be subject to an increase in nitrogen deposition of 2-3%. However, the change in nitrogen deposition is less than 0.4 kg N/ha/yr. The site comprises predominantly open water which is already exposed to traffic emissions. Given the size of the water body, mixing and dilution of the deposited nitrogen would be expected, minimising any effects. Therefore, it is not considered likely that the white-clawed crayfish population would be affected.

Therefore, in summary, no change to the qualifying features of Stowe Pool and Walk Mill Clay Pit SSSI would be anticipated which is an effect of neutral significance.

- **Chasewater and the Southern Staffordshire Coalfield Heaths SSSI**: The implementation of the Scheme will result in an increase in Nitrogen deposition of up to 0.1 kg N/ha/yr within the SSSI.

  There is no change in nitrogen deposition for units 7, 9, 13 and 15 and therefore effects are not anticipated. In unit 8, the change is less than 1% of the critical load for dwarf shrub heath and therefore, as stated in LA 105 (Ref 8.52), this is not considered to be significant.

  The predominant habitat type for Unit 14 is listed as Standing open water and canals (Ref 8.51); however, APIS does not include this as a feature of the site (Ref 8.51). Therefore, the lowest critical loads provided for Fen, marsh and swamp at the site which is 10 - 15 N/ha/yr have been used to undertake the assessment as these thresholds are most relevant to the location. This means that at 0.1 kg N/ha/yr the change is less than 1% of the critical load and therefore in line with LA 105 (Ref 8.52), this is considered to be insignificant.

  For SSSI units 7 and 15, the increase in concentration of NOx is less than 1% and therefore in line with LA 105 (Ref 8.52), this is considered to be insignificant. For units 8, 9, 13 and 14 the increase in concentration exceeds 1% of the critical levels which is which is 30 µg/m^3 (Ref 8.51).

  Therefore, in summary, significant effects from NOx concentration or nitrogen deposition on the Chasewater and the Southern Staffordshire Coalfield Heaths SSSI are not anticipated.

8.9.129 None of the statutorily designated sites scoped in will be subject to any change as a result of operational noise as a result of the distances involved (minimum of 1.5 km) and the large areas of green space as well as existing infrastructure separating them from the Scheme boundary.

Non-statutory designated sites and ancient woodland

8.9.130 There would be no direct impact on any of the identified non-statutory sites and ancient woodland within the Scheme boundary or the study area during operation. The potential operational impacts upon these sites therefore relates to indirect impacts which could result in habitat degradation.

8.9.131 None of the non-statutory sites scoped into the assessment have qualifying features noted in their designation to be sensitive to noise disturbance. However, noise impacts upon protected and notable species identified at these sites (where applicable) are considered separately in the species sections below.

8.9.132 Scheme runoff would be appropriately managed in accordance with the Drainage Strategy (refer to Appendix 13.2 [TR010054/APP/6.3]).

8.9.133 The flood risk assessment (Appendix 13.1 [TR010054/APP/6.3]) has confirmed that there would not be a significant change to the area or duration of flood events on Latherford Brook within the Brookfield Farm LWS and SBI woodland.

8.9.134 Applications of rock salt during winter months would adhere to the relevant standards and guidance, and application rates in Highways England guidelines. While initial concentrations of de-icing agent on the carriageway would be high, this would rapidly become diluted following rain events or snow melts, with runoff concentrations being further diluted within the highway drainage attenuation features. Saltwater spray impacts upon vegetation would be limited to <5 m from the road (Ref 8.54), wholly within the highway verge and therefore impacts would not be anticipated.

8.9.135 In relation to the above, the Scheme is therefore considered to have a negligible impact resulting in an effect of neutral significance).

8.9.136 APIS (Ref 8.51) does not include a critical load for ancient woodland or veteran trees therefore it has been agreed with Natural England that 10-20 kg N ha^{-1} $year^{-1}$ will be used to inform the assessment which is the critical load provided for broadleaved deciduous woodland which is the closest habitat type to the ancient woodland and veteran trees present.

8.9.137 **Veteran Trees:** There would be an increase in nitrogen deposition of between 0.2 and 0.7 kg N ha^{-1} yr^{-1} across the veteran trees, which is greater than 1% of the critical load. However, with the exception of T137, nitrogen deposition increase is 0.4 kg N ha^{-1} yr^{-1} or less, therefore the effect is not considered to be significant.

8.9.138 The increase in nitrogen deposition for T137 is 0.7 kg N ha-1 year-1 and T221 is 0.5 kg N ha-1 year-1 which is large enough to lead to the loss of one species. However, as in these cases 'the site' is one tree, species richness is not a relevant metric. The botanical effects of nitrogen deposition on tree growth and health are subtle and tree survival is unlikely to be affected. The slight increase in deposition is not considered to have any more than a minor adverse impact, resulting in an effect of slight significance.

8.9.139 **Brookfield Farm SBI, LWS and ancient woodland**: There would be an increase in nitrogen deposition of between 0.3 to 1.7 kg N ha^{-1} yr^{-1} across the site.

8.9.140 This equates to an increase of between 3 and 17% across the woodland. The woodland is already significantly over the critical load (101.9 – 102.9 kg N ha^{-1} yr^{-1}). Potential impacts of nitrogen deposition on woodland include adverse impacts on roots, increased sensitivity to natural stress, reduced growth and species diversity of ground flora and nutrient imbalance (Ref 8.51). In line with the LA 105 methodology, the lowest change in nitrogen deposition, regardless of background

nitrogen deposition, which would bring about a change of loss of one species has been reviewed using Table 21 in the published nitrogen deposition dose response report by Natural England, NECR210 (Ref 8.53). As woodland is not listed as a habitat type within Table 21 (Ref 8.53), the habitat with the lowest change in nitrogen deposition likely to lead to the loss of one species, excluding nutrient impoverished sand dunes, has been used to inform the judgement of significant air quality effects which is Upland heath TU 2009 or Lowland Heath TU 2009 and is listed as 0.4 kg N ha^{-1} yr^{-1} (Ref 8.52).

8.9.141 At the site edge nitrogen deposition increase is 1.7 kg N ha^{-1} yr^{-1} and up to 150 m from the site edge the change is >0.4 kg N ha^{-1} yr^{-1} which would trigger a one species change (Ref 8.53). For the purposes of the assessment, this is considered to result in changes to the ancient woodland ecosystem. The total area of ancient woodland affected by nitrogen deposition is 0.54 ha, which would be compensated for by replacement planting on a ratio of 1:1 (0.54 ha of woodland) within the immediate vicinity of the Brookfield Farm LWS, as described in paragraph 8.8.8 and document reference AS-059/8.2, 'DMRB Updates and the Impact on the DCO Application' paragraph 3.5.7. However, as ancient woodland is irreplaceable habitat, this would result in a moderate adverse impact resulting an effect of moderate significance.

8.9.142 In terms of the SBI habitats excluding the ancient woodland, when considering the additional woodland habitat proposed surrounding SBI to the east of the Scheme and connecting to the SBI to the west of the Scheme as well as 0.39 ha of standing water immediately to the south, and species rich grassland and hedgerows proposed on the Scheme embankments, this would only be likely to result in a minor adverse impact of neutral significance.

8.9.143 **Oxden Leasow (Whitgreaves Wood) ancient woodland:** There would be an increase in nitrogen deposition of between 0.1 and 0.9 kg N ha^{-1} $year^{-1}$ across the site. At the site edge, the increase would be 0.9 N ha-1 yr-1 and up to 30 m from the site edge the increase would be >0.4 N ha^{-1} yr^{-1}. Beyond 30 m, the increase in nitrogen deposition does not exceed 1% of the critical load identified therefore no significant impact would occur. On the eastern side of the woodland up to 30 m this increase is the equivalent of 3 to 9%. Effects of nitrogen deposition on woodland include adverse impacts on roots, increased sensitivity to natural stress, reduced growth and species diversity of ground flora and nutrient imbalance (Ref 8.51).

8.9.144 The total area of ancient woodland affected by nitrogen deposition is 0.33 ha, which would be compensated for by replacement planting on a ratio of 1:1 (0.33 ha of woodland) within the immediate vicinity of the Brookfields Farm LWS. However, as ancient woodland is irreplaceable habitat, this would result in a moderate adverse impact resulting an effect of moderate significance.

8.9.145 **Essington Wood ancient woodland:** There is a reduction in in nitrogen deposition of 0.1 to 0.4 kg N ha^{-1} $year^{-1}$ as a result of the Scheme although the site is already over the national air quality objective and critical load threshold so no impact would be anticipated.

8.9.146 Burns Wood (East) Warstone Belt: There is a reduction in nitrogen deposition of 0.1 kg N ha^{-1} yr^{-1} as a result of the Scheme although the site is already over the national air quality objective and critical load threshold so no impact would be anticipated.

8.9.147 All other ancient woodland sites identified within 2 km of the Scheme boundary or within 200 m of the ARN: The change in NOx concentration is less than 0.4 µg/m^3 and the change in nitrogen deposition is <0.1 kg N ha^{-1} yr^{-1} which in line with LA 105 (Ref 8.52) means that the change at ecological receptors is imperceptible and no significant impact would occur. For further details of other sites identified within 200 m of the ARN refer to document AS-059/8.2 'DMRB updates and the impact on the DCO Application'.

Habitats

8.9.148 There would be no direct impact on habitat during operation of the Scheme; however, there is potential for habitat degradation to occur as a result of indirect impacts. This would include potential pollution as a result of surface water run-off.

8.9.149 All retained and newly created habitats would be subject to a detailed 5-year LEMP (as set out in the OEMP [TR010054/APP/6.11]) for Scheme specific maintenance, with routine management and maintenance to follow for 30 years after completion of the Scheme and set out in a future HEMP (based on the OEMP [TR010054/APP/6.11]). The focus of which would be conservation led to maximise the biodiversity value and connectivity of these habitats to the wider landscape. This would likely require implementation through the provisions of the DCO only, with the exception of Oxden Leasow (Whitgreaves Wood) that may need a third party agreement.

8.9.150 Overall, the operational impacts to habitats are negligible (an effect of neutral significance).

Badger

8.9.151 There is a potential risk for increased badger mortality as a result of the Scheme during operation. Existing records show that there are multiple instances of road traffic accidents involving badgers on the M54 and the M6; however, there are no records of this on the A460. The existing A460 is extremely congested and likely acts as a barrier to badger movement. The Scheme would result is a reduction in traffic levels on the A460 of 83% meaning that the A460 may no longer be a significant barrier to badger movement during operation.

8.9.152 The Scheme would include a rigid concrete barrier in the central reservation which would act as a barrier for badgers and therefore mitigation measures incorporated into the design of the Scheme to maintain habitat connectivity, include the use of three mammal tunnels spaced along the length of the Scheme (refer to Figures 2.1 to 2.7 [TR010054/APP/6.2] for locations). The southern badger clan would have two tunnels and the northern clan would have a tunnel and also the open span structure at Latherford Brook. The tunnels, open structure and fencing, would mitigate the risk of accidental mortality of badgers within the Scheme through their collision with vehicles and also offer the potential for increased connectivity to the wider area representing an improvement on the existing situation.

8.9.153 Overall, the operational impacts to badgers are negligible, which is of neutral significance.

Barn owl

8.9.154 It is likely that there is only limited use of the habitats within the Scheme boundary by foraging barn owl. Furthermore, the quantity of suitable foraging habitat within the Scheme boundary is low and the Scheme is isolated, as a result of the surrounding major network. The incorporation of appropriate mitigation, in the form of planting, fences and noise barriers alongside those sections of the Scheme which are adjacent to suitable barn owl foraging habitat (refer to the Figures 2.1 to 2.7 [TR010054/APP/6.2] for locations) provides both a barrier preventing barn owl from accessing the highways verges, but also encourages barn owl flights up and over the carriageway. This would ensure that any individuals that cross the Scheme are encouraged to increase their flight height across the road and thus reduce the risk of road traffic collision. Therefore, impacts from direct mortality from the operational phase of the Scheme is considered to be negligible adverse, resulting in an effect of neutral).

8.9.155 There are no established guidelines for evaluating the effects of noise as a source of disturbance to barn owl. The effects of noise disturbance on birds varies with the species and the nature of the noise and different species of bird have different tolerance thresholds to noise disturbance. Barn owl within the surrounding habitat are likely to be tolerant to certain levels of background noise, given the locations of existing major road networks. A roosting barn owl was located 110 m from the Scheme boundary, although it is likely that this roosting barn owl is already habituated to the baseline levels of ambient noise (55 dB $L_{A10,18h}$ free-field). The predicted traffic noise increase on the barn owl roost is predicted to be 2 dB. The barn owl roost is screened from visual stimuli (cars along the carriageway) that will accompany the increased noise disturbance and therefore, an increase in noise, to 57 dB, is unlikely to impact upon the roost site or displace barn owl from roosting or foraging therefore a neutral effect is anticipated.

Bats

8.9.156 The potential operational impacts upon bats relate to direct mortality and reduction of habitat quality due to artificial light.

8.9.157 The severance of flight lines has the potential to increase levels of bat mortality through accidental collision with vehicles. Direct collision resulting in mortality of bats occurs in areas where bats would attempt to cross the highway when following existing or new linear features (hedgerows, tree lines, woodland edge, linear riparian habitats and other features).

8.9.158 Vehicle collision resulting in direct mortality tends to be associated with the species adapted to edge habitat, for example pipistrelles which are more likely to attempt to cross larger unsheltered and open spaces at a height that may bring them into the path of oncoming vehicles. Species that regularly fly at height, far above the maximum height of vehicles, for example noctule bats, may reasonably be expected to either avoid or fly over the road. Although some regularly used flight lines may be

affected, the risk of accidental mortality is likely to be reduced for vulnerable bat species as a good proportion of the Scheme is in cutting. Crossing point surveys do not indicate significant flight lines will be severed by the Scheme. The only locations subject to detailed survey were locations B and E, and E is not severed (it was included for survey prior to Scheme fix when alternatives routes were considered). The majority of activity at location B was by foraging pipistrelles rather than any indication of signification flight lines. Height of noctules recorded were 20-30m above ground level, which would not be expected to result in collision. As mentioned above, the primary habitat connections across the Scheme have been included in areas where the Scheme is in cutting. The linear habitat guiding crossing at Hilton Lane will be around 7.7m above the height of the road and 4m above at the accommodation bridge to the north. With most species recorded across all crossing point surveys at 0.5 m to 5 m (but most commonly 5 m) above ground level this is not likely to result in significant collision risk. Likewise, the elevation of the Scheme to 8.5 m above the current ground level over Latherford brook will also avoid collision risk of those species most commonly recorded. It is considered accidental mortality is unlikely to adversely impact the conservation status of the local bat population, and the magnitude of impact on all bat species would be negligible leading to a minor adverse effect that is not significant.

8.9.159 If not subject to appropriate management newly created and retained areas of habitat may degrade e.g. through incursion of rhododendron in woodland, resulting in reduced use of those habitats by bats giving rise to long term fragmentation effects if the degraded habitat is avoided and potential abandoning of roosts in the locality. As such, all retained and newly created habitats of value to foraging and roosting bats would be subject to a detailed five year LEMP (as outline in the OEMP [TR010054/APP/6.11]) for Scheme specific maintenance, with routine management and maintenance to follow for 30 years after completion of the Scheme and set out in a future HEMP. The focus of these would be conservation led to maximise the biodiversity value of these habitats to fauna including bats and ensure retention of habitat connectivity to the wider landscape.

8.9.160 Artificial lighting has the potential to impact upon bats, causing them to avoid otherwise suitable areas of habitat (Ref 8.55).

8.9.161 The design of lighting, lighting concentrated at the junctions and none along the carriageway, has been developed to minimise light-spill onto adjacent habitats, including where there are potential roosts or important foraging and/or commuting habitat that is regularly used by the local bat population.

8.9.162 Furthermore, the length of the Scheme would be unlit with new lighting limited to the junctions with the M54 and M6 only, where artificial lighting is already present on the existing road network. This is unlikely to result in increased risk of collision-based mortality from crossing the motorway, as the retained and created habitats encourage safe crossing at specific points, such as Hilton Lane Bridge and the accommodation bridge south-east of Brookfield Farm.

8.9.163 Predicted levels of traffic noise during operation do not indicate that there would be significant disturbance to retained roosts within the study area. Although the

proximity of buildings with roosts to the Scheme is as low as 17 m (in the case of B11) and up to 70 m (B21) (refer to Figure 8.13 [TR010054/APP/6.2]) given the transitional nature of such roosts and as disturbance would be temporary no significant effects are anticipated.

8.9.164 Overall, the operational impacts to bats would be negligible, which is of neutral significance.

Breeding and wintering birds

8.9.165 The operation of the Scheme has the potential to affect the breeding and wintering bird assemblages recorded within the study area through direct mortality and habitat degradation.

8.9.166 Certain birds, for example thrush species and game birds, are at a higher risk of collision as they fly at low heights. Collisions occur where hedgerows and other woodland habitat directly adjoins the carriageway. The Scheme sits largely in a cutting for most of its length and incorporates steep embankments and drainage areas along the verges (rather than vegetation), which thereby reduces the risk of direct mortality.

8.9.167 Artificial lighting has the potential to impact upon some bird species, causing them to avoid otherwise suitable areas of habitat.

8.9.168 The provision of an OEMP (as set out in Section 8.8) covering the retained and newly created habitats and would maximise the biodiversity value of these habitats to fauna, including birds, and ensure retention of habitat connectivity to the wider landscape. This would likely require implementation through the provisions of the DCO and via third party agreements.

8.9.169 The design of lighting has been developed to minimise light-spill onto adjacent habitats, being concentrated on the junctions, would minimise any effects on birds.

8.9.170 The Scheme would be provided with new shelterbelt planting through the Scheme. This shelterbelt would screen birds which are using, and potentially nesting in, these surrounding habitats including both the LWS/SBI sites within the Scheme boundary. The shelterbelt together with the installation of the noise and screening barriers (refer to Figures 2.1 to 2.7 [TR010054/APP/6.2]) would encourage any birds wishing to cross the road to increase their flight height across the road and thus reduce the risk of collision with road traffic. Furthermore, the significant additional woodland planting would provide additional habitats for the existing assemblages to use at a range of distances from the Scheme.

8.9.171 Scheme operation would have a negligible impact resulting in a neutral effect on the breeding and wintering bird assemblages.

Otter and water vole

8.9.172 No breeding holts are present within the study area. One potential otter holt is present at the eastern extent of the Scheme; unaffected by the works. As surveys within the study area had restricted access, holt absence cannot be assumed within suitable unsurveyed aquatic and terrestrial habitat. Presence of an otter population is assumed in all suitable habitat due to confirmed otter presence at Watercourse 5

and due to the large home range of otter. It is considered that accidental mortality by collision with vehicles could be possible during otter movement through the landscape.

8.9.173 Water vole is known to cross land during dispersal. However, it is considered that if retained aquatic and terrestrial habitats are suitable (i.e. water levels are sufficient, foraging resource is available, banks are suitable for burrow creation) and connectivity to off-site habitats for dispersing individuals is retained post-construction, adverse operational impacts on water vole population by direct mortality due to vehicle collision are not anticipated.

8.9.174 Additional operational adverse effects for both species could include impacts due to degradation of in-channel or adjacent terrestrial habitat by pollution caused by road run-off. New habitat and enhanced retained habitat would be managed appropriately to prevent degradation and long-term fragmentation/isolation impacts are negligible, resulting in an effect of neutral significance.

8.9.175 Based on the operational noise assessment, no change in traffic noise levels are predicted at the location of the potential otter holt at Watercourse 5. Given the distance of the potential holt from the works area (over 200 m), construction noise and vibration is unlikely to result in an adverse impact (impacts are negligible, resulting in an effect of neutral significance) and therefore no mitigation is required.

Great crested newt

8.9.176 Potential impacts to GCN during operation of the Scheme would be as a result of habitat degradation. This could include introduction of fish or invasive plant species to new and existing GCN ponds, as a result of increased access.

8.9.177 As such, all retained and newly created habitats of importance to GCN, namely retained GCN ponds, compensatory ecology ponds, species-rich, grassland, hedgerows and woodland, would be subject to a detailed five-year LEMP (as set out in the OEMP [TR010054/APP/6.11]) for Scheme specific maintenance, with routine management and maintenance to follow for 30 years after completion of the Scheme as set out in the OEMP. The focus of these would be conservation led to maximise the long-term biodiversity value of these habitats to fauna including GCN. Specific management requirements for GCN would be incorporated within this document as well as being controlled by the Natural England mitigation licence. The licence would also provide details of the mechanism for site safeguard to ensure the long-term retention and management of GCN mitigation, to be controlled by the DCO powers.

8.9.178 Habitat management of benefit to GCN would include aquatic vegetation management in waterbodies and control of bankside vegetation, to prevent over-shading; low intensity woodland management, including replacement of failed specimens; rotational/sectional mowing of areas of species-rich grassland within proximity to ecology ponds, to allow development of a tussocky structure of benefit to GCN and rotational hedgerow management, cutting alternate sides, to ensure establishment of reinstated hedgerows.

8.9.179 Owing to the locations of confirmed and assumed GCN waterbodies within each GCN metapopulation, between which GCN are anticipated to disperse, the Scheme

is not anticipated to result in fragmentation i.e. would not act as a barrier to GCN moving between these waterbodies. Seven of the eight ecology ponds will be located within 500 m of existing GCN metapopulations, and not separated by barriers to dispersal, therefore allowing dispersal and colonisation of these waterbodies by GCN. The remaining ecology pond is within 1 km of confirmed GCN ponds, waterbodies 34 and 52, also not separated by barriers to dispersal, therefore providing potential opportunities for expansion of GCN populations from metapopulation 6. As a result, increased mortality of GCN would not be expected as a result of the Scheme during operation.

8.9.180 Overall, the operational impacts to GCN as a result of habitat degradation is considered to be negligible (an effect of neutral significance).

Terrestrial invertebrates

8.9.181 Mortality of invertebrates and insects by cars is largely unquantifiable; however, the addition of the Scheme given its scale compared to the existing road network is unlikely to result in significant impacts (negligible adverse impacts resulting in an effect of neutral significance).

Aquatic invertebrates, fish and aquatic macrophytes

8.9.182 The potential operation impacts of the Scheme will be similar for fish, macroinvertebrates and macrophytes and have therefore been discussed together in this section. The operational impacts across the Scheme relate to potential degradation of habitats through run-off and pollution.

8.9.183 However, the drainage measures incorporated into the Scheme would address these issues and residual effects are anticipated to be negligible and of neutral significance.

Other fauna

8.9.184 There are potential operational impacts on hedgehog populations due to mortality from traffic, however, due to the habitat and connectivity mitigation being provided, the impact upon the status of local populations is considered to be negligible and of neutral significance.

Summary of significant effects

8.9.185 The Scheme delivers no net loss of biodiversity.

8.9.186 All residual effects are non-significant, i.e. lie within the neutral or slight categories, with the exception of the following:

- The loss of ancient woodland through compaction of tree roots and soil within 15 m of the construction works would result in a permanent large adverse residual effect during the construction of the Scheme.
- Increases in emissions at Brookfield Farm SBI, LWS ancient woodland and Oxden Leasow (Whitgreaves Wood) ancient woodland would result in a moderate adverse residual effect on ancient woodland during the operation of the Scheme.

8.10 Monitoring

Monitoring of significant effects

8.10.1 The loss of ancient woodland cannot be mitigated for, however, the replacement woodland planting would be monitored as part of the LEMP (five years) and routine maintenance (30 years) to ensure that it establishes and develops into high-quality habitat.

8.10.2 Monitoring of the significant air quality effect on ancient woodland within Brookfield Farm SBI, LWS is not considered to be appropriate as there is no effective mitigation and, therefore, no likely change in the levels over time.

Monitoring for licence requirements

8.10.3 **Bats**: The draft bat licence sets out monitoring requirements for bat boxes as a result of potential impacts identified and controlled by the licence. In addition, bat boxes erected to provide compensation for loss of potential roosting opportunities and provide an overall enhancement will also require monitoring. All bat boxes erected will be subject to maintenance and monitoring checks by a licensed bat worker in years 2 and 5 after construction. Establishment and maintenance of retained and newly created habitats of benefit to bats, including woodland, ecology ponds and species rich grassland will be detailed within the LEMP.

8.10.4 **GCN**: The draft GCN licence sets out monitoring requirements for GCN as a result of potential impacts identified and controlled by the licence. This will include monitoring of exclusion fencing during the construction phase to ensure it remains intact and functional, until its removal, outside of the hibernation season; habitat monitoring to ensure successful establishment and maintenance of newly created habitats of benefit to GCN, including ecology ponds, to be detailed within the LEMP; and monitoring of all retained assumed and confirmed GCN ponds within metapopulations to be impacted and covered by the licence (i.e. excluding waterbodies within metapopulations 1 and 8a) and all newly created ecology ponds, where access is granted. Those waterbodies associated with metapopulations 5 and 8b will have 6 years of population size class assessment monitoring with all other retained, assumed and confirmed GCN ponds within metapopulations 2, 4, 6 and 10, subject to 4 years monitoring, as no breeding ponds will be impacted outside of these metapopulations. This will comprise population size class assessment monitoring for existing waterbodies and ecology ponds located within existing metapopulations. For ecology ponds outside of existing metapopulations, eDNA surveys will be undertaken, in order to confirm presence or likely absence.

8.10.5 As part of the detailed 5-year LEMP for Scheme specific maintenance, with routine management and maintenance to follow for 30 years after completion of the Scheme and set out in a future HEMP (based on outline in the OEMP [TR010054/APP/6.11]), monitoring of the success of establishment and ongoing maintenance of the habitats, including condition assessment, will be assessed at 5-year intervals and any changes made to achieve the aims of the LEMP/HEMP. These will also include the following fauna monitoring:

- Badger monitoring surveys: monitoring during construction and monitoring of the mammal tunnels after the first year of installation. Monitoring as specified in the badger licence if required following pre-construction surveys.
- Bat monitoring surveys: monitoring to assess the continued occupation of roosts within the highway boundary and to inform the on-going maintenance regime.

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