Environmental Statement

Volume 2i: Scheme-wide Assessment

Chapter 9: Biodiversity

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9. BIODIVERSITY

Summary of principal findings

This chapter presents the Ecological Impact Assessment (EcIA) associated with the construction and operation of the Huddersfield to Westtown (Dewsbury) section of the Transpennine Route Upgrade (TRU) Programme. This chapter covers the assessment of the entirety of the Huddersfield to Westtown (Dewsbury) route.

The following Important Ecological Features (IEF) were identified relevant to the Scheme:

- Statutory nature conservation designations (Peak District Moors (South Pennine Moors Phase 1) Special Protection Area (SPA), South Pennine Moors Special Area of Conservation (SAC), Denby Grange Colliery Ponds SAC, Gledholt Woods Local Nature Reserve (LNR), Dalton Bank LNR, Sunny Bank Ponds LNR and Lower Spen Wildlife Area LNR);
- Non-statutory nature conservation designations (Sir John Ramsden Canal Local Wildlife Site (LWS), Huddersfield Narrow Canal LWS, Gledholt Woods LWS, Grimescar Wood LWS, Bradley Park Woods LWS, Dalton Bank LWS, Sunny Bank Ponds LWS, Briery Bank Woods LWS, Covey Clough Wood and Hepworth Wood LWS, Clifton Lagoon LWS, Gregory Spring LWS, Whitley Wood LWS, Jordan Wood and Oliver Wood LWS, Liley Wood LWS, Lower Spen Wildlife Area LWS, Laneside Quarry LWS and Howroyd Beck Fields Lowe Whitley LWS);
- Terrestrial habitats (ancient woodland, traditional orchards, semi-natural broad-leaved woodland, semi-natural mixed woodland, plantation broad-leaved woodland, plantation mixed woodland, hedgerows, scattered trees, scrub, marsh grassland and semi-improved neutral grassland);
- Aquatic habitats (Huddersfield Broad Canal, including an unnamed 'tributary' of the canal at Bradley Culvert, River Colne, River Calder, Calder and Hebble Navigation, Gledholt Beck, Hebble Beck, Blackhouse Dike, Ladywood Lakes (GCN_019a and GCN_019b), recently created ponds in Thornhill Landfill Site (GCN_023 and GCN_024) and ponds which do not yet exist but shall be constructed under approved planning permission/restoration plans (GCN_035, GCN_036 and GCN_037); and
- Protected and priority flora and fauna (floating water-plantain, great crested newt (GCN), bats, badger, barn owl, breeding birds, reptiles, otter and water vole).

Taking into consideration the embedded mitigation, which is integrated into the Scheme design (see Chapter 9 (Biodiversity) in Volume 2i of the ES), and with the implementation of additional mitigation measures set out in Section 9.4 of this assessment, the following residual significant adverse effects are predicted during construction or operation of the Scheme:

- A temporary, adverse effect on Geldholt Woods LNR/LWS, significant at the local level in the short term (5-10 years) until replacement planting or natural regeneration becomes established. After this point, no significant residual effects are predicted;
- A temporary, adverse effect to Sir John Ramsden Canal LWS that is significant at the Local level in the medium term (<30 years) until replacement planting is established. After this point, no significant residual effects are predicted;
- A temporary, adverse effect on the River Calder, significant at the Local level, in the short term (2-5 years) until compensatory riparian planting is established. After this point, no significant residual effects on rivers are predicted;
- A temporary adverse effect on ponds, significant at a County level, in the short term (3-5 years), until replacement pond habitats are established to comparable condition. After this point, no significant residual effects on ponds are predicted;

- A temporary, adverse effect on semi-natural broad-leaved woodland, significant at the Local level, in the medium to long term (30-100 years) until replacement planting is established. After this point, no significant residual effects are predicted; and
- A temporary, adverse effect to semi-natural mixed woodland and plantation broad-leaved woodland that is significant at the Local level in the medium term (<30 years) until replacement planting is established. After this point, no significant residual effects are predicted;
- A temporary, adverse effect on scrub, significant at the Local level, in the short term (5-10 years) until replacement planting or natural regeneration is established. After this point, no significant residual effects are predicted; and
- A temporary, adverse effect to semi-improved neutral grassland that is significant at the Local level in the short term (<5 years) until replacement planting or natural regeneration is established. After this point, no significant residual effects are predicted.

With the inclusion of embedded mitigation measures in the Scheme design and the implementation of the additional mitigation measures outlined in Chapter 11 (Water environment), as well as additional mitigation measures detailed in Section 9.6 (Mitigation measures), no temporary or permanent significant adverse (or beneficial) effects on any other IEF are predicted during either construction or operation of the Scheme.

9.1 Introduction

9.1.1 This chapter presents the Ecological Impact Assessment (EcIA) associated with the construction and operation of the Huddersfield to Westtown (Dewsbury) section of the Transpennine Route Upgrade (TRU) Programme. This chapter covers the assessment of the entirety of the Huddersfield to Westtown (Dewsbury) Route (herein referred to as the 'Scheme'). The assessment is further broken down into six Route Section Assessments in Volume 2ii of this Environmental Statement (ES) which provide additional detail to this chapter.

9.1.2 This chapter is set out as follows:

- Legislative and policy context – relevant international, national and local policy requirements, legal requirements and guidance which have been used to define the assessment approach are outlined;
- Assessment methodology – the methodology the EcIA follows is defined including the justification for the study area and the approach for determining significance of effects;
- Baseline – the ecological baseline relevant to the Scheme is described and the nature conservation importance of ecological features within the Scheme are evaluated;
- Potential effects – the potential impacts and effects (both beneficial and adverse) on Important Ecological Features (IEF)[1] during construction and operation are characterised;
- Mitigation measures – agreed avoidance, mitigation, compensation and enhancement measures are described;
- Residual effects – the significance of residual effects (both beneficial and adverse) on IEF following the implementation of mitigation measures are assessed; and
- Cumulative effects – the potential likely significant cumulative effects of the Scheme are described and assessed.

9.1.3 A detailed description of the Scheme is provided in Chapter 2 (Scheme description) of this Route Section Assessment and all appendices and figures referred to in this chapter are provided in Volumes 3 and 4 of this ES respectively.

9.1.4 For the purposes of this chapter, the term 'screening' refers to the process of determining the need for field-based surveys for a habitat or priority species, based on an initial review of publicly available aerial imagery. The term 'scoping' refers to the process of determining the need for further detailed field-based survey for a habitat or priority species based on the results of initial field surveys. For example, a water body may be screened out of GCN (*Triturus cristatus*) surveys if a significant barrier is present that would prevent the movement of newts between the Scheme and the water body. A water body may be scoped out of further surveys if the initial survey concluded the water body was unsuitable for GCN.

9.2 Legislative and policy context

<u>European/international</u>

9.2.1 The following key pieces of European nature conservation legislation are relevant to this assessment:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora (the Habitats Directive). This Directive was transposed into UK law by the Conservation of Habitats and Species Regulations 2017 and has been subsequently

[1] Ecological features valued at a Local level or higher that are taken forward to impact assessment

amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019;

- The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention). This is implemented into UK Law by Wildlife and Countryside Act 1981; and
- Council Directive 2000/60/EC Establishing a Framework for Community Action in the Field of Water Policy (Water Framework Directive (WFD)). This is implemented into UK Law by Implemented by Water Framework (Water Framework Directive) (England and Wales) Regulations 2017.

National (UK)

9.2.2 The following key pieces of national nature conservation legislation and policy are relevant to this assessment:

- The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 – which mainly deals with the protection of sites that are important for nature conservation in a European context. However, it also gives protection to certain species of flora and fauna;
- The Wildlife and Countryside Act 1981 (as amended) (WCA) – which deals with the protection of special sites (for example Sites of Special Scientific Interest (SSSIs)) and the protection of certain species;
- The Natural Environment and Rural Communities (NERC) Act 2006 – which, amongst other measures, extends the biodiversity duty set out in the Countryside and Rights of Way (CROW) Act (below) to public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity;
- The Countryside and Rights of Way (CRoW) Act 2000 – which strengthens the protection given to SSSIs and certain species under the WCA, making it an offence to "…recklessly disturb…" the sheltering places of wild animals designated under Schedule 5 of the WCA;
- The Protection of Badgers Act 1992 – which makes it an offence to kill, injure or take a badger, or to damage or interfere with a set unless a licence is obtained from a statutory authority;
- The Hedgerow Regulations 1997 – which protects important hedgerows within England and Wales by controlling their removal through a system of notification;
- The National Planning Policy Framework (NPPF)[2] – which provides guidance to local planning authorities on their local plans, sets out how planning authorities should deal with biodiversity when considering planning applications and encourages net gains for biodiversity to be sought through planning policies and decisions; and
- Biodiversity 2020: A strategy for England's wildlife and ecosystem services – which sets out the strategic direction for England's biodiversity policy on land (including rivers and lakes) and at sea.

Local (Kirklees District)

9.2.3 Section 41 of the NERC Act 2006 contains a list of Species of Principal Importance (SPI) and Habitats of Principal Importance (HPI) for the considerations of biodiversity in England. These HPI and SPI are national conservation priorities, however Section 40 of the Act places a duty to conserve biodiversity on public authorities in England (i.e. Kirklees Council). Definitions of the HPI were produced by the Biodiversity Reporting and Information Group[3]. HPI and SPI were formerly known as UK Biodiversity Action Plan (UK BAP) priority habitats and priority

[2] National Planning Policy Framework - Ministry of housing, communities & local government (2019) 'National Planning Policy Framework'. London.
[3] BRIG, 2011. UK Biodiversity Action Plan – Priority Habitat Descriptions. JNCC, Peterborough

species.

9.2.4 Some counties or districts define local habitat and species conservation priorities in a local Biodiversity Action Plan (LBAP). The LBAP for Kirklees[4] is a nature conservation strategy identifying threats to habitats and species within the county and setting out the actions necessary to conserve them through a series of habitat and species action plans. LBAP priorities are often directly comparable to HPI and SPI but not exclusively so.

9.2.5 Local planning policy is set out in the Kirklees Local Plan[5]. Policies relevant to ecology and nature conservation are as follows.

- Policy LP30 – Biodiversity and Development. This sets out the Council's approach to protect and enhance the biodiversity and geodiversity of Kirklees, including the range of international, national and locally designated wildlife and geological sites, Habitats and Species of Principal Importance and the Kirklees Wildlife Habitat Network. The policy states that development proposals will be required to:
  - Result in no significant loss or harm to biodiversity in Kirklees through avoidance, adequate mitigation or, as a last resort, compensatory measures secured through the establishment of a legally binding agreement;
  - Minimise impact on biodiversity and provide net biodiversity gains through good design by incorporating biodiversity enhancements and habitat creation where opportunities exist;
  - Safeguard and enhance the function and connectivity of the Kirklees Wildlife Habitat Network at a local and wider landscape-scale, unless the loss of the site and its functional role within the network can be fully maintained or compensated for in the long term;
  - Establish additional ecological links to the Kirklees Wildlife Habitat Network where opportunities exist; and
  - Incorporate biodiversity enhancement measures to reflect the priority habitats and species identified for the relevant Kirklees Biodiversity Opportunity Zone.
- Policy LP31 – Strategic Green Infrastructure Network. This sets out the Council's approach to safeguarding and enhancing green infrastructure networks, green infrastructure assets and the range of functions they provide.
- Policy LP33 – Trees. This sets out the Council's approach to protecting trees and woodland of significant amenity which are threatened directly or indirectly by development. The policy states that "Proposals should normally retain any valuable or important trees where they make a contribution to public amenity, the distinctiveness of a specific location or contribute to the environment, including the Wildlife Habitat Network and green infrastructure networks". The policy also covers other aspects including compliance with relevant national standards regarding the protection of trees and the requirement for detailed mitigation scheme where tree loss is deemed acceptable.
- Policy LP34 – Conserving and enhancing the water environment. This sets out the Council's approach to prevent the deterioration of water courses or waterbodies (including groundwater) by conserving and, where practicable, enhancing watercourses to their natural state, water quality and the ecological value of the water environment.

[4] Kirklees Biodiversity Action Group. Taylor, J.K. (ed). (1998). *Local Biodiversity Action Plan for Nottinghamshire.* Nottinghamshire County Council.
[5] Kirklees Local Plan (2019) 'Kirklees Local Plan Strategy and Policies'.

Other guidance documents

9.2.6 The following other policy and guidance documents are relevant to the Scheme in respect of nature conservation:

- DEFRA Biodiversity Net Gain, which is mentioned within the draft Environment Bill[6] and The Biodiversity Metric 2.0[7] which is a calculator used to assess Biodiversity Net Gain within a development;
- UK Post-2010 Biodiversity Framework[8], which identifies the activities required to complement the UKs biodiversity strategies, and where work in the strategies contributes to international obligations;
- British Standard (BS) 42020:2013 Biodiversity: Code of practice for planning and development[9], which offers a cohort methodology for biodiversity management to promote transparency and consistency in the quality and appropriateness of ecological information submitted with planning applications and applications for other regulatory approvals; and
- 'Making space for nature': a review of England's Wildlife Sites and Ecological Network[10], which describes ecological networks, the benefits they bring and makes recommendations for ecological solutions to improve the network.

9.2.7 The following Network Rail Standards are applicable to the management of biodiversity and vegetation:

- Planning and manging biodiversity (see Appendix 9-9)[11]
- Lineside vegetation management manual (see Appendix 9-10)[12]; and
- Protected Sites and Species Management (see Appendix 9-11)[13].

9.3 Assessment methodology

Approach

9.3.1 The assessment approach applied is based upon published best practice guidance by the Chartered Institute of Ecology and Environmental Management (CIEEM)[14], which is widely used in the UK to produce EcIA. The approach broadly follows the assessment methodology detailed in Chapter 4 (EIA methodology) in Volume 2i of the ES, however there are a number of deviations from the generic methodology and these are set out below:

- Ecological features are valued within a geographical frame of reference (e.g. national or county) rather than being assigned a sensitivity rating (e.g. very high or high);

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[6] DEFRA (2018) 'Draft Environment (Principles and Governance) Bill'. Defra
[7] DEFRA (2019) The Biodiversity Metric 2.0. July 2019. Available from http://publications.naturalengland.org.uk/publication/5850908674228224#:~:text=The%20Biodiversity%20Metric%202.0%20provides%20a%20way%20of,updates%20and%20replaces%20the%20original%20Defra%20biodiversity%20metric (accessed August 2020).
[8] JNCC and Defra (on behalf of the Four Countries Biodiversity Group) (2012) 'UK Post-2010 Biodiversity Framework'. July 2012. Available from https://jncc.gov.uk/our-work/uk-post-2010-biodiversity-framework/ (accessed February 2020)
[9] British Standard (2013). Biodiversity: Code of practise for planning and development. British Standards Institute.
[10] Defra (2010) 'making space for nature': a review of England's Wildlife Sites and Ecological Network. September 2010. Available from: https://www.gov.uk/government/news/making-space-for-nature-a-review-of-englands-wildlife-sites-published-today (accessed February 2020).
[11]Network Rail (2018) Planning and Managing Biodiversity NR/GN/ESD05
[12] Network Rail (2019) 'Level 2 Manual – Lineside vegetation management manual: NR/L2/OTK/5201.
[13] Network Rail (2008) 'Level 2 Standard – Protected Sites and Species Management Issue 2: NR/L3/MTC/EN0099'
[14] CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

- Impacts are characterised based on a range of factors (e.g. duration, reversibility and timing of works) and are not assigned a level of magnitude (e.g. high, medium or low); and
- The significance of effects on ecological features is determined by assessing whether the potential impacts are likely to undermine (or complement) the conservation status of habitats and species, or the conservation objectives of designated sites. The matrix of sensitivity against impact magnitude is not used to determine the significance of effects.

9.3.2 EcIA is a process of identifying, quantifying and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems. The principal steps involved are summarised below, and further details are provided in the relevant sections that follow.

- Ecological features that are both present and might be affected by the Scheme are identified (this includes features likely to be present at the time works begin, and for the sake of comparison, those predicted to be present at a set time in the future) through a combination of targeted desk-based study and field survey work, to determine the relevant baseline conditions;
- The importance of the identified ecological features is evaluated to place their relative biodiversity and nature conservation value into a geographic context, and this is used to define the IEF that need to be considered further within the EcIA process;
- The potential impacts of the Scheme on IEF are identified and their nature described. Incorporated design measures to avoid or minimise impacts are also described and taken into account;
- The potential effects (adverse or beneficial) on IEF are then assessed, and where possible quantified. Potential effects include;
  - Temporary and permanent loss of terrestrial and aquatic habitats during construction;
  - Degradation of habitats during construction and operation through potential changes in noise and artificial light levels, air quality, water quality, shading and hydrology;
  - Killing/injury of protected and priority fauna during construction and operation;
  - Disturbance of protected and priority fauna during construction and operation; and
  - Interference with species' ability to commute and disperse within their normal range;
- Mitigation – measures to avoid or reduce any predicted significant effects are then developed, where possible, in conjunction with other elements of the design (including mitigation for other environmental disciplines). If necessary, measures to compensate for effects on features of nature conservation importance are also included; and
- Residual effects – any residual effects of the Scheme are reported.

Study areas

9.3.3 The study areas used in this assessment were defined with reference to the potential zone of influence (ZoI) over which the Scheme may result in significant effects on IEF.

9.3.4 The potential ZoI of the Scheme may vary over time (e.g. the construction ZoI may differ from the operational ZoI) and depending on the individual sensitivities of different ecological features.

9.3.5 The extent of the study areas applied during the desk study and field surveys are detailed within Table 9-1 and Table 9-2. The study areas are considered sufficient to address the potential worst case ZoI of the Scheme on potential IEF.

Data sources

9.3.6 The ecological baseline has been determined through a combination of desk study, field survey and review of approved landscape restoration plans for two sites currently under development/extraction, summarised as follows.

Desk study

9.3.7 A desk study was carried out to identify nature conservation designations and protected and priority habitats and species potentially relevant to the Scheme. The desk study was carried out using the data sources detailed in Table 9-1 and the results are reported in detail in Appendices 9-1 to 9-8.

Table 9-1 Desk study data sources and study areas

Data source	Ecological feature	Study area[15]
Multi-Agency Geographic Information for the Countryside (MAGIC) website[16]	Existing and proposed international statutory designated sites (Ramsar sites) and European statutory designated sites (Special Areas of Conservation (SAC; pSAC) and Special Protection Areas (SPA; pSPA)).	10km
	Statutory national nature conservation designations (Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR))	5km
	Statutory Local Nature Reserves (LNR)	2km
	Ancient woodlands[17] and Habitats of Principal Importance (HPI)[18]	2km
	Granted European Protected Species Mitigation (EPSM) licences	2km
West Yorkshire Ecology (WYE) (data supplied in May 2019)	Non-statutory Local Wildlife Sites (LWS)	2km
	Protected and priority species[19]	2km
West Yorkshire Bat Group (WYBG) (data supplied in December 2019)	Bat records[20]	2km

[15] Study areas are defined based on the maximum potential ecological Zone of Influence of the Scheme on different ecological features. Further detail is provided in Chapter 9 (Biodiversity) in Volume 2i of the ES, as well as in Appendices 9-1 to 9-8.
[16] https://magic.defra.gov.uk/ (Accessed February 2020)
[17] Woodlands listed on the Ancient Woodland Inventory (AWI)
[18] Habitats of Principal Importance for nature conservation in England as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006
[19] Protected and priority species include those listed under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended); Schedules 2 and 4 of The Conservation of Habitat & Species (Amendment) (EU Exit) Regulations 2019; and Species of Principal Importance for nature conservation in England listed under Section 41 of the NERC Act 2006. The data also includes records of invasive non-native plant species, as listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). Records considered in the assessment are generally those that are recent (within the last ten years (dated 2010 onwards)), but records dated between the years 2000 and 2010 are also included where considered relevant (such as a species of particular interest that has not been recorded more recently). Records dated before the year 2000 have not been considered
[20] Records of bats held by WYBG that may be additional to those held by WYE. Records considered in the assessment are generally those that are recent (within the last ten years (dated 2010 onwards)), but records dated between the years 2000 and 2010 are also included where considered relevant (such as bat roosts or bat species of particular interest that have not been recorded more recently). Records dated before the year 2000 have not been considered.

Data source	Ecological feature	Study area[15]
Environment Agency (EA) – publicly available data	EA Humber River Basin Management Plan (RBMP)[21] EA Data Catchment Explorer[22] EA Freshwater and Marine Biological Survey data for invertebrates, fish, macrophytes and diatoms[23] and taxa lists for aquatic macroinvertebrates and macrophytes[24] EA River Habitat Surveys – Survey Details and Summary Results[25]	2km
Canal & River Trust	Vegetation survey report for the Calder and Hebble Navigation and Huddersfield Broad Canal[26]	2km
Ordnance Survey maps (1:25000 scale) Publicly available aerial imagery (Google Earth)	Information on habitats (including ponds and other waterbodies) and habitat connectivity across the Scheme relevant to the assessment of protected/priority species constraints.	500m (2km for rivers)

Field surveys

9.3.8 The scope of habitat and protected species survey work that has been undertaken to inform the EcIA is summarised in Table 9-2. The scope of protected species survey work was defined based on the results of extended Phase 1 habitat surveys completed across the Scheme in 2019 and 2020.

[21] EA (2016). Humber River Basin District RBMP: 2015. https://www.gov.uk/government/publications/humber-river-basin-district-river-basin-management-plan (Accessed Oct 2019)
[22] EA Biological Monitoring Data. https://data.gov.uk/search (Accessed Oct 2019)
[23] EA Biological Monitoring Data. https://data.gov.uk/search (Accessed Oct 2019)
[24] EA taxa lists, downloaded from the EA Ecology and Fish Data Explorer, available at: https://environment.data.gov.uk/ecology-fish/ (Accessed April 2020)
[25] EA River Habitat Surveys – Survey Details and Summary Results. https://data.gov.uk/dataset/4cb467c9-346e-44ac-85c6-6cd579111e2c/river-habitat-survey-survey-details-and-summary-results (Accessed Oct 2019)
[26] Goulder, R. (2019) *Observations on the impact of dredging on aquatic plants in the Huddersfield Broad Canal and some canal lengths of the Calder & Hebble Navigation*, Canal & River Trust, Leeds.

Table 9-2 Scope of ecological field surveys

Survey type	Brief description	Timescales	Study area	Further comments/rationale
Habitats	Phase 1 habitat survey The condition of habitats was also assessed in order to allow biodiversity metrics to be calculated.	Throughout 2019 and 2020	All accessible areas within and immediately adjacent to the Scheme	Habitats (priority or otherwise) located outside the footprint of the Scheme or immediately adjacent areas are unlikely to be subject to significant adverse effects.
Hedgerows	Standardised hedgerow survey.	April to October 2019	Hedgerows within the Scheme or connected to hedgerows within the Scheme. Hedgerows within or on the boundary of dwelling houses were scoped out.	Based on the above rationale, hedgerows outside the Scheme boundary (excluding connecting hedgerows) are unlikely to be significantly affected by the Scheme. The Hedgerow Regulations 1997 do not apply to hedgerows within or on the boundary of dwelling houses and therefore such hedgerows cannot be classed as 'important hedgerows' and are unlikely to be important ecological features.
Great crested newt (GCN)	Habitat Suitability Index (HSI) assessment.	March – June 2019 June 2020 and October 2020	Standing water bodies potentially suitable for GCN within 500m of the Scheme. Water bodies were screened out of GCN field survey in the following situations: • Where significant barriers to GCN dispersal are present between the water body and the Scheme (such as major roads, large areas of unsuitable habitat such as urban development and fast flowing watercourses); and • Water bodies located over 250m from the Scheme where there is extensive suitable terrestrial habitat for GCN within 250m of the water body, such that there is a very small risk of GCN dispersal into the Scheme.	GCN populations associated with water bodies located more than 500m from the Scheme, or water bodies screened out within 500m, are very unlikely to disperse into habitats to be impacted by the Scheme.
	Environmental DNA (eDNA) survey	15 April – 25 June 2019 June 2020		
	Presence/likely absence survey	May 2019	Waterbodies screened in as above and with historic records of GCN presence.	To determine potential effects on GCN.
Bats	Bat roost assessments including preliminary bat roost assessments (external and (where possible) internal inspections of structures and ground-based and aerial inspections of trees); dusk emergence and dawn re-entry surveys of structures and trees; and hibernation surveys of structures and trees.	Preliminary bat roost assessments – throughout 2019 and 2020 Dusk/dawn surveys – May to September 2019 and May to September 2020 Hibernation surveys – December 2019 to February 2020	All structures and trees to be directly impacted (demolition/felling/pruning).	To determine potential effects on roosting bats.
			Structures and trees to be retained, within and up to 100m of the Scheme boundary where there is potential for significant indirect effects on roosting bats through disturbance (artificial light, noise, vibration) that is significantly higher than existing background levels (such as in more rural areas where the Scheme extends beyond the immediate vicinity of the existing railway line).	Structures and trees to be retained within, and up to 100m from, the Scheme that are located adjacent to the existing railway line, or within urban or industrial areas, were scoped out of bat roost assessments. Any roosting bats using such features will already be accustomed to relatively high levels of disturbance (frequent train movements, trackside maintenance operations (includes lighting), industrial operations, road traffic noise) and are therefore unlikely to be subject to significant adverse effects. Structures and trees located more than 100m from the Scheme are unlikely to be subject to disturbance at a scale that could result in significant adverse effects on roosting bats.
			Structures and trees beyond the Scheme boundary where there is potential for significant indirect effects through the loss of/damage to habitats that are important for the integrity of bat roosts (such as commuting corridors).	To determine potential indirect effects on bat roosts as a result of habitat loss. The identification of important foraging/commuting habitats has been informed by the bat activity surveys (see below).
	Bat activity surveys, including walked transects and deployment of automated bat detectors.	Late May to October 2019 and early May to June 2020	Within habitats of potential value to foraging and commuting bats within, and up to 100m from, the Scheme.	The Scheme is unlikely to result in a significant adverse effect on bats using habitats more than 100m from the Scheme.
Barn owl	Surveys to identify potentially suitable nesting and foraging habitats	Throughout 2019 and 2020	Habitats within and up to 100m from the Scheme.	The Scheme is unlikely to result in a significant adverse effect on barn owl using habitats more than 100m from the Scheme.

Survey type	Brief description	Timescales	Study area	Further comments/rationale
	Nest site verification survey	June – July 2019	Potentially suitable nesting features (old buildings, mature trees) within and up to 100m from the Scheme.	
Badger	Survey for badger setts and field signs	Throughout 2019 and 2020	Suitable habitat within 50m of the Scheme.	Disturbance to setts beyond 50m is unlikely as a result of the Scheme.
Otter	Survey of riparian habitats for signs of otter to determine presence/likely absence	April – October 2019 and June – November 2020	Riparian habitats within, and up to 100m, from the Scheme at watercourse (rivers, canals, streams, ditches) crossing points.	The Scheme is unlikely to result in significant adverse effects (disturbance) on otter beyond 100m of the Scheme.
Water vole	Survey of riparian habitats for signs of water vole to determine presence likely absence	April – September 2019 and May 2020 – November 2020	Riparian habitats within and up to 50m from the Scheme at watercourse (rivers, canals, streams, ditches) crossing points.	The Scheme is unlikely to result in significant adverse effects (disturbance) on water vole beyond 50m of the Scheme.
River Habitats – River Corridor Survey (RCS) Fish Habitat Survey (FHS) River Habitat Survey (RHS) Spot-check watercourse habitat survey	Watercourses for which at least 250m of open channel could be accessed were subject to RCS, FHS and RHS (canals subject to RCS and FHS only, since RHS habitat modification scoring is not informative in the context of artificial canal systems). Watercourse for which less than 250m could be accessed were subject to a spot-check habitat survey based on parameters included in RHS and FHS. The physical habitat structure and sensitivity of each watercourse was characterised throughout the reach within which the potential scheme effect originates.	August 2019	Watercourses within 150m of the Scheme.	Watercourse habitats beyond 150m from the Scheme (and not hydrologically linked to those within 150m) are unlikely to be subject to significant adverse effects from the Scheme. Watercourses were subject to varying levels of habitat survey, based on accessibility and watercourse type. Survey reaches were aligned to key points of interaction with the Scheme (e.g. crossing points) where there is greatest potential for effects.
Predictive System for Multimetrics (PSYM) pond survey	Basic pond physical/environmental survey data (for example pH) and detailed biological data was collected in order to characterise the ecological importance of ponds affected by the Scheme, in accordance with the prescribed PSYM method.	July 2020	Potentially ecologically important ponds and lakes within 150m of the Scheme that are likely to be subject to Scheme effects.	Ponds were subject to detailed survey and assessment only where: • The pond is to be lost by any mechanism (drainage, land take to construction etc.) or may experience a significant change in water quality or quantity as a result of the Scheme (e.g. severance of feeder surface/groundwater pathways to the water body) based on available design information; and • The pond is considered to be potentially ecologically important (i.e. potentially of Local ecological importance or greater), based on the review of physical habitat data collected during HSI survey.

9.3.10 The following field surveys were scoped out based on a review of desk study information and the results of terrestrial and aquatic habitat surveys completed across the Scheme in 2019:

- National Vegetation Classification (NVC) survey – no priority or particularly diverse habitats that require further botanical assessment using the NVC method were identified;
- Wintering/passage bird survey – the habitats to be impacted by the Scheme are unlikely to support important numbers of wintering or passage birds. There are no designated sites within 10km with overwintering birds as a qualifying feature;
- Breeding bird survey – no habitats or sites with the potential to support diverse assemblages of breeding birds were identified that would be subject to direct impacts (habitat loss or damage) or indirect impacts (significant or long-term disturbance) as a result of the Scheme. The potential presence of breeding Schedule 1 bird species[27] within the vicinity of the Scheme (with the exception of barn owl (see Table 9-2)) is limited to kingfisher (*Alcedo atthis*; along watercourses that are crossed by the Scheme) and little ringed plover (*Charadrius dubius*; potentially present in Forge Lane Quarry), based on the habitats present. No targeted surveys for these species were considered necessary for the following reasons: no suitable nesting habitat for kingfisher was identified along watercourses within 100m of the Scheme; and likely impacts and effects on little ringed plover can be assessed and appropriate mitigation measures can be specified without the need for survey information;
- Dormouse survey – there are no records of dormouse in the desk study area and the current known distribution of the species in the UK does not extend into West Yorkshire. Furthermore, the proposed loss of habitats that are potentially suitable for dormouse (broad-leaved woodland, dense scrub, hedgerows) is relatively minor and those that will be impacted by the Scheme are very unlikely to support dormouse populations as they are disconnected from habitats in the wider area that could support viable populations of dormouse;
- Reptile survey – small areas of habitat suitable for common reptile species are present across the Scheme. Likely impacts and effects can be accurately characterised without the need for survey information;
- Terrestrial invertebrate survey – the habitats to be impacted by the Scheme are unlikely to support diverse assemblages of invertebrates, or important populations of rare/notable invertebrates;
- Fish survey – suitable proxy data (EA fish monitoring data) is available within the 2km study area for watercourses identified as requiring detailed assessment (i.e. those watercourses identified as both potentially ecologically important and potentially affected by the Scheme). In combination with habitat survey results (RHS, RCS, FHS and spot-check habitat surveys), the available EA data is considered sufficient to characterise fish populations for the purpose of EcIA;
- Aquatic macroinvertebrate survey – suitable proxy data (EA macroinvertebrate monitoring data) is available within the 2km study area for watercourses identified as requiring detailed assessment (i.e. those watercourses identified as both potentially ecologically important and potentially affected by the Scheme). In combination with habitat survey results (RHS, RCS, FHS and spot-check habitat surveys), the available EA data is considered sufficient to characterise aquatic macroinvertebrate populations for the purpose of EcIA;
- White-clawed crayfish (*Austropotamobius pallipes*) survey – this species is unlikely to be present in watercourses to be impacted by the Scheme as there are no recent records of the species within 2km and signal crayfish (*Pacifastacus leniusculus*; an invasive non-native species that rapidly out-competes and spreads crayfish plague to the native white-clawed crayfish) has been recorded in Huddersfield Broad Canal, the River Colne and the

[27] Bird species listed on Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended), which receive additional protection from disturbance whilst breeding

River Calder (all of which are hydrologically connected to watercourses to be impacted by the Scheme); and

- Floating water-plantain (*Luronium natans*) – records of floating water-plantain have been identified within the 2km study area for the Scheme. Habitat survey results (RHS, RCS and spot-check habitat surveys), combined with existing available data within the 2km study area (Canal & River Trust vegetation survey results and protected and priority species records) are considered sufficient to characterise floating water-plantain populations for the purpose of EcIA.

Review of restoration plans

9.3.11 Two areas of land within Route Section 6 are subject to approved planning permissions for fuel recovery, sand and gravel extraction and disposal of waste (Thornhill Quarry, planning ref. 85/62/05507/A2 and subsequent amendments) and extraction of sand, gravel and ash (Forge Lane Quarry planning ref. 2012/62/92979/E and subsequent amendments). Both schemes are currently in progress and landscape restoration works are being/to be completed as a requirement of each permission. As such, as a conservative approach, the fully restored schemes, detailed within the landscape restoration plans submitted with each application (the 'quarry restoration plans'), have been taken as the ecological baseline habitats within these locations and are the habitats against which potential impacts have been assessed. Floral species lists within the quarry restoration plans have been used to assign the corresponding Phase 1 habitat types within this assessment.

9.3.12 The assessment of protected or notable species within the quarry restoration areas have been assessed against the baseline conditions as observed in 2019 and 2020 as it is not possible to predict the future presence of protected or notable species within the restored schemes.

Assessment criteria

Nature conservation evaluation

9.3.13 It is not necessary in the assessment to address all habitats and species with potential to occur in the ZoI of a proposed development. Instead, the focus should be on those that are *'important'*. CIEEM guidance makes it clear that '*it is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable*'. However, this does not mean that efforts should not be made to safeguard wider biodiversity, and requirements for this have been considered. National policy documents emphasise the need to minimise impacts on and provide net gains for biodiversity[28].

9.3.14 To support focussed EcIA, there is a need to determine the scale at which the ecological features identified through the desk study and field surveys undertaken for the Scheme are of value. The approach taken when valuing ecological features needs to be robust as it provides much of the rationale for the identification and further assessment of IEF.

9.3.15 Ecological features can be of value for a variety of reasons and the rationale used should be explained to demonstrate a robust selection process. Value may relate, for example, to the quality or extent of designated sites or habitats, to habitat/species rarity, to the extent to which they are threatened throughout their range, or to their rate of decline.

9.3.16 CIEEM guidance identifies a number of characteristics that can be used to identify ecological

[28] Ministry of Housing, Communities and Local Government (2019) National Planning Policy Framework. https://www.gov.uk/government/publications/national-planning-policy-framework--2

features likely to be important in terms of their biodiversity value as follows:

- Animals or plant species, subspecies or varieties that are rare or uncommon, internationally, nationally or more locally;
- Ecosystems and their component parts that provide the habitats required by the above species, population and/or assemblages;
- Endemic species or locally distinct sub-populations of a species;
- Habitat diversity, connectivity and/or synergistic associations;
- Notably large populations of animals or concentrations of animals considered uncommon or threatened in a wider context;
- Plant communities (and their associated animals) that are considered to be typical of valued natural/semi-natural vegetation types;
- Species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change;
- Species-rich assemblages of plants or animals; and
- Typical faunal assemblages that are characteristic of homogenous habitats.

9.3.17 Where available, relevant guidance is used to inform valuation of ecological features. Resources relevant to the study area include the Kirklees Wildlife Habitat Network[29], Kirklees LBAP[30], guidance for the identification of ecological features of value in West Yorkshire[31] and National Character Area Profile: 37 Yorkshire Southern Pennine Fringe. The status of habitats and species that are rare or threatened is outlined nationally in various Red Data Books and Lists[32], and also in the NERC Act Section 41 list of habitats and species of principal importance (HPI/SPI) for nature conservation in England. There are national criteria for rarity and level of threat to populations for different groups of species, and guidance on the assessment of the relative value of habitats such as the Ratcliffe Criteria[33]. Species may be widespread or common nationally, but of scarce occurrence in the county or district. Conversely, a species may be common in a county or district context but considered rare nationally. In addition, some species termed legally protected species such as bats, badger and reptiles, are given statutory protection that protects them from harm or forms of disturbance, but that does not necessarily translate to biodiversity value (e.g. a transitory occurrence of a single individual of a protected bat species would not be afforded the same weight as a regularly occurring large population of bats).

9.3.18 Professional judgement has also been used as appropriate when assigning value, particularly where species or habitats are poorly known, or guidance is lacking. Ecological features may be identified that are not included in lists of priority habitats and species, but that can be considered important on the basis of professional judgment (e.g. because of their local rarity or because they enable effective conservation of other important features).

9.3.19 The value of each ecological feature has been defined with reference to the geographical level at which it is considered to be important, and the results of this assessment have been used to identify the IEF requiring impact assessment. The frames of reference used for this assessment are:

- International (Europe): such as SAC and SPA;
- National (UK): such as SSSI;

[29] Kirklees Wildlife Habitat Network. Environmental Designations Technical Paper (kirklees.gov.uk)
[30] Kirklees Biodiversity Action Plan. https://www.kirklees.gov.uk/beta/delivering-services/policies-and-strategies.aspx
[31] West Yorkshire Local Sites Partnership (2019) West Yorkshire Local Wildlife Site Selection Criteria https://www.wyjs.org.uk/ecology/local-sites/
[32] UK Red Data Books and Lists http://archive.jncc.gov.uk/page-3352
[33] Ratcliffe, D.A. (Ed). (1977) A Nature Conservation Review. 2 volumes. Cambridge University Press

- Regional[34]: such as populations of species that enrich biodiversity on a regional scale and whose loss would significantly affect the species' regional distribution;
- County (West Yorkshire): such as LNR or habitats and/or populations of species which meet Local Wildlife Site (LWS) selection criteria;
- District (Kirklees): HPI and SPI, less common ecological features such as old hedgerows and ponds (that do not meet criteria for valuation at County level), the Kirklees Wildlife Habitat Network and habitats/species detailed within the Kirklees LBAP;
- Local (the Scheme and its immediate environs): ecological features common within the local area that do not meet criteria for valuation at a District or higher level, but that have sufficient value to merit retention or mitigation; and
- Negligible: common and widespread ecological features that do not require retention or mitigation at the relevant location to otherwise maintain a favourable nature conservation status (e.g. amenity grassland, arable land).

9.3.20 All ecological features of Local value and above are the IEF that have been taken forward to impact assessment.

Impact assessment

9.3.21 In line with the CIEEM guidelines, the terminology used within the EcIA draws a clear distinction between the terms *'impact'* and *'effect'*. For the purposes of the EcIA, these terms are defined as follows:

- Impact – actions resulting in changes to an ecological feature. For example, demolition activities leading to the removal of a building used as a bat roost;
- Effect – outcome to an ecological feature from an impact. For example, killing/injury of bats and reducing the availability of breeding habitat as a result of the loss of a bat roost may lead to an adverse effect on the conservation status of the population concerned.

9.3.22 When describing potential impacts (and where relevant the resultant effects) consideration is given to the following characteristics likely to influence this:

- Beneficial/adverse (i.e. is the change likely to be in accordance with nature conservation objectives and policy);
- Beneficial (positive) – a change that improves the quality of the environment, or halts or slows an existing decline in quality (e.g. increasing the extent of a habitat of conservation value);
- Adverse (negative) – a change that reduces the quality of the environment (e.g. destruction of habitat or increased noise disturbance);
- Magnitude – the size, amount or intensity of an impact - this is described on a quantitative basis where possible;
- Spatial extent – the spatial or geographical area or distance over which the impact/effect occurs;
- Duration – the time over which an impact is expected to last, prior to recovery or replacement of the resource or feature. Consideration has been given to how this duration relates to relevant ecological characteristics such as a species' lifecycle. However, it is not always appropriate to report the duration of impacts in these terms. The duration of an effect may be longer than the duration of an activity or impact;
- Reversibility (i.e. is the impact temporary or permanent). A temporary impact is one from which recovery is possible or for which effective mitigation is both possible and

[34] A geographical area for Regional importance has not been defined. A feature is of Regional importance when it is of greater importance than within West Yorkshire but does not meet the threshold to be considered of National importance.

enforceable. A permanent effect is one from which recovery is either not possible, or cannot be achieved within a reasonable timescale (in the context of the feature being assessed); and

- Timing and frequency (i.e. consideration of the point at which the impact occurs in relation to critical life-stages or seasons).

9.3.23 For each ecological feature only those characteristics relevant to understanding the ecological effect and determining the significance are described.

Determining the significance of effects

9.3.24 For nature conservation designations, other defined habitats and ecosystems the assessment considers what effect the potential impacts are likely to have on conservation objectives or interest/qualifying features. For ecosystems, consideration is given to whether a change in ecosystem structure and/or function is likely that would substantively alter its ecological integrity.

9.3.25 For habitats and species, the assessment considers what effect the potential impacts would have on 'conservation status', and whether or not the effect is likely to substantively alter the ecological integrity of the habitat or species under consideration. Further guidance on how to assess conservation status is provided in CIEEM guidance, as follows:

- For habitats: "conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area"; and
- For species: "conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area".

9.3.26 In considering effects on conservation status, reference is made to relevant available guidance on the current conservation status of the ecological feature under consideration.

9.3.27 The determination of the significance of effects has been made based on the predicted effect on the structure/function, or conservation status, of IEF, as follows:

- Not significant – no ecologically meaningful effect on structure/function or conservation status; and
- Significant – an ecologically meaningful effect on structure/function or conservation status.

9.3.28 Such judgements are based, wherever possible, on quantitative evidence. However, where necessary the professional judgement of an experienced ecologist has been applied.

9.3.29 For those effects considered significant, the effect will also be characterised as appropriate (e.g. adverse or beneficial) and qualified with reference to the geographic scale at which the effect is significant (e.g. an adverse effect significant at a national level).

9.3.30 The scale of significance of an effect may not be the same as the geographic context in which the feature is considered important.

Temporal scope

9.3.31 When assessing the potential impacts of the Scheme on IEF, consideration has been given to how baseline conditions may have changed between the surveys and the start of construction.

9.3.32 Where available, long-term trend information was used to make judgements about the significance of effects on designated sites, habitats and species (e.g. a species with a long-

term national population decline may be more susceptible to Scheme impacts).

9.3.33 The assessment undertaken has assumed that once the construction phase is complete, the operation phase of the Scheme will occur.

Residual impact assessment

9.3.34 If further mitigation (in addition to that which is embedded in the Scheme design) is required to reduce otherwise significant effects, this is identified in the mitigation section with a final assessment detailed in the residual impact section. This has been an iterative process throughout the Scheme's design to ensure that mitigation can be built into the design wherever possible with the objective of removing significant residual risks at the design stage.

Embedded mitigation

9.3.35 The design process has enabled the development of appropriate design adaptations, referred to as embedded mitigation. These remove the risk of impacts to biodiversity and, where this is not possible, they reduce these risks and minimise the associated consequences to acceptable levels. The following assessment (potential effects) is undertaken with consideration of embedded mitigation.

9.3.36 Appropriate additional mitigation measures to reduce and, wherever possible, avoid identified adverse effects will be explored and discussed within this ES chapter.

9.3.37 Any residual effects of the Scheme on biodiversity following the inclusion of mitigation measures will be identified.

9.3.38 Further detail is provided in Chapter 3 (Consideration of alternatives) of this ES, however examples include:

- Siting and layout of construction compounds to avoid sensitive ecological receptors; and
- Design of Baker Viaduct Underbridge (RBA/2) to minimise effects on the river corridor. The preferred option means that piers are not required to be sited within the river. Consideration has also been given to the shadowing effect of the viaduct structure.

Scoping and consultation

9.3.39 Consultation undertaken during the preparation of the EcIA is summarised in Table 9-3.

Table 9-3 Summary of consultation undertaken for the EcIA

Consultee	Date	Content
Natural England (NE)	10 September 2019	Introductory call to introduce the Scheme
	7 May 2020	Call to provide updated information, including design developments and a summary of results of ecology surveys to date. The requirement for submission of draft protected species licenses (likely to be required for bats and badger, and may be required for floating water-plantain) to NE prior to submission of the Transport and Works Act Order (TWAO) application was queried. The level of Habitats Regulations Assessment (HRA) reporting required was also queried.
	19 May 2020	Email from NE case officer confirming that NE do not need to review draft licence applications prior to submission of the TWAO application, and that a standalone HRA report is not required as long as

Consultee	Date	Content
		impacts and effects on European sites are adequately assessed within the reports already being produced. Further details on the potential impacts on floating water-plantain were requested in order for NE to provide a view of the need for licensing.
	10 January 2020	Letter in response to NE comments on their letter to the TWAO Unit with regard to the Environmental Scoping Report (dated 15 July 2019).
Environment Agency (EA)	21 May 2020	Call to discuss design of Baker Viaduct Underbridge (RBA/2). Options were presented, and environmental constraints and preferred options discussed for relevant environmental topics, including aquatic ecology.
	03 June 2020	Email from EA confirming that the approach to baseline data collection for aquatic ecology assessment is reasonable and acceptable.
	30 July 2020	WFD-specific consultation at which proposed designs, potential implications on watercourse baselines (in terms of hydromorphology, water quality and aquatic ecology), and proposed mitigation measures were discussed.
Canal & River Trust	21 May 2020	Introductory call to introduce the Scheme. A summary of ecology survey results to date was provided.
	19 November 2020	Call to provide updated information including design developments and a summary of ecology survey results to date. Ecological mitigation and enhancement measures (for bats and floating water plantain) were also discussed.

Cumulative effects

9.3.40 The assessment of potential cumulative effects of the Scheme has included the combined effects that result from Reasonably Foreseeable Future Projects (RFFPs) on the existing environment during both construction and operation. Details of the cumulative effects are discussed Chapter 22 (Cumulative effects) of the ES.

9.3.41 Cumulative effects can be both direct and indirect and can result from individually insignificant but collectively significant actions. They are particularly important as many ecological features are already exposed to background levels of threat or pressure and may be close to critical thresholds where further impact could cause irreversible decline. Effects can also make habitats and species more vulnerable or sensitive to change.

9.3.42 Two types of cumulative effects have been considered:

- Intra-Scheme effects (synergistic): combined effects on ecological features from different environmental impacts from the Scheme; and
- Inter-Scheme effects: combined effects of the Scheme and RFFPs within the area on an ecological feature. For example, effects on the local bat population may not be significant from one development alone but may become significant in combination with other proposed developments.

Assumptions and limitations

9.3.43 The baseline includes ecological features that are assumed to be present based on a reasonable precautionary approach where surveys were subject to limitations. For example,

where surveys to assess a feature suitable for roosting bats have not yet been completed, it is assumed that a bat roost is present within that feature.

9.3.44 The level of biodiversity survey data collected to inform this ES is extensive and as such is considered sufficient to inform this assessment. Notwithstanding this, details on the approach to missing information for each ecological feature (where required) to ensure a wholly robust assessment of the Scheme are provided in Appendices 9-1 to 9-8.

9.3.45 Limitations encountered when undertaking desk studies and field surveys are detailed within Appendices 9-1 to 9-8.

9.4 Baseline

Statutory designated sites

9.4.1 Three European statutory nature conservation designations are located within 10km of the Scheme, as summarised in Table 9-4. These are illustrated on Figure 9-1.

Table 9-4 European statutory nature conservation designations within 10km of the Scheme

Designation	Approximate distance and direction from the Scheme	Reason for designation
Denby Grange Colliery Ponds SAC (and SSSI)	4.8km south-east	Presence of Annex II species: • Great crested newt
Peak District Moors (South Pennine Moors Phase 1) SPA	7.5km south-west	Supports important populations of the following bird species: • Golden plover (*Pluvialis apricaria*) • Merlin (*Falco columbarius*) • Short-eared owl (*Asio flammeus*)
South Pennine Moors SAC	7.5km south-west	Presence of the following Annex I habitats: • European dry heaths • Blanket bogs • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

9.4.2 There is one SSSI within 5km of the Scheme that has been designated on the basis of nature conservation interests: Denby Grange Colliery Ponds SSSI (for GCN). Both Elland Bypass Cutting SSSI and Honley Station Cutting SSSI are also located within 5km but are designated on earth heritage interests. There are no NNR within 5km of the Scheme.

9.4.3 Five LNR are located within 2km of the Scheme (Gledholt Woods, Dalton Bank, Sunny Bank Ponds, Lower Spen Wildlife Area and Sparrow Wood). All of these are also designated as LWS and further details are provided in Table 9-5.

Non-statutory designated sites and networks

9.4.4 There are eighteen LWS within 2km of the Scheme, two of which are located within the Scheme boundary (Gledholt Woods LWS and Sir John Ramsden Canal LWS). These are summarised in Table 9-5 and illustrated on Figure 9-1.

Table 9-5 Non-statutory nature conservation designations within 2km of the Scheme

Designation	National Grid Reference (NGR)	Approximate distance and direction from the Scheme	Qualifying criteria/features of interest
Gledholt Woods LWS (also LNR)	SE131165	Within the Scheme boundary	Qualifies based on status as LNR. The woodlands support an unusual range of fungi. White-clawed crayfish have also been found in the pond here (located 130m north of the Scheme).
Sir John Ramsden Canal LWS (watercourse name is Huddersfield Broad Canal)	SE155185	Within the Scheme boundary	Qualifies based on standing water criteria Sw5 - 'Networks: within 500m of another standing water LWS' (Huddersfield Narrow Canal LWS).
Huddersfield Narrow Canal LWS	SE100151	Directly adjacent to the south	Nutrient rich standing water, species rich plant community
Whitley Wood LWS	SE215185	35m south	High native bluebell (*Hyacinthoides non-scripta*) cover
Lower Spen Wildlife Area LWS (also LNR)	SE227208	230m north	Qualifies based on status as LNR. Woodland, scrubland, meadow, wetland
Briery Bank Wood LWS	SE204187	350m south	High native bluebell cover
Sparrow Wood LWS (also LNR)	SE244201	210m east	Qualifies based on status as LNR. Broad-leaved woodland.
Dalton Bank LWS (also LNR)	SE172186	500m south-east	Qualifies based on status as LNR. A mix of conifer plantations and native woodlands.
Jordan Wood and Oliver Wood LWS	SE220188	130m west	High native bluebell cover
Covey Clough Wood and Hepworth Wood LWS	SE200182	900m south	Species diverse acid woodland with high native bluebell cover
Bradley Park Woods LWS	SE160210	920m north-west	Dense native bluebell cover
Gregory Spring LWS	SE206179	1.15km south	Species diverse acid woodland with high native bluebell cover
Liley Wood LWS	SE211176	1.15km south	Species diverse neutral woodland; high native bluebell cover
Grimescar Wood LWS	SE131190	1.45km north-west	High native bluebell cover
Sunny Bank Ponds LWS (also LNR)	SE199216	1.4km north-east	Qualifies based on status as LNR. Parkland, mature trees, wetland.
Clifton Lagoon LWS	SE165219	1.6km north-west	Species-rich neutral grassland and mixed habitats
Laneside Quarry LWS	SE184175	1.8km south	Good populations of GCN and smooth newt
Howroyd Beck Fields Lowe Whitley LWS	SE226176	803m south	Species rich acid grassland

9.4.5 Several areas within the Scheme are mapped as part of the Kirklees Wildlife Habitat Network[35] as shown in Figure 9-1. This ecological network is intended to enable species populations to be sustained by protecting and enhancing the ecological corridors and linkages within the wider environment. The network identifies continuous stretches of permeable habitat as links between designated sites of biodiversity and geological importance and notable habitat links within the district (such as woodlands, watercourses, natural and semi-natural areas). It also provides connection to adjoining districts.

Habitats of Principal Importance and ancient woodlands

9.4.6 Eighteen ancient woodland sites are present within 2km of the Scheme, the nearest being Whitley Wood/Hagg Wood located 35m to the south (part of Whitley Wood LWS). Further details are provided in Appendix 9-2.

9.4.7 During the desk study, 913 distinct areas of potential deciduous woodland HPI (all low confidence) were identified within 2km of the Scheme. Only woodlands within and directly adjacent to the Scheme are considered relevant to the assessment, and these are described in Table 9-6.

9.4.8 Eight traditional orchard HPI are present within 2km of the Scheme, the nearest located 360m to the north-east of the Scheme.

Terrestrial habitats

9.4.9 The terrestrial habitats recorded within and directly adjacent to the Scheme during Phase 1 habitat surveys are summarised in Table 9-6. Habitats are detailed within Appendix 9-3 and illustrated on Figure 9-2.

Table 9-6 Summary of Phase 1 habitat survey results

Phase 1 habitat type	Description
Semi-natural broad-leaved woodland	Several blocks of semi-natural broadleaved woodland are located within and directly adjacent to the Scheme, including large mature woodlands within Gledholt Wood in Huddersfield and Lady Wood in Ravensthorpe (both partially within the Scheme boundary). In general, woodlands are semi-mature to mature in age and species include: English oak (*Quercus robur*), birch (*Betula* sp.), willow (*Salix* spp.), ash (*Fraxinus excelsior)* and sycamore (*Acer pseudoplatanus*) in the canopy; holly (*Ilex aquifolium*), hawthorn *(Crataegus monogyna)* and elder (*Sambucus nigra*) in the understorey; and bluebell, ramsons (*Allium ursinum*), common nettle (*Urtica dioica*) and bramble (*Rubus fruticosus* agg.) within the ground flora.
Semi-natural mixed woodland	A large area of mature woodland is present to the north of Peace Pit Lane, Huddersfield, located directly adjacent to the Scheme. Species include sycamore, beech (*Fagus sylvatica*), English oak and pine (*Pinus sp.)* in the canopy, holly and elder in the understorey, and bluebell within the ground flora.
Plantation broad-leaved woodland	Young to semi-mature plantation woodlands are present within and adjacent to the Scheme, typically in recreational areas and along railway embankments. Species include willow, sycamore, alder (*Alnus*

[35] Kirklees Council (2015) Kirklees Local Plan – Technical Paper: Environmental Designations. Available online at Environmental Designations Technical Paper (kirklees.gov.uk) (Accessed June 2020)

Phase 1 habitat type	Description
	sp.), ash, hawthorn, oak, birch, cherry (*Prunus* sp.), hawthorn, hazel *(Corylus avellana)* and field maple *(Acer campestre)*.
Plantation mixed woodland	A single area of semi-mature to mature plantation mixed woodland is present on land above Gledholt Tunnel (MVL3/86), outside the Scheme. Species include pine, sycamore and birch.
Scattered trees	Native and non-native trees ranging in age from young to mature are abundant along the railway corridor, within areas of urban soft landscaping and in surrounding private and public land such as along field boundaries and riverbanks. Species include birch, willow, beech, ash, lime (*Tilia* sp.*)* sycamore and English oak.
Scrub	Dense and scattered scrub dominated by bramble is abundant within the Scheme, especially along the railway corridor and along the Calder Valley Greenway. It generally occurs as a mosaic with tall ruderal vegetation (common nettle (*Urtica dioica*), rosebay willowherb (*Chamerion angustifolium*)), semi-improved neutral grassland and scattered trees.
Semi-improved neutral grassland	Present in fields, roadside verges and public open spaces within and adjacent to the Scheme, as well as habitat mosaics along the railway. Species include cocksfoot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), ribwort plantain (*Plantago lanceolata*), tufted hair-grass (*Deschampsia cespitosa*) and creeping buttercup (*Ranunculus repens*).
Marsh grassland	Detailed within restoration plans for Forge Lane Quarry. Species are expected to be dominated by grasses such as crested dogstail, common bent *(Agrostis capillaris)* and red fescue with wildflower such as yellow iris *(Iris pseudacorus),* purple loosestrife *(Lythrum salicaria)* and great burnet *(Sanguisorba officinalis)* present, amongst others.
Improved grassland	Grass leys are currently established in fields around Helm Farm and further grazed fields are located within the Ravensthorpe area.
Hedgerows	Species-poor hedgerows (both intact and defunct) dominated by hawthorn are present as boundary features within and adjacent to the Scheme, predominantly around Helm Farm, Ladywood Lakes and to the south of Wheatley's Underbridge (MVN2/196). None were classified as 'important' under The Hedgerow Regulations 1997.
Ephemeral/short perennial vegetation	Patchy distributions of herbs are present on bare ground along the railway corridor, industrial sites and elsewhere. Species include red clover (*Trifolium pratense*), common ragwort (*Senecio jacobaea)*, common chickweed (*Stellaria media)*, bird's-foot trefoil (*Lotus corniculatus*), herb Robert (*Geranium robertianum)*, groundsel (*Senecio vulgaris)*, creeping cinquefoil (*Potentilla reptans*), creeping thistle (*Cirsium arvense)*, St John's wort (*Hypericum* sp.), wild mignonette (*Reseda lutea)* and common vetch (*Vicia sativa*).
Amenity grassland	Associated with gardens, recreational areas and well managed grass verges within and adjacent to the Scheme.
Arable	Fields under arable crops are present around Helm Farm and to the south of the Scheme in Ravensthorpe, both located partially within the Scheme.
Introduced shrubs	Located within formal landscaped areas and gardens across the Scheme.

Aquatic habitats

Watercourses

9.4.10 A screening exercise was undertaken to identify watercourses within 150m of the Scheme relevant to aquatic habitat and/or aquatic species (fish, macroinvertebrates and macrophytes) assessment. Full details of the watercourse screening methodology are provided in Section 2 in Appendix 9-4.

9.4.11 The screening exercise identified the following eighteen watercourses within the Scheme study area[36]. All are located within the Scheme boundary, with the exception of the Huddersfield Narrow Canal which is directly adjacent to the south of the Scheme:

- Gledholt Beck (Ordinary Watercourse[37]);
- Hebble Beck (Ordinary Watercourse);
- Huddersfield Broad Canal (Canal);
- Blackhouse Dike (Main River[38]);
- Unnamed watercourse at Field House Culvert (Ordinary Watercourse);
- Unnamed Watercourse at Bradley Culvert (Ordinary Watercourse);
- River Colne (Main River);
- River Calder (Main River);
- Unnamed Watercourse at Bog Green Lane (Ordinary Watercourse);
- Unnamed Watercourse at Colnebridge Culvert (Ordinary Watercourse);
- Unnamed Watercourse at Heaton Lodge Junction (Ordinary Watercourse);
- Unnamed Watercourse at Heaton Lodge Underpass (Ordinary Watercourse);
- Calder and Hebble Navigation (Canal);
- Unnamed Watercourse at Chadwick Close Culvert (Ordinary Watercourse);
- Unnamed Watercourse at Steanard Lane Culvert (Ordinary Watercourse);
- Spen Beck (Main River);
- Unnamed Watercourse at Long Plantation (Ordinary Watercourse); and
- Huddersfield Narrow Canal (Canal).

9.4.12 Watercourses identified within the study area were visited by an experienced freshwater ecologist to assist in identifying IEF and support screening for assessment.

9.4.13 Eight watercourses (Gledholt Beck, Hebble Beck, Huddersfield Broad Canal, Blackhouse Dike, Unnamed Watercourse at Bradley Culvert, River Colne, River Calder and Calder and Hebble Navigation) were considered relevant to the impact assessment for the Scheme, based on the application of assessment screening criteria (i.e. those watercourses both considered to be potential IEF and potentially significantly affected by the Scheme).

9.4.14 Desk study and field survey results for these watercourses are summarised in Table 9-7. Full details of desk study and field survey methods and results are presented in Appendix 9-4.

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[36] Refer to Section 2 in Appendix 9-4 for full definitions of aquatic habitat screening and study areas.
[37] All watercourses not shown on the EA's statutory Main River Map are classified as Ordinary Watercourses
[38] All watercourses shown on the statutory Main River Map are classified as Main Rivers. The EA carries out maintenance, improvement or construction work to manage flood risk on these watercourses. Main Rivers are typically larger streams and rivers, but some are small watercourses of significance.

Table 9-7 Desk study and field survey results for watercourses relevant to the Scheme

Watercourse name	Available background data	Habitat survey results
Gledholt Beck	Designated sites: Gledholt Beck flows through Gledholt Woods LWS but is not cited as an important feature of the site. EA data: EA data within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: No recent records for aquatic species.	Survey location: NGR: SE 13080 16749 to SE 13367 16407 Survey findings: RHS and RCS identified a relatively steep, fast-flowing woodland stream with cobble/pebble dominated substrate. An artificial online pond is present, along with an associated weir and artificial waterfall, contributing to a habitat modification classification of Severely Modified. In-channel vegetation is limited by the upland nature of the channel and shading by the surrounding woodland, with the greatest extent of macrophytes occurring immediately upstream of the pond (brooklime (*Veronica beccabunga*), pendulous sedge (*Carex pendula*) and yellow flag iris (*Iris pseudacorus*)). The invasive, non-native species (INNS) Himalayan balsam *(Impatiens glandulifera*), Japanese knotweed (*Reynoutria japonica*) and American skunk cabbage (*Lysichiton americanus*) were noted during survey (all located outside the Scheme). FHS: the size of the channel and shallow water depth limit use of the watercourse to smaller fish species, such as common minnow (*Phoxinus phoxinus)* and stone loach (*Barbatula barbatula*). Woody debris locally improve habitat diversity and areas of fine sediment provide suitable habitat for lamprey species. Macrophyte beds within and upstream of the pond, provide suitable spawning habitat for phytophillic (vegetation spawning) species. A weir, artificial waterfall, and several culverts act as barriers to fish movement within the watercourse.
Hebble Beck	Designated sites: There are no designated sites associated with Hebble Beck. EA data: EA data within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: No recent records for aquatic species.	Survey location: NGR: SE 14291 17825 Survey findings: A shallow, highly modified watercourse flowing through primarily urban/suburban land use, with very limited broadleaved woodland present on either bank. Channel substrate was predominantly artificial, with limited pebble and gravel substrate present. Both banks were re-profiled and reinforced. Fish habitat was limited by the shallow water depth and predominantly artificial substrate, however a small area of riffle/run habitat with gravel/pebble substrate was recorded, which may support small lithophilic (gravel spawning) species such as common minnow and stone loach.
Huddersfield Broad Canal	Designated sites: The canal is designated as a LWS (Sir John Ramsden Canal LWS) based on its value for appreciation of nature and provision of standing open water habitat. EA data: EA data within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: Several notable aquatic species have been recorded within the 2km study area, including: European eel (*Anguilla anguilla*; critically endangered and a species of principal importance for nature conservation in England); floating water-plantain (protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019); and the INNS water fern (*Azolla filiculoides*), Canadian waterweed (*Elodea canadensis*) and Nuttall's waterweed (*Elodea nuttalii*).	Survey location: NGR: SE 17588 20196 to SE 17607 20586 Survey findings: RCS identified the canal as a deep, slow-moving, artificial watercourse flowing through predominantly industrial land use. The north bank is lined by emergent/marginal macrophytes (reed sweet-grass (*Glyceria maxima*), reedmace (*Typha latifolia*) and branched bur-reed (*Sparganium erectum*)), along with brambles and scattered broad-leaved trees. Localised patches of emergent macrophytes are also present on the south bank, however overall, the south bank is predominantly formed of bare brick. The INNS Himalayan balsam was recorded on both banks and Nuttall's waterweed was recorded at points throughout the survey reach. Additional observations taken upstream confirmed channel characteristics at this location were similar to those observed within the 500m survey reach. FHS recorded primarily deep glide/pool habitat, providing suitable feeding and refuge habitat for a variety of coarse fish species and potentially adult salmonids. Macrophyte beds provide suitable spawning habitat for phytophillic (vegetation spawning) species. The presence of two locks within the survey reach is likely to restrict the movement of fish within the canal.

Watercourse name	Available background data	Habitat survey results
	Canal & River Trust data: Canal & River Trust surveys recorded floating water-plantain within the canal in 2012, 2017 and 2018, with highest abundances recorded towards the northern end of the canal.	
Blackhouse Dike	Designated sites: There are no designated sites associated with the Blackhouse Dike. EA data: EA data within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: No recent records for aquatic species.	Survey location: NGR: SE 14987 18637 to SE 15213 18580 Survey findings: RHS and RCS identified a small (around 1m wide), severely modified watercourse with channel culverting, channel and bank re-sectioning and reinforcement. The channel is generally lined by trees or brambles, with herbaceous species occasionally present. Himalayan balsam was noted on both bank faces at a number of locations throughout the survey reach. In-channel vegetation was limited to emergent pendulous sedge. Upstream and downstream of a central culvert are short lengths of faster flow (unbroken standing wave) with cobble substrate, but these are limited in length and there is no morphological diversity throughout the reach. FHS indicated that fish habitat is limited by the presence of artificial banks and substrate, or shallow run habitat over gravel/cobble substrates. Salmonid use of this habitat resource is likely to be limited however smaller rheophilic fish species, such as common minnow and stone loach may be present in low numbers. The presence of a partially blocked trash screen, culverts and associated debris is likely to present a barrier to both upstream and downstream fish movement within the watercourse.
Unnamed Watercourse at Bradley Culvert	Designated sites: There are no designated sites associated with the Unnamed Watercourse at Bradley Culvert. EA data: EA data within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: No recent records for aquatic species.	Survey locations: NGR: SE 16915 19758 and SE16664 19910 Survey findings: Approximately 100m upstream of the Scheme (NGR: SE 16915 19758), the watercourse is heavily modified with vertical brick banks and a straight, over deepened profile. The channel was dry at the time of survey and as such, is assumed to only flow intermittently following high rainfall events. The culvert upstream is thought to be partially blocked, restricting flows from the upper reaches. Some scattered trees and scrub are present on the left bank, however, the right bank top is wholly comprised of artificial material and urban land use. Further upstream (NGR: SE 16664 19910) the open channel flows through an area of broadleaved woodland in a gently sloping valley. Large stands of Himalayan balsam line the banks of the channel at this location, reducing habitat suitability for other emergent vegetation. The channel is choked with fine sediment as a result of a blocked culvert screen. This has impounded flows leading to very slow velocities. Water depth is shallow, limiting habitat suitability for fish and the prevalence of fine sediment reduces the likelihood of lithophilic gravel spawning species.
River Colne	Designated sites: There are no designated sites associated with the River Colne. EA data: EA data available within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: Several aquatic species of note have been recorded within the 2km study area for this watercourse. These include the INNS curly waterweed (*Lagarosiphon major*) and Canadian waterweed, and floating water-plantain (protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019).	Survey location: NGR: SE 17340 19873 to SE 17708 20110 Survey findings: RHS and RCS identified a large, severely modified watercourse with a wetted width of approximately 20m within the study area. Bank profiles are steep and densely wooded. European larch (*Larix decidua*) is predominant on the north bank in the upper section of the survey area but is replaced by broad-leaved species such as sycamore, hawthorn and cherry (*Prunus avium*), further downstream. The south bank is lined by a strip of broad-leaved woodland, with industrial land use beyond. Emergent common reeds (*Phragmites australis*) and sedges (*Carex* spp.) were noted at the margins in the upper half of the survey, however no other in-channel vegetation was recorded. The INNS Japanese knotweed and Himalayan balsam were noted along the north and south bank faces. FHS noted the reach as being primarily deep glide habitat providing suitable feeding for adult coarse fish, salmonids and eels. Overhanging trees locally improve cover for fish and limited marginal macrophyte beds may provide spawning habitat for phytophillic species. Overall, habitat variation appears to be limited with little flow or macrophyte diversity, however artificial features (placed boulders and a major weir) have created localised areas of faster flowing riffle/run habitat which may be suitable for rheophilic fish including salmonid parr. The weir itself is likely to act as a partial barrier to the upstream movement of fish.
River Calder	Designated sites: Clifton Lagoon LWS includes a section of the River Calder located approximately 1.6km upstream of the Scheme.	Survey locations: NGR: SE 23694 20531 to SE 23174 20429 SE 19819 19941 to SE 20140 19443 SE 20820 19281 to SE 21274 19313

Watercourse name	Available background data	Habitat survey results
	EA data: EA data available within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: Several aquatic species of note have been recorded within the 2km study area for this watercourse. These include the INNS signal crayfish, Canadian waterweed, curly waterweed and Nuttall's waterweed, the critically endangered European eel and floating water-plantain (protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.	Survey findings: RHS and RCS identified the River Calder as a large watercourse between 28m and 50m wide. The channel has been historically modified for flood defence and navigation, with RHS Habitat Modification Scores (HMS) indicating a "severely modified" watercourse (channel and bank re-sectioning being the biggest contributors). Throughout the surveyed reaches, the channel character is similar, with smooth flows and heavily vegetated banks, predominantly comprising of grasses, tall herbs, scrub and semi-continuous broad-leaved trees. Occasional patches of emergent monocots were observed including species such as reed sweet-grass, reedmace and reed canary-grass (*Phalaris arundinacea*). Large stands of the INNS Himalayan balsam were recorded throughout each of the surveyed reaches, with Japanese knotweed also frequently observed. Occasional instances of giant hogweed (*Heracleum mantegazzianum*) were also recorded. FHS noted the reach as being primarily deep glide habitat, providing suitable feeding for adult coarse fish, salmonids and eels. Macrophyte beds provide spawning habitat for phytophillic species and overhanging trees locally improve cover for fish. Overall, habitat variation is limited. Three weirs create localised fast flows with riffle/run habitat suitable for rheophilic fish but are likely to act as partial barriers to fish movement, particularly for species with low swimming performance. Nonetheless, the River Calder supports a relatively diverse range of fish species as reported in background data for the river.
Calder and Hebble Navigation	Designated sites: There are no designated sites associated with the Calder and Hebble Navigation. EA data: EA data available within the 2km study area are considered suitable proxies for likely species presence, when compared against habitat surveys undertaken for the Scheme. Further details of proxy fish and macroinvertebrate data are provided in Section 3 of Appendix 9-4. Local wildlife records: Local wildlife records indicate the presence of several aquatic species of note within the 2km study area for this watercourse. These include narrow-leaved water-plantain (*Alisma lanceolatum*), which is a local species of principal importance in the Kirklees LBAP[39], floating water-plantain (protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019), and the INNS floating pennywort (*Hydrocotyle ranunculoides*) and Nuttall's waterweed.	Survey locations: NGR: SE 23071 20301 to SE 23495 20170 SE 23495 20170 to SE 23811 19801 Survey findings: RCS identified a deep, slow-moving, artificial watercourse flowing through a predominantly industrial setting. The canal has an approximate width of 15m to 25m within the surveyed reaches. The character of the watercourse is similar throughout the survey reaches, with uniform smooth flows and minimal geomorphological diversity. The channel is deep with vertical banks, resulting in no visibility of the bed at the time of survey. The majority of the channel is open, with emergent macrophytes recorded along both banks. Marginal vegetation is predominantly comprised of the INNS Himalayan balsam and native reed sweet grass, with yellow flag iris, reedmace, great willowherb (*Epilobium hirsutum*) and the INNS floating pennywort also recorded. Floating leaved duckweed (*Lemna minor*) and submerged macrophytes (*Callitriche* sp.) were recorded at points throughout the survey reach. The survey reaches consisted primarily of deep glide/pool habitat, providing suitable feeding and refuge habitat for a variety of coarse fish species, as well as adult salmonids. Macrophyte beds observed throughout the survey reaches provide suitable spawning habitat for phytophillic species. The presence of a lock within the canal is likely to restrict the movement of fish into and out of the adjacent River Calder.

[39] https://www.kirklees.gov.uk/beta/delivering-services/policies-and-strategies.aspx (Accessed February 2020)

Ponds and lakes

9.4.15 A screening exercise was undertaken to identify ponds and lakes[40] within 150m of the Scheme (study area) relevant to aquatic habitat and/or aquatic species (fish, macroinvertebrates and macrophytes) assessment. Additionally, ponds and lakes identified as being hydrologically connected to ponds, lakes or watercourses within 150m of the study area were identified within 2km (measured in linear watercourse extent) of the Scheme. Full details of the screening methodology for ponds and lakes are included in Section 2 of Appendix 9-4.

9.4.16 The screening exercise identified 22 ponds and lakes of relevance to aquatic ecology assessment within the Scheme study area (GCN_001, AE_P001, GCN_003, GCN_005, GCN_006, GCN_008, GCN_009, GCN_010, GCN_012, GCN_013, GCN_014, GCN_017, GCN_018, GCN_019a and GCN_019b, GCN_022, GCN_023, GCN_024, GCN_025 and GCN_027, GCN_033 and GCN_034) as shown in Appendix 9-3 and Figure 9-3.

9.4.17 Four of these identified ponds and lakes (GCN_019a, GCN_019b, GCN_023 and GCN_024) were taken forward for assessment based on application of assessment screening criteria (i.e. ponds and lakes considered to be both potentially important ecological features and potentially significantly affected by the Scheme).

9.4.18 No relevant desk study data was available for these ponds and lakes and none are associated with a designated site (statutory or non-statutory). The results of field surveys are summarised in Table 9-8. Full details of field survey methods and results are presented in Appendix 9-4.

Table 9-8 Field survey results for ponds and lakes relevant to the Scheme

Water body reference	Field survey results
GCN_019a	PSYM survey identified a large (7,180m^2) coarse fishing pond, with significant bank erosion around its perimeter, high turbidity and moderate water quality. The pond forms part of the Ladywood Lakes fishery and is stocked with fish. The macroinvertebrate assemblage recorded was species poor, with eight discrete species confirmed during survey (additional taxa were identified to genus, family and order level). The macroinvertebrate community was assessed as 'Low' conservation value under the Community Conservation Index (CCI) scoring system[41], which is used to assess the intrinsic conservation importance of the community present. No notable macroinvertebrate taxa or priority species were identified. The macrophyte community was species poor, with only two common[42], emergent species recorded, and no truly aquatic vascular plants. Overall, PSYM analysis identified the pond as being of Poor quality.
GCN_019b	PSYM survey identified a large (46,750m^2) coarse fishing lake with significant bank erosion around its perimeter, high turbidity and moderate water quality. The lake forms part of the Ladywood Lakes fishery and is stocked with fish.

[40] Ponds are defined as artificial or natural standing water bodies less than 2 ha (20,000 m^2) in area. Lakes are defined as artificial or natural standing water bodies greater than 2 ha (20,000 m^2) in area.
[41] Chadd, R.P. and Extence, C.A. (2004) The conservation of freshwater macroinvertebrate populations: a community-based classification scheme. Aquatic Conservation: Marine and Freshwater Ecosystems.14, 597–624.
[42] Recorded from >700 10x10km grid squares in Britain

Water body reference	Field survey results
	The macroinvertebrate assemblage recorded was moderately species rich, with twelve discrete species confirmed during survey (additional taxa were identified to genus, family and order level). The macroinvertebrate community was assessed as 'Moderate' conservation value under the CCI scoring system[41], which is used to assess the intrinsic conservation importance of the community present. One Regionally Notable[43] macroinvertebrate species, the Nationally Scarce[44] freshwater snail species *Gyraulus laevis,* was identified within the lake. The macrophyte community was species poor, with only six Common[42] emergent species recorded in total, and no truly aquatic vascular plants. Overall, PSYM analysis identified the lake as being of Very Poor quality.
GCN_023	PSYM survey identified a large (4,160m^2) pond, with moderate water quality, low shading and limited emergent macrophyte cover. The pond was created in 2010 within the restored area of Thornhill Quarry (landfill). The macroinvertebrate assemblage recorded was species rich, with twenty-six discrete species confirmed during survey (additional taxa were identified to genus, family and order level). The macroinvertebrate community was assessed as 'Moderate' conservation value under the CCI scoring system[41], which is used to assess the intrinsic conservation importance of the community present. No notable macroinvertebrate taxa were identified. The macrophyte community was fairly species poor, with nine species recorded (six emergent and three submerged species). The majority of species recorded are Common[42], however two species are of Local[45] rarity (lesser bladderwort *Utricularia minor* and spiked water-milfoil *Myriophyllum spicatum*). Lesser bladderwort is also listed as Vulnerable on the vascular plant Red List for England (which presents the current state of England's flora measured against standardised IUCN criteria)[46] but is classed as being of Least Concern within the UK. Overall, PSYM analysis identified the pond as being of Moderate quality.
GCN_024	PSYM survey identified a small (100m^2) pond, with moderate water quality and high levels of overhanging vegetation and emergent macrophyte cover. The pond was created in 2010 within the restored area of Thornhill Quarry (landfill). The macroinvertebrate assemblage recorded was moderately species rich, with fourteen discrete species confirmed during survey (additional taxa were identified to genus, family and order level). The macroinvertebrate community was assessed as 'Moderate' conservation value under the CCI scoring system[41], which is used to assess the intrinsic conservation importance of the community present. No notable macroinvertebrate taxa were identified.

[43] Species thought to occur in fewer than five localities (regions) across Great Britain;
[44] Nationally Scarce taxa are defined as those occurring in 16-100 10km squares in Britain.
[45] Species occurring in 101 - 700 grid squares in Britain
[46] JNCC (2020). Conservation designations for UK taxa. https://jncc.gov.uk/our-work/conservation-designations-for-uk-taxa/ (Accessed July 2020).

Water body reference	Field survey results
	The macrophyte community was species poor, with six species recorded (four emergent, one floating-leaved and one submerged species). The majority of species recorded are Common[42]; however one species recorded is of Local[45] rarity (spiked water-milfoil). Overall, PSYM analysis identified the pond as being of Good quality. This is likely to be a reflection of lower predicted scores for small ponds under the PSYM method, as well as the pond's proximity to the larger landfill pond, which may have expedited its colonisation by aquatic species.

9.4.19 In addition to the existing ponds identified during screening, two ponds and one lake will be created as part of the quarry restoration plans described in paragraph 9.3.11 (and which lie within the Scheme. These waterbodies are assumed to be present based on implementation of the restoration plans. All three waterbodies were taken forward for assessment based on application of assessment screening criteria (i.e. ponds/lakes considered to be both potentially important ecological features and potentially significantly affected by the Scheme). A description of each pond/lake, as detailed in the restoration plans, is provided in Table 9-9.

Table 9-9 Ponds included in Forge Lane Quarry restoration plans

Water body reference	Description
GCN_035	Wildlife pond detailed within the quarry restoration plans. The pond shall be planted with a range of native and common marginal aquatic plants. Seasonally flooded shallow scrape habitat will also be locally created around the eastern pond perimeter.
GCN_036	Wildlife pond detailed within the quarry restoration plans. The pond shall be planted with a range of native and common marginal aquatic plants. Seasonally flooded shallow scrape habitat will also be created around the eastern pond perimeter.
GCN_037	Large fishing lake detailed within the quarry restoration plans. The lake shall be planted with a range of native and common marginal aquatic plants. Seasonally flooded shallow scrape habitat will also be created around the eastern pond perimeter. The lake will otherwise be surrounded primarily by scrub and grassland habitat. Fishing piers will be present around the perimeter of the lake and it is assumed that the lake will be stocked with fish.

Invasive non-native plants

9.4.20 Japanese knotweed, Himalayan balsam, giant hogweed, rhododendron (*Rhododendron ponticum*), Nuttall's waterweed and floating pennywort were identified within the Scheme during the field surveys. As invasive species, these do not have a nature conservation value. The locations of invasive plants are shown on Figure 9-2.

Protected and priority flora

Floating water-plantain

9.4.21 WYE data contained records of floating water-plantain (protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019) within Huddersfield Broad Canal, the River Colne, the River Calder and Calder and Hebble

Navigation. A report produced for the Canal & River Trust[47] provides further information on the distribution of floating water-plantain within the Huddersfield Broad Canal and Calder and Hebble Navigation. Given the desk study records and the wide distribution of floating water-plantain within the canals, the species is considered to be potentially present within sections of these watercourses associated with the Scheme.

9.4.22 No other relevant protected or priority terrestrial or aquatic flora was identified during desk studies or field surveys.

Protected and priority fauna

Great crested newt

9.4.23 WYE data contained eight records of GCN within 2km of the Scheme, the closest from a location 20m north of the Scheme (2006 record). No EPSM licences for GCN have been granted within 2km of the Scheme. Full details of desk study records are provided in Appendix 9-5.

9.4.24 In total, 19 water bodies were screened in for survey within 500m of the Scheme. Environmental DNA (eDNA) surveys[48] were completed at all water bodies and presence/likely absence surveys were completed at GCN_017 due to the data search records within this pond. The results of these surveys are summarised in Table 9-10, with further details provided in Appendix 9-5 and locations of each water body illustrated in Figure 9-4.

Table 9-10 Summary of great crested newt field survey results

Water body reference	Description	Approximate distance and direction from the Scheme	eDNA result	Presence/ likely absence survey result	Survey limitations
GCN_001	A pond within mature broad-leaved woodland (Gledholt Wood)	145m north	Negative	N/A	None
GCN_005	An ornamental pond within an industrial estate	Directly adjacent to the east	Negative	N/A	None
GCN_008	A small pond within a water treatment works	Within Scheme	Negative	N/A	None
GCN_010	A large pond on the edge of broad-leaved woodland	20m north	Negative	N/A	None
GCN_012	A large fishing pond in a former gravel pit	20m north	Negative	N/A	None
GCN_013	A fishing pond in a former gravel pit	25m north	Negative	N/A	None
GCN_014	A fishing pond in a former gravel pit	15m north	Negative	N/A	None

[47] Goulder, R. (2019) *Observations on the impact of dredging on aquatic plants in the Huddersfield Broad Canal and some canal lengths of the Calder & Hebble Navigation,* Canal & River Trust, Leeds.
[48] An industry standard survey technique used to determine the presence or likely absence of GCN by testing water samples for traces of eDNA. Negative results indicate the likely absence of GCN. Positive results confirm the presence of GCN.

Water body reference	Description	Approximate distance and direction from the Scheme	eDNA result	Presence/ likely absence survey result	Survey limitations
GCN_017	An ornamental lined pond (the location of the GCN record in 2006 noted above)	25m north	Negative	Negative	None
GCN_019 a	Large fishing pond surrounded by a mosaic of dense scrub, grassland and tall ruderal	5m north	Negative	To be completed spring 2021	None
GCN_019 b	Large fishing lake surrounded by a mosaic of dense scrub, grassland and tall ruderal	Directly adjacent to the west	Positive	To be completed spring 2021	None
GCN_022	A small ornamental lined pond	5m north	Negative	N/A	None
GCN_023	A large, recently created pond in a restored quarry	Within the Scheme	Negative	N/A	None
GCN_024	A small, recently created pond in a restored quarry	Within the Scheme	Negative	N/A	None
GCN_029	A medium size pool of standing water on the edge of a block of mature broad-leaved woodland (Lady Wood)	180m south	Negative	N/A	None
GCN_030	An area of flooded broad-leaved woodland connected to a drainage ditch (GCN_031)	Within the Scheme	Negative	N/A	None
GCN_031	A drainage ditch located adjacent to the railway, connected to an area of flooded woodland (GCN_030)	Within the Scheme	Negative	N/A	None
GCN_032	A small concrete water storage tank within an industrial site. The water body has no aquatic vegetation but was found to support numerous smooth newts (*Lissotriton vulgaris*)	85m south-west	Negative	N/A	None

Water body reference	Description	Approximate distance and direction from the Scheme	eDNA result	Presence/ likely absence survey result	Survey limitations
GCN_033	Three small lined ornamental garden ponds	5m south	Negative	N/A	None
GCN_034	Ornamental pond within residential garden surrounded by amenity grassland. Dry at time of Phase 1 survey but understood to be seasonally wet over winter.	Within the Scheme	To be completed spring 2021	N/A	-

9.4.25 GCN are considered likely absent within all water bodies that returned a negative eDNA, with the exception of GCN_019a (see below). It has not yet been possible to complete an eDNA survey at GCN_034, however given the absence of any records of GCN within 500m of this pond, below average HSI score and negative eDNA results of pond GCN_008 (located within 500m of this pond), it is considered highly unlikely that GCN would be present in GCN_034.

9.4.26 A positive eDNA result was returned for a large fishing lake at Ladywood Lakes carp fishery (GCN_019b), indicating the presence of GCN. No further surveys have been completed at this water body to date to determine the GCN population size class but are programmed for spring 2021. However, in advance of further survey, it is considered likely that the lake supports only a small population of GCN given the presence of large numbers of stocked fish and very few areas of refuge, such as dense macrophyte beds (fish are very effective predators of newt eggs and larvae. GCN are particularly vulnerable due to the open water swimming habits of their larvae). The results of these further surveys will be detailed within a post-submission addendum to this ES.

9.4.27 On a precautionary basis, GCN are also considered to be present in one other pond (GCN_019a, despite its negative eDNA result) given its proximity to GCN_019b (35m west). No other ponds are present within 500m of these three water bodies that are not separated by significant barriers to amphibian dispersal.

9.4.28 The existing railway line is located nearby to the south of these water bodies; this comprises a 15m wide strip of ballast and hardstanding, which creates a significant barrier to amphibian dispersal.

Bats

9.4.29 WYE and WYBG data contained records of ten bat species within 2km of the Scheme, including common, soprano and Nathusius' pipistrelle (*Pipistrellus pipistrellus, P. pygmaeus* and *P. nathusii*), noctule (*Nyctalus noctula*), Leisler's bat (*Nyctalus leisleri*), Daubenton's bat *(Myotis daubentonii)*, whiskered bat (*Myotis mystacinus*), Natterer's bat (*Myotis nattereri*), brown long-eared bat (*Plecotus auratus*) and *Myotis* bat species. The nearest roost record was a common pipistrelle, noctule and Leisler's bat roost in a building located 10m to the south of the Scheme. In total, 13 EPSM licences for bats have been granted within 2km of the Scheme, relating to common pipistrelle, brown-long eared bats and Natterer's bats; the nearest licence was granted for the destruction of a common pipistrelle resting place at a

location 70m south of the Scheme in 2016 (NGR: SE 203194). Full details of desk study records are provided in Appendix 9-6.

9.4.30 The Scheme encompasses heavily urbanised areas around Huddersfield and urban/industrial areas of Bradley, Mirfield, Ravensthorpe and Westtown, with more rural land use in between. Foraging and commuting habitat for bats within and adjacent to the Scheme includes areas of woodland, linear habitat features such as tree and scrub habitats along the railway corridor, hedgerows in farmland, riparian habitats associated with the River Colne, River Calder, Huddersfield Broad Canal and Calder and Hebble Navigation, fishing lakes and ponds.

9.4.31 In total, 251 structures within and adjacent to the Scheme (buildings, bridges, tunnels and culverts) were subject to PBRA. Of these, 28 structures were scoped in for further survey based on the application of scoping criteria (structures with suitability for roosting bats that could be subject to direct or significant indirect impacts as a result of the Scheme). These are shown in Figure 9-5 and listed as follows:

- Huddersfield Station parcel subway (MVL3/91A);
- Peel's Pit Underbridge (MVL3/100);
- 29330_B1 – Stone bridge;
- 29940_B1 – Stone building;
- Whitacre Street Overbridge (MVL3/101);
- A62 Leeds Road Overbridge (MVL3/102);
- Bradley No.2 (BBW/1) Overbridge (MVL3/105);
- Colne Viaduct Underbridge (MVL3/109);
- Helm Lane Underbridge (MVN2/188);
- 31430_B1 – Stone and metallic bridge;
- 31635_B1 – Stone bridge;
- 31801_B1 – Stone barn;
- 31801_B5 – Stone building;
- 31801_B6 – Stone house;
- 31801_B7 – Stables;
- 31801_B14 – Stone barn;
- 31825_B1 – Stone building;
- 31825_B2 – Stone building;
- 31825_B3 – Stone building;
- 31890_B1 – Stone culvert;
- 32030_B1 – Stone cottages;
- 32150_B1 – Brick building;
- Cooper Bridge Sewage Plant Underbridge (MVN2/186);
- Hurst Lane Underbridge (MVN2/194);
- Wheatley's Underbridge (MVN2/196);
- Ladywood Road Side (MVN2/199A);
- River Calder Underbridge (MDL1/8); and
- Off Forge Lane Underbridge (MVN2/206).

9.4.32 In total, 46 individual trees and 36 tree groups were identified within the Scheme study area with potential suitability for roosting bats. Of these, 29 individual trees (listed below) were scoped in for further survey based on the application of scoping criteria (trees with moderate

or above suitability for roosting bats that could be subject to direct or significant indirect impacts as a result of the Scheme).

- 29650_T1;
- 29650_T2;
- 29650_T3;
- 30065_T1;
- 30065_T2;
- 30065_T3;
- 30065_T4;
- 30065_T5;
- 30065_T6;
- 30065_T8;
- 30065_T10;
- 30065_T11;
- 30065_T12;
- 30065_T13;
- 30065_T14;
- 30065_T17;
- 30170_T1;
- 32150_T1;
- 32150_T2;
- 40892_T1 (a-f);
- 40868-T1;
- 40868-T2;
- 40868-T3;
- 40868-T4 (a&b);
- 40868-T5 (a-d);
- 41812_T3;
- 41812_T5;
- 41812_T6; and
- 41812_T7.

9.4.33 Six bat roosts were identified within and adjacent to the Scheme, as follows:

- Daubenton's bat maternity roost (≥15 bats) within Colne Viaduct Underbridge (MVL3/109), located within the Scheme. This roost is also used by hibernating Daubenton's bats;
- Brown long-eared bat feeding perch within an old stone barn at Helm Farm (31801_B5), located 40m outside the Scheme to the south;
- Common pipistrelle day roost (one bat) within this same stone barn at Helm Farm (31801_B5), located 40m outside the Scheme to the south;
- Daubenton's bat maternity roost (≥10 bats) within a crevice feature in Off Forge Lane Underbridge (MVN2/206), located immediately adjacent to the Scheme. This roost is also used by hibernating Daubenton's bats;
- Common pipistrelle day roost (1 bat) within Heaton Lodge Cottages (32030_B1), located within the Scheme; and

- Noctule hibernation roost (1 bat) within Cooper Bridge Sewage Plant Underbridge (MVN2/186), located within the Scheme.

9.4.34 No evidence of roosting bats was found within Peel's Pit Underbridge (MVL3/100) during further emergence/re-entry surveys, however it has not yet been possible to complete hibernation surveys of this structure. It is therefore assumed, on a precautionary basis, that this structure supports a hibernation roost. Surveys to determine the presence or likely absence of hibernating bats in this structure are programmed for winter 2020-21 and results will be submitted via a post-submission addendum to this ES.

9.4.35 It has not been possible to complete emergence/re-entry surveys at 10 individual trees to date. Surveys of these trees are programmed for spring/summer 2021 and results will be submitted via a post-submission addendum to this ES. However, for the purposes of this assessment, it is assumed on a precautionary basis that these features each support a summer day roost:

- 41812_T3, T5, T6 and T7 within Route Section 6 that may be subject to direct impacts (felling) from works to overhead power lines;
- 40892_T1 (a-f), a tree located in Route Section 4 that will be subject to direct impacts (felling) from the use of Paul Lane construction compound; and
- 40868-T1, 40868-T2, 40868-T3, 40868-T4 (a&b) and 40868-T5 (a-d) directly adjacent to Route Section 4 that will be subject to indirect impacts (noise, vibration and lighting) from the use of Paul Lane construction compound.

9.4.36 It has not been possible to complete hibernation bat surveys at 6 individual trees to date. Hibernation surveys of these trees are programmed for winter 2020-21 and results will be submitted via a post-submission addendum to this ES. However, for the purposes of this assessment, it is assumed on a precautionary basis that these features each support a hibernation roost:

- 32150_T1 and T2, both willows within Route Section 4 that may be subject to direct impacts (felling) and indirect impacts from the creation of a construction compound at Heaton Lodge Sewage Treatment Works located 90m to the south-east; and
- 41812_T3, T5, T6 and T7 within Route Section 6 that may be subject to direct impacts (felling) from works to overhead power lines.

9.4.37 Full details of bat roost survey methods and results are included in Appendix 9-6 and Figure 9-5.

9.4.38 Five separate bat activity transect routes were walked within and adjacent to the Scheme on a monthly basis between late May and October 2019 and between early May and early June 2020. These sampled bat activity within woodland, grassland, farmland and wetland habitats across the Scheme, and also included potentially important linear features for bats[49]. Static bat detectors were also deployed at seven locations within the Scheme for periods of at least five nights per month between late June and October 2019 and between early May and early June 2020. The locations of the static bat detectors are shown in Figure 9-6. During transects, generally small numbers of foraging bats (1-3) were observed at any one time, the vast majority of which were common pipistrelle bats. The vast majority of recordings on the static detectors were also of common pipistrelle bats. The following additional bat species were recorded during transect and static detector surveys: soprano pipistrelle, Nathusius' pipistrelle, brown long-eared bat, noctule, Leisler's bat, Daubenton's bat and *Myotis* bat species. No particularly notable levels or patterns of bat activity were identified during the bat activity

[49] Linear habitat features such as hedgerows and tree lines that provide key linkages between isolated areas of foraging habitat (such as blocks of woodland) or between roosts/potential roosts and foraging areas.

transects or static detector surveys.

9.4.39 A back-tracking survey was also undertaken to investigate potential commuting routes within Lady Wood (mature broad-leaved woodland) within Route Sections 5 and 6. No significant commuting or foraging routes were identified as a result of the back-tracking surveys and no roost commuting lines were identified. The findings of the bat activity surveys completed are considered likely to be representative of the levels and patterns of bat activity associated with habitats within and adjacent to the Scheme outside of the areas subject to surveys, based on the type and extent of these habitats and their similarity to those surveyed.

Badger

9.4.40 WYE data contained five records of badger within 2km of the Scheme, the nearest being a sett (unspecified classification) located 10m to the east (2017 record). The three other badger records are all located over 1km from the Scheme. Full details are provided within Confidential Appendix 9-7.

9.4.41 A total of 31 badger setts (Sett _001 to Sett_023 inclusive, and Setts_026, to Sett 033 inclusive) were identified within and adjacent to the Scheme during field surveys. These comprise one active main sett and thirty non-main setts (two of which were active, eight of which were partially used and 20 of which were disused at the time of survey). The sett located 10m to the east of the Scheme within the desk study data was confirmed as not being in use by badger at the time of survey. Further details of badger setts can be found in Confidential Appendix 9-7.

9.4.42 No other badger field signs were identified within 50m of the Scheme, though it is possible that further setts are present within areas of impenetrable dense scrub along the rail corridor that could not be comprehensively inspected for badger setts. However, given the lack of field signs, the risk of active main setts occurring in such areas is considered to be low. Measures to conduct pre-construction surveys are identified in paragraph 9.6.38 along with mitigation measures to be employed should any new setts be identified at this stage.

9.4.43 Extensive areas of potential foraging habitat for badger are present within and adjacent to the Scheme, including areas of woodland, mosaics of scrub, trees, grassland and tall ruderal vegetation along the railway corridor, farmland habitats (grass leys, hedgerows) and areas of grassland associated with the Calder Valley Greenway.

Barn owl

9.4.44 WYE data contained no recent records of barn owl within 2km of the Scheme.

9.4.45 An active barn owl roost site was identified within a barn at Helm Farm (31801_B5; shown on Figure 9-5), located 40m to the south of the Scheme. The barn is an old two-storey stone building, with a pitched pantile roof (lined with a bituminous felt membrane). Internally, the barn is open from the ground floor to the roof, with no raised floor or loft space present. It was formerly used as a hen battery and the old cages are still present inside, creating an approximately 3-4m high structure at ground level throughout. The barn is dark internally and access to the interior is available through an open circular window high up on the north-facing gable end and an open ground floor door in the west facing elevation.

9.4.46 Numerous barn owl pellets (mixture of fresh and old), together with droppings and barn owl feathers were found on the floor of the barn beneath a timber joist during a field survey on 4 June 2019. No signs of barn owl nesting were found within the barn, but the area on top of the old hen cages was not accessible to inspect for physical signs of nesting.

9.4.47 Barn owl nest site verification surveys were subsequently completed at the barn to determine

whether it was used as a breeding site. Further inspections of the barn for physical signs of nesting were not possible due to health and safety issues relating to climbing up to inspect the area on top of the old hen cages, so external observational surveys were completed to record any barn owl activity indicative of breeding (such as arrival of adults with food and food-begging calls by young owls). Surveys were completed at dusk on 9 and 10 July 2019 (from 30 minutes before sunset until 1 hour and 30 minutes after sunset), as well as at dawn on 10 July 2019 (from 1 hour and 30 minutes before sunrise until 30 minutes after sunrise) in combination with bat emergence and re-entry surveys of the barn and adjacent farm buildings.

9.4.48 During both dusk surveys, a single adult barn owl was recorded emerging from the circular window in the north-facing gable end of the barn before sunset and flying away to the east. No further barn owl sightings were noted during the surveys, and no calls of young owls were recorded. During the dawn survey, a single adult barn owl was recorded entering the barn through the circular window 20 minutes before sunrise (with no food). No further barn owl sightings or calls of young barn owls were noted during the survey. Incidental observations of similar activity by a single adult barn owl were made at the site during further dusk and dawn bat surveys on 4, 5 and 17 September 2019 (outside the optimum period for barn owl nest site verification surveys).

9.4.49 The results of the nest site verification surveys indicate that the barn is used as a roost site by a single adult barn owl, but not as a breeding site. No other potential barn owl nesting sites were identified within the Scheme study area.

9.4.50 Within the Scheme, potentially suitable foraging habitat for barn owl is limited to the fields associated with Helm Farm to the south of the existing railway. However, these are likely to be of low value to barn owls because they comprise arable fields with little or no unmanaged grass field margins, grass leys/improved grassland fields, and grasslands heavily grazed by horses, all of which provide poor habitat for field voles (*Microtus agrestis*), the main prey species of barn owls. Extensive areas of open farmland (mixture of arable and grassland fields) suitable for foraging barn owl are present to the south of the Scheme. In addition, an area of old sludge beds, now colonised by tussocky rank grassland (covering an area of approximately 1 hectare (ha)) and dense scrub, is present directly to the north of the Scheme between the MVN line and the Calder and Hebble Navigation (canal), which could potentially provide optimal foraging habitat for barn owls.

Breeding birds

9.4.51 Habitats within the Scheme such as woodland, scrub and scattered trees, are likely to be used by a range of common bird species for nesting and foraging, and could also support priority bird species, such as song thrush (*Turdos philomelos*), house sparrow (*Passer domesticus*), dunnock (*Prunella modularis*) and starling (*Sturnus vulgaris),* all of which have been recorded locally.

9.4.52 Whilst there is a possibility that areas of Forge Lane Quarry (within and adjacent to Route Section 6) currently support breeding little ringed plover (Schedule 1 species), restoration of this area (including removal of current habitats of value for this species) will be completed prior to the commencement of the Scheme. Furthermore, WYE data contained no records of little ringed plover within 2km of Route Section 6.

9.4.53 Kingfisher (Schedule 1 species) are likely to forage along the Huddersfield Broad Canal, River Colne, River Calder and Calder and Hebble Navigation, but no suitable nesting habitat was identified along these watercourses within 100m of the Scheme. No other Schedule 1 bird species (with the exception of barn owl) are likely to be present and breeding within habitats associated with the Scheme.

Reptiles

9.4.54 WYE data contained no recent records of reptiles within 2km of the Scheme.

9.4.55 Pockets of potentially suitable habitat for reptiles are present along the railway corridor and adjacent areas such as the Calder Valley Greenway. Mosaics of scrub, scattered trees, tall ruderal vegetation and grassland, as well as riparian and aquatic habitats associated with ponds, drainage ditches, canals and rivers, provide a range of conditions for foraging, basking and shelter. Such habitats may support small populations of common reptile species such as common lizard, slow-worm and grass snake.

Otter

9.4.56 WYE data contained six records of otter within 2km of the Scheme, five associated with the River Calder and one associated with the River Colne. The nearest record was from a location 90m north-east of the Scheme in 2009. No EPSM licences for otter have been granted within 2km of the Scheme.

9.4.57 Nine watercourses (Huddersfield Broad Canal, River Calder, River Colne, Calder and Hebble Navigation, Blackhouse Dike, Unnamed Watercourse at Heaton Lodge Junction, Unnamed Watercourse at Colnebridge Culvert, Unnamed Watercourse at Chadwick Close Culvert and Unnamed Watercourse at Bradley Culvert), two drainage ditches (AF016 and AF021), three standing water bodies (AF020, AF022 and AF027) and five areas of terrestrial habitat (TH_002, TH_004, TH_006, TH_008 and TH_011) were screened in for survey within the Scheme study area, as shown in Figure 9-7. No evidence of otter was recorded within any of these habitats during field surveys. However, the surveys were subject to limitations, such as incomplete access to both banks of watercourses and the inability to comprehensively search areas of dense vegetation in terrestrial habitats. Further details of survey screening methodology, survey results and limitations are provided within Appendix 9-8.

9.4.58 Despite not finding any evidence of otter during field surveys, given the presence of suitable foraging and commuting habitat and records of otter in the wider area, it is considered likely that Huddersfield Broad Canal, the River Colne, the River Calder, Calder and Hebble Navigation, as well as connected watercourses and associated terrestrial habitats, form part of one or more otter territories. Otters are considered likely to commute along and forage within the rivers and canals and take refuge in dense areas of associated terrestrial habitat. Otters may also occasionally forage within fishing ponds and lakes adjacent to the River Calder (AF022 and AF027), though the likelihood of use is reduced by the presence of anglers, including at night.

9.4.59 The presence of natal holts within and adjacent to the Scheme is considered unlikely as the habitats present are subject to disturbance from the railway, adjacent industrial sites and recreational activities associated with the river, canal and fishing lakes including public rights of way along the banks of the rivers and canals.

9.4.60 Given that otters typically occupy home ranges that extend over several kilometres of watercourse, suitable otter habitat associated with the Scheme will represent only a very small proportion of the overall extent of habitat used within the wider area, and as a result any otter presence within or adjacent to the Scheme is likely to be relatively transitory.

Water vole

9.4.61 WYE data contained six records of water vole within 2km of the Scheme, the closest of which was 650m north-west of the Scheme. All desk study records are historical (all from the year 2000). Full details of desk study records are provided in Appendix 9-8.

9.4.62 The Kirklees LBAP[50] contains a Species Action Plan for water vole, which states that '*at best, only a few isolated populations remain*'. The remaining known locations in the district are around Batley, Marsden and in the northern tip of the Peak District National Park; none of these locations are located near the Scheme.

9.4.63 Nine watercourses (Huddersfield Broad Canal, River Calder, River Colne, Calder and Hebble Navigation, Blackhouse Dike, Unnamed Watercourse at Heaton Lodge Junction, Unnamed Watercourse at Colnebridge Culvert, Unnamed Watercourse at Bradley Culvert and Unnamed Watercourse at Chadwick Close Culvert), two drainage ditches (AF016 and AF021) and two standing water bodies (AF020 and AF022) were screened in for survey within the Scheme, as shown in Figure 9-7. All watercourses have limited potential to support water vole due to factors such as artificial bank construction/canalisation, heavy shading, lack of suitable marginal vegetation for food and shelter, and human disturbance. No evidence of water vole was recorded in any water bodies during field surveys. However, surveys were subject to limitations, such as incomplete access to both banks of the watercourses. Further details of survey screening methodology, survey results and limitations are provided within Appendix 9-8.

9.4.64 The early season water vole survey of AF010 River Colne is programmed for completion in spring 2021 (between mid-April to June) and results will be submitted via a post-submission addendum to this ES. However, for the purposes of this assessment, it is assumed on a precautionary basis that water vole are present within this section of the watercourse.

Evaluation of ecological features

9.4.65 The nature conservation value of ecological features present, or likely to be present, within the Scheme is detailed in Table 9-11**,** together with a summary of the rationale for valuation.

9.4.66 Ecological features valued at Local level or above are the IEF that have been taken forward to impact assessment.

[50] https://www.kirklees.gov.uk/beta/delivering-services/policies-and-strategies.aspx (Accessed February 2020)

Table 9-11 Nature conservation value of ecological features within the Scheme

Ecological feature	Nature conservation value	Summary of rationale for valuation
Designated sites and networks		
Peak District Moors (South Pennine Moors Phase 1) SPA	International (Europe)	These sites are designated as they make a significant contribution to the maintenance of habitats and/or species that are considered to be most in need of conservation at a European level.
South Pennine Moors SAC	International (Europe)	
Denby Grange Colliery Ponds SAC	International (Europe)	
Sir John Ramsden Canal LWS (watercourse name is Huddersfield Broad Canal)	National	WYE data contained records of floating water-plantain at several locations within Huddersfield Broad Canal. Floating water-plantain is currently listed as Near Threatened in England and Nationally Scarce in the UK[51]. The population within the canal is therefore considered to be of National importance on a precautionary basis. Watercourses are afforded an ecological value that is at least commensurate with the species they support.
Whitley Wood LWS	County	These sites have been designated based on the application of LWS selection criteria[52], which identify features of County level importance.
Lower Spen Wildlife Area LWS (also LNR)	County	
Huddersfield Narrow Canal LWS	County	
Gledholt Woods LWS (also LNR)	County	
Briery Bank Wood LWS	County	
Sparrow Wood LWS (also LNR)	County	
Dalton Bank LWS (also LNR)	County	
Jordan Wood and Oliver Wood LWS	County	
Covey Clough Wood and Hepworth Wood LWS	County	
Bradley Park Woods LWS	County	
Gregory Spring LWS	County	
Liley Wood LWS	County	
Grimescar Wood LWS	County	
Sunny Bank Ponds LWS (also LNR)	County	
Clifton Lagoon LWS	County	
Laneside Quarry LWS	County	
Howroyd Beck Fields Lowe Whitley LWS	County	
Kirklees Wildlife Habitat Network	District	This network is referenced within the Kirklees Local Plan and provides ecological connectivity at a District level.
Terrestrial habitats		
Ancient woodland	County	Ancient woodlands are irreplaceable habitats and several of those within the desk study area are designated as LWS, indicating that they are of importance at a County level.
Traditional orchards	County	Traditional orchards are HPI and appear to be relatively rare within Kirklees and West Yorkshire (based on a review of MAGIC). In the absence of survey information, they have been valued at County level as a precaution.
Semi-natural broad-leaved woodland	Local	Whilst these habitats are common and widespread in the local and wider area, they contribute to the biodiversity interest of the local area, provide habitat connectivity in the landscape (especially in urban settings), and provide habitat for protected and priority species.
Semi-natural mixed woodland	Local	
Plantation broad-leaved woodland	Local	
Plantation mixed woodland	Local	
Semi-improved neutral grassland	Local	
Scattered trees	Local	
Scrub	Local	
Hedgerows	Local	
Marsh grassland	Local	
Introduced shrubs	Negligible	These habitats are common and widespread in the local area and their extent within the Scheme will contribute little to the biodiversity interest of the local area or provide important habitat for protected and priority species.
Amenity grassland	Negligible	

[51] Joint Nature Conservation Committee (JNCC) (2018). Conservation designations for UK taxa. https://jncc.gov.uk/our-work/conservation-designations-for-uk-taxa/ (Accessed Oct 2019)
[52] West Yorkshire Local Sites Partnership (2019) West Yorkshire Local Wildlife Site Selection Criteria

Ecological feature	Nature conservation value	Summary of rationale for valuation
Ephemeral short perennial	Negligible	
Improved grassland	Negligible	
Arable	Negligible	
Aquatic habitats		
Huddersfield Broad Canal	National	WYE data contained records of floating water-plantain within all of these watercourses. Floating water-plantain is currently listed as Near Threatened in England and Nationally Scarce in the UK[51]. The populations within these watercourses are therefore considered to be of National importance on a precautionary basis. Watercourses are afforded an ecological value that is at least commensurate with the species they support.
River Colne	National	
River Calder	National	
Calder and Hebble Navigation	National	
Ladywood Lakes – GCN_019b	Regional	Although classed as Very Poor under PSYM for overall quality, the lake supports a Regionally Notable[53] and Nationally Scarce[54] freshwater snail species (*Gyraulus laevis)*.
Recently created pond in Thornhill Quarry (landfill) site (GCN_023)	County	The pond supports a species of conservation interest (lesser bladderwort, listed as Vulnerable in England) that is not recognised as Nationally Scarce[54].
Recently created pond in Thornhill Quarry (landfill) site (GCN_024)	County	The pond is classed as being of Good quality under the PSYM method, and therefore qualifies as a HPI in England[55]. The number of ponds likely to meet this criteria is estimated to be as many as 80,000 in the UK. The pond itself, whilst meeting the qualifying criteria as a HPI, is therefore not considered to be essential for maintaining this habitat type in England, nor supports any notable species of conservation interest, and is therefore valued as being important at the County level.
Wildlife ponds and fishing lake detailed within Forge Lane Quarry restoration plans (GCN_035, GCN_036 and GCN_037)	County	In the absence of survey information (as these features do not yet exist), the wildlife ponds and fishing lake have been valued at County level on a precautionary basis. This precautionary valuation considers the character and value of other recently created ponds in the area as well as the potential for the waterbodies to support aquatic species of conservation interest within the county (e.g. Regionally Notable aquatic invertebrate assemblages that are not Nationally Scarce) based on the existing distribution of those species in the local environs.
Ladywood Lakes – GCN_019a	Local	No notable macroinvertebrate or macrophyte species were identified within the pond, and the overall quality of the pond is classed as Poor under PSYM; however, the pond is likely to be locally important for supporting fish and macroinvertebrate assemblages (and wider ecological communities).
Gledholt Beck	Local	Gledholt Beck flows through Gledholt Woods LWS (LNR) but is not designated in its own right and is not cited as an important feature of the LWS. The watercourse is not considered to contribute to the designation of the LWS but, is likely to be locally important for supporting fish and macroinvertebrate assemblages (and wider ecological communities.
Hebble Beck	Local	These watercourses are neither designated in their own right, nor contribute to the designation of any statutory or non-statutory designated sites. They are heavily modified and extensively culverted; however, areas of open channel provide a degree of habitat diversity in an otherwise urban/suburban landscape and the watercourses are therefore likely to be locally important in supporting minor fish species and macroinvertebrate assemblages.
Unnamed Watercourse at Bradley Culvert		
Blackhouse Dike	Local	
Protected and priority flora and fauna		
Floating water-plantain	National	See Sir John Ramsden Canal LWS and Huddersfield Broad Canal, River Colne, River Calder and Calder and Hebble Navigation above.
GCN population associated with water bodies GCN_019a and GCN_019b	County	Precautionary valuation (in the absence of population size class information) based on the possibility that the population could meet the following LWS selection criteria[52]: Guideline AR2 – any site supporting a good population of great crested newt (defined as >= 11 adults or juveniles counted at night)
Bats – Daubenton's bat roosts within the following structures (as well as connecting riparian habitat along associated rivers and canals): • Colne Viaduct Underbridge (MVL3/109 used for breeding and hibernation. • Off Forge Lane Underbridge (MVN2/206) over canal, used for breeding and hibernation.	County	Precautionary valuation based on the possibility that these roosts could meet one of the LWS selection criteria[52]: • *Hibernation sites that regularly support 10 or more individual bats* – only one hibernating bat was found within each of the roost sites during surveys, but the roosting features within these structures cannot be comprehensively inspected and they are likely to be used by a larger number of hibernating bats (possibly more than 10) • *Breeding roost site that regularly supports a significant population of a bat species* (defined as 20 or more Daubenton's bats) – a maximum of 15 and 10 Daubenton's bats were recorded using Colne Viaduct Underbridge (MVL3/109) and Off Forge Lane Underbridge (MVN2/206) respectively during surveys in summer 2019, but it is possible that larger numbers of bats are present as the view of roosting features at Colne Viaduct Underbridge (MVL3/109) was restricted in places and Off Forge Lane Underbridge (MVN2/206) could only be viewed from one side of the canal.
Bats – minor roosts within:	Local	Such minor roosts are of low importance for the integrity of bat populations and are only likely to be of value at the local level.

[53] Species thought to occur in fewer than five localities (regions) across Great Britain;
[54] Nationally Scarce taxa are defined as those occurring in 16-100 10km squares in Britain.
[55] Natural England (2010). List of habitats and species of principal importance https://webarchive.nationalarchives.gov.uk/20140605093420/http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx (Accessed Oct 2019)

Ecological feature	Nature conservation value	Summary of rationale for valuation
• An old stone barn at Helm Farm (31801_B5); brown long-eared bat feeding perch and common pipistrelle day roost (one bat) • Heaton lodge cottages (32030_B1); common pipistrelle day roost (one bat) • Cooper Bridge Sewage Plant Underbridge (MVN2/186), used for hibernation (one noctule bat)		
Bats – assumed hibernation roosts within: • Trees 32150_T1 and T2; and • Peel's Pit Underbridge (MVL3/100).	County	Precautionary valuation based on the possibility that any roosts present could meet LWS selection criteria[52], as outlined above.
Bats – assumed summer/hibernation roosts within; • Trees 41812_T3, T5, T6 and T7	Local	Given the size of potential roosting features identified, it is unlikely that any roost present would meet LWS selection criteria[52], as outlined above (i.e. more than 10 individual bats).
Bats – assumed summer day roosts within: • 40892_T1 (a-f) • 40868-T1, T2, T3, T4 (a&b) and T5 (a-d)	Local	Given the size and type of boxes present, it is unlikely that any roost present would meet LWS selection criteria[18], as outlined above.
Bats – foraging and commuting	Local	Given the relatively low level of bat activity recorded within and adjacent to the Scheme, the habitats to be impacted by the Scheme are only likely to be important for populations of bats at a local level (excluding habitats associated with the Daubenton's bat roosts which are included above).
Badger	Local	Badgers are common and widespread but are a protected species (though for welfare reasons rather than rarity or population decline) and contribute to the biodiversity interest of the local area.
Barn owl	Local	The identified barn owl roost site is likely to be important for the maintenance of barn owl populations at no more than a local level. Furthermore, the limited extent of potential barn owl foraging habitat associated with the Scheme is only likely to be of value to barn owls at a local level.
Breeding birds	Local	Habitats within and adjacent to the Scheme are unlikely to support diverse assemblages of breeding birds and are therefore only likely to be important for populations of birds at a local level. If Thornhill Sand and Gravel Quarry is used by breeding little-ringed plover, it is only likely to be locally important for the species because such man-made sites are relatively transient in nature, and the species frequently moves between different sites in response to changing conditions.
Reptiles	Local	Habitats within and adjacent to the Scheme may support small populations of common reptiles, which would be important at no more than the local level.
Otter	Local	Otter presence within and adjacent to the Scheme is likely to be very transitory and as such the habitats to be impacted are only likely to be locally important for otters.
Water vole – assumed presence in AF010 River Colne	Local	Precautionary valuation based on the likelihood that any water vole present adjacent to the Scheme are likely to be very transitory and this section of the River Colne is only likely to be locally important for water vole.

9.5 Potential effects

9.5.1 This section describes the potential impacts and effects on IEF during construction and operation of the Scheme in the absence of any mitigation measures over and above the embedded mitigation, including those identified in Chapter 11 (Water environment). Further detail on embedded mitigation is provided in paragraphs 9.3.35 to 9.3.38.

9.5.2 The locations of habitat loss as a result of the construction of the Scheme (areas for which are stated below) are illustrated in Figure 9-8.

Construction

Statutory designated sites

9.5.3 No significant effects on Denby Grange Colliery Ponds SAC, Peak District Moors (South Pennine Moors Phase 1) SPA, South Pennine Moors SAC, Dalton Bank LNR (and LWS), Sunny Bank Ponds LNR (and LWS), Lower Spen Wildlife Area LNR (and LWS) and Sparrow Wood LNR (and LWS) are anticipated during construction works. There will be no direct or indirect impacts given the nearest site (Lower Spen Wildlife Area LNR (and LWS)) is located 150m north of the Scheme, and there are no pathways for indirect impacts, including via hydrological connectivity, at this distance.

9.5.4 Habitats within the Scheme will not be of functional importance to the bird populations associated with the SPA. Given the absence of any likely significant effects on these European designated sites, there is considered to be no further requirements in respect of Habitats Regulations Assessment.

9.5.5 Gledholt Woods LNR (and LWS) is located within the Scheme boundary. Construction access and works to replace the existing stone wall boundary along the railway with palisade fencing will result in the temporary damage or loss of up to 0.09ha of semi-improved neutral grassland and 0.02ha scrub within the LNR/LWS. These areas impacted represent approximately 1.2% of the total area of the LNR/LWS, and are habitats of relatively low value when compared with areas of other habitat within the LNR/LWS such as mature semi-natural broad-leaved woodland and ponds.

9.5.6 Mature semi-natural broad-leaved woodland areas within the south-east of the LNR/LWS boundary are located immediately adjacent to the railway boundary. Fencing is already in place along this boundary, but this will be removed and replaced during construction. Fence replacement works would be facilitated from trackside but may have temporary localised impacts on trees along the boundary of the LNR/LWS, such as damage to root systems through excavation and soil compaction, as well as pruning of overhanging branches.

9.5.7 Temporary potential indirect impacts on grassland and woodland habitats within Gledholt Woods LNR/LWS from pollution to air (dust generation) are also expected.

9.5.8 In view of the above, the direct and indirect impacts of the construction phase are is assessed to have a temporary adverse effect on statutory designated sites (specifically Gledholt Woods LNR/LWS) that is significant at the District level.

Non-statutory designated sites

9.5.9 The impacts to Gledholt Woods LWS are as per the assessment of Gledholt Woods LNR above.

9.5.10 Temporary potential indirect impacts on Whitley Wood LWS from pollution to air (dust generation) are predicted during construction due to the proximity of this site, located 35m

south of the Scheme.

9.5.11 Sir John Ramsden Canal LWS (Huddersfield Broad Canal) is located within the Scheme. The LWS supports floating water-plantain, which is protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Construction of a utilities pipe bridge over the canal, adjacent to Huddersfield Broad Canal Underbridge (MVL3/108S), will require construction of new bank top abutments and clearance of adjacent riparian/terrestrial vegetation on either side of the bridge. The establishment and use of construction compounds adjacent to the canal at Red Doles Road, Ridings and Colne Bridge Road, as well as works to replace the bridge deck of Huddersfield Broad Canal Underbridge (MVL3/108S), will also result in the temporary loss of adjacent riparian/terrestrial vegetation along the canal, affecting up to 330m of canal bank in total. No in-channel works or marginal/in-channel vegetation clearance is required. The proximity of the compounds and structural works provide potential pathways for pollution (for example, fuel/chemical spills) and sedimentation (for example, overland drainage of sediment-laden water) of the watercourse which could adversely affect aquatic habitats and species within the watercourse (including any floating water-plantain present). Due to the dilution capacity of the canal and the presence of locks that serve to isolate canal sections, an uncontrolled pollution event is unlikely to have more than a localised effect on the canal.

9.5.12 No direct or indirect impacts are predicted to the remaining 15 LWS relevant to the Scheme.

9.5.13 In view of the above, the construction phase is assessed to have a temporary adverse effect on non-statutory sites (specifically Whitley Wood LWS and Sir John Ramsden Canal LWS (and any floating water-plantain present)) that is significant at the Local level.

Kirklees Wildlife Habitat Network

9.5.14 Construction works will result in the localised loss of habitats located within the Kirklees Wildlife Habitat Network. However, such losses are not considered to impact the integrity and function of the network given their limited nature and that the species which may require the network to move around the Kirklees urban area are able to tolerate small gaps in habitat connectivity (already present within the network). Furthermore, as the network serves a spatial function within the district, indirect impacts from pollution to air (dust generation) and water (surface run-off) are not a relevant impact. As such, no significant effects are predicted during construction.

Terrestrial habitats

Ancient woodland

9.5.15 The nearest ancient woodland is Whitley Wood/Hagg Wood located 35m to the south of the Scheme. There will be no direct impacts on this or any other areas of ancient woodland due to their distance from the Scheme. Potential indirect impacts during construction include pollution to air (dust generation). These indirect impacts have potential to cause an impact at the local level only and are not considered to impact the ancient woodland resource at a County scale.

9.5.16 As such, the construction phase is assessed to have a temporary adverse effect that is significant at the Local level.

Traditional orchards

9.5.17 The nearest traditional orchard is located 360m to the north-east of the Scheme. There will be no direct or indirect impacts on this habitat (or other orchards located further away) due to their distance from the Scheme. As such, no significant impacts are predicted during construction.

Semi-natural broad-leaved woodland

9.5.18 Construction works will result in the loss of up to 8.48ha of semi-mature to mature semi-natural broad-leaved woodland due to land take required for the following: slope stabilisation work to the railway embankment around Hillhouse Lane; widening of an existing soil embankment near Red Doles Road; widening of an existing rock cutting before Hunger Hill; and the establishment of construction compounds at Hillhouse Sidings, Red Doles Road, Fieldhouse Lane, Colne Bridge Road, Paul Lane and in the Ravensthorpe area. Works to overhead power lines in Ravensthorpe may also result in localised losses.

9.5.19 In general, woodland habitat losses are relatively small in any one area and are spread out across the Scheme. However, up to 0.77ha of mature semi-natural broad-leaved woodland will be lost at the northern edge of Lady Wood adjacent to the existing railway due to land take requirements for the establishment of the Ravensthorpe construction compounds and earthworks. The area of woodland to be lost represents approximately 8.5% of the total area of Lady Wood (approximately 9ha in size) and is in a relatively poor condition compared to the remainder of the woodland, with a disturbed and impoverished ground flora and significant encroachment by invasive species, in particular Japanese knotweed.

9.5.20 Installation of palisade fencing along the railway boundary may have localised impacts on small areas of woodland located adjacent to the railway line, such as damage to root systems through excavation and soil compaction, as well as pruning of overhanging branches.

9.5.21 Potential indirect impacts to retained areas during construction include pollution from dust generation and surface run-off due to the proximity of retained semi-natural broad-leaved woodland to construction works.

9.5.22 Whilst semi-natural broad-leaved woodlands of similar age (including ancient woodlands) are well represented in the wider area, especially to the south and west of the Scheme, the anticipated scale of impacts during construction is predicted to have a temporary adverse effect on semi-natural broad-leaved woodland habitat that is significant at the Local level.

Semi-natural mixed woodland

9.5.23 Construction works will result in the loss of up to 0.68ha of semi-natural mixed woodland due to land take required for the establishment of construction compounds at Fieldhouse Lane and slope stabilisation work to the railway embankment east of this location, and construction works at Wheatley's Overbridge (MVL3/103). Semi-natural mixed woodlands of similar age are well represented in the surrounding area.

9.5.24 Potential indirect impacts during construction include dust generation and surface run-off.

9.5.25 As such, the construction phase is assessed to have a temporary adverse effect on semi-natural mixed woodland that is significant at the Local level.

Plantation broad-leaved woodland

9.5.26 Construction works will result in the loss of up to 3.74 of young to semi-mature plantation broad-leaved woodland due to land take required for slope stabilisation work to the railway embankment near Hillhouse Lane, construction works at Bradley Culvert (MVL3/102A), Wheatley's Overbridge (MVL3/103), and Baker Viaduct Underbridge (RBA/2), and the establishment of construction compounds at Paul Lane, Ravensthorpe and Thornhill Road.

9.5.27 Potential indirect impacts to retained areas during construction include pollution from dust generation and surface run-off.

9.5.28 Whilst plantation broad-leaved woodlands of similar age are well represented in the wider area, the anticipated scale of impacts during construction is predicted to have a temporary adverse effect that is significant at the Local level.

Plantation mixed woodland

9.5.29 Areas of plantation mixed woodland associated with the Scheme are located on land above both the east and west portals of Gledholt Tunnel (MVL3/86). Direct impacts on these areas will be very limited because works will be mainly confined to the tunnel below. However, the upgrading of existing fencing above Gledholt Tunnel western portal to palisade fencing may have localised impacts on trees within surrounding plantation mixed woodland, such as damage to root systems through excavation and soil compaction, as well as pruning of overhanging branches.

9.5.30 Potential indirect impacts to retained areas during construction include pollution from dust generation and surface run-off.

9.5.31 As such, the construction phase is assessed to have a temporary adverse effect that is significant at the Local level.

Hedgerows

9.5.32 The establishment of the Paul Lane construction compound will result in the loss of up to 750m of species-poor hedgerow along field boundaries around Helm Farm. All hedgerows to be affected are dominated by hawthorn and are estimated to be less than 30 years old. None qualify as ‘ecologically important’ hedgerows under The Hedgerow Regulations 1997.

9.5.33 There will be no direct impacts on the two species-poor hedgerows located to the south of Wheatley’s Underbridge (MVN2/196) and east of Ladywood Lakes. Indirect impacts (such as dust generation and surface run-off) to these hedgerows during construction are not considered to have potential to impact the nature conservation status of the wider hedgerow resource in the local area.

9.5.34 The length of hedgerow to be affected represents a relatively small proportion of the total hedgerow habitat in the surrounding area and the scale of impact would not adversely affect the conservation status of this habitat locally. As such, no significant effects are predicted during construction.

Scattered trees

9.5.35 Pruning and/or felling of scattered trees (outside areas of defined woodland) will be required during the establishment of construction compounds and during vegetation clearance associated with the requirement to increase the size of the railway area to be maintained clear of woody vegetation on either side of the track to accommodate line-speed increases/electrification.

9.5.36 Potential indirect impacts to retained scattered trees during construction include pollution from dust generation and surface run-off.

9.5.37 When viewed in the context of the total tree resource within the local area, the impacts on scattered trees are not considered to adversely affect the conservation status of this habitat. Therefore, no significant effects on scattered trees are predicted during construction.

Scrub

9.5.38 The establishment of construction compounds across the Scheme, as well as vegetation clearance along the railway to accommodate line-speed increases/electrification and works to

re-align the railway, will result in the loss of up to 8.25ha of scrub habitat.

9.5.39 Potential indirect impacts to retained areas of scrub during construction include pollution from dust generation and surface run-off.

9.5.40 Whilst scrub is very common along the railway and well represented in the surrounding area, due to the scale of impacts the construction phase will have a temporary adverse effect that is significant at the Local level.

Semi-improved neutral grassland

9.5.41 Construction works will result in the loss of up to 5.95ha of semi-improved neutral grassland due to land take required for access to facilitate fencing works, realignment of Baker Viaduct Underbridge (RBA/2) and construction compounds at Hillhouse Sidings, Ridings, Deighton Station, A62 Leeds Road, Paul Lane, Ledgard Bridge, Steanard Lane, Ravensthorpe and Thornhill Road. Losses will be spread out across the Scheme and are relatively small in any one area.

9.5.42 Potential indirect impacts to retained areas during construction include pollution from dust generation and surface run-off.

9.5.43 Whilst this habitat type is very common within the Scheme and wider area, due to the scale of anticipated losses the construction phase is assessed to have a temporary adverse effect on semi-improved neutral grassland that is significant at the Local level.

Marsh grassland

9.5.44 Land take for the re-alignment of Baker Viaduct Underbridge (RBA/2) will result in the permanent loss of approximately 0.04ha of marsh grassland along the northern edge of the Forge Lane Quarry site. This small-scale impact on this newly created marsh grassland will not affect the conservation status of the wider marsh grassland resource in the local area. Therefore, no significant effects on marsh grassland are predicted during construction.

Aquatic habitats

9.5.45 Impacts and effects on terrestrial elements of the aquatic habitats referred to in the following section are assessed above.

Huddersfield Broad Canal

9.5.46 Impacts and effects on Huddersfield Broad Canal are assessed above as Sir John Ramsden Canal LWS (paragraph 9.5.11).

Unnamed Watercourse at Bradley Culvert

9.5.47 The extension of Bradley Culvert (MVL3/102A) (currently 45m in length) by approximately 5m will result in the permanent loss of open watercourse habitat and reduced habitat quality for aquatic species within the Unnamed Watercourse at Bradley Culvert, immediately upstream of the existing railway culvert.

9.5.48 The culvert extension will also cause disturbance to aquatic habitats and species during construction, as well as potential water quality impacts on retained sections of the watercourse downstream of the culvert extension.

9.5.49 In view of the above the construction phase is assessed to have both temporary (pollution and disturbance) and permanent (habitat loss) adverse effects on the Unnamed Watercourse at Bradley Culvert that are significant at the Local level.

River Colne

9.5.50 Establishment of the Colne Bridge Road and Heaton Lodge Waste Water Treatment Works (WWTW) compounds adjacent to the River Colne, as well as works to Colne Viaduct Underbridge (MVL3/109), will not require in-channel working or marginal/in-channel vegetation clearance. The proximity of the compounds and works to this structure provide potential pathways for pollution (for example, fuel/chemical spills) and sedimentation (for example, overland drainage of sediment-laden water) of the watercourse which could adversely affect aquatic habitats and species within the watercourse (including any floating water-plantain present). There is potential for additional indirect water quality impacts as a result of works adjacent to Gledholt Beck, which is a minor tributary of the River Colne.

9.5.51 Due to the dilution capacity of the watercourse, an uncontrolled pollution event is unlikely to have more than a localised effect on the River Colne.

9.5.52 In view of the above, the construction phase is assessed to have a temporary adverse effect on the River Colne (and any floating water-plantain present) that is significant at the Local level.

River Calder

9.5.53 Establishment of construction compounds adjacent to the River Calder at Heaton Lodge WWTW, Ledgard Bridge, Station Road (Mirfield), Steanard Lane and Ravensthorpe construction compound will not require in-channel working or marginal/in-channel vegetation clearance. The proximity of the compounds provides potential pathways for pollution of the watercourse which could adversely affect aquatic habitats and species (including any floating water-plantain present). Additional water quality impacts could result from works to culverts on minor tributaries of the River Calder (Colnebridge Culvert (MVL3/110A)) on the Unnamed Watercourse at Colnebridge Culvert, and Heaton Lodge Junction, Mirfield Culvert (MVN2/190A) on the Unnamed Watercourse at Heaton Lodge Junction), works to bridges spanning the river (Mirfield Viaduct Underbridge (MVN2/192 and MVN2/192A), Wheatley's Underbridge (MVN2/196) and Calder Road River Bridge Overbridge (MDL1/3)) and works within and adjacent to the watercourse during the construction of Baker Viaduct Underbridge (RBA/2). Due to the dilution capacity of the watercourse, an uncontrolled pollution event is unlikely to have more than a localised and temporary adverse effect on the River Calder.

9.5.54 The Baker Viaduct Underbridge (RBA/2) will cross the River Calder, resulting in permanent alteration of adjacent riparian/terrestrial habitat within the footprint of the structure. This will affect approximately 40m of riverbank (i.e. bank-top) in total (20m on each bank). It also includes the need to construct training walls during the construction phase but which are likely to remain in-situ permanently, which will result in permanent artificial bank-face beneath the structure on both banks (approximately 60m of riverbank (i.e. bank-face) in total; 30m on each bank). The area affected on the right (west) bank consists primarily of grass and tall herbs; the left (east) bank includes an area of broadleaved tree cover. Marginal macrophytes are also present on both banks. Whilst the existing banks are highly modified at this location, the new structure will result in further localised of marginal habitat complexity, including loss of trees adjacent to the River Calder (a source of woody material that locally enhances river habitat diversity) and the loss of marginal macrophytes to the footprint at the point of construction. Riparian/marginal habitat loss will have a localised but permanent effect on the River Calder.

9.5.55 The construction of river training walls to support Baker Viaduct Underbridge (RBA/2) structure will require temporary in-channel works, causing temporary disturbance of in-channel habitat and aquatic species. The in-channel habitat affected includes marginal macrophytes on both banks and, although not specifically recorded within the proposed works areas, desk study records indicate that floating water-plantain may be present within the wider River Calder. Given the temporary and localised nature of in-channel works, and the relatively

small proportion of the watercourse affected as a whole, no significant effect is predicted for the River Calder or its macrophyte assemblage (including floating water-plantain). However, floating water-plantain is protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. If present within the in-channel works area at the point of construction, local translocation of individual plants outside of the works may be required under an EPSM licence (see Section 9.6 (Mitigation measures)).

9.5.56 Neither the temporary in-channel works, nor the permanent structures (training walls and viaduct), will significantly affect fish or fish passage within the watercourse. In-channel conveyance will be maintained throughout the works, and no significant areas of spawning or juvenile fish habitat were recorded within the affected areas that are not otherwise well distributed in adjacent habitats. There is potential for disturbance of fish (for example, due to noise and vibration). This will primarily affect adult fish which are capable of moving into suitable adjacent habitats.

9.5.57 In view of the above, the construction phase is assessed to have both temporary (pollution) and permanent (habitat loss) adverse effects on the River Calder (and any floating water-plantain present) that are significant at the Local level.

Calder and Hebble Navigation

9.5.58 Establishment of the Ravensthorpe construction compounds and Heaton Lodge WWTW construction compound adjacent to the canal will not require in-channel working or marginal/in-channel vegetation clearance; however, there is potential for water quality impacts (pollution and sedimentation) due to the proximity of the works area, which could adversely affect aquatic habitats and species (including any floating water-plantain present). Works adjacent to the watercourse during the construction of the Baker Viaduct Underbridge (RBA/2) also have the potential to cause pollution and sedimentation of the watercourse. Due to the dilution capacity of the watercourse, and the presence of locks which serve to isolate canal sections, an uncontrolled pollution event is unlikely to have more than a localised and temporary adverse effect on the canal.

9.5.59 The Baker Viaduct Underbridge (RBA/2) over the Calder and Hebble Navigation will require construction of new bank top abutments and localised clearance of adjacent riparian/terrestrial vegetation on either side of the viaduct, affecting approximately 50m of canal bank in total (25m on each bank). The existing banks are highly modified and consist primarily of grass and tall herbs, with scattered trees also present. The clear-span structure does not include any in-channel elements and piers will be set back from the canal. No significant effects on the canal are anticipated from this localised and predominantly temporary terrestrial/riparian habitat loss.

9.5.60 Two temporary bailey bridges will be required over the canal during construction works (for a period of up to four years) to provide access to the Ravensthorpe construction compound. The bailey bridges do not require any in-channel structures; however the likely dimensions of the structures and the duration over which they are in place is such that it will lead to a change in localised shading that could exclude macrophyte growth within the Calder and Hebble Navigation beneath the bridge decks. The in-channel habitat potentially affected includes a fringe of marginal macrophytes on the left (east) bank, and desk study records indicate that floating water-plantain is likely be present within this section of the Calder and Hebble Navigation. Floating water-plantain is therefore assumed to be present within the area affected by the bailey bridge, on a precautionary basis. Given the temporary and localised nature of this shading effect (9m in total, which is less than 0.01% of the local 2.3km reach between Thornhill double locks and Thornhill flood locks shown to support macrophytes including floating water-plantain), no significant effects from shading are predicted for the Calder and Hebble Navigation or its macrophyte assemblage.

9.5.61 Floating water-plantain is protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. The destruction of an individual plant through shading is likely to be considered an offence. To ascertain the likelihood that plants (if present at the point of construction) could be lost to this effect, the predicted shading from the bailey bridges has been considered in more detail.

9.5.62 Broome et al. (2005)[56] examined, in detail, the correlation between the ratio of bridge height (H) and bridge width (W) and effects of shading on vegetation growth and primary productivity. This study concluded that, under extreme circumstances, shading by bridges may result in a complete loss of vegetation under the bridge. These effects tend to be small in area and occur under bridges with a height to width (H:W) ratio of less than 0.3. Whilst there can be a reduction in biomass and primary productivity above the threshold of 0.3 (between H:W ratio of 0.3 to 0.7), Willby and Eaton (1993) suggest that plasticity of floating water-plantain supports its ability to tolerate a wide ecological range, with the submerged form of the species generally occurring where light intensities are reduced by shading. Based on a conservative assessment of height (which takes the minimum clearance of existing infrastructure over the Calder and Hebble Navigation i.e. 2.85m), and proposed width of each bridge (4.5m each) the height:width ratio of the structures is expected to be 0.63 (to indicative water level) and 0.88 (to indicative bed level). Given the plasticity of floating water plantain and the fact that the bailey bridges do not preclude macrophyte growth based on published H:W ratios, the risk of losing individual floating water-plantain plants, should they be present pre-construction, is considered to be negligible. An EPSM licenced approach for these works is therefore considered unlikely to be required.

9.5.63 In view of the above, the construction phase is assessed to have a temporary adverse effect (pollution) on the Calder and Hebble Navigation (and any floating water-plantain present within the watercourse) that is significant at the Local level.

Gledholt Beck

9.5.64 Vegetation removal and construction of fencing adjacent to Gledholt Beck will not require marginal/in-channel vegetation clearance; however, the proximity of the works provides a potential pathway for pollution and sedimentation of the watercourse, which could adversely affect aquatic habitats and species. As such, the construction phase is assessed to have a temporary adverse effect on Gledholt Beck that is significant at the Local level.

Hebble Beck

9.5.65 No impacts on Hebble Beck are expected during construction. Although the proposed scheme includes works to the section of railway line that crosses Hebble Beck, the watercourse is culverted beneath the railway, and for approximately 250m upstream and approximately 30m downstream of the Scheme. No works to Hebble Beck Culvert (MVL3/93) are proposed and no works are planned in or adjacent to the watercourse. Therefore, no significant effects on Hebble Beck are predicted during construction.

Blackhouse Dike

9.5.66 The establishment of a construction compound at Red Doles Road and earthworks to widen the embankment near Red Doles Road will not require in-channel working or marginal/in-channel vegetation clearance; however, there is potential for water quality impacts (pollution and sedimentation) due to the proximity of the works area.

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[56] Broome, S.W. Craft, C.B. Struck, S.D. SanClements, M. (2005). Effects of Shading from Bridges on Estuarine Wetlands. North Carolina State University, College of Agriculture & Life Sciences, Department of Soil Science. Joint Environmental Research Programme.

9.5.67 The watercourse is culverted for approximately 120m under the existing railway crossing. The extension of Red Doles Road Culvert (MVL3/96A) by approximately 10m will result in the permanent loss of open watercourse habitat and reduced habitat quality for aquatic species within Blackhouse Dike, immediately downstream of the existing railway culvert.

9.5.68 The culvert extension will also cause disturbance to aquatic habitat and species during construction, as well as potential water quality impacts on retained sections downstream of the culvert extension.

9.5.69 In view of the above, the construction phase is assessed to have both temporary (pollution and disturbance) and permanent (habitat loss) adverse effects on the Blackhouse Dike that are significant at the Local level.

Ladywood Lakes

9.5.70 Vehicle/plant access routes associated with construction compounds at Sands Lane and the construction area to be located to the east of Ladywood Lakes (GCN_019a and GCN_019b) (within 20m) provide potential pathways for water quality impacts (pollution and sedimentation) during construction.

9.5.71 An uncontrolled pollution event has the potential to result in the deterioration of pond habitats and/or direct loss of resident species of nature conservation interest.

9.5.72 GCN 019a receptor value (Local) is underpinned by the fact the pond provides locally important pond habitat but supports no notable macroinvertebrate or macrophyte species of conservation interest. In the event of an uncontrolled pollution event, deterioration of pond habitat and loss of species which are otherwise widespread is likely to be temporary, with the pond naturally recovering similar quality with time following the event. The construction phase is therefore assessed to have a temporary adverse effect on GCN 019a that is significant at the Local level.

9.5.73 GCN 019b receptor value (Regional) is underpinned by the presence of a Regionally Notable and Nationally Scarce freshwater snail *Gyraulus laevis*, which could conceivably be lost from the pond in the event of an uncontrolled pollution event and may not re-establish. The construction phase is therefore assessed to have a permanent adverse effect on GCN 019b that is significant at the Regional level.

Ponds within Thornhill Quarry Site

9.5.74 Establishment of the Ravensthorpe compound and construction of Baker Viaduct Underbridge (RBA/2) and the Flyover Intersection (RBA/1) as well as embankment works will result in the complete loss of two (recently created) ponds within the restored area of Thornhill Quarry (GCN_023 and GCN_024), as well their associated species.

9.5.75 In view of the above, the construction phase is assessed to have permanent adverse effects on the ponds within Thornhill Quarry that are significant at the County level.

Ponds/lakes within Forge Lane Quarry

9.5.76 Baker Viaduct Underbridge (RBA/2) will cross the restored area of the Forge Lane Quarry (described in paragraph 9.3.11), passing within close proximity of the wildlife pond located at the west of the site (GCN_035). Additionally, vehicle/plant access routes associated with the Ravensthorpe construction compound will be located adjacent to (within 20m) of the three waterbodies (GCN_035, GCN_036 and GCN_037) identified in the quarry restoration plan.

9.5.77 No loss of pond habitat or associated marginal habitat is anticipated; however, there is

potential for water quality impacts (pollution and sedimentation) to all three waterbodies during construction.

9.5.78 In view of the above, the construction phase is assessed to have temporary adverse effects on the ponds/lakes within Forge Lane Quarry that are significant at the County level.

Protected and priority flora and fauna

Floating water-plantain

9.5.79 Potential impacts and effects on floating water-plantain have been considered as part of the assessments of Sir John Ramsden Canal LWS, the River Colne, the River Calder and the Calder and Hebble Navigation above.

Great crested newt

9.5.80 There will be no direct impacts on the water bodies associated with the GCN population (GCN_019a and GCN_019b) during construction. Potential indirect impacts on these water bodies include water quality impacts (pollution and sedimentation) during construction.

9.5.81 The establishment of Sands Lane compound will result in the loss of terrestrial habitat (scrub) to the north of the railway line within 100m of the water bodies (vehicle/plant access routes associated with this construction compound will be located along existing surfaced roads and unsurfaced access tracks). This impact could result in the killing/injury of individual GCN and would lead to a reduction in the availability of habitat used for foraging, commuting and shelter. GCN are fully protected under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 and the above impacts may require licensing and mitigation (see Section 9.6).

9.5.82 Construction works to the south of the railway line will result in further losses of terrestrial habitat (scrub, grassland, trees, woodland) located at least 50m from the water bodies. However, given the likely small remnant population associated with the water bodies and the presence of the railway line acting as a dispersal barrier to amphibians, the risk of encountering GCN within habitats to the south of the railway is considered to be very low. As a result, works to the south of the railway are not considered to be licensable (see Section 9.6).

9.5.83 In view of the above, the construction phase is assessed to have both a permanent and temporary effect on GCN that is significant at the Local level.

Bats – roosting

9.5.84 Construction works to Colne Viaduct Underbridge (MVL3/109) will result in impacts on the Daubenton's bat roost (used for breeding and hibernation) within this structure. At least some of the features of the viaduct used by roosting bats (those associated with the steel deck) will be directly impacted and lost during bridge deck re-construction. Other features used by roosting bats (crevices within the overland stone archways on the west side of the viaduct) will not be directly impacted, but would be subject to significant disturbance (noise, vibration, artificial light) during works to the viaduct and during use of the Colne Bridge Road compound, which will be located directly to the south of the viaduct. The above impacts could result in the killing and injury of bats, as well as the loss and/or abandonment of roost sites in the viaduct, which could affect the survival and reproductive success of the local population of Daubenton’s bats.

9.5.85 There will be no direct impacts on the Daubenton's bat roost (used for breeding and hibernation) within Off Forge Lane Underbridge (MVN2/206), which spans the Calder and Hebble Navigation, as no works to the structure are proposed as part of the Scheme.

However, construction and use of the Ravensthorpe construction compound (proposed to be used over a period of four years) could indirectly impact the roost, both through disturbance (noise, vibration and artificial light) of the roost itself (located directly adjacent to the south-eastern boundary of the compound) and disturbance of connecting riparian habitats along the Calder and Hebble Navigation, which are likely to be important for the integrity of the roost. The roost and connecting habitats are already subject to varying levels of disturbance from the active railway line, recreational use of the canal and towpath, an industrial site immediately to the south-east and quarry operations to the north. However, additional disturbance associated with the Ravensthorpe compound could potentially cause the abandonment of the roost and affect the survival and reproductive success of the local population of Daubenton's bats.

9.5.86 Construction works to create a major new cutting at the Heaton Lodge will result in impacts on the common pipistrelle day roost (one bat) at Heaton Lodge cottages (32030_B1) due to the demolition of this building. This could result in the killing and injury of bats and a reduction of available roosting sites in the local area.

9.5.87 There will be no direct impacts on the noctule hibernation roost (one bat) within Cooper Bridge Sewage Plant Underbridge (MVN2/186), as no works to the structure are proposed as part of the Scheme. Construction and use of the Heaton Lodge WWTW compound (proposed to be used over a period of up to four years), which is located 60m to the south of this underbridge at its nearest point, is considered unlikely to have an indirect impact on this roost due at this distance. The movement of bats between the roost and suitable surrounding foraging and commuting habitat will not be significantly affected by the use of this compound as habitat connectivity to woodlands and hedgerows will remain to the north, west and east of the Underbridge during construction. On this basis, it is considered unlikely that indirect impacts during construction will adversely affect the integrity of this noctule hibernation roost.

9.5.88 The brown long-eared bat feeding perch and common pipistrelle day roost (one bat) identified in an old stone barn at Helm Farm (31801_B5) will not be directly impacted during construction as the barn is located outside the Scheme. Construction and use of the Paul Lane construction compound (proposed to be used over a period of up to four years), which is located 50m to the north of the barn at its nearest point, will result in an increase in the level of noise and artificial light in the area. However, the barn will be buffered from residual disturbance to a degree by other farm buildings and mature unmanaged scrub located between the barn and the compound site. The movement of bats between the roosts at the farm and suitable surrounding foraging and commuting habitat will not be significantly affected by the use of the Paul Lane compound as habitat connectivity to woodlands and hedgerows will remain to the west, south and east of the farm during construction. On this basis, it is considered unlikely that indirect impacts during construction will adversely affect the integrity of the minor brown long-eared and common pipistrelle bat roosts at Helm Farm.

9.5.89 The proposed infilling works to Peel's Pit Underbridge (MVL3/100) have the potential to result in the loss of a bat roost (hibernation) that could be present in this structure. This could potentially have direct impacts on bats (killing/injury) and would lead to a reduction in the availability of suitable roosting sites in the local area.

9.5.90 The presumed hibernation roost at 32150_T1 and T2 may be directly impacted as a result of felling. This could potentially have direct impacts on bats (killing/injury) and would lead to a reduction in the availability of suitable roosting sites in the local area, resulting in a permanent adverse effect that is significant at the Local level. If these trees are not felled, the movement of bats between these roosts and suitable surrounding foraging and commuting habitat will not be significantly affected by the use of Heaton Lodge WWTW compound, located 90m to the south-east, as habitat connectivity to woodlands and hedgerows will remain to the north, west and east during construction. Indirect impacts from a potential increase in noise and artificial light are not considered significant at this distance. On this basis, it is considered unlikely that

indirect impacts during construction will adversely affect the integrity of the assumed hibernation roosts at 32150_T1 and _T2, should these trees be retained.

9.5.91 The presumed summer/hibernation roosts at 41812_T3, T5, T6 and T7 may be directly impacted as a result of felling. This could potentially have direct impacts on bats (killing/injury) and would lead to a reduction in the availability of suitable roosting sites in the local area. If these trees are not felled, indirect impacts include the potential for an increase in the level of noise and artificial light in the area from works to overhead power lines which may cause abandonment of these roosts. The movement of bats between these roosts and suitable surrounding foraging and commuting habitat will not be significantly affected by works to overhead powerlines as habitat connectivity to woodland will remain during construction.

9.5.92 The presumed summer day roosts at 40892_T1 (a-f) will be directly impacted as a result of tree felling to provide access to Paul Lane compound. This could potentially have direct impacts on bats (killing/injury) and lead to a reduction in the availability of suitable roosting sites in the local area.

9.5.93 No direct impacts are anticipated to the presumed summer day roosts at 40868-T1, 40868-T2, 40868-T3, 40868-T4 (a&b) and 40868-T5 (a-d) given their location outside the Scheme boundary. Indirect impacts (disturbance) from lighting, noise and vibration are however anticipated due to their proximity to the construction access route for Paul Lane compound, which have the potential to cause abandonment of these presumed roosts.

9.5.94 Bats and their roosts are fully protected under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 and the disturbance and destruction of roosts would require licensing and mitigation (see Section 9.6). The above impacts could result in the killing and injury of bats, as well as the loss and/or abandonment of several roost sites, resulting in a permanent adverse effect that is significant at the County level.

Bats – foraging and commuting

9.5.95 The assessment that follows relates to impacts on foraging and commuting bats not associated with the Daubenton's bat roosts assessed above.

9.5.96 Construction works will directly impact on habitats of value to foraging and commuting bats, including semi-natural broad-leaved woodland, plantation broad-leaved woodland, scrub, semi-improved neutral grassland, scattered trees, hedgerows, loss of two ponds and localised loss of riparian habitat along watercourses. The loss of these habitats will reduce the availability of bat foraging habitat in the local area, but the habitats lost represent a small proportion of the available habitat for bats in the surrounding area, which includes numerous areas of woodland and riparian habitats. In addition, habitat losses will be spread over the entire 15km extent of the Scheme and are relatively localised in any one area. Habitat loss may also result in some localised disruption to the movement of bats within the local area, but habitats located adjacent to those that will be lost will provide continued habitat connectivity in the landscape, including woodlands, retained hedgerows and watercourses. The hedgerows to be lost are considered unlikely to be of particular functional importance in connecting areas of suitable habitat in the landscape based on the results of the bat activity surveys and the presence of other suitable connecting habitats locally, as outlined above.

9.5.97 Retained habitats of value to foraging and commuting bats within and adjacent to the Scheme will also be subject to disturbance (noise, vibration and artificial light) during construction works, which are expected to last up to four years overall, but for shorter periods of a year or less in most locations. Disturbance may cause some temporary, localised displacement of foraging and commuting bats, but there is sufficient habitat in adjacent areas for bats to move into, and bats present in the area will already be habituated to varying levels of disturbance

from the active railway line and industrial areas.

9.5.98 The above direct and indirect impacts on bat foraging and commuting habitat are considered unlikely to adversely affect the conservation status of local bat populations given the continued availability and connectivity of suitable habitat in areas adjacent to the Scheme. Therefore, no significant effects on bats are predicted during construction as a result of impacts on foraging and commuting habitat.

Badger

9.5.99 The establishment of construction compounds at Paul Lane, Heaton Lodge WWTW, Steanard Lane and in the Ravensthorpe area, as well as the installation of overhead line equipment (OLE), works to overhead power lines in the Ravensthorpe area, earthworks, replacement or installation of lineside fencing, construction of Deighton Station and Wheatley's Overbridge (MVL3/103) and vegetation clearance along the railway corridor is likely to result in the destruction and/or disturbance of badger setts, including one active main sett (at Heaton Lodge junction), seven partially used non-main setts and 19 disused non-main setts. Construction works including vegetation clearance and earthworks may also result in the disturbance (noise, vibration, artificial light) and obstruction/destruction of other unidentified setts within the Scheme.

9.5.100 The destruction of setts will result in a reduction in the availability of suitable places for badger to shelter/take refuge and could also potentially cause harm to individual badgers using setts that have been identified as active. Disturbance of retained setts during construction may cause badgers to avoid using these setts for the duration of works or abandon setts altogether. Badgers are protected under the Protection of Badgers Act 1992 and any disturbance or destruction of setts would require licensing and mitigation (see Section 9.6).

9.5.101 The combined impacts of destruction and/or disturbance of setts and removal of habitat during establishment of compounds at Paul Lane and Heaton Lodge WWTW and works at Cooper Bridge Junction are likely to cause the displacement of the local badger clan centred on the active main sett at Heaton Lodge junction away from this area for at least the duration of construction, which is expected to last for four years. However, there are suitable sett building, foraging and commuting habitats in the surrounding area (such as areas of dense scrub, woodland and grassland) for badgers to move into, within which no signs of badger have been found to date other than a single disused non-main sett.

9.5.102 Habitat of potential value to badger for foraging, commuting and sett building would be lost during the establishment of construction compounds, earthworks, construction works and clearance of vegetation along the railway, including the following (within the areas where badger activity was identified or is likely); semi-natural broad-leaved woodland, plantation broad-leaved woodland, scrub and grassland (including both improved grassland and semi-improved neutral grassland). The habitats to be impacted represent a small proportion of the total available foraging/commuting habitat for badger in the surrounding area and the localised loss of habitat over the entire 15km extent of the Scheme is unlikely to significantly affect the free movement of badger in the landscape as there are adjacent habitats that provide continued habitat connectivity.

9.5.103 There may be some localised displacement of badgers foraging/commuting in retained habitats adjacent to works as a result of disturbance (noise, vibration, artificial light). However, badgers present within and adjacent to the Scheme will also be habituated to a relatively high level of disturbance from the active railway line, industrial areas and roads, and there is generally sufficient habitat in adjacent areas for badgers to move into.

9.5.104 The free movement of badger through areas where construction compounds will be established will likely be restricted during construction, especially where working at night is

required. However, the movement of badger within the wider surrounding area will not be significantly affected during construction as sufficient habitat connectivity will remain within retained habitats within and adjacent to the Scheme.

9.5.105 Badgers could come to harm in construction sites, for example by becoming trapped in open excavations.

9.5.106 In view of the above, the construction phase is assessed to have both a permanent and temporary effect on badger that is significant at the Local level.

Barn owl

9.5.107 There will be no direct impacts on the identified barn owl roost site in a barn at Helm Farm (31801_B5) as this building is outside the Scheme. Construction and use of the Paul Lane construction compound (proposed to be used over a period of up to four years), which is located 50m to the north of the barn at its nearest point, will result in an increase in the level of noise and artificial light in the area. However, the barn will be buffered to a degree from residual disturbance by other farm buildings and mature unmanaged scrub located between the barn and the compound site. It is possible that residual disturbance associated with construction activity within the Paul Lane compound will discourage barn owls from roosting in the barn for the duration of construction works. However, there are likely to be numerous alternative suitable roosting sites in the local area, especially within farmsteads to the south.

9.5.108 Establishment of the Paul Lane compound will result in the loss of grassland habitat that may be used by foraging barn owl, including semi-improved neutral grassland and improved grassland/grass ley. However, these habitats are of low value to foraging barn owls (as they provide sub-optimal habitats for field voles) and they comprise a very small proportion of the total available foraging habitat in the surrounding area.

9.5.109 It is possible that construction activity within the Paul Lane compound, especially at night, will discourage barn owl movements between Helm Farm (assuming barn owls continue to roost at the farm or nearby) and an area of potentially optimal foraging habitat to the north of the Scheme (tussocky grassland on the site of former sludge beds). This would reduce the availability of suitable foraging habitat for barn owl during the four-year construction period. The movement of barn owls between Helm Farm and extensive areas of foraging habitat in open farmland to the south will not be affected by construction works.

9.5.110 Given the continued availability of sufficient suitable habitat for barn owl in the local area, the anticipated impacts during construction are unlikely to affect the conservation status of the local barn owl population. Therefore, no significant effects on barn owl are predicted during construction.

Breeding birds

9.5.111 Construction works will result in direct impacts on habitats of potential value to breeding birds, including semi-natural broad-leaved woodland, plantation broad-leaved woodland, scattered trees and scrub. This will result in the loss of suitable breeding habitat and has potential to result in the destruction of active nests and injury/killing of birds.

9.5.112 Removal of habitat will also result in a reduction in the availability of foraging habitat in the local area, but the scale of habitat loss would be relatively small in the context of the total extent of suitable nesting and foraging habitat in the surrounding area.

9.5.113 Disturbance (noise, vibration, artificial light) during construction works, which are expected to last for up to four years overall, could also cause some localised displacement of breeding and foraging birds. However, birds would be able to move into suitable adjacent habitats for

the duration of works, and birds using habitats within and adjacent to Route Section 6 will also already be habituated to disturbance from the existing railway and other sources of human disturbance in the area, such as industrial sites and roads.

9.5.114 In view of the above, the construction phase will result in a permanent, direct adverse effect on breeding birds that is significant at the Local level from the destruction of active nests.

Reptiles

9.5.115 Vegetation clearance along the railway corridor has potential to kill/injure any individuals which may be present.

9.5.116 Vegetation clearance will also result in the localised loss of habitat suitable for reptiles, such as mosaics of grassland, scrub and scattered trees. However, any existing reptile populations will be present in the context of an ongoing programme of vegetation management along the railway and are therefore likely to be resilient to such works. Vegetation clearance may also enhance habitats for reptiles along the railway and in adjacent land, for example by removing dense cover and creating more opportunities for basking.

9.5.117 In view of the above, the construction phase is assessed to have a direct, permanent adverse effect that is significant at the Local level.

Otter

9.5.118 The establishment of construction compounds adjacent to Huddersfield Broad Canal, the River Colne, the River Calder and Calder and Hebble Navigation, vegetation clearance and earthworks at Deighton Station will result in the localised loss of riparian habitat along these watercourses, as well as minor losses of associated terrestrial habitats of potential value to otter, such as dense scrub and woodland.

9.5.119 Baker Viaduct Underbridge (RBA/2) will cross the River Calder and Calder and Hebble Navigation, resulting in temporary, localised in-channel works (River Calder) and permanent alteration of adjacent riparian/terrestrial habitat within the footprint of the structure. It also includes training walls in the River Calder which will result in permanent artificial bank-face beneath the structure on both banks (approximately 60m of riverbank in total; 30m on each bank). These impacts will result in a reduction in the availability of habitat that may be used by otter and could also potentially lead to the loss of unidentified resting sites. However, the extent of riparian and terrestrial habitats that will be affected will represent a very small proportion of the total extent of habitat within a typical otter home range, which extends over several kilometres of watercourse. The in-channel works would only affect part of the channel at any one time and would not impede the movement of otter along the river.

9.5.120 There could be some localised displacement of otter as a result of disturbance (noise, vibration, artificial light) during construction works adjacent to watercourses, which are expected to last for up to four years overall but for shorter periods of a year or less in most locations. However, any otters using the rivers and canals associated with the Scheme will already be habituated to varying levels of disturbance from the active railway line, adjacent industrial sites and recreational activities along watercourses. There is sufficient habitat in adjacent areas for otters to move into if disturbed.

9.5.121 There is a small possibility that otter could come to harm in construction sites, for example by becoming trapped in open excavations.

9.5.122 In view of the above, the construction phase is assessed to have a temporary adverse effect on otter that is significant at the Local level.

Water vole

9.5.123 Given construction works within the Scheme are either located within existing industrial areas, or are located over 100m from AF010 River Colne, no direct or indirect impacts to water vole are likely. Therefore, no significant effects on water vole are predicted during construction.

Operation

Designated sites and terrestrial habitats

9.5.124 No potential impacts from operation of the Scheme are considered likely to designated sites with hydrological connectivity to the Scheme (Sir John Ramsden Canal LWS, Lower Spen Wildlife Area LNR/LWS and Clifton Lagoon LWS).

9.5.125 The only other potential pathway for impacts on designated sites and terrestrial habitats during operation of the Scheme is through changes in air quality. However, emissions from rail locomotives and road vehicles during operation of the Scheme have been scoped out of the assessment of air quality impacts because background concentrations of nitrogen dioxide (NO_2) within the Scheme are below 25µg/m^3 and as such, the effects of emissions will be not significant (see Chapter 7 (Air quality)). There is also the possibility that air quality may improve during operation due to electrification of the line and subsequent increase in the use of electric trains.

9.5.126 In view of the above, no significant effects on designated sites, terrestrial habitats or flora are predicted during operation.

Aquatic habitats and flora

9.5.127 In general, drainage provision to watercourses will replicate existing drainage provision, and therefore no change in discharge quantity or quality is expected. However, there are two exceptions to this, described as follows.

9.5.128 An increase in drainage discharge associated with Colnebridge Culvert (MVL3/110A) on the Unnamed Watercourse at Colnebridge Culvert (a tributary of the River Calder) is likely. The watercourse itself is a minor drainage pathway and is not considered an IEF, as discussed in Appendix 9-4. Due to the very small relative contribution of the Unnamed Watercourse at Colnebridge Culvert to overall flows within the River Calder the risk of significant change to flow and/or water quality in the River Calder is negligible.

9.5.129 There is potential for increased drainage discharge to the Calder and Hebble Navigation and River Calder during operation, due to new track alignments around Ravensthorpe and drainage associated with Baker Viaduct Underbridge (RBA/2). Due to the size and dilution capacity of the watercourses, increased track drainage is unlikely to have more than a localised effect on the River Calder or Calder and Hebble Navigation (including any floating water plantain present).

9.5.130 There is potential for permanent localised effects on macrophytes as a result of reduced light availability beneath the existing Colne Viaduct Underbridge (MVL3/109) (which will be widened) and Baker Viaduct Underbridge (RBA/2) (crossing the River Calder and Calder and Hebble Navigation).

9.5.131 Widening of the bridge deck at Colne Viaduct Underbridge (MVL3/109), has the potential to change the effect of structure channel shading in the River Colne, relative to baseline conditions. This could theoretically lead to a change in localised shading that could exclude macrophyte growth within the River Colne at this location. However, the existing bridge deck already effects shading suppression on the River Colne due to its H:W ratio. Based on a

conservative assessment of height (which takes the lower of the existing stone arch and metal deck combined structure i.e. 3.05m), and width (which takes the maximum width extension of 1.2m), the combined H:W ratio of this compound structure is expected to change from 0.18 to 0.17 as a result of the Scheme. Broome et al. (2005)[56] examined, in detail, the correlation between the ratio of bridge height (H) and bridge width (W) and effects of shading on vegetation growth and primary productivity. This study concluded that, under extreme circumstances, shading by bridges may result in a complete loss of vegetation under the bridge. However, these effects tend to be small in area and only occur under bridges with a H:W is less than 0.3. The potential for any significant effect relative to baseline as a result of a change in H:W from 0.18 to 0.17 (based on the minor changes to the bridge configuration) is considered negligible.

9.5.132 The Baker Viaduct Underbridge (RBA/2) will locally increase shading that could theoretically reduce macrophyte growth beneath the new bridge deck, including floating water-plantain (if present at the point of construction). However, the width of the structure crossing the River Calder and Calder and Hebble Navigation represents less than 0.1% of the watercourses as a whole and no significant effect on the macrophyte populations of either watercourse is predicted.

9.5.133 However, floating water-plantain is protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. The destruction of an individual plant through shading is likely to be considered an offence. To ascertain the likelihood that plants (if present at the point of construction) could be lost to this effect, the predicted shading from Baker Viaduct Underbridge (RBA/2) has been considered in more detail. In the study by Broome et al. (2005)[56] sample size and variation of bridge orientation were not large enough to adequately assess the impacts of bridge orientation, but orientation east to west (as proposed for Baker Viaduct Underbridge (RBA/2)) is likely to result in less in-channel shading than orientation north-south. H:W thresholds derived from this study group of bridges with a range of orientations are therefore considered conservative in their application to Baker Viaduct Underbridge (RBA/2). Whilst there can be a reduction in biomass and primary productivity above the threshold of 0.3 (between H:W ratio of 0.3 to 0.7), Willby and Eaton (1993) suggest that plasticity of floating water-plantain supports its ability to tolerate a wide ecological range. The submerged form of the species generally occurring where light intensities are reduced by shading. Based on proposed heights and widths over the River Calder (H=8.75, W=20m) and Calder and Hebble Navigation (H=8.5, W=26m), the H:W ratio of Baker Viaduct Underbridge (RBA/2) is expected to be 0.44 (to indicative water level) and 0.51 (to indicative bed level) over the River Calder; and 0.33 (to indicative water level) and 0.38 (to indicative bed level) over the Calder and Hebble Navigation. Given the plasticity of floating water plantain and the fact that Baker Viaduct Underbridge (RBA/2) does not preclude macrophyte growth based on published H:W ratios, the risk of losing individual floating water-plantain plants, should they be present pre-construction, is considered to be negligible. An EPSM licenced approach for these works is therefore considered unlikely to be required.

9.5.134 In view of the above, operation of the Scheme (specifically an increase in track drainage at Ravensthorpe) is assessed to have a permanent adverse effect on the River Calder and Calder and Hebble Navigation (including any floating water-plantain present) that is significant at the Local level. No significant effects are predicted for any other watercourse habitats or protected and priority aquatic species during operation.

9.5.135 No potential operational effects are predicted for ponds or lakes. The recently created ponds in the Thornhill Quarry site (GCN_023 and GCN_024) will have been removed during construction and any replacement ponds constructed will be suitably designed to avoid any adverse impacts from operation of the Scheme. There are no pathways for operational effects on the Ladywood Lakes (GCN_019a and GCN_019b) or the three waterbodies (GCN_035, GCN_036 and GCN_037) identified in the quarry restoration plan for Forge Lane Quarry.

Protected and priority fauna

Bats

9.5.136 Moving trains have the potential to kill or injure bats through collision or barotrauma[57]. Bats that are present along the existing railway line are already exposed to the risk of mortality from moving trains, but there will be an increase in the frequency and speed of trains within the Scheme during operation (an increase in the line speed capability from the existing 70mph to 110mph is proposed). There will be only very minor changes in track alignment across the majority of the Scheme, though there will be more significant changes in alignment at Heaton Lodge (approximately 1km of new track located to the south of the existing track passing through a new approximately 12m deep cutting) and Ravensthorpe (approximately 2km of new track associated with the Baker Viaduct Underbridge (RBA/2), located up to 50m to the south of the existing line).

9.5.137 These changes in train speed, frequency and alignment may slightly increase the risk of mortality for bats crossing the railway, though no key commuting routes across the existing railway (or across new alignments) were recorded during surveys. Conversely, there may be a slight reduction in the risk of mortality for bats foraging/commuting along the existing railway corridor due to the increase in the size of the railway area to be maintained clear of woody vegetation on either side of the track (which would increase the distance between moving trains and adjacent habitats). There may also be a slight reduction in the risk of bat mortality along part of Baker Viaduct Underbridge (RBA/2) (along a 300m section of the viaduct supported on piers where it spans the River Calder and the Calder and Hebble Navigation) because bats will be able to cross the railway beneath the structure and it will be less attractive to foraging/commuting bats as it will not have any associated vegetation. Overall, no significant change in bat mortality relative to existing baseline levels is considered likely during operation of the Scheme.

9.5.138 Installation of OLE along the railway is unlikely to affect foraging or commuting bats. As stationary infrastructure, it does not pose any collision risk, and bats will be able to fly through, over or around the overhead lines and supporting infrastructure, so it is unlikely to significantly disrupt their movement within trackside habitats.

9.5.139 The frequency of disturbance events (noise, vibration, artificial light) associated with moving trains will increase during operation of the Scheme as a result of a small increase in the frequency of train movements. Disturbance could cause displacement of bats away from affected habitats, but bats present along the railway will already be habituated to a relatively high level of disturbance from existing train movements, as well as other sources of human disturbance in the area, such as industrial sites and roads. In the context of existing baseline levels of disturbance, any increase in disturbance is unlikely to have a significant adverse effect on bats. The Daubenton's bat roost identified in Off Forge Lane Underbridge (MVN2/206) is very unlikely to be affected by any changes in disturbance during operation as the new alignment of the railway over Baker Viaduct Underbridge (RBA/2) will still be around 375m away from the roost.

9.5.140 The re-location of Calder Road Overbridge (MVN2/202) and the existing Ravensthorpe Station to the west of their current location, as well as the associated re-alignment of roads, is unlikely to have any direct or indirect impacts on bats in the area. The new roads, overbridge and station will be located in habitats of low value to bats, including an arable field to the south of the railway and a heavily disturbed cement works to the north, so any significant disturbance of bats is unlikely. The new roads will be minor, low speed roads similar to existing roads in the area, which will pose a minimal risk of collision to bats.

[57] Injury caused by rapid air pressure reduction near fast moving objects

9.5.141 In view of the above, potential direct and indirect impacts on bats are considered unlikely to have any meaningful effect on the conservation status of local bat populations and therefore no significant adverse effects on bats are predicted during operation of the Scheme.

Badger

9.5.142 Train movements during operation of the Scheme have the potential to kill or injure badgers through collision. As for bats, there may be a slight increase in the risk of mortality for badgers crossing the railway due to the increased speed and frequency of trains, but the increase in the size of the railway area to be maintained clear of woody vegetation on either side of the track may slightly reduce the risk of mortality (due to the increased distance between moving trains and adjacent habitats used by badger). Overall, no significant change in badger mortality relative to existing baseline levels is considered likely during operation of the Scheme.

9.5.143 Changes in the frequency and levels of disturbance associated with moving trains during operation of the Scheme (as described in paragraph 9.5.136) are unlikely to have a significant adverse (or beneficial) effect on badger foraging, commuting or sett building activities given the existing baseline levels of disturbance.

9.5.144 In view of the above, potential direct and indirect impacts on badger are considered unlikely to have any meaningful effect on the conservation status of local badger populations. Therefore, no significant adverse (or beneficial) effects on badger are predicted during operation.

Barn owl

9.5.145 The increase in the frequency and speed of trains moving along existing lines during operation of the Scheme will slightly increase the risk of collision mortality for any barn owls crossing the railway. However, the current risk of collision mortality is likely to be relatively low because there are no traffic accident blackspots (areas of high quality foraging habitat bisected by the railway line) and habitats alongside the railway (mostly dense scrub) are generally unsuitable for foraging barn owl. The area of potentially optimal foraging habitat for barn owls located to the north of the Scheme (which barn owls roosting at Helm Farm may cross the railway lines to reach, possibly at track height due to the lack of intervening good quality foraging habitat) is gradually succeeding to scrub and will therefore become unsuitable for foraging barn owl over time (assuming no intervention takes place). This may reduce the frequency with which barn owls cross the railway in this area during operation.

9.5.146 The new 1km section of fast line at Heaton Lodge will present an additional potential collision hazard to foraging and commuting barn owls during operation. The risk of collision will be reduced by the new section of line being in a cutting (as barn owls are more likely to fly over it above the height of moving trains), but this would be negated if habitat suitable for foraging barn owls is allowed to develop adjacent to the new section of railway, as this could attract barn owls and increase the risk of collision with moving trains.

9.5.147 Changes in disturbance (noise, vibration, artificial light) caused by moving trains during operation (increase in frequency of disturbance events but decrease in magnitude of noise and vibration, as discussed in paragraph 9.5.139) are considered unlikely to have any meaningful effect on barn owls in the local area. The roost at Helm Farm will be located over 100m away from the nearest section of line (the new 1km section of line in a cutting), and the anticipated changes in disturbance are unlikely to affect the use of the roost at this distance. Any barn owl foraging activity in the vicinity of the railway is also unlikely to be affected by the anticipated changes in disturbance given the existing site context and levels of disturbance.

9.5.148 As such, the operational phase is assessed to have a permanent adverse impact on barn owl that is significant at the Local level.

Breeding birds

9.5.149 Train movements during operation of the Scheme have the potential to kill or injure birds through direct collision and cause displacement away from habitats along the railway through disturbance. However, for the same rationale as for bats, badgers and barn owl above, given the existing site context these potential impacts are considered unlikely to have any meaningful effect on the conservation status of local breeding bird populations (including any little-ringed plover that may be present). Installation of OLE is unlikely to adversely affect birds for the same rationale as for bats. Therefore, no significant adverse (or beneficial) effects on breeding birds are predicted during operation.

Reptiles

9.5.150 The only potential impact on reptiles during operation of the Scheme would be disturbance caused by moving trains which could result in displacement from suitable habitat along the railway corridor. The frequency of disturbance events will increase as a result of a higher frequency of train movements, however any reptiles present along the railway will already be habituated to a relatively high level of disturbance from existing train movements, and the anticipated changes in disturbance are unlikely to have any meaningful effect on the local reptile population. Therefore, no significant effects on reptiles are predicted during operation.

Great crested newt

9.5.151 As for reptiles, the only potential impact on GCN during operation of the Scheme would be disturbance caused by moving trains which could potentially result in displacement away from suitable habitat along the railway corridor. However, the anticipated changes in disturbance are unlikely to have any meaningful effect on the local GCN population for the same rationale as reptiles. Therefore, no significant effects on GCN are predicted during operation.

Otter

9.5.152 Disturbance caused by moving trains during operation of the Scheme could result in displacement of otters away from suitable habitats adjacent to the railway. The frequency of disturbance events will increase as a result of a higher frequency of train movements, however any otters using habitats adjacent to the railway will already be habituated to a relatively high level of disturbance from existing train movements, and the anticipated changes in disturbance are unlikely to have any meaningful effect on the local otter population.

9.5.153 Otters are unlikely to have cause to cross the railway line as they will continue to be able to move freely along the watercourses during operation, so potential mortality from moving trains is not a relevant impact.

9.5.154 Changes to water quality are expected during operation of the Scheme (which could reduce the abundance of fish and other aquatic prey in watercourses) and therefore have potential to impact otter.

Water vole

9.5.155 Due to the distance between AF010 River Colne and the railway corridor (over 100m) no direct or indirect impacts to water vole are likely during operation of the Scheme. Therefore, no significant effects on water vole are predicted during operation.

9.6 Mitigation measures

9.6.1 This section provides details of any agreed avoidance, mitigation, compensation and enhancement measures that are necessary, over and above the embedded mitigation detailed in Section 9-3 as well as in Chapter 11 (Water environment) of this ES.

9.6.2 Part A of the CoCP is provided in Appendix 2-1. Part B of the CoCP will incorporate a Noise and Vibration Management Plan (NVMP), Pollution Prevention and Incident Control Plan (PPICP), Nuisance Management Plan (NMP) and Environmental Design Plan (EDP) (Land Contamination and Hydrogeology). The contents of these documents will be submitted to and agreed by the Local Authority pursuant to a condition attached to the deemed planning permission[58] prior to construction works commencing.

9.6.3 A Landscape and Ecological Management Plan (LEMP) will also be prepared pursuant to a condition to be attached to the deemed planning permission. This will be submitted to and agreed by the Local Authority prior to construction works commencing.

9.6.4 The following mitigation detail would be included within the CoCP, LEMP or NE EPSM licence application(s), as appropriate.

Statutory designated sites

9.6.5 Loss of semi-improved neutral grassland and scrub within Gledholt Woods LNR/LWS will be mitigated via re-instatement and/or natural regeneration following construction and will take approximately 5 years and 5-10 years, respectively, to achieve a comparable condition to the existing baseline. Potential impacts to mature semi-natural broad-leaved woodland will be adequately mitigated via the implementation of standard environmental control measures, such as establishment of tree root protection areas as detailed within the Arboricultural Impact Assessment in Appendix 9-1.

9.6.6 Temporary potential indirect impacts on grassland and woodland habitats within the LNR/LWS from pollution to air (dust generation) will be adequately mitigated with the implementation of Part A of the CoCP and the NMP under Part B of the CoCP concerning dust and air pollution.

Non-statutory designated sites

9.6.7 Potential water quality impacts to Sir John Ramsden Canal LWS (pollution and sedimentation) will be mitigated through the implementation of standard environmental control measures detailed within Part A of the CoCP.

9.6.8 Areas of lost riparian/terrestrial habitats associated with Sir John Ramsden Canal LWS will be mitigated for via re-instatement (in land that is in temporary use for construction), or natural regeneration following construction, achieving a condition comparable to the existing baseline within approximately 15-30 years (for areas of tree cover). Any additional compensatory planting requirements will be undertaken in line with the Outline Environmental Mitigation Plan in Figure 2-3, with further details (including planting plans) included within the LEMP, the contents of which will be submitted to and agreed by the Local Authority, prior to construction works, pursuant to a condition to be attached to the deemed planning permission.

9.6.9 Potential indirect impacts to Whitley Wood LWS from pollution to air (dust generation) will be adequately mitigated with the implementation of Part A of the CoCP and through the NMP under Part B of the CoCP.

Aquatic habitats

9.6.10 Potential water quality impacts (pollution and sedimentation) will be mitigated through the implementation of the PPICP under Part B of the CoCP. Where additional mitigation measures are proposed for specific aquatic habitats, these are outlined as follows.

[58] On making an order under the Transport and Works Act 1992, the Secretary of State may direct that planning permission shall be deemed to be granted, subject to such conditions (if any) as may be specified in the direction.

Unnamed Watercourse at Bradley Culvert

9.6.11 The impacts of the culvert extension on aquatic habitats and species will be minimised with the implementation of sensitive culvert/watercourse design measures set out in Section 11.6 of Chapter 11 (Water environment) of this Scheme-wide Assessment.

River Calder

9.6.12 The extent of river training walls required for Baker Viaduct Underbridge (RBA/2) on the River Calder will be minimised through detailed design. Details will be included within the EDP (Land Contamination and Hydrogeology) under Part B of the CoCP. The design, where possible, will also seek opportunities to soften the hard-engineered solution through, for example, rough rather than smooth structure facing. It will also incorporate green bank protection solutions to transition hard engineering to the existing naturalised bank face.

9.6.13 Compensation will be required for the localised permanent loss of riparian habitat to piers (bank top), training walls (bank face), and reduced quality of habitat likely to be supported beneath Baker Viaduct Underbridge (RBA/2) bridge deck (i.e. grasses and/or ruderal vegetation rather than shrubs and trees) (cumulatively affecting approximately 60m of the River Calder; 30m on each bank). As compensation, the existing riparian habitat adjacent to and downstream of Baker Viaduct Underbridge (RBA/2) shall be enhanced. This will include planting of approximately 90m of bank habitat on the right bank, between Baker Viaduct Underbridge (RBA/2) and an existing utilities pipe crossing downstream adjacent to the existing weir. Currently this habitat is of poor quality, dominated by grasses and ruderal vegetation, devoid of riparian habitat structure and complexity. Detailed measures will be included in the LEMP and the location of this compensatory habitat is indicated in the Outline Environmental Mitigation Plan in Figure 2-3.

9.6.14 Potential disturbance of fish (for example, due to noise and vibration) will be mitigated through the implementation of measures within Part A of the CoCP and detailed in the NVMP under Part B of the CoCP, to reduce acoustic disturbance. In the event dewatering (for example over-pumping) is required to create dry conditions, fish rescue will be implemented as part of environmental control measures included in the LEMP.

9.6.15 Any increase in track drainage will be managed through adherence to the Scheme-wide drainage strategy as summarised in Appendix 11-4.

Calder and Hebble Navigation

9.6.16 Any increase in track drainage will be managed through adherence to the Scheme-wide drainage strategy as summarised in Appendix 11-4.

Blackhouse Dike

9.6.17 The impacts of the culvert extension on aquatic habitats and species will be minimised with the implementation of sensitive culvert/watercourse design measures set out in Section 11.6 of Chapter 11 (Water environment) of this Scheme-wide Assessment.

Ponds within Thornhill Quarry

9.6.18 New pond habitat will be created to fully compensate for the loss of the two ecologically important ponds within Thornhill Quarry (GCN_023 and GCN_024). Proposed locations for compensatory pond habitat are shown in the Outline Environmental Mitigation Plan in Figure 2-3 and further details, including final location(s) and pond design, will be included within the LEMP.

9.6.19 The compensatory pond habitats shall be designed to occupy a cumulative surface area that

is, at a minimum, equivalent to that being lost (a combined 4,260m^2). The following design principles shall also be observed in the development of a detailed design for the compensation pond(s). The compensatory pond habitat shall:

- Be created prior to the removal of the existing ponds, if practically achievable taking account of construction phasing, to ensure continuous provision of standing water habitat. Where it is not possible to create compensation ponds prior to the loss of existing ponds, smaller ponds/scrapes will be created in advance of the works with larger areas of pond habitat created following construction to compensate for the total area of standing water lost;
- Consider groundwater and surface drainage and their impact on permanent and temporary water levels, to ensure a minimum of 75% of the replacement habitat is permanent standing water throughout the entire year;
- Avoid lining where possible and where unavoidable, select a clay or bentonite liner;
- Be 'seeded' with viable translocated material from the existing pond where possible (bank-side vegetation, benthic sediment, and aquatic submerged and emergent vegetation);
- Include marginal slopes with approximately 50% of pond perimeter gradient no steeper than 1:8 (to enhance the drawdown zone, the area between winter high water level and the summer low water level) and approximately 50% with gradient no shallower than 1:4;
- Include undulating topography, particularly within the drawdown zone, to maximise hydrological diversity; and
- Include water depth proportions of approximately 50% shallow water (less than 0.5m) and 50% deep water (1-2m or greater).

9.6.20 The existing ponds will be drained and removed sensitively to minimise impacts on associated species. Animals (such as newts) will be recovered from the ponds as far as possible and transferred to the newly created ponds and/or other suitable habitat outside construction areas. The sensitive removal of the existing ponds will be completed in accordance with an approved method statement (set out within the LEMP) and under the supervision of an ecologist.

Terrestrial habitats

9.6.21 Direct impacts to terrestrial habitats (where identified) will be mitigated for via re-instatement as far as possible following construction, with any additional planting requirements undertaken in line with the Outline Environmental Mitigation Plan in Figure 2-3. Further details (including planting plans) will be included as part of the LEMP, which will include details on the management of any replacement planting. Timescales for replacement or naturally regenerated (i.e. scrub and grassland) habitats to reach a comparable condition to the existing baseline are as follows;

- Semi-natural broad-leaved woodland: 30-100 years;
- Semi-natural mixed woodland: <30 years;
- Plantation broad-leaved woodland: <30 years;
- Scrub: 5-10 years; and
- Semi-improved neutral grassland: <5 years.

9.6.22 Potential indirect impacts to all terrestrial habitats from pollution to air (dust generation) and water (surface run-off), where identified, will be adequately mitigated with the implementation of measures outlined in Part A of the CoCP and detailed in the NMP and PPICP under Part B of the CoCP.

Protected and priority flora and fauna

Floating water-plantain

9.6.23 Potential water quality impacts on floating water-plantain (pollution and sedimentation) will be mitigated through the implementation of the PPICP under Part B of the the CoCP.

9.6.24 The species is protected under Schedule 5 of The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. If present within areas where macrophyte loss has been identified as possible during construction (namely, localised in-channel works area on the River Calder), local translocation of individual plants outside of the works may be required under a EPSM licence.

9.6.25 Once the construction activities are confirmed, pre-construction surveys of the potentially affected areas shall be undertaken to confirm whether floating water-plantain is present within the affected areas. Micro-siting of construction activities should be undertaken in the first instance where avoidance is possible, followed by movement of plants outside of the works area under EPSM licence in advance of construction works, where unavoidable. NE will be consulted to confirm the scope of pre-construction surveys and any licensable activities. At least a three to six-month lead in time will be required to allow for any licence application preparation and processing by NE.

Great crested newt

9.6.26 Vegetation removal to facilitate the set-up of Sands Lane compound, to the north of the railway line and within 100m of the water bodies associated with the GCN population (GCN_019a and GCN_019b), may need to be completed in accordance with an approved NE EPSM licence. Up to date survey information will be required to support a licence application and at least a three to six month lead in time will be required to allow for licence application preparation and processing by NE.

9.6.27 The following mitigation measures will likely be required as a condition of the EPSM licence. All mitigation would be overseen by a suitably licensed ecologist:

- Removal and exclusion of GCN from working areas, using amphibian drift fencing where appropriate and necessary;
- Destructive searches of potential refugia in working areas; and
- Habitat re-instatement and enhancement upon decommission of the compound to compensate for any permanent habitat loss.

9.6.28 Non-licensed reasonable avoidance measures will be implemented during vegetation clearance to the south of the railway line within 500m of the water bodies associated with the GCN population (GCN_019a and GCN_019b). These will include measures such as sensitive clearance of vegetation, fingertip searches of vegetation and destructive searches of potential refugia. The approach and rationale will be documented in a Precautionary Working Method document and works will be completed under the supervision of an Ecological Clerk of Works.

9.6.29 Potential water quality impacts to waterbodies GCN_19a and GCN_19b (pollution and sedimentation) will be mitigated through the implementation of standard environmental control measures outlined in Part A of the CoCP and detailed within the PPICP under Part B of the CoCP.

Bats

9.6.30 Re-construction of Colne Viaduct Underbridge (MVL3/109) and demolition of Heaton Lodge cottages (32030_B1) will need to be undertaken in accordance with an approved NE EPSM

licence. Up to date survey information will be required to support a licence application (data from the latest survey season (May to August)) and at least a three to six-month lead in time will be required to allow for licence application preparation and processing by NE.

9.6.31 The following mitigation measures will likely be required as a condition of the EPSM licence(s). All mitigation would be overseen by a licensed bat ecologist:

- Colne Viaduct Underbridge (MVL3/109):
  - Provision of temporary alternative roosting sites (bat boxes suitable for use by Daubenton's bats) on nearby bridges over rivers that will not be subject to significant disturbance during construction and where no roosting opportunities currently exist. The recommended site is the A62 Leeds Road bridge over the River Calder to the north. Alternative roosting sites will be in place before bats are excluded from the existing roost in Colne Viaduct Underbridge (MVL3/109);
  - Exclusion of roosting bats from roosting features to be directly impacted using one-way exclusion devices and/or other suitable methods. This would need to be completed during April, September or October only to avoid the periods when bats are most vulnerable during breeding (May to August inclusive) and hibernation (November to March inclusive);
  - Pre-works inspections and/or surveys to ensure that bats continue to be excluded;
  - Soft demolition of identified roosting features under supervision of a licenced ecologist who would be able to remove any opportunistic bats that return as necessary;
  - Monitoring of replacement roost sites during construction to determine their effectiveness and the need for any alterations;
  - Re-instatement of roosting features as far as possible in the re-constructed Colne Viaduct Underbridge (MVL3/109) to allow bats to continue roosting within the structure in the long term. Provision of alternative roosting sites in the bridge to compensate for any roosting features lost; and
  - Monitoring of the bridge for several years after completion of construction works to determine the effectiveness of re-instated/replacement roosting features and the need for any alterations.
- Heaton Lodge cottage (32030_B1)
  - Provision of an alternative roosting site (a bat box suitable for use by common pipistrelle bats) on a nearby tree that will not be subject to significant disturbance during construction and where no roosting opportunities currently exist. Recommended sites include trees within woodland to the south of Helm Lane, around 100m south-west of the roost. The alternative roosting site needs to be in place before soft demolition;
  - Soft demolition of identified roosting feature under supervision of a licenced ecologist. This would need to be completed during September-May inclusive when bats were least likely to be present. The supervising licenced ecologist would be able to remove any opportunistic bats present;
  - Monitoring of replacement roost site during construction to determine its effectiveness and the need for any alterations; and
  - Monitoring of the replacement roost site for several years after completion of construction works to determine the effectiveness of re-instated/replacement roosting features and the need for any alterations

9.6.32 No additional mitigation is considered necessary in relation to the minor common pipistrelle and brown long-eared bat roosts at Helm Farm or the minor noctule roost at Cooper Bridge

Sewage Plant Underbridge (MVN2/186) as these will be not be directly impacted and indirect impacts during construction are unlikely to affect their integrity (as discussed in paragraphs 9.5.87 and 9.5.88).

9.6.33 Based on the worst-case scenarios that;

- Peel's Pit Underbridge (MVL3/100) supports a hibernation roost;
- 32150_T1 and T2 support hibernation roosts and are removed;
- 41812_T3, T5, T6 and T7 support summer/hibernation roosts and are removed; and
- 40892_T1 (a-f) 40868-T1, 40868-T2, 40868-T3, 40868-T4 (a&b) and 40868-T5 (a-d) support summer roosts;

9.6.34 Destruction and/or disturbance of these roosts as a result of Scheme would need to be undertaken in accordance with an approved NE EPSM licence. Up to date survey information would be required to support a licence application (data from the latest relevant survey season) and at least a three to six month lead in time would be required to allow for licence application preparation and processing by NE.

9.6.35 The following mitigation measures may be required as a condition of the EPSM licence(s) for the above worst-case scenarios, depending on the type of roost present. All mitigation would be overseen by a licensed bat ecologist:

- Provision of an alternative roosting site (bat boxes suitable for use by summer roosting or hibernating bats) or re-siting of existing bat boxes on nearby structures or trees that will not be subject to significant disturbance during construction and where no roosting opportunities currently exist. Alternative roosting sites would need to be in place before bats are excluded from the presumed roosts;
- Timing of tree removal or construction works may be required based on type of bat roost, should one be present;
- Exclusion of bats from roosting features using one-way exclusion devices and/or other suitable methods. This would need to be completed at a specific time of year, depending on the type of roost identified;
- Ecological supervision immediately prior to felling or works to ensure that bats continue to be excluded from roosting features and to remove any opportunistic bats that are present; and
- Monitoring of replacement roost sites during construction to determine their effectiveness and the need for any alterations.

9.6.36 Indirect impacts to 40868-T1, T2, T3, T4 (a&b), T5 (a-d), 41812_T3, T5, T6 and T7 will be adequately mitigated for via the implementation of standard environmental control measures set out in Part A of the CoCP, which will contain measures to minimise noise, vibration and light spill.

9.6.37 A buffer zone will be maintained around the bat roost in Off Forge Lane Underbridge (MVN2/206) to avoid disturbance during establishment and use of the Ravensthorpe Area construction compound. This compound will not extend beyond the public footpath that runs between Scholefield Underbridge (MVN2/205) and Off Forge Lane Underbridge (MVN2/206) over the Calder and Hebble Navigation. This will maintain a minimum 75m distance between the compound and the bat roost. Construction lighting within the Ravensthorpe compound will be positioned and designed so as to minimise light spill onto the Calder and Hebble Navigation and associated riparian habitats, as far as possible. Hoods and covers will be used to direct lighting onto working areas only. This will minimise disturbance of riparian habitats along the canal, which are likely to be important for bats moving to and from the roost in Off Forge Lane Underbridge (MVN2/206).

Badger

9.6.38 Measures will be implemented prior to and during construction to minimise impacts on badger and ensure legislative compliance, including pre-construction surveys to confirm the status of identified setts (and if any new setts have been created or identified in areas previously inaccessible for surveys), provision of a replacement setts (see below) and sensitive habitat clearance under an ecological watching brief, where necessary.

9.6.39 A badger development licence will need to be obtained from NE to permit the destruction of the active main badger sett (Sett_007) and partially active non-main sett (Sett_022) at Heaton Lodge junction, as well as any other active or partially used setts identified. Up to date information on the status of setts would be required to support a licence application. Sett closure would only be permitted between July and November inclusive. The following measures would likely be required as a condition of the licence:

- Provision of an artificial sett within the local area (within the Scheme) to compensate for the loss of the main sett. This will be constructed well in advance of sett removal (up to 6 months in advance);
- Exclusion of badgers from setts using one-way gates and monitoring over a period of at least 21 days to ensure that exclusion has been effective; and
- Destruction of the sett as soon as possible after exclusion to reduce the chances of re-occupation by badger. It may be necessary to install heavy-gauge chainlink or weldmesh over the former sett to prevent re-excavation of the sett by badgers. It would also be necessary to discourage excluded badgers from excavating new setts in other areas of the Scheme that will be directly or indirectly impacted during construction by rendering habitat unsuitable, such as by clearing vegetation.

9.6.40 Measures will be implemented to minimise direct impacts on the partially used non-main Setts_015, _027, _028 and _030. Where direct or significant indirect impacts cannot be avoided on these partially used badger setts, appropriate mitigation measures will be undertaken under the authority of a badger development licence. The measures would depend on the type of sett and nature of the impact but could include sett closure (generally only permitted between July and November inclusive). The provision of replacement setts for these non-main setts would not be required.

9.6.41 Measures will be implemented to minimise disturbance of any retained setts (such as noise, vibration and artificial light) within and adjacent to the Scheme as far as possible through the establishment of exclusion zones and/or the implementation of standard environmental control measures set out in Part A of the CoCP. Examples include the use of hoods/covers on artificial lighting to minimise illumination of adjacent habitats. Where necessary, such measures would be specified and authorised by inclusion within a badger development licence.

9.6.42 Risks to badgers within construction sites will be adequately mitigated with the implementation of measures set out in the LEMP, such as leaving a means of egress within excavations that are left open overnight.

Barn owl

9.6.43 Soft landscaping along the new section of railway line around Heaton Lodge Junction will be designed so as not to provide rank grassland habitat suitable for foraging barn owl, in order to reduce the risk of barn owl collisions/mortality from moving trains during operation of the Scheme. In addition to avoiding the creation of grassland habitat as an end goal, the creation of habitats within which rank grassland can develop during establishment, such as plantation woodland, will also be avoided. Further detail will be provided in the LEMP.

Breeding birds

9.6.44 Direct impacts on other nesting bird species during vegetation clearance would be adequately mitigated for via the removal of potential nesting habitat outside the bird breeding season (which runs February to September), and pre-construction nest checks (no more than 24 hours prior to removal) where this is not possible. Appropriate buffer zones would be established around any active nests until the young have fully fledged and left the nest. Further detail will be provided in the LEMP.

Reptiles

9.6.45 Mitigation measures to avoid killing/injury of reptiles, such as phased vegetation clearance, will be implemented during construction where necessary as part of standard environmental control measures which will be set out in the LEMP.

Otter

9.6.46 Measures will be implemented prior to and during construction to minimise the risk of impacts on otter and ensure legislative compliance, including pre-construction surveys to determine the presence/likely absence of otter resting sites, leaving a means of egress within excavations that are left open overnight, and sensitive habitat clearance under an ecological watching brief, where necessary. Further details will be included within the LEMP. Potential water quality impacts (pollution and sedimentation effects) during works will also be adequately mitigated with the implementation of Part A of the CoCP and the PPICP under Part B of the CoCP. Potential water quality impacts during operation of the Scheme will be mitigated for with the implementation of the Scheme-wide drainage strategy, as summarised Appendix 11-4.

9.6.47 If no changes to the existing baseline are identified, then no further mitigation in respect of otter resting sites will be required. However, if additional otter resting sites are identified prior to or during construction, measures to minimise direct impacts and disturbance as far as possible, such as through establishment of exclusion zones, will be implemented. Where direct or significant indirect impacts on otter resting places cannot be avoided, appropriate mitigation measures will be undertaken under the authority of an otter EPSM licence, such as the creation of replacement resting sites outside of working areas.

9.6.48 Lighting within construction compounds at Heaton Lodge WWTW, Colne Bridge Road, Paul Lane and Ravensthorpe area will be positioned and designed so as to minimise light spill onto the River Colne, the River Calder, Calder and Hebble Navigation and their associated riparian habitats, as far as possible. Hoods and covers will be used to direct lighting onto working areas only, to minimise disturbance along these watercourses. Details will be included within the NMP under Part B of the CoCP and also included within the LEMP.

9.7 Residual effects

9.7.1 This section considers potential residual effects on ecological features following the implementation of the additional mitigation measures detailed in Section 9.6. No further consideration is given to ecological features for which no significant effects were predicted during construction or operation of the Scheme.

Statutory designated sites

9.7.2 With the implementation of the mitigation measures detailed in Section 9.6, potential effects to Gledholt Woods LNR (and LWS) are either avoided or are mitigated to such a degree as to not be considered significant for the maintenance of the LNR (or LWS). Therefore, no significant residual effects are predicted.

Non-statutory designated sites

9.7.3 With identified mitigation measures, residual effects to Sir John Ramsden Canal LWS are assessed to be temporary, adverse at the Local level in the medium term (<30 years) until replacement planting is established. After this point, no significant residual effects are predicted.

9.7.4 With the implementation of the mitigation measures detailed in Section 9.6, potential effects to Whitley Wood LWS are mitigated to such a degree as to not be considered significant for the maintenance of the LWS. Therefore, no significant residual effects are predicted.

Aquatic habitats

Watercourses

9.7.5 With the implementation of the mitigation measures outlined in Section 9.6, potential impacts on the Huddersfield Broad Canal, Unnamed Watercourse at Bradley Culvert, River Colne, Calder and Hebble Navigation, Gledholt Beck and Blackhouse Dike are either avoided or are mitigated to such a degree as to not be considered significant for the maintenance of the conservation status of watercourse habitats and aquatic species present within the Scheme. Therefore, no significant residual effects are predicted for these watercourses.

9.7.6 With identified mitigation, there will be a temporary residual effect on the River Calder that is significant at the Local level. The effect will be temporary and short term (2-5 years) until the compensatory riparian planting is established; no permanent residual effects are anticipated.

Ponds/lakes

9.7.7 With the implementation of the mitigation measures outlined in Section 9.6, potential impacts on Ladywood Lakes (GCN_019a and GCN_019b) and the Forge Lane Quarry ponds and lakes (GCN_035, GCN_036 and GCN_037) are either avoided or are mitigated to such a degree as to not be considered significant for the maintenance of the conservation status of pond/lake habitats and aquatic species present. Therefore, no significant residual effects are predicted for these waterbodies.

9.7.8 There will be a temporary residual adverse effect on the Thornhill Quarry Landfill Site ponds (GCN_023 and GCN_024) that is significant at a County level. The effect will be temporary and short term (3-5 years) until the replacement ponds establish to comparable condition; no permanent residual effects are anticipated.

Terrestrial habitats

9.7.9 With the implementation of mitigation measures identified in Section 9.6:

- Residual effects to semi-natural broad-leaved woodland are assessed to be temporary, adverse and significant at the local level in the medium to long term (30-100 years) until replacement planting is established. After this point, no significant residual effects are predicted;
- Residual effects to semi-natural mixed woodland, plantation broad-leaved woodland and plantation mixed woodland are assessed to be temporary, adverse and significant at the local level in the medium term (<30 years) until replacement planting is established. After this point, no significant residual effects are predicted;
- Residual effects to scrub are assessed to be temporary, adverse and significant at the local level in the short term (5-10 years) until replacement planting or natural regeneration becomes established. After this point, no significant residual effects are predicted;

- Residual effects to semi-improved neutral grassland are assessed to be temporary, adverse and significant at the local level in the short term (<5 years) until replacement planting or natural regeneration becomes established. After this point, no significant residual effects are predicted; and
- No residual significant effects from indirect impacts (dust generation and surface run-off) are predicted.

Protected and priority fauna and flora

Floating water-plantain

9.7.10 The potential for localised loss of individual plants during construction is not considered likely to affect the conservation status of the species within the River Calder, nor at the National scale at which floating water-plantain is considered important. With the implementation of standard environmental control measures set out in Part A of the CoCP and implementation of the PPICP under Part B of the CoCP, no significant residual effects on floating water-plantain are predicted.

Great crested newt

9.7.11 The implementation of the mitigation measures outlined in Section 9.6 would avoid direct impacts on individual GCN and ensure the continued provision of suitable terrestrial habitat in the local area. The measures would be expected to maintain the favourable conservation status of the GCN population to be affected, and therefore no significant residual effects on GCN are predicted.

Bats

9.7.12 The implementation of the mitigation measures outlined in Section 9.6 would avoid direct impacts on individual bats and ensure the continued provision of suitable roosting habitat in the local area. The measures would be expected to maintain the favourable conservation status of the population of bats to be affected, and therefore no significant residual effects on bats are predicted.

Badger

9.7.13 No significant effects on badger are predicted during construction with the implementation of the mitigation measures outlined in Section 9.6. These will ensure that direct impacts on individual badgers are avoided and that suitable provision of shelter/refuge (setts) is maintained in the local area. As such, no significant residual effects on badger are therefore predicted.

Barn owl

9.7.14 With the implementation of the mitigation measures outlined in Section 9.6, potential impacts on barn owl during operation of the Scheme (collision mortality) will be minimised as far as possible and to such a degree that no significant additional risk will be posed relative to the existing baseline level of collision risk. Therefore, no significant residual effects on barn owl are predicted.

Breeding Birds

9.7.15 Direct impacts on breeding birds would be avoided with the implementation of the mitigation measures detailed in Section 9.6. As such, no significant residual effects on breeding birds are predicted.

Reptiles

9.7.16 The implementation of the mitigation measures outlined in Section 9.6 would avoid direct impacts to reptiles and as such, no residual significant effects are predicted during construction.

Otter

9.7.17 With the implementation of the mitigation measures outlined in Section 9.6, impacts during construction are unlikely to affect the conservation status of any population of otter associated with Huddersfield Broad Canal, River Calder, River Colne, and Calder and Hebble Navigation. Therefore, no significant effects on otter are predicted.

9.8 Cumulative effects

9.8.1 Cumulative effects can include intra-Scheme impacts and inter-Scheme impacts. Intra-Scheme impacts are where in-combination impacts arise from the Scheme. Inter-Scheme impacts occur due to impacts from more than one scheme.

Intra-Scheme (synergistic) impacts

9.8.2 Potential intra-Scheme effects may occur from interaction with other environmental topics.

9.8.3 Potential synergistic impacts have been identified that correspond to biodiversity. These include:

- Noise and vibration;
- Air quality; and
- Landscape, townscape and visual – proposed mitigation planting and landscaping schemes.

9.8.4 Further consideration of cumulative effects is provided in Chapter 22 (Cumulative effects) of this ES.

Inter-Scheme effects

9.8.5 Inter-Scheme cumulative effects may occur from interaction with other proposed developments (Reasonably Foreseeable Future Projects (RFFPs)) located near the Scheme. When combined with the works in the Scheme area these could cumulatively affect sensitive receptors. Inclusion of RFFPs includes their proximity to the Scheme, likely impacts and timing of construction and operation.

9.8.6 The potential inter-Scheme cumulative effects in relation to biodiversity are provided in Table 9-12.

Table 9-12 Potential inter-Scheme cumulative effects

Route Section	Planning Application ref.	Development description	Location	Planning status	RFFP environmental information	Potential cumulative effect
1 – Huddersfield	2020/90014	Demolition of existing building and erection of car sales and speculative B1/B2 unit with associated parking and access	11, The Triangle, Huddersfield, HD1 4RN Adjacent to Scheme boundary	Conditional Full Permission – March 2020	No supporting environmental information	This is a small-scale development located primarily on existing hardstanding. The proposed development is not located within any statutory or non-statutory designated nature conservation sites. Impacts on habitats and species are likely to be minimal. It is not expected to result in any significant cumulative effects on IEF relevant to the Scheme during construction and operation.
1 – Huddersfield	Strategic highway scheme	Highways improvements to the junction of Huddersfield Ring Road/Southgate/ Northumberland Street.	Junction is located east of Huddersfield Station.	Strategic Scheme	No information available.	The works are likely to be largely confined to highways, and as such impacts on habitats and species are likely to be minimal. The proposed development is not located within any statutory or non-statutory designated nature conservation sites. Any impact on protected species would need to be adequately mitigated to comply with licensing requirements, and this would be expected to maintain the favourable conservation status of the species concerned. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
1 – Huddersfield	Strategic highway scheme	Highways improvements to the junction of Leeds Road/Lower Fitzwilliam Street/Gasworks Street.	Junction is located east of Huddersfield Station.	Strategic Scheme	No information available.	The works are likely to be largely confined to highways, and as such impacts on habitats and species are likely to be minimal. The proposed development is not located within any statutory or non-statutory designated nature conservation sites. Any impact on protected species would need to be adequately mitigated to comply with licensing requirements, and this would be expected to maintain the favourable conservation status of the species concerned. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
1 – Huddersfield 2 – Hillhouse and Fartown	Strategic highway scheme	A62 Smart Corridor (Leeds Road - Phase 1)	A62 is located to south-east and parallel to the railway.	Strategic Scheme	No information available.	The works are likely to be largely confined to highways, and as such impacts on habitats and species are likely to be minimal. The proposed development is not located within any statutory or non-statutory designated nature conservation sites. Any impact on protected species would need to be adequately mitigated to comply with licensing requirements, and this would be expected to maintain the favourable conservation status of the species concerned. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
1 – Huddersfield 2 – Hillhouse and Fartown	Strategic highway scheme	Highways improvements to the junction of Leeds Road/Thistle Street/Hillhouse Lane.	Junction is located south-east of Hillhouse construction compound.	Strategic Scheme	No information available.	The works are likely to be largely confined to highways, and as such impacts on habitats and species are likely to be minimal. The proposed development is not located within any statutory or non-statutory designated nature conservation sites. Any impact on protected species would need to be adequately mitigated to comply with licensing requirements, and this would be expected to maintain the favourable conservation status of the species concerned. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
2 – Hillhouse and Fartown	Strategic highway scheme	Highways improvements to the junction of Leeds Road/Old Fieldhouse Road.	Junction is located south-east of Field House Overbridge (MVL3/98) adjacent to the Scheme boundary	Strategic Scheme	No information available.	The works are likely to be largely confined to highways, and as such impacts on habitats and species are likely to be minimal. The proposed development is not located within any statutory or non-statutory designated nature conservation sites. Any impact on protected species would need to be adequately mitigated to comply with licensing requirements, and this would be expected to maintain the favourable conservation status of the species concerned. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
3 – Deighton and Bradley	2017/91111	Outline application for erection of industrial development for B1 (business), B2 (general industry), and B8 (storage and distribution) uses	Station Road, Bradley, HD2 1UT Within Scheme boundary	Conditional Outline Permission August 2017	No EIA but application is supported by environmental assessments in relation to contaminated land,	A preliminary ecological appraisal was completed in support of the application; this concluded that potential ecological impacts from the development are pollution of the adjacent Huddersfield Broad Canal and loss of on-site habitat within the Kirklees Wildlife Habitat Network. Habitats within the Network would largely be retained and enhanced as part of the development and mitigation

Route Section	Planning Application ref.	Development description	Location	Planning status	RFFP environmental information	Potential cumulative effect
					transport, arboriculture, ecology as well as a FRA	will be provided for potential pollution events on the canal. Therefore, this proposed development is not expected to result in any significant cumulative effects on IEF relevant to the Scheme during construction and operation.
4 – Colne Bridge and Battyeford	2016/93896	Erection of 1 dwelling and associated works	Site off, Station Road, Bradley, HD2 1US Within Scheme boundary	Conditional Full Permission – February 2017	No EIA – application is supported by a Design and Access Statement.	The works are largely confined to existing hardstanding. No ecological constraints are noted within the submitted application. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
4 – Colne Bridge and Battyeford	2017/91208	Outline application for erection of industrial development of up to 3684 sqm B1c/B2/B8, with means of access (to, but not within, the site) from Colnebridge Road	Land adjacent to Colnebridge WWTW, Colnebridge Road, Bradley 30m south-west of Scheme boundary	Conditional Outline Permission – Nov 2017	No EIA but application is supported by environmental assessments in relation to noise, transport, arboriculture, ecology as well as a FRA.	A preliminary ecological appraisal was completed in support of the application. The site was found to be of value for badger, foraging and commuting bats, and is located adjacent to the River Colne, Kirklees Wildlife Habitat Network and Sir John Ramsden Canal LWS. Conditions were attached to the outline planning permission relating to the submission of an EcIA within the Landscape detail at reserved matters submission, in order to fully mitigate and compensate for impacts on ecological features. In view of the above, this development is not expected to result in any significant cumulative effects on IEF relevant to the Scheme during construction and operation.
4 – Colne Bridge and Battyeford	Strategic highway scheme	A62/A644 Wakefield Road (Cooper Bridge)	The junction of A62 Cooper Bridge/A644 Wakefield Road/A62 Leeds Road Within the Scheme boundary	Strategic Scheme	No information available.	The works are likely to include upgrades to existing highways and the development of a new link road between Bradley Junction and the A644 to the north of the Scheme. The proposed development is not located within any statutory or non-statutory designated nature conservation sites however may include areas located within the Kirklees Wildlife Habitat Network. Any impact on protected species would need to be adequately mitigated to comply with licensing requirements, and this would be expected to maintain the favourable conservation status of the species concerned. Based on the information available, no impacts on the mitigation for the Daubenton's roost associated with Colne Viaduct Underbridge (MVL3/109) (i.e. temporary relocation of this roost to beneath the A62 over the River Calder) are anticipated from this scheme. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
4 – Colne Bridge and Battyeford	Strategic housing scheme	Kirklees Local Plan Allocation HS11 – housing allocation for 1.460 dwellings with potential for a further 498 dwellings beyond the plan period	Land north of Bradley Road, Bradley 900m north-west of the Scheme		No information available.	This RFFP is located on land to the north of Bradley Road c.1km to the north-west of the Scheme. This area is predominantly comprised of Bradley Park Golf Couse and farmland to the west. The allocation is not located within any statutory or non-statutory designated nature conservation sites but is located directly adjacent to Bradley Wood LWS and Park Hill LWS. It also contains land within the Kirklees Wildlife Habitat Network and Habitats of Principal Importance. Impacts on ecological features are not known at this stage, but any impacts will need to be adequately mitigated in accordance with local and national planning policy and to comply with protected species licensing requirements, where necessary. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
6 – Ravensthorpe and Westtown	2017/94119	Demolition of existing building, erection of new building for educational classroom, cafe and toilets, upgraded access road, car parking, cycle parking, picnic and play areas.	Land off Sands Lane, Mirfield, WF14 Within the Scheme boundary	Conditional Full Permission – May 2018	No EIA but application is supported by a bat survey and FRA sequential test.	A preliminary bat roost assessment was completed in support of the application, which concluded that the building to be demolished had negligible suitability for roosting bats. This is a small-scale development located primarily on existing hardstanding and waste ground; impacts on habitats and species are likely to be minimal. It is not expected to result in any significant cumulative effects on IEF relevant to the Scheme during construction and operation.
6 – Ravensthorpe and Westtown	2017/90443	Erection of 3 units for B1 (light industrial) and B8 use, erection of two storey office building and alterations to existing building	Ratcliffe Mills, Forge Lane, Thornhill Lees, Dewsbury, WF12 9BU	Conditional Full Permission – Nov 2017	No EIA but application is supported by environmental assessments in relation to	This RFFP is located on land to the east of the Scheme and directly to the east of Forge Lane Quarry. This area is predominantly hardstanding but contains vegetation on the western boundary. No supporting ecological information has been provided with the application and there are no biodiversity related

Route Section	Planning Application ref.	Development description	Location	Planning status	RFFP environmental information	Potential cumulative effect
			Within the Scheme boundary		agriculture, transport as well as a FRA.	conditions. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
6 – Ravensthorpe and Westtown	2016/94241	Non-Material Amendment to previous permission 2007/91742 for erection of 7 terraced industrial units	Calder Bank Road, Thornhill Lees, Dewsbury, WF12 9QB Adjacent to Scheme boundary	NMA Approved – May 2017	No EIA but application is supported by environmental assessments in relation to contaminated land, flood risk, noise and drainage.	No ecological surveys were completed in support of this application, but this site has been subject to Extended Phase 1 Habitat survey as part of this ES submission due to its proximity to the Scheme. Construction is currently in progress and no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.
6 – Ravensthorpe and Westtown	2016/94118	Outline application for residential development	Land off Ravensthorpe Road, Dewsbury Within the Scheme boundary	Conditional Outline Permission – April 2017	No EIA but application is supported by environmental assessments in relation to contaminated land, ecology, arboriculture and transport. A conservation/heritage assessment and FRA have also been submitted.	A suite of ecological surveys was completed in support of the application, including a preliminary ecological appraisal, a hedgerow survey, breeding and wintering bird surveys, a preliminary bat roost assessment and bat activity surveys. The proposed development site is located in an area of intensively managed arable farmland with species-poor hedgerow field boundaries. The site was found to be of relatively low value for both breeding and wintering birds, with generally small numbers of individual bird species recorded and a bird assemblage typical of the geographic location and limited suite of habitats present. The site was also found to be of relatively low value for bats; no roosts were recorded, and low levels of bat foraging activity were recorded along hedgerow field boundaries, the vast majority of which was by common pipistrelle bats. Conditions were attached to the outline planning permission relating to the submission of an Ecological Design Strategy and a Landscape and Ecological Management Plan, in order to fully mitigate and compensate for impacts on ecological features. In view of the above, this development is not expected to result in any significant cumulative effects on IEF relevant to the Scheme during construction and operation.
6 – Ravensthorpe and Westtown	2016/94117	Outline application for 120 residential units at Lees Hall Road	Land off Lees Hall Road, Dewsbury 400m east of the Scheme boundary	Conditional Outline Permission	No EIA but application is supported by environmental assessments in relation to contaminated land, ecology and transport. A conservation/heritage assessment and FRA have also been submitted.	A suite of ecological surveys was completed in support of the application, including a preliminary ecological appraisal, a hedgerow survey, breeding and wintering bird surveys, a preliminary bat roost assessment and bat activity surveys. The proposed development site is located in an area of intensively managed arable farmland with species-poor hedgerow field boundaries. The site was found to be of relatively low value for both breeding and wintering birds, with generally small numbers of individual bird species recorded and a bird assemblage typical of the geographic location and limited suite of habitats present. The site was also found to be of relatively low value for bats; no roosts were recorded, and low levels of bat foraging activity were recorded along hedgerow field boundaries, the vast majority of which was by common pipistrelle bats. Conditions were attached to the outline planning permission relating to the submission of an Ecological Design Strategy and a Landscape and Ecological Management Plan, in order to fully mitigate and compensate for impacts on ecological features. In view of the above, this development is not expected to result in any significant cumulative effects on IEF relevant to the Scheme during construction and operation.
6 – Ravensthorpe and Westtown	2017/94080	Erection of precast concrete production unit, demolition of existing casting shed and ancillary buildings, associated site works to modify external storage areas and installation of gantry cranes – condition to vary plans and specs (2019/92570)	C R Longley And Co Ltd, Ravensthorpe Road, Thornhill Lees, WF12 9EF Within the Scheme boundary	Conditional Full Permission – July 2018 (approval of condition November 2019)	No EIA but application is supported by environmental assessments in relation to noise, air quality, ecology and transport. A conservation/heritage assessment and FRA have also been submitted.	A preliminary ecological appraisal, breeding bird survey and preliminary bat roost assessment were completed in support of the application; these concluded that the only potential ecological constraint to the proposed works was the presence of nesting birds. Given the existing industrial context of the site, any impacts on breeding bird habitat are likely to be minimal. Therefore, this proposed development is not expected to result in any significant cumulative effects on IEF relevant to the Scheme during construction and operation.

Route Section	Planning Application ref.	Development description	Location	Planning status	RFFP environmental information	Potential cumulative effect
6 – Ravensthorpe and Westtown	Strategic housing scheme	Kirklees Local Plan Allocation HS61 (Dewsbury Riverside) – housing allocation for 4000 units (1869 units during plan period, with potential for a further 2131 beyond the plan period).	Land off Ravensthorpe Road, Dewsbury Within the Scheme boundary		Dewsbury Riverside Masterplan document is available.	This RFFP is located on land to the south of the Scheme between Sands Lane in the west and land to the south of Ravensthorpe Road in the east. This area is predominantly farmland (mixture of arable fields and improved pasture with hedgerow field boundaries), but also contains areas of mature woodland, such as Lady Wood. The allocation is not located within any statutory or non-statutory designated nature conservation sites but is located directly adjacent to Jordan Wood and Oliver Wood LWS. The Kirklees Wildlife Habitat Network is also located within the allocation site. Impacts on ecological features are not known at this stage, but any impacts will need to be adequately mitigated in accordance with local and national planning policy and to comply with protected species licensing requirements, where necessary. The allocation document states a requirement for habitats, green infrastructure and a landscape buffer along the southern boundary within any forthcoming masterplan. In view of this, no significant cumulative effects are anticipated on IEF relevant to the Scheme during construction and operation.

9.8.7 It is anticipated that any developments brought forward will be subject to National and Local Policy as well as legislative requirements and application of best practice measures will be required to ensure that mitigation and control measures are adopted during construction and operation of the projects.