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Worsbrough Solar

Ecological Impact Assessment

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Worsbrough Solar

Ecological Impact Assessment

0733950



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ACRONYMS AND ABBREVIATIONS

Acronym	Description
ACIEEM	Associate Member of the Chartered Institute of Ecology and Environmental Management
ASNW	Ancient Semi-Natural Woodland

Acronym	Description
BAT	Best Available Techniques
BBRC	Barnsley Biological Records Centre
BBS	Breeding Bird Survey
BoCC	Birds of Conservation Concern
BTO	British Trust for Ornithology
CBC	Common Bird Census
CEMP	Construction and Environment Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
DBW	Daytime Bat Walkover
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
eDNA	Environmental DNA
EPSML	European Protected Species Mitigation Licence
ERM	Environmental Resources Management
GCN	Great Crested Newt
GLTA	Ground Level Tree Assessment
HPI	Habitats of Principal Importance
ha	Hectare
HSA	Habitat Survey Area
HSI	Habitat Suitability Index
IEF	Important Ecological Feature
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
km	Kilometre
kW	Kilowatts
LBAP	Local Biodiversity Action Plan
LDC	Lawful Development Certificate
LEMP	Landscape and Ecological Management Plan
LNR	Local Nature Reserves
LWS	Local Wildlife Site
m	Metres
MAGIC	Multi-Agency Geographic Information for the Countryside
NERC	Natural Environment and Rural Communities Act
NLMS	Non-Licensed Method Statement
NSN	National Site Network

Acronym	Description
OMH	Open Mosaic Habitat
PEA	Preliminary Ecological Appraisal
PRA	Preliminary Roost Assessment
PRF	Potential Roost Feature
PV	Photovoltaic
RPZ	Root Protection Zone
SAC	Special Area of Conservation
SPA	Special Protection Area
SPI	Species of Principal Importance
SPP	Species Protection Plan
SSSI	Site of Special Scientific Interest
TN	Target notes
UK	United Kingdom
UKHAB	UK Habitat Classification
UV	Ultra-violet
WWTW	Wastewater Treatment Works
ZoI	Zone of Influence

1. INTRODUCTION

Environmental Resources Management Limited (ERM) was commissioned by Downing Energy Development Company Limited (the Applicant) to complete an Ecological Impact Assessment (EcIA) in connection with a proposed ground mounted solar photovoltaic (PV) system (the Proposed Development) within land at Worsbrough Wastewater Treatment Works (WWTW) near Barnsley (the Site).

This EcIA report has been completed in accordance with current professional guidance[1] and details the approach and methods to identify and describe potentially significant effects that could arise from the Proposed Development; as well as (i) recommendations to avoid, mitigate and compensate for potentially significant effects, and (ii) opportunities for biodiversity enhancement.

This EcIA report is provided in support of an application to Barnsley Metropolitan Borough Council to obtain a Certificate of Lawful Development (CoLD) for the Proposed Development.

1.1 SITE DESCRIPTION

The Site comprises a 1.4 ha portion of land within Yorkshire Water's landholding at Worsbrough WWTW, within an area that has been in operational use since the land was acquired in 2007. The Site is located at Ordnance Survey National Grid Reference (OS NGR) SE 36424 03482; as shown on **Figure 1, Appendix A**.

The Site is not accessible to the public, and is under sole control of the Applicant, with access to the Site managed through a locked gate within Worsbrough WWTW. The Site has previously accommodated infrastructure and assets relating to the operational WWTW.

Based on a review of aerial imagery and mapping, the Site primarily supports open grassland, scattered scrub and individual trees. The Site is bounded by hedgerows and trees to the north and east; and the River Dove to the south. Worsbrough WWTW overlaps with the western extent of the Site. There are no watercourses or waterbodies within the Site; although a stocked fishery is located to the east of the Site at Lewden Springs.

The Site adjoins the urban fringe of Worsbrough with local roads, residential properties and private gardens present to the north and west. Land to the south of the Site, beyond the River Dove, contain more extensive areas of grassland, woodland and arable fields.

1.2 DEVELOPMENT DESCRIPTION

The Applicant is seeking to construct and operate a 700 kW photovoltaic (PV) solar array at the Site; as shown **on Figure 1, Appendix A.** The Proposed Development would include a fixed racking solar array with solar-mounted inverters, solar-mounted transformers, CCTV system, palisade fence, access track, grid connection and temporary works area. The power generated by the Proposed Development would be utilised by the Applicant to power the operations of the

[1] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: terrestrial, Freshwater, Coastal and Marine version 1.3*. Chartered Institute of Ecology and Environmental Management, Winchester.

WWTW. Very occasionally, any excess power produced by the Proposed Development may be exported to the grid by the Application.

The construction period for the Proposed Development would last approximately 8 – 10 weeks. The Proposed Development would result in temporary traffic increases during the construction period; however, once operational, only limited maintenance will be required. Site access will be gained from existing WWTW access on Edmunds Road.

Maintenance will be undertaken by the Applicant's operational staff as part of the wider routine maintenance programme for the Site. The lifetime of the Proposed Development is 25 years, following which the Proposed Development would be decommissioned in line with relevant planning-related requirements.

1.3 PREVIOUS STUDIES

Previous ecological surveys were completed on the Site in 2020 and 2022, and the following reports were reviewed as part of the desk study:

- Preliminary Ecological Appraisal (PEA) Report[2];
- Worsbrough environmemtal DNA (eDNA) Survey Results Letter Report[3];
- Worsbrough – Badger, Ground Level Tree Roost Assessment (GLTA) and Breeding Bird Survey Report[4]; and,
- Worsbrough Further Ecological Survey Report[5].

[2] BL Ecology (2020) *Solar PV site screening project, site 49 – Worsbrough treatment works, preliminary ecological appraisal report.* BL Ecology, Clayton
[3] RSK (2022) *Worsborough Treatment Works GCN eDNA Letter Report*. RSK Biocensus, Leeds.
[4] RSK (2022) *2483510 – Yorkshire Water Solar Sites – Worsbrough – Badger GLTA and Breeding Bird Survey Report*. RSK Biocensus, Leeds.
[5] RSK (2023) *Worsbrough Treatment Works – Further Ecological Survey Report*. RSK Biocensus, Leeds.

2. LEGISLATION, POLICY AND GUIDANCE

The principal nature conservation legislation that is considered relevant to this assessment includes:

- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (otherwise known as the 'Ramsar Convention')[6];
- Directive 2009/147/EC on the conservation of wild birds (otherwise known as the 'Birds Directive')[7];
- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (otherwise known as the 'Habitats Directive')[8];
- The Conservation of Habitats and Species Regulations 2017 (as amended in England)[9]
- The Wildlife and Countryside Act 1981 (as amended in England)[10];
- The Environment Act 2021[11];
- The Hedgerows Regulations 1997[12]; and,
- The Natural Environment and Rural Communities (NERC) Act 2006[13].

The principal planning policies relating to biodiversity that are considered relevant to this assessment includes:

- National Planning Policy Framework[14];
- UK Post-2010 Biodiversity Framework[15];
- Barnsley Metropolitan Borough Council Local Plan[16]; and,
- Barnsley Local Biodiversity Action Plan[17].

[6] JNCC (2019) The Ramsar Convention [Online] Available at: Ramsar Convention | JNCC - Adviser to Government on Nature Conservation. Accessed: 25/11/2024.
[7] The Birds Directive [Online] Available at: Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. Accessed: 25/11/2024.
[8] European Commission (1992) Council Directive 92/43/EEC the Conservation of Natural Habitats and of Wild Fauna and Flora. [Online] Available at: eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN. Accessed: 25/11/2024.
[9] The Conservation of Habitats and Species Regulations (Amendment) (EU Exit) Regulations 2019 [Online] Available at: The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Accessed at: 25/11/2024.
[10] The Wildlife and Countryside Act 1981 (as amended) [Online] Available at: http://www.legislation.gov.uk/ukpga/1981/69. Accessed: 25/11/2024.
[11] The Environment Act 2021 [Online] Available at: Environment Act 2021. Accessed: 25/11/2024.
[12] The Hedgerow Regulations 1997 [Online] Available at: The Hedgerows Regulations 1997. Accessed: 25/11/2024.
[13] Natural Environment and Rural Communities (NERC) Act 2006 [Online] Available at: Natural Environment and Rural Communities Act 2006. Accessed: 25/11/2024.
[14] Department for Levelling up, Housing and Communities (December 2023) National Planning and Policy Framework [Online] Available at: National Planning Policy Framework. Accessed: 25/11/2024.
[15] Four Countries Biodiversity Group (2010) UK Post -2010 Biodiversity Framework [Online] Available at: UK Post-2010 Biodiversity Framework (jncc.gov.uk). Accessed 25/11/2024.
[16] Barnsley Metropolitan Borough Council (2019) Barnsley Local Plan (adopted January 2019) [Online] Available at: Local Plan. Accessed: 25/11/2024.
[17] Barnsley Biodiversity Trust (2010). *Barnsley Biodiversity Action Plan*. [Online] Available at: Barnsley Biodiversity Action Plan. Accessed 25/11/2024.

In addition to these documents, the following guidance was used to inform this EcIA:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine[1];
- UK Habitat Classification Version 2.0[18];
- Great crested newt mitigation guidelines[19];
- Reptile Survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation[20];
- Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus*) environmental DNA[21];
- Monitoring the otter (*Lutra lutra*)[22];
- Common Bird Census (CBC) instructions[23]; and,
- Birds of Conservation Concern (BoCC): the population of birds in the United Kingdom[24].

[18] UKHab Limited (2023) *UK Habitat Classification Version 2.0*. UKHab Ltd, Stockport. [Online] Available at: http://www.ukhab.org/. Accessed: 30/10/2024.
[19] English Nature (2001) *Great crested newt mitigation guidelines.* English Nature, Peterborough.
[20] Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.* Froglife Advice Sheet 10. Froglife, Halesworth.
[21] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffith Ram Foster J, Wilkinson J, Arnett A, Williams P, and Dunn (2014). *Analytical and methodological development for improved surveillance of the Great Crested Newt, Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA*. Freshwater Habitats Trust, Oxford.
[22] Chanin and Smith (2003) *Monitoring the otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No 10.* Peterborough, UK.
[23] Marchant, J. (1983) *Common Birds Census Instructions*. British Trust for Ornithology, Thetford.
[24] Stanbury, A.J., Eaton, M.A., Aebischer, N.J., Balmer, D., Brown, A.F., Douse, A., Lindley, P., McCulloch, N., Noble, D.G. & Win, I. (2021). *The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain*. British Birds 114, 723-747.

3. METHODOLOGY

The following sections detail the approach and methods in relation to desk study, field surveys and impact assessment.

3.1 DESK STUDY

Natural England's Multi Agency Geographic Information for the Countryside (MAGIC)[25] was consulted in July 2024 to identify the presence of:

- statutory designated sites within 2 km of the Site including Ramsar sites, Special Areas of Conservation (SAC), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR);
- ancient woodlands within 500 m of the Site;
- habitats of principal importance within 500 m of the Site; and,
- European Protected Species Mitigation Licences (EPSML) issued by Natural England within 2 km of the Site.

Records from Barnsley Biological Records Centre (BBRC) were obtained in July 2024 via Yorkshire Water's Service Level Agreement to identify the presence of protected and priority species, as well as locally important sites, within 2 km of the Site.

Aerial imagery and OS mapping was reviewed to identify any potential semi-natural habitats or features that could support protected and priority species, including a specific search to identify waterbodies and watercourses within at least 250 m of the Site.

In addition, reports describing the findings of previous ecological surveys in relation to the Proposed Development were reviewed to identify the presence of protected and priority habitats and species at the Site. This included a review of the following:

- Preliminary Ecological Appraisal (PEA) Report[26];
- Worsbrough environmental DNA (eDNA) Survey Results Letter Report[27];
- Worsbrough Badger, Ground Level Tree Roost Assessment (GLTA) and Breeding Bird Survey Report[28]; and,
- Worsbrough Further Ecological Survey Report[29].

For the purpose of this assessment, a 2 km search radius was considered an appropriate Zone of Influence (ZoI) based on the limited scope, scale and complexity of the Proposed Development, prevailing habitats understood to be within and adjoining the Site and professional judgement.

[25] Multi Agency Geographic Information for the Countryside (MAGIC) [Online] Available at: Magic Map Application. Accessed: 30/10/2024.
[26] BL Ecology (2020) *Solar PV site screening project, site 49 – Worsbrough treatment works, preliminary ecological appraisal report.* BL Ecology, Clayton.
[27] RSK (2022) *Worsborough Treatment Works GCN eDNA Letter Report*. RSK Biocensus, Leeds.
[28] RSK (2022) *2483510 – Yorkshire Water Solar Sites – Worsbrough – Badger GLTA and Breeding Bird Survey Report*. RSK Biocensus, Leeds.
[29] RSK (2023) *Worsbrough Treatment Works – Further Ecological Survey Report*. RSK Biocensus, Leeds.

3.2 FIELD SURVEYS

The geographic extent of field surveys was determined using zones of influence established in current good practice guidelines; as well as professional judgement based on the nature of potential impacts that could arise from the Proposed Development. All the surveys were led by professional ecologists of at least of capable level experience, based on the Chartered Institute of Ecology and Environmental Management (CIEEM) competency framework.

3.2.1 PRELIMINARY ECOLOGY WALKOVER

An ecology walkover survey was completed by ERM Managing Technical Consultant Monica Wood ACIEEM on 23 July 2024. The purpose of this survey was to identify and map accessible habitats within and up to 50 m from the Site (the Habitat Survey Area); in accordance with the UK Habitat Classification (UKHab). The DAFOR scale was used to describe the abundance of floral species. Target Notes (TN) were recorded for features of interest; and normally accompanied by a grid reference and site photograph. The nomenclature of vascular plants follows Stace (2019)[30].

In addition, ecological features within the Habitat Survey Area were also assessed for their suitability to support protected and priority species including bats, badger (*Meles meles*), reptiles, amphibians, otter (*Lutra lutra*), water vole (*Arvicola amphibious*) and breeding birds. Evidence of protected and priority species encountered during the survey were recorded as target notes; to help inform the need for further surveys.

The Habitat Survey Area is shown on **Figure 2**, **Appendix A**.

In addition, the presence of invasive non-native species (INNS) including (but not limited to) giant hogweed (*Heracleum mantegazzianum*), Indian balsam (*Impatiens glandulifera*) and Japanese knotweed (*Reynoutria japonica*) encountered during the habitat survey were noted; to help inform the need for further survey and/or management.

3.2.2 BATS

A Daytime Bat Walkover (DBW) survey was completed by ERM Managing Technical Consultant Monica Wood ACIEEM on 23 July 2024, which was undertaken concurrently with the habitat survey. The purpose of this survey was to identify the suitability of potential roosting, foraging and commuting bat habitats within the Habitat Survey Area; in accordance with Collins (2023)[31] and as described in Table 4.1.

This included Ground-Level Tree Assessment (GLTA) within the Site to identify and classify the suitability of Potential Roost Features (PRFs), as described in Table 4.2.

Surveyors visually assessing features that could be utilised by roosting bats using a high-powered torch and binoculars to determine the suitability of PRFs. For buildings, this included appraising gaps around brickwork, windows, doors, roofing tiles and flashing. For trees, this included appraising knot holes, broken limbs, hollows, cavities and woodpecker holes.

[30] Stace, C (2019). *New Flora of the British Isles 4th edition*. UK. Cambridge University Press.
[31] Collins, J. (ed.) (2023) *Bat Surveys for Professional Ecologists: Good Practice Guidelines. 4th edition*. The Bat Conservation Trust, London.

TABLE 4.1 GUIDELINES FOR ASSESSING THE SUITABILITY OF BAT HABITATS

Suitability	Roosting Habitats (Structures)	Commuting and Foraging Habitats
None	No habitat features on site are likely to be used by any roosting bats at any time of the year.	No habitat features on site likely to be used by any foraging and commuting bats at any time of the year.
Negligible	No obvious habitat features likely to be used by roosting bats; however, a small uncertainty remains as bats can use small and apparently unsuitable features on occasion.	No obvious habitat features likely to be used by commuting or foraging bats; however, a small element of uncertainty remains in order to account for non-standard bat behaviour.
Low	A structure with one or more potential roost sites that could be used by the individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions, and/or suitable surrounding habitat to be used regularly or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).	Habitat that could be used by small numbers of commuting bats such as fragmented hedgerows or an unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by another habitat. Suitable, but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting, such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

Taken from Table 4.1 in Collins (2023)[31].

TABLE 4.2 GUIDELINES FOR CATEGORISING THE POTENTIAL SUITABILITY OF PRFS

Suitability	Description
PRF-I	PRF is only suitable for individual bats or very small number of bats either due to size or lack of suitable surrounding habitats
PRF-M	PRF suitable for multiple bats and may therefore be used by maternity colony
Taken from Table 6.2 in Collins (2023)[31].	

3.2.3 GREAT CRESTED NEWT

3.2.3.1 HABITAT SUITABILITY INDEX (HSI) ASSESSMENT

Whilst great crested newt may utilise suitable terrestrial habitats up to 500 m from their breeding sites[19], research indicates that most animals are typically encountered within approximately 100 m of their breeding site: with a notable decrease in abundance beyond 200-250 m from their breeding site[32]. Therefore, 250 m was considered an appropriate ZoI for great crested newt.

Therefore, all accessible waterbodies within at least 250 m of the Site were subject to a Habitat Suitability Index (HSI) assessment on 19 June 2024 and 27 June 2024 (the GCN Survey Area), which was undertaken by Managing Technical Consultant Hannah Newton ACIEEM under a valid Natural England Class 1 (CL08) Survey Licence. The purpose of this survey was to verify the presence of waterbodies within the GCN Survey Area and assess their suitability to support breeding great crested newts; in accordance with Oldham *et al*. (2000)[33]. The GCN Survey Area is shown on **Figure 3**, **Appendix A**.

The HSI assessment is a quantitative predictor of habitat suitability for great crested newt that delivers a numerical index between 0 and 1, determined from an assessment of ten habitat variables known to influence the presence of great crested newt including: geographic location, waterbody size, waterbody permanence, water quality, presence of predatory fish and wildfowl, availability of suitable aquatic, marginal and terrestrial habitat; as well as pond density. The suitability of each waterbody was then classified as Poor, Below Average, Average, Good and Excellent as described in ARG UK guidance[34] and shown in **Table 4.3**.

[32] Natural England (2004) *An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt (ENRR576)*. Available from: http://publications.naturalengland.org.uk/publication/134002. Accessed: 29/11/2024.
[33] Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000) 'Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus)'. *Herpetological Journal* 10(4), 143-155. Accessed: 29/11/2024.
[34] ARG UK. (2010) *Great Crested Newt Habitat Suitability Index: Amphibian and Reptile Groups of the United Kingdom ARG UK Advice Note 5* [online]. Available from: https://www.arguk.org/. Accessed: 29/11/2024.

TABLE 4.3 CATEGORISATION OF HSI SCORES

HSI Score	Pond Suitability
<0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
>0.8	Excellent

Taken from ARG UK[34]

3.2.3.2 ENVIRONMENTAL DNA SURVEYS

All accessible waterbodies within the GCN Survey Area found to contain water were subject to an environmental DNA (eDNA) survey on 19 June 2024 and 27 June 2024. This was undertaken by Managing Technical Consultant Hannah Newton ACIEEM under a valid Natural England Class 1 (CL08) Survey Licence, and concurrently with the HSI assessment.

The eDNA survey involved water samples being collected and tested for the presence of great crested newt DNA, in accordance with current guidelines[21], which would indicate that the species is present within a waterbody.

Using sterile sample kits provided by an accredited laboratory, a total of 20 water samples were collected from the margins around each waterbody between 15 April and 30 June, to coincide with the great crested newt breeding season. The location of samples was spaced evenly around the margin, targeting areas where vegetation suitable for use as egg laying material was present. At each sampling point, the water column was mixed gently using a sterile ladle, taking care not to disturb sediments on the bottom of the waterbody, to minimise potential loss or degradation of any great crested newt DNA that may be present. Water sample was placed and combined into a sterile whirl bag. Once all 20 water samples were collected, the whirl bag was vigorously shaken for ten seconds so that any potential great crested newt DNA was suitably mixed. A pipette was then used to add the water samples to sterile tubes containing ethanol to preserve any DNA present. Each tube was then mixed for a further ten seconds to prevent any potential degradation of great crested newt DNA. Preserved samples were then stored at a cool ambient temperature until they were returned to an accredited laboratory for analysis through quantitative Polymerase Chain Reaction (qPCR) testing.

3.2.4 OTTER

An otter survey was completed by ERM Managing Technical Consultant Hannah Newton ACIEEM on 06 June 2024. The purpose of this survey was to assess the suitability of wetland habitats and their immediate surroundings within and up to 200 m from the Site to support foraging

and commuting otter (the Otter Survey Area); using an approach adapted from Chanin (2003)[22]. The Otter Survey Area is shown on **Figure 4**, **Appendix A**.

In addition, a systematic search was undertaken to identify habitat features within the Otter Survey Area that could be used by otter for shelter or protection, and classified according to Harris and Yalden (2008)[35]:

- Holt: an underground feature that can be situated in natural cavities or specifically dug by an individual. Normally in frequent use by otter, with an abundance of spraints and prints at the entrance, although non-breeding individuals may utilise a network of holts as they move through their territory. Breeding typically occurs in holts with extensive tunnel-systems and chambers where cubs are raised; and
- Couch: an above ground feature regularly used by otter for resting, normally characterised by vegetation that has been pulled up and flattened by an individual into a nest. Specially constructed covered couches can be used for breeding.

It is understood from previous site assessments that bankside areas to the River Dove and Blacker Dike (both within the Otter Survey Area) are unsafe to access due to tall vegetation obscuring footings; as well as steep sloping banksides and vertical drops above deep water. Therefore, the habitat assessment was supplemented by the deployment of trail cameras positioned as close as possible to the sections of the River Dove that adjoin the Site; as well as additional locations upstream and downstream of the Site.

In total, five trail camera were deployed on 06 June 2024 and left to monitor continuously for a period of consecutive 21 days, which is considered sufficient to detect the presence of any otter that may be regularly utilising habitats within the Otter Survey Area. The location of each trail camera is shown on **Figure 4, Appendix A**. Footage was subsequently reviewed to identify species.

3.2.5 REPTILES

A reptile survey was undertaken at the Site by ERM Managing Technical Consultants Hannah Newton ACIEEM, Monica Wood ACIEEM and Callum Gilhooley ACIEEM in accordance with Froglife (1999)[20], which recommends artificial refugia is deployed at a minimum density of 5-10 refugia per ha, based on each refugia being approximately 0.5 m^2 in size.

On the basis that the Site is approximately 1.4 ha in size, a total of 20 artificial refugia, each comprising a 0.25 m^2 square of bitumen roofing felt, were deployed at the Site so that the minimum density could be achieved. Each refugia was positioned in reptile 'hotspots' to increase the potential for reptile species to be detected (e.g. sunny areas where short vegetation or bare ground is in close proximity to cover). The extent of the reptile survey is shown on **Figure 5**, **Appendix A**.

Refugia was deployed on 06 June 2024 and left to 'bed in' to the vegetation for at least one month. As recommended by Froglife (1999), a total of seven visits were completed during July and August 2024. Each visit was scheduled to be completed when air temperatures were forecast to be between 9°C and 18°C, with no heavy rain or high wind. Conditions during each survey visit are summarised in Table 4.3. During each visit, surveyors moved slowly between

[35] Harris, S., and Yalden, D.W. (2008) Mammals of the British Isles; Handbook (4th edn) . Southampton, Mammal Society

each refugia, visually scanning other 'hotspots' for reptiles and sloughs within intervening areas. Upon approach to each refugia, surveyors visually scanned the top of the refugia and the adjoining vegetation to check for evidence of reptiles. Refugia was then lifted by hand to check for any reptiles that could be underneath. Care was taken to replace the refugia as it was found before moving on to the next refugia.

TABLE 4.4 REPTILE SURVEY INFORMATION

Visit	Date	Start Time	Weather Conditions
1 of 7	23/07/2024	09:40	Temperature (ºC): 18 Cloud Cover (Oktas): 7/8 Wind (Beaufort): 2 Precipitation: None
2 of 7	25/07/2024	08:32	Temperature (ºC): 19 Cloud Cover (Oktas): 7/8 Wind (Beaufort): 1 Precipitation: None
3 of 7	30/07/2024	09:00	Temperature (ºC): 19 Cloud Cover (Oktas): 2/8 Wind (Beaufort): 1 Precipitation: None
4 of 7	01/08/2024	09:20	Temperature (ºC): 17 Cloud Cover (Oktas): 6/8 Wind (Beaufort): 1 Precipitation: Rained prior to survey but waited for dry window plus about 15 minutes after rain stopped prior to commencing survey.
5 of 7	06/08/2024	08:50	Temperature (ºC): 17 Cloud Cover (Oktas): 4/8 Wind (Beaufort): 1 Precipitation: None

Visit	Date	Start Time	Weather Conditions
6 of 7	08/08/2024	08:38	Temperature (ºC): 18 Cloud Cover (Oktas): 2/8 Wind (Beaufort): 1 Precipitation: None
7 of 7	13/08/2024	09:00	Temperature (ºC): 18 Cloud Cover (Oktas): 3/8 Wind (Beaufort): 2 Precipitation: None

3.2.6 BREEDING BIRD SURVEY

A breeding bird survey (BBS) was completed between May and July 2024 within the Site and immediate surrounds. Survey visits were completed by ERM sub-contractor and experienced ornithologist Chris Gomersall, with ERM oversight provided by Consulting Senior Associate Will Scott, an experienced ornithologist and qualifying member of CIEEM.

The BBS was adapted from the British Trust for Ornithology's (BTO) method for the Common Bird Census (CBC)[23]. This involved the surveyors slowly walking throughout the Site and immediate surrounds (where accessible) recording all birds encountered (both seen and heard), including behavioural observations where applicable.

Additionally, surveyors played the vocalisations of willow tits at regular intervals to determine the species' presence within the Site and immediate surrounds. This followed the latest multistakeholder guidance[36].

All surveys were carried out in the morning and lasted for up to three hours. Surveys were carried out during periods of good weather, avoiding precipitation, strong winds or high temperatures; as summarized in Table 4.5.

TABLE 4.5 WEATHER DATA FOR BBS

Date	Time	Wind*	Cloud**	Rain
16/05/2024	05:45-09:00	1 N	8	None
31/05/2024	07:00-09:30	3 NNW	8-7	None
05/07/2024	06:00-08:30	2 W-WSW	4-7	None

[36] RSPB, Natural England, NRW, RBBP and Welsh Ornithological Society (2020) *Willow Tit National Survey Methods* [Online] Available at: Microsoft Word - WT survey methods 2020 Nov19 (H&S). Accessed: 25/11/2024.

Date	Time	Wind*	Cloud**	Rain
19/07/2024	06:00-09:00	1 SSW	3-4	None

**Wind: Strength according to Beaufort scale, direction per 16-point compass*

***Cloud: in eighths, 1/8, 2/8, etc.*

3.2.6.1 BREEDING BIRD SURVEY DATA ANALYSIS

Data analysis focused on identifying species of conservation importance, which included any bird species matching one or more of the following criteria:

- Annex I listed species on the Birds Directive[7];
- Schedule 1 listed species on the Wildlife and Countryside Act 1981 (as amended)[10];
- The UK BoCC Red or Amber list[24]; and,
- Species of Principal Importance (SPI) listed on the NERC Act, 2006[13].

To analyze the BBS data, all registrations from the field maps of birds of conservation importance were transferred to produce 'species summary maps' from which the number and distribution of likely territories for each species could be determined. The method was based on Bibby *et al.* (2005)[37], with an element of professional judgement.

A precautionary approach was taken, and a bird was deemed to be breeding or holding territory if a pair was observed in suitable habitat, or an individual was recorded singing or exhibiting other behaviour indicative of breeding during two of the four BBS visits.

3.3 LIMITATIONS

Surveyors were provided with full access to the Site; however, access to the southern extent of the survey area, south of the River Dove was not possible due to dense vegetation and the extensive presence of hemlock. Furthermore, surveyors did not always have access to the 50 m buffer in the north and east of the survey area, as this was beyond the landholding of Yorkshire Water. Where possible, habitats on the 50 m buffer were visually assessed from adjoining areas and supplemented by aerial imagery. Therefore, habitats within the Site, and within 50 m of the Site were able to be broadly assessed and provided with a UK Hab Classification, therefore this is not considered a significant limitation.

Whilst reptile survey guidelines[20] recommend the use of artificial refugia that is 0.5 m² in size, it acknowledges that refugia that is smaller in size is still effective in detecting reptiles provided that the refugia is left undisturbed. Habitats encountered within the Site were found to be more overgrown than anticipated, particularly the southern extent of the Site. As well as limiting surveyor access, dense vegetation also reduced the suitability of habitats for reptiles and – as a result – reduced the reptile survey extent. Therefore, a total of 20 artificial refugia, each 0.25 m^2 in size, were deployed in the northern extent of the Site to increase the detectability of reptiles in accessible areas; and still complies with the minimum density of 5-10 per hectare at 0.5 m^2. Therefore, the use of smaller artificial refugia is not considered a significant limitation.

[37] Bibby et al (2005) *Bird Census Techniques – Second Edition* Academic Press, London, England.

Reptile visits two and three, completed on 25 July 2024 and 30 July 2024 respectively, were undertaken in temperatures above 18ºC, with temperatures being recorded at 19ºC on both days. Though the temperature was 1ºC above the guideline limits for surveys, weather conditions were dry and calm, and surveys were undertaken in suitable weather conditions, this coupled with the fact that a grass snake was recorded during the survey on 25 July 2024, confirms this is not a significant limitation.

Typically, willow tit surveys involving playback are carried out during the pre-breeding season when the species is territorial. The surveys at Worsbrough started later in the breeding season, so whilst not earlier in the season, they were still undertaken in the timings when willow tit could be detected; therefore, this is not considered a significant limitation.

BBS guidance states that surveys should commence between half an hour before sunrise and half an hour after sunrise, finishing mid-morning. However, surveys started between 45 minutes and 2.3 hours after sunrise and finished mid-morning due to the fact that surveyors needed to be accompanied by a member of Yorkshire Water staff and so it was not possible to facilitate an earlier start time. To account for this, surveyors spent longer on Site to ensure that the data was an accurate reflection of the species present. Guidance also recommends six visits, though four visits were carried out, but due to the small size of the Site this does not impact the robustness of the data collected. Therefore, this is not considered a significant limitation.

Five camera traps were deployed; however, camera five, which was the most downstream camera trap placed on the River Dove, was not recovered and assumed stolen. However, there were three other camera traps placed upon the River Dove, camera traps 1, 2 and 4; therefore, activity levels within the River Dove could still be accurately recorded and this is not considered a significant limitation.

Due to the presence of dense vegetation, it was not possible to fully access the line of poplar trees within the Site; however, a visual assessment could be completed from adjoining areas. A precautionary approach was taken to assessing the suitability of roosting habitats, taking cognisance of previous survey findings and site observations.

Based on a review of aerial imagery, OS mapping and previous survey findings, a total of 12 waterbodies were identified within the GCN Survey Area. Of these, surveyors were permitted access to six waterbodies for the purpose of completing the HSI assessment and eDNA survey. This included P2, P4, P5, P6, SuDS and Soakaway. An HSI assessment of the remaining waterbodies was undertaken based on previous survey findings and a review of aerial imagery to identify pond suitability; and characterize potential impacts on great crested newt. Therefore, a precautionary approach was taken in developing the mitigation strategy in relation to great crested newt.

3.4 ECOLOGICAL IMPACT ASSESSMENT

The methodology used to assess effects on ecology and nature conservation has been assessed using current CIEEM guidelines for EcIA. The assessment involved:

- identifying important ecological features (IEFs) that may be affected by the Proposed Development based on the Desk Study and Field Surveys;

- setting out embedded mitigation inherent to the Proposed Development such as good practice, requirements for legal compliance and design measures;
- predicting likely impacts (actions resulting in changes to an ecological feature) and assessing resultant effects (outcome resulting from an impact upon the conservation status or structure and function of an ecological feature) arising from construction and operation;
- setting out specific mitigation and compensatory measures to avoid potentially significant effects on IEFs;
- identifying enhancement measures that would improve biodiversity at the Site; and,
- assessing residual effects (predicted to remain after the implementation of mitigation, compensation and enhancement measures) of the Proposed Development.

Based on current CIEEM guidelines for EcIA, the assessment of likely significant and residual effects categorises effects as *significant* or *not significant* and quantifies them in relation to the *geographic scale at which the effect is significant*. This depends on the likely severity and spatial scale of effects, the level at which the integrity of an ecological receptor will likely be affected, and whether the effects will likely result in a temporary or more permanent long-term effect on the extent, size or integrity of a site, habitat, species assemblage or community, population, or group. Additional information relating to impact characteristics are presented in **Appendix B**.

Legal protection is considered separately from value. The protection of a particular ecological feature through international or national legislation does not mean that the feature is of international or national importance. For example, badgers and their setts are protected under national legislation, the Protection of Badgers Act (1992)[38], but this does not mean that the presence of a badger sett is of national importance. Where present, legally protected species are included in the mitigation strategy so that the Applicant can comply with relevant legislation.

[38] HM Government (1992). Protection of Badgers Act 1992. Available at: https://www.legislation.gov.uk/ukpga/1992/51/contents. Accessed: 30/07/24.

4. BASELINE CONDITIONS

4.1 DESK STUDY

4.1.1 DESIGNATED SITES

The data search returned no NSN sites within 2 km of the Site. There are two nationally designated sites within 2 km of the Site: Dearne Valley Wetlands SSSI and Worsbrough Country Park LNR.

Six Local Wildlife Sites (LWS) are present within 2 km of the Site, the nearest of which is Barrow Colliery LWS, situated approximately 166 m west of the Site.

The position of these sites relative to the Site are shown on **Figure 6, Appendix A**, with further information on these sites, and their reason for designation shown on Table 6.1.

TABLE 6.1 SUMMARY OF DESIGNATED SITES WITHIN 2 KM OF THE SITE

Site	Designation	Minimum Distance and Direction from the Site	Qualifying Features
Dearne Valley Wetlands	SSSI	169 m southwest of the Site	Dearne Valley Wetlands SSSI is of special interest for the following nationally important features: • Breeding gadwall (*Mareca strepera*), shoveler (*Spatula clypeata*), garganey (*Spatula querquedula*), pochard, bittern (*Botaurus stellaris*), black-headed gull (*Chroicocephalus ridibundus*) and willow tit. • Non-breeding gadwall and shoveler. • Diverse assemblages of breeding birds of lowland damp grasslands, lowland scrub, and a mixed assemblage of lowland open waters and their margins and lowland fen.
Worsbrough Country Park	LNR	155 m west of the Site	Site dominated by a large reservoir, with associated willow (*Salix spp.,*) carr, woodland and reedbeds. The reservoir attracts good numbers of wintering wildfowl such as pochard (*Aythya ferina*) and goosander (*Mergus merganser*). Other species include willow tit

Site	Designation	Minimum Distance and Direction from the Site	Qualifying Features
			(*Poecile montanus klienschmidti*), great spotted woodpecker (*Dendrocopos major*) and kingfisher (*Alcedo atthis*). The meadows support a several wildflowers and butterflies.
Barrow Colliery	LWS	166 m west of the Site	Designated due to grassland, running water, open water, hedgerow, young plantation, and lowland heathland habitats. Also noted for orchids (*Dactylorhiza sp.,*), breeding birds and invertebrates.
Wombwell Wood	LWS	434 m southeast of the Site	Designated due to woodland, scrub, standing water and running water. Also noted for woodruff (*Galium odoratum*), breeding birds and rock exposures.
Bell Bank Wood and Wolley Bank Wood	LWS	625 m west of the Site	Features unknown.
Worsbrough Reservoir	LWS	1.09 km west of the Site	Designated due to standing water, running water, fen woodland, swamp, scrub and grassland habitats. Also noted for breeding birds, wintering birds, passage birds, bats, invertebrates and touch-me-not balsam (*Impatiens noli-tangere*).
Short Wood and Hay Green	LWS	1.34 km southwest of the Site	Designated due to woodland, acid grassland, neutral grassland, standing water and running water habitats. Also noted for Dyer's greenweed (*Genista tinctoria*), pink purslane (*Monia sibirica*), yellow

Site	Designation	Minimum Distance and Direction from the Site	Qualifying Features
			rattle (*Rhinanthus minor*), and viper's bugloss (*Echium vulgare*).
Swaithe Flood Meadows	LWS	1.41 km northeast of the Site	Designated due to inundation, open water and cultivated land habitats. Also noted for breeding birds.

4.1.2 PROTECTED AND PRIORITY HABITATS

4.1.2.1 ANCIENT WOODLANDS

The desk study returned nine areas of ancient woodlands within 2 km of the Site: six areas of ancient semi-natural woodland (ASNW) and three areas of ancient (replanted) woodland. The nearest of these is 455 m southeast of the Site at Dovecliffe Wood. The position of these areas of ancient woodland relative to the Site are shown on **Figure 7, Appendix A.**

4.1.2.2 HABITATS OF PRINCIPAL IMPORTANCE

The desk study returned three habitats of principal importance (HPI)[39] within 2 km of the Site:

- Lowland meadows: two separate areas, the nearest being approximately 1.3 km southwest of the Site;
- Deciduous woodlands: 76 separate areas, with three of these laying adjacent to the Site to the north, northwest and southeast of the Site; and,
- Open Mosaic Habitat (OMH): three separate areas, the nearest being 847 m northwest of the Site.

The position of these HPIs, relative to the Site, are shown on **Figure 7, Appendix A.**

4.1.3 PROTECTED AND PRIORITY SPECIES

A total of 21 records of protected and priority species within 2 km of the Site were returned during the desk study as summarised in Table 6.2.

[39] Considered to be of principal importance for the purpose of conserving or enhancing biodiversity, within the meaning of the Natural Environment and Rural Communities (2006) Act (as amended in England).

TABLE 6.2 PROTECTED AND PRIORITY SPECIES WITHIN 2 KM OF THE SITE

Taxonomic Group	Species	Number of Records	Date of most recent record	Distance and direction of most recent record from the Site
Birds	Yellowhammer (*Emberiza citronella*)	4	18/12/2015	325 m south of the Site
	Skylark (*Alauda arvensis*)	2	22/03/2011	522 m southwest of the Site
	Reed bunting (*Emberiza schoeniclus*)	6	18/12/2015	232 m southwest of the Site
	Redwing (*Turdus iliacus*)	2	26/11/2016	522 m southwest of the Site
	Peregrine (*Falco peregrinus*)	1	08/03/2021	143 m southwest of the Site
	Grey partridge (*Perdix perdix*)	3	21/03/2012	228 m south of the Site
	House sparrow (*Passer domesticus*)	1	25/05/2009	522 m southwest of the Site
	Kingfisher (*Alcedo atthis*)	8	08/07/2018	**Within the Site**
	Lapwing (*Vanellus vanellus*)	1	25/05/2009	522 m southwest of the Site

Taxonomic Group	Species	Number of Records	Date of most recent record	Distance and direction of most recent record from the Site
	Lesser redpoll (*Acanthis cabaret*)	1	20/11/2008	522 m southwest of the Site
	Cuckoo (*Cuculus canorus*)	4	05/06/2021	290 m southwest of the Site
	Green sandpiper (*Tringa ochropus*)	1	23/11/2011	295 m south of the Site
Lepidoptera (butterflies and moths)	White-letter hairstreak (*Satyrium w-album*)	3	11/07/2014	180 m west of the Site
	Cinnabar (*Tyria jacobaeae*)	3	02/06/2020	26 m south of the Site
	Dingy skipper (*Erynnis tages*)	2	17/05/2019	**Within the Site**
Mammals	Hedgehog (*Erinaceus europaeus*)	1	17/10/2012	365 m west of the Site
	Brown hare (*Lepus europaeus*)	1	25/03/2011	522 m southwest of the Site
Reptiles	Common lizard (*Zootoca viviparus*)	3	2011	522 m southwest of the Site
	Grass snake (*Natrix natrix*)	5	04/09/2017	**Within the Site**
Amphibians	Common toad (*Bufo bufo*)	6	23/03/2019	358 m south of the Site

Taxonomic Group	Species	Number of Records	Date of most recent record	Distance and direction of most recent record from the Site
Flowering plant	Bluebell (*Hyacinhoides non-scriptai)*	6	Dates not provided	Nearest record given due to lack of dates; nearest record is approximately 78 m south of the Site

There was one European Protected Species Mitigation Licence (EPSML) application identified within 2 km of the Site. This was located approximately 50 m east of the Site and relates to soprano pipistrelle (*Pipistrellus pygmaeus*). The licence ran from 01 April 2018 to 30 April 2018 and allowed for the following:

- Impact on a breeding place;
- Damage of a resting place;
- Destruction of a breeding place; and,
- Destruction of a resting place.

4.1.4 REVIEW OF PREVIOUS REPORTS

4.1.4.1 PEA REPORT, BL ECOLOGY (2020)[2]

BL Ecology undertook an Extended Phase 1 Habitat Survey and an associated desk study in May 2022. The following section summarises the results shown within the report.

The Phase 1 Habitat Survey identified the following habitats within the Site, all of which were considered common habitats that are ubiquitous within the United Kingdom (UK):

- Semi-natural broadleaved woodland;
- Scattered broadleaved trees;
- Hedgerows;
- Dense and scattered scrub;
- Tall ruderal vegetation;
- Bare ground with ephemeral / short perennial vegetation;
- Species-rich semi-improved grassland;
- Semi-improved neutral grassland;
- Species-poor semi-improved grassland;
- Marshy grassland;
- Running water;
- Standing water; and,

- Dry ditches.

The report also advised that the barge ground with ephemeral / short perennial vegetation may qualify as OMH on Previously Developed Land, which is a HPI.

There were five ponds subjected to a HSI assessment for GCN, and three of these were found to be suitable for GCN: P3 – P5. No eDNA survey could be completed on P3, but P4 and P5 returned a negative result for GCN eDNA.

No badger signs were recorded during the survey; however, banks covered with dense scrub, and woodland provided suitable sett building habitat for badgers, with the grassland and tall ruderal vegetation providing suitable foraging habitat. Therefore, badger presence could not be ruled out.

The Site was considered to provide good foraging habitat for bats, particularly woodland, aquatic habitats, scrub, tall ruderal and grassland; as well as linear features such as hedgerows, lines of trees and watercourses. Trees within the Site were considered to provide potential roosting habitat for bats.

Potential breeding habitat was recorded across the entire Site, within trees, scrub and waterbodies, with grassland within the Site having provided habitat for ground nesting species.

The River Dove was considered to have potential for commuting and foraging otter and woodland and dense scrub was considered to hold potential for otter resting sites.

The waterbodies, tall ruderal, scrub and grassland habitats within the Site were considered suitable for common reptile species. Suitable basking habitat and hibernation habitat was recorded within the hardstanding and debris / spoil.

Some limited habitats for water vole (*Arvicola amphibious*) were recorded on the River Dove and Blacker Dike.

Suitable habitat was considered to exist for invertebrates, hedgehog fish and brown hare.

4.1.4.2 WORSBROUGH EDNA SURVEY RESULTS LETTER REPORT, RSK BIOCENSUS (2022)[3]

RSK Ecology undertook GCN eDNA surveys of Ponds 1 and 5 on 19 April 2022 and Ponds 2 and 3 on 25 April 2022. Pond 4 was not sampled. Ponds 2, 3, and 5 returned a negative result for GCN eDNA. This means GCN are considered absent from these ponds. Pond 4 returned a negative result from BL Ecology, and so GCN were also considered absent from Pond 4. Pond 1 returned an indeterminate result; however, as Pond 1 was considered to offer poor quality habitat, as per the HSI undertaken by BL Ecology, GCN were considered unlikely to be present in Pond 1.

4.1.4.3 WORSBROUGH – BADGER, GLTA AND BREEDING BIRD SURVEY REPORT, RKS BIOCENSUS (2022)[4]

This described the findings of GLTA, badger surveys and BBS undertaken by RSK Ecology in 2023.

The GLTA and badger surveys were completed on 11 April 2022. For breeding birds, four survey visits were conducted during the peak of the breeding season (April 2022 to the end of May 2022).

The GLTA assessed all trees within the Site for their potential for roosting bats, and identified the following:

- Two trees with moderate bat roosting potential, one poplar (Tree 1) and one oak (*Quercus robur*) (Tree 2). These were at OSNGR SD 36451 03459 and SD 36174 03494 respectively; and,
- Two willow trees that held high bat roosting potential. These were found at OSNGR SD 36549 03434 (Tree 3) and SD 36383 03355 (Tree 4).

The badger surveys identified two occasionally used outlier badger setts, each with a single entrance. Sett A was in the top of a north facing bank to the south of the Site (OSNGR SE 36289 03381). Sett B was in a shallow hollow in an area of grassland to the north of Sett A (OSNGR SE 36290 03407). No other badger field signs were recorded.

The BBS identified 11 Amber-listed BoCC[24] and three Red-listed BoCC[24] using the Site, with 5 Amber-listed and two Red-listed species recorded as probable breeding within the Site:

- Bullfinch (*Pyrrhula pyrrhula*) – Amber-listed;
- Dunnock (*Prunella modularis*) – Amber-listed;
- Grasshopper warbler (*Locustella naevia*) – Red-listed;
- Goldfinch (*Carduelis carduelis*) – Red-listed;
- Magpie (*Pica pica*) – Amber-listed;
- Whitethroat (*Sylvia communis*) – Amber-listed; and,
- Wren (*Troglodytes troglodytes*) – Amber-listed.

4.1.4.4 WORSBROUGH TREATMENT WORKS – FURTHER ECOLOGICAL SURVEY REPORT, RSK BIOCENSUS (2023)[5]

Detailed the findings of further ecological surveys, which comprised of aerial tree inspections for bats, water vole and otter surveys.

No evidence of roosting bats was recorded during the aerial tree inspection, with Trees 1 and 2 downgraded to low bat roosting potential after the first inspection. Trees 3 and 4 were assessed as having high and moderate bat roosting potential respectively following the aerial inspection surveys.

No evidence of water vole activity was recorded during the survey and no otter evidence was recorded during the survey.

Himalayan balsam (*Impatiens glandulifera*), an invasive non-native species, was recorded within the Site.

4.2 FIELD SURVEYS

The following sections provide a summary of the results of the Field Survey. Any features not specifically discussed here is due to the Site being located outside their current natural range, there is an absence of supporting habitat and/or that any habitat features encountered within specified survey areas are considered unsuitable to support the species.

4.2.1 HABITATS

A total of 12 UKHab classifications have been identified within the Habitat Survey; as summarised in **Table 6.3**. They are listed by classification grouping order as set out in the UK Habitat Classification User Manual (2023)[18], not in order of ecological importance. Accompanying Target Notes describing each habitat is presented in **Appendix C**.

TABLE 6.3 UKHAB CLASSIFICATIONS WITHIN THE HABITAT SURVEY AREA

Broad Habitat Type	UKHab Code	Habitat Classification
Grassland	g3c	Other Neutral Grassland
	g4	Modified Grassland
Woodland and forest	w1g	Other broadleaved woodland
	w1g 33	Line of trees
Heathland and scrub	h2a	Native hedgerow (with trees)
	h3h	Other Mix Scrub
Urban	u1b	Developed land–sealed surface
	u1b5	Buildings
	u1c	Artificial unvegetated sealed surface
	u1f	Sparsely Vegetated urban land
Rivers and Lakes	r1g	Other Standing water
	r2g	Other rivers and streams

4.2.1.1 GRASSLAND

Other Neutral Grassland (g3c)

Most of the Site is comprised of other neutral grassland, (TNs 2, 3 and 8) with an additional area of neutral grassland within the habitat survey area (TN10).

The habitat community varied slightly dependent upon location. In the area adjacent to the woodland (TN2 on **Figure 1, Appendix A**), the grassland comprised abundant red fescue, (*Festuca rubra*) and false oat grass *(Arrhenatherum elatius),* and frequent Yorkshire-fog (*Holcus lanatus*). Other species recorded included abundant bramble (*Rubus fruticosus agg.*), great willowherb (*Epilobium hirsutum*), creeping cinquefoil (*Potentilla reptans*), and vetch (*Vicia sp)*, frequent creeping thistle (*Cirsium arvense*), creeping buttercup (*Ranunculus repens*), and Ragwort (*Jacobaea vulgaris*), with occasional black medick (*Medicago lupulina*), American willowherb (*Epilobium ciliatum*), butterfly-bush (*Buddleja davidii*), common knapweed (*Centaurea nigra*), common nettle (*Urtica dioica*), hawthorn (*Crataegus monogyna*) and wild teasel (*Dipsacus fullonum*).

The area adjacent to the woodland (TN3, **Figure 1, Appendix A**) contains abundant bramble, creeping thistle, great willowherb, hemlock (*Conium maculatum*) and Indian balsam, frequent nettle and ragwort, occasional creeping buttercup, creeping cinquefoil, hawthorn and elder (*Sambucus nigra)*; as well as rare forget-me-nots (*Myosotis sp*.).

The grassland within the centre of the Site (TN8, **Figure 1, Appendix A**), contains frequent Yorkshire-fog, and red fescue. In addition to the grasses, abundant bramble, great willowherb, hemlock and hogweed (*Heracleum sphondylium*) are present, with frequent nettle, creeping buttercup, creeping cinquefoil and rosebay willowherb (*Chamerion angustifolium*); as well as occasional hawthorn, vetch, elder, dock (*Rumex sp.*) and willow (*Salix sp.*).

Surrounding the pond (TN10, **Figure 1, Appendix A**), abundant bramble, creeping thistle, great willowherb and hemlock are present alongside frequent cleavers (*Galium aparine*).

Modified Grassland (g4)

A small patch of modified grassland was present surrounding the waterworks infrastructure adjacent to the Site (TN9, on **Figure 1, Appendix A**). This comprised of abundant perennial rye-grass (*Lolium perenne)* and frequent Yorkshire-fog. Interspersed among these grasses was a variety of forb species including abundant creeping cinquefoil, frequent creeping buttercup and occasional black medick (*Medicago lupulina*), common mouse-ear (*Cerastium fontanum*), ribwort plantain (*Plantago lanceolata*) and wavy bittercress (*Cardamine flexuosa*). In areas of the grassland that are not regularly mowed, ruderal species were recorded, including frequent common nettle and creeping thistle and occasional curled dock, henbit, and ragwort.

4.2.1.2 WOODLAND AND FOREST

Other Broadleaved Woodland (w1g)

A strip of woodland is present in the north of the Habitat Survey Area, with a small amount within the Site. This woodland comprised of abundant willow, with frequent poplar and occasional oak, silver birch (*Betula pendula*), and sycamore (*Acer pseudoplatanus*). The understory features abundant butterfly-bush (*Buddleja davidii*) and bramble, with frequent hawthorn. Common nettle and wood avens (*Geum urbanum*) are abundant within the ground flora. Smaller sections of woodland similar in composition are present to the east and south of the Site.

Line of trees (33)

Two lines of Poplar trees are present within the Site, one along the eastern boundary (TN11) and one in the centre of the site (TN12).

4.2.1.3 HEATHLAND AND SCRUB

Native Hedgerow with trees (h2a)

A native hedgerow with trees is present along the western boundary of the Site, comprising abundant bramble, with frequent hawthorn, poplar, and willow. The ground flora is dominated by nettle.

Mixed Scrub (h3h)

Mixed scrub is present in the centre and the northeast of the Site (TN6 and TN4 respectively on **Figure 1, Appendix A**). The scrub in the northeast of the Site (TN4), is dominated by dog wood (*Cornus sanguinea*), with frequent bramble and occasional hawthorn also present. The scrub in the centre of the Site contains abundant hawthorn, willow, occasional elder and rare sycamore. A small section of scattered scrub similar in composition is present on the southwest of the Site.

4.2.1.4 URBAN

Developed land–sealed surface (u1b); Buildings (u1b5)

There are sections of developed land-sealed surface within the Habitat Survey Area, which comprise of buildings (TN26) and structures (TN24 and 27) associated with Worsbrough

WWTW in the west of the Site. There is also a small section of road in the northeast of the Habitat Survey Area.

Artificial unvegetated sealed surface (u1c)

There are mounds of earth in the east of the Site, which appeared to have been created from earthworks (TN7). A dirt track was noted which leads from the entrance of the Site to the earthworks (TN7) and continues from the Site along the north of Worsbrough WWTW (TN25).

Sparsely Vegetated urban land (u1f)

A section of disused track on the north of the Site is sparsely vegetated with a mix of herbaceous species and grasses. This includes: abundant black medick, frequent American willowherb, creeping buttercup, meadow grass, ragwort, red fescue, wild teasel, vetch, silverweed (*Potentilla anserina),* and Yorkshire-fog, occasional bramble, bristly oxtongue (*Helminthotheca echioides*), creeping thistle, daisy (*Bellis perennis*), forget-me-nots, selfheal (*Prunella vulgaris*), and white clover (*Trifolium repens*), and rare butterbur (*Petasites hybridus*).

4.2.1.5 RIVERS AND LAKES

Other Standing water (r1g)

Standing water is present within the Habitat Survey Area. This included a tank which was part of Worsbrough WWTW (TN24) and various ponds to the east and north of the Site (TN16 - 19).

Other rivers and streams (r2g)

The River Dove runs parallel to the Site, along the southern section of the Habitat Survey Area.

4.2.2 BATS

Four trees are present along the northern boundary of the Site. The trees are covered in ivy (Hedra helix) (TN22). Ivy has the potential to have obscured potential roosting features (PRFs); therefore, the trees were assigned PRF-I precautionarily. Tree 1, recorded within the GLTA Report by RSK[4] but could not be accessed, has been precautionarily assessed as PRF-I given the tree was in very poor condition.

The line of trees, hedgerow and woodland edge present within the Site offers good quality habitat for commuting bats. These habitats alongside the tussocky grassland and standing water provide a variety of niches for invertebrates to exploit and, therefore provide good foraging opportunities for bats. The woodland to the north and the river to the south help connect the habitat on Site to the wider landscape. The Site is of Moderate suitability for foraging and commuting bats.

4.2.3 GREAT CRESTED NEWT

Results of the HSI and eDNA Surveys are shown in Table 6.4.

TABLE 6.4 POND SURVEY RESULTS

Waterbody Number and Pond Name	HSI Score	HSI Suitability Category	eDNA Survey Completed (Y/N)	Comments
P1 – Fishing lake	0.51	Below Average	N	No permitted access
P2 – Settling tank	0.48	Poor	N	Yorkshire Water operational lagoon
P3 – Wet woodland	0.37	Poor	N	
P4 – LWS Pond	0.76	Good	Y (negative)	
P5 – LWS Pond	0.63	Average	Y (negative	
P6 – LWS Pond	0.78	Good	Y (negative)	
SuDS – Sustainable Drainage Systems (SuDS)	0.68	Average	Y (negative)	
S – Soakaway	0.42	Poor	N	No water present
DP – Duck Pond	0.48	Poor	N	No permitted access
GP1 – Garden Pond	0.70	Average	N	No permitted access
GP2 – Garden Pond	0.63	Average	N	No permitted access
GP3 – Garden Pond	0.61	Average	N	No permitted access

eDNA Surveys were completed at the following waterbodies: Pond 4, Pond 5, Pond 6 and SuDS. These all returned negative results. The other ponds were not sampled for the reasons given in Table 6.4.

Results indicate great crested newt are absent in P4, P5 and P6, and likely absent in S, as the pond was dry during the breeding season. However, the presence of GCN cannot be ruled out in all other ponds.

The River Dove acts as a barrier to dispersal of newts that may be present in ponds to the south of the River Dove, this means that P4, P5, P6, S and P3 are separated from the Site due to the River Dove.

The raw eDNA analysis is shown in **Appendix D**.

The position of these ponds is shown on **Figure 9, Appendix A**.

4.2.4 OTTER

The River Dove, Blacker Dike and the numerous ponds within the Site and close by are all suitable for foraging and commuting otter. The grassland scrub and woodland present within the Site is suitable for otter to establish resting sites, including holts and natal holts.

On camera one, a mammal swimming was recorded on 06 June 2024, 18 June 2024 and 20 June 2024 during the hours of darkness. Whilst the animal displays characteristics similar to that of an otter, the quality of the image is not sufficiently clear to confirm species identification with confidence. Therefore, as a precaution, otter is assumed to be present.

4.2.5 REPTILE

The mosaic of woodland, dense scrub, tussocky grassland and sparsely vegetated areas present within the Site, and immediately adjacent to the Site, provides good quality commuting, resting and foraging habitat for reptiles. Piles of debris are present on Site (TN21) and are suitable hibernacula for reptiles.

A total of five grass snake (*Natrix natrix*) were recorded during the reptile surveys. The peak count of grass snake was one. Therefore, the Site does not qualify as a Key Reptile Site, based on criteria within the latest guidelines[20].

The grass snake were found on the following dates, under the following artificial refugia.

- Visit 1 23 July 2024 refugia 13;
- Visit 2 25 July 2024 refugia 14;
- Visit 3 30 July 2024 refugia 14;
- Visit 4 01 August 2024 refugia 12 – record was of a juvenile; and,
- Visit 5 06 August 2024 refugia 14 – record was of a juvenile.

The position of positive records for reptiles are shown on **Figure 10, Appendix A.**

4.2.6 BREEDING BIRDS

A total of 45 species were recorded during the BBS. Of these, 19 were species of conservation importance (as defined in Section 124.1.6) including seven that showed evidence of breeding or holding territory within the Site or immediate surrounds, as shown in Table 6.2.

No willow tits were recorded during the BBS.

Kingfisher was observed. Kingfisher is afforded protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), which protects the species from disturbance whilst

nesting. The River Dove did not have suitable nesting features for kingfisher, but access to the watercourse was limited and so suitability for nesting could not be ruled out.

TABLE 6.5 SUMMARY OF SPECIES OF CONSERVATION IMPORTANCE ASSESSED AS BREEDING OR HOLDING TERRITORY DURING THE BBS

Species	**Number of territories identified**		**Summary of observations**	**Conservation status**
	Within Site	Immediate surrounds		
Mallard (*Anas platyrhynchos*)	0	1	An adult with two juveniles was located just west of the Site boundary.	Amber
Stock dove (*Columba oenas*)	0	1	A territory was located in the trees around the fishing lakes just east of the Site.	Amber
Whitethroat (*Sylvia communis*)	1	1	Two territories were identified, one within and one to the south of the Site.	Amber
Wren *(Troglodytes troglodytes)*	2	7	A total of nine territories were located, of which two were within the Site.	Amber
Song thrush *(Turdus philomelos)*	0	3	Three territories were identified, all in woodland outside the Site.	Amber
Dunnock *(Prunella modularis)*	3	2	Five territories were located, three of which were within the Site.	Amber
Grey wagtail *(Motacilla cinerea)*	0	1	A single territory was identified around the buildings to the west of the Site. Two adults and four juveniles were seen during the second visit.	Amber

Although amber-listed, woodpigeon (*Columba palumbus*) was not included in the territory analysis. This species' status is due to the importance of the British population in the context of wider European populations. This species is abundant in the UK. Woodpigeon were present within the Site and immediate surrounds but, given their population status and trends within

the UK, including their ubiquity across many areas and regular presence in heavily disturbed habitats, this species is not considered an important feature and was excluded from territory mapping analysis.

A further 11 species of conservation importance were recorded during the BBS: greylag goose (*Anser anser*), swift (*Apus apus*), moorhen (*Gallinula chloropus*), oystercatcher (*Haematopus ostralegus*), black-headed gull (*Chroicocephalus ridibundus*), common tern (*Sterna hirundo*), sparrowhawk (*Accipiter nisus*), kingfisher, kestrel (*Falco tinnunculus*), mistle thrush (*Turdus viscivorus)* and greenfinch (*Carduelis chloris*). Many of these observations relate to birds overflying the Site, or potentially breeding birds from the surrounding landscape foraging within the Site; however, in most cases the Site lacks suitable resources for these species, and they were not considered to have bred or held territory within the BBS Area.

A further 26 common and widespread species[40] were recorded, many of which were considered likely to be breeding or holding territory within the Site or immediate surrounds: pheasant (*Phasianus colchicus*), coot (*Fulica atra*), cormorant (*Phalacrocorax carbo*), grey heron (*Ardea cinerea*), buzzard (*Buteo buteo*), great spotted woodpecker (*Dendrocopos major*), green woodpecker (*Picus viridis*), jay (*Garrulus glandarius*), magpie (*Pica pica)*, jackdaw (*Corvus monedula*), carrion crow (*Corvus corone*), coal tit (*Periparus ater*), blue tit (*Cyanistes caeruleus*), great tit (*Parus major*), swallow (*Hirundo rustica*), long-tailed tit (*Aegithalos caudatus*), chiffchaff (*Phylloscopus collybita*), blackcap (*Sylvia atricapilla*), garden warbler (*Sylvia borin*), goldcrest (*Regulus regulus*), treecreeper (*Certhia familiaris*), blackbird (*Turdus merula*), robin (*Erithacus rubecula*), pied wagtail (*Motacilla alba*), chaffinch (*Fringilla coelebs*) and goldfinch (*Carduelis carduelis*).

4.2.7 BADGER

A single badger was encountered on 09 June 2024 by one of the trail cameras deployed as part of the otter survey. The animal was detected approximately 200 m west of the Site, close to where Edmunds Road crosses over the River Dove. Evidence of badger was recorded during the UKHab Survey, in the form of footprints recorded just to the north of the Site boundary (TN20). Habitats within the Site are considered to provide limited foraging or sett building habitat. There is potential for badger to move through linear features adjoining the Site; and establish new setts within woodland areas to the north and east of the Site. Badger is legally protected under the Protection of Badgers Act 1992.

4.2.8 OTHER SPECIES OBSERVATIONS

A common toad (*Bufo bufo*) was recorded on 06 August, under one of the artificial refugia deployed as part of the reptile survey. There are no suitable wetland habitat features within the Site that could be utilised by common toad; however, there is potential for ponds and ephemeral wetland features in surrounding areas to support breeding common toad. In addition, areas of dense vegetation cover could be used by individuals for shelter or hibernation. Common toad is a species of principal importance[41].

[40] UK BoCC Green-listed species that are not afforded special protection under Annex I of the Birds Directive or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).
[41] Considered to be of principal importance for the purpose of conserving or enhancing biodiversity, within the meaning of the Natural Environment and Rural Communities (2006) Act (as amended in England).

Three species of Lepidoptera (moths and butterflies) listed as priority species under the NERC Act 2006 were returned within the data search: white-letter hairstreak, cinnabar and dingy skipper. The grassland, scrub, and woodland within the Site have potential for floral species which support breeding and foraging of all these species.

Brown hare and hedgehog records were both returned within the data search. Both these species are listed as priority species under the NERC Act 2006. The grassland, scrub and hedgerows within the Site have potential to support both these species.

4.3 DETERMINATION OF IMPORTANCE

Table 6.6 evaluates the importance of ecological features within the Habitat Survey Area, taking cognisance of the geographic scales of importance described in **Appendix B**.

TABLE 6.6 DETERMINATION OF IMPORTANCE

Feature	Rationale	Importance	Determination
Dearne Valley SSSI	Dearne Valley Wetlands is found 171 m southwest of the Site at its nearest point and is designated for a variety of breeding and non-breeding birds. Birds are mobile features, and so some of the species for which the Site is designated have potential to be subjected to effects. Therefore, Dearne Valley SSSI is of National importance and scoped into the assessment.	National	Potentially important. Scoped into the assessment.
Worsbrough Country Park LNR	The LNR lies 155 m west of the Site and is designated for its reservoir, associated willow carr, woodland and reedbeds; as well as its assemblage of bird species. The Site lies upstream of the River Dove and beyond Edmondson Road, and whilst there is potential for breeding birds to pass through the Site, the birds associated with the LNR are waterfowl and so habitats within the Site are not suitable for breeding, and as such impacts to the LNR and its features are unlikely. It is therefore of Local importance and scoped out of the assessment.	Local	Not important. Scoped out from further assessment.
Barrow Colliery LWS	Barrow Colliery LWS is approximately 166 m west and is designated for grassland, running water, open water, hedgerow, young plantation and lowland heathland habitats. It is also noted for orchids, invertebrates and breeding birds. Due to the proximity of the LWS to the Site there is potential for breeding birds to pass through the Site. The birds associated with the LWS are waterfowl and so habitats within the Site are not	Less than Local	Not important. Scoped out from further assessment.

Feature	Rationale	Importance	Determination
	suitable for breeding; therefore, Barrow Colliery LWS is of Less than Local importance and scoped out of the assessment.		
Wombwell Wood LWS	Wombwell Wood LWS lies 434 m southeast of the Site and is designated due to scrub woodland, standing water and running water; as well as being noted for woodruff, breeding birds and rock exposures. Due to its proximity to the Site there is potential for breeding birds to pass through the Site. The birds associated with the LWS are waterfowl and so habitats within the Site are not suitable for breeding; therefore, the LWS is of Less than Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out the assessment.
Bell Bank Wood and Woolley Bank Wood LWS	Bell Bank Wood was approximately 625 m west of the Site. However, it seems likely that it is designated due to being a woodland. Woodland is widespread throughout the UK, with 2256 ha of mixed deciduous woodland being found within Barnsley[17], this coupled with the fact that due to the distance from the Site, and the small nature of the works, it seems unlikely that any direct or indirect effects are probable. Therefore, the LWS is of Less than Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.
Worsbrough Reservoir LWS	Worsbrough Reservoir LWS is designated due to standing water, running water, fen woodland, swap, scrub and grassland habitats, and lies approximately 1.09 km west of the Site. The LWS lies upstream of the Site and so there is no direct or indirect connection	Less than Local	Not important. Scoped out from further assessment.

Feature	Rationale	Importance	Determination
	between the Site and the aquatic habitats within the LWS. Furthermore, due to the distance between the Site and the LWS, there is no direct and indirect connectivity between the terrestrial habitats within the Site and the LWS; therefore, Worsbrough Reservoir is of Less than Local importance and scoped out of the assessment.		
Short Wood and Hay Green LWS	Short Wood and Hay Green LWS is designated due to woodland, acid grassland, neutral grassland, standing water and running water. The LWS is situated 1.34 km southwest of the Site. Short Wood and Hay Green LWS is not hydrologically connected to the Site, and due to the distance between the LWS and the Site there is no direct or indirect connectivity between the LWS and the Site; therefore, Short Wood and Hay Green LWS is of Less than Local importance and is scoped out of the assessment.	Less than Local.	Not important. Scoped out from further assessment.
Swaithe Wood Meadows LWS	Swaithe Flood Meadows is approximately 1.41 km northeast of the Site. Swaithe Flood Meadows is designated due to inundation, open water, cultivated land habitats and breeding birds. The Site is not hydrologically connected to Swaithe Flood Meadows LWS and due to the distance between the Site and the LWS there is no direct or indirect connectivity between the Site and the LWS. Therefore, Swaithe Flood Meadows LWS is of Less than Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.

Feature	Rationale	Importance	Determination
Protected and Priority Habitats: Ancient Woodland	There were nine areas of ancient woodland returned within the data search. The nearest of these was 455 m southeast of the Site. Ancient woodland is irreplaceable and can support many protected and priority species including bats and breeding birds. Due to the distance between the Site and the areas of ancient woodland there is unlikely to be any direct or indirect connectivity between the Site and the ancient woodland. Therefore, ancient woodland is considered of Local importance and scoped out of the assessment.	Local	Not important. Scoped out from further assessment.
Protected and Priority Habitats: Lowland Meadows	There were two areas of lowland meadows within 2 km of the Site. Lowland meadows is a HPI under the NERC Act 2006, and a priority habitat under the Barnsley LBAP. The nearest area of known lowland meadows is found 1.3 km southwest of the Site, and due to the distance between the Site and the areas of lowland meadows, there is no direct or indirect connectivity between the Site and these areas of lowland meadows. Therefore, lowland meadows is of Less than Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.
Protected and Priority Habitats: Deciduous Woodland	There were several areas of deciduous woodland returned within the data search, with three areas laying immediately adjacent to the Site. Deciduous woodland is both a HPI under the NERC Act 2006 and mixed deciduous woodland is a priority habitat under the Barnsley LBAP[17]. Woodland is widespread throughout the UK, with 2256 ha of mixed deciduous woodland being found within Barnsley[17].	Local	Not important. Scoped out from further assessment.

Feature	Rationale	Importance	Determination
	Woodland can support many species, including bats, badgers, otter and breeding birds. Considering the above the other deciduous woodland is of Local importance and scoped out of the assessment.		
Protected and Priority Habitats: Open Mosaic Habitat	Three areas of open mosaic habitat were identified within 2 km of the Site. Open mosaic habitat is both a HPI under NERC and a priority habitat under the Barnsley LBAP. Open mosaic habitat is particularly important for invertebrates. The nearest area of open mosaic habitat was 847 m northeast of the Site; therefore, due to the distance between the open mosaic habitat and the Site there is no direct or indirect connectivity between the Site and the open mosaic habitat. Consequently, open mosaic habitat is of Less than Local importance and is scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.
Other neutral grassland	Most of the Site was comprised of other neutral grassland. This habitat is common and widespread within the UK, and not protected nor a HPI under the NERC Act 2006. However neutral grassland is considered a Priority Habitat under the Barnsley LBAP[17], with the Barnsley LBAP identifying that there is 64 ha of this habitat within the Barnsley area[17]. Other neutral grassland can support a variety of species, particularly invertebrates and breeding birds.	Local	Not important. Scoped out from further assessment.

Feature	Rationale	Importance	Determination
	Considering the above other neutral grassland is of Local importance and scoped out of the assessment.		
Modified grassland	Modified grassland is widespread within the UK, not protected and is neither a HPI under the NERC Act 2006 or a priority species under the Barnsley LBAP[17]. Modified grassland is unlikely to support a large population of protected and/or priority species. Considering the above, modified grassland is of Less than Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.
Other broadleaved woodland	Other broadleaved woodland, in the form of Lowland Deciduous Woodland, is a HPI under the NERC Act 2006. Mixed deciduous woodland is also considered a priority habitat under the Barnsley LBAP[17]. Woodland is widespread throughout the UK, with 2256 ha of mixed deciduous woodland being found within Barnsley[17]. Woodland can support many species, including bats, badgers, otter and breeding birds. Considering the above the other broadleaved woodland is of Local importance and scoped out of the assessment.	Local	Not important. Scoped out from further assessment.
Line of trees	Lines of trees are common and widespread throughout the UK, not protected and neither a HPI under the NERC Act 2006 or a Priority Habitat under the Barnsley LBAP[17]. Lines of trees are unlikely to support large populations of protected or priority species;	Less than Local	Not important. Scoped out from further assessment.

Feature	Rationale	Importance	Determination
	therefore, lines of trees are of Less than Local importance and scoped out of the assessment.		
Native hedgerow (with trees)	Hedgerows are common and widespread within the UK. The hedgerow within the Site is a native hedgerow with trees. It is not clear, whether the hedgerow contains at least 80 % or more of at least one woody species; and as a precaution it has been assumed this is the case. Therefore, it is assumed that it is both a Priority Habitat within the Barnsley LBAP[17] and a HPI under the NERC Act 2006. Hedgerows provide habitat for a variety of species, particularly breeding birds. Considering the above, the native hedgerow with trees is of Local importance and scoped out of the assessment.	Local	Not important. Scoped out from further assessment.
Other mixed scrub	Mixed scrub is common and widespread within the UK and is not protected and is not considered a HPI under the NERC Act 2006. However, the Barnsley LBAP[17], considers scrub a priority habitat, as it can support a range of wildlife species and is of importance to biodiversity. Considering the above, other mixed scrub is of Local importance and scoped out of the assessment.	Local	Not important. Scoped out from further assessment.
Developed land sealed surface	Developed land sealed surface is unlikely to support large populations of protected or priority species and is of negligible importance to biodiversity; therefore, developed land sealed	Less than Local	Not important.

Feature	Rationale	Importance	Determination
	surface is of Less than Local importance and is scoped out of the assessment.		Scoped out from further assessment.
Buildings	Buildings are ubiquitous within the UK, not protected and not considered a HPI under the NERC Act 2006. However, built up areas and gardens are considered a Priority Habitat under the Barnsley LBAP[17]. This includes buildings, which can provide a significant resource for common and vulnerable species. Considering the above buildings are of Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.
Artificial unvegetated sealed surface	Artificial unvegetated sealed surface is common and widespread within the UK, not protected and not considered either a HPI under the NERC Act 2006 or a priority habitat under the Barnsley LBAP[17]. Furthermore, the habitat is unlikely to support a large population of protected or priority species; therefore, artificial unvegetated sealed surface is of Less than Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.
Sparsely vegetated urban land	Sparsely vegetated urban land is common and widespread within the UK, not protected and is not a HPI under the NERC Act 2006, nor a priority habitat under the Barnsley LBAP[17]. Furthermore, the habitat is unlikely to support a large population of protected or priority species; therefore, sparsely vegetated urban land is of Less than Local importance and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.

Feature	Rationale	Importance	Determination
Other standing water	The other standing water recorded within the Site, do not meet the criteria[42] to be classified as a HPI under the NERC Act 2006. However, standing water is a priority habitat under the Barnsley LBAP[17]. Other standing water provides habitat for a variety of species including invertebrates. Considering the above other standing water is of Local importance and scoped out of the assessment.	Local	Not important. Scoped out from further assessment.
Other rivers and stream	Other rivers and streams are common and widespread within the UK and are both a HPI under the NERC Act 2006 and a priority habitat under the Barnsley LBAP[17] and can support a variety of species including otter, fish and breeding birds. Considering the above other rivers and streams are of Local importance and scoped out of the assessment.	Local	Not important. Scoped out from further assessment.
Bats	Several trees within the Site have been recorded as containing bat roost potential; furthermore, the woodland, aquatic habitats, grassland and scrub were considered to hold suitability for foraging and commuting bats.	Local	Yes. Scoped into assessment as there is a risk of impact which could lead to legal offences being committed.

[42] Joint Nature Conservation Committee (JNCC) *UK Biodiversity Action Plan: Ponds* [Online] Available at: Ponds (UK BAP Priority Habitat description). Accessed: 18/11/2024.

Feature	Rationale	Importance	Determination
	One EPSML was returned within the data search, which allowed destruction of a resting place and breeding place for soprano pipistrelle bats. It seems likely bats would be using the Site; however, it is likely any population using the Site would be of Local importance. Bats are afforded protection under Annex II of the Habitats Directive and Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), with nine species of bats being listed as priority species under the Barnsley LBAP[17]: soprano pipistrelle, brown long-eared bat. Due to a risk of a breach of the legislation afforded to bats, in line with CIEEM guidance[1], bats are scoped into the assessment.		
Badger	Two outlier setts were recorded during surveys undertaken by RSK in 2022, and camera traps record badger using the Site on 09 June 2024. Badger is a widespread species throughout the UK with a stable and inclining population estimated at 562,000, and the species is listed on the IUCN Red List as of 'Least Concern' in the UK. Therefore, any population using the Site is likely to be of Local importance; however, badgers are afforded protection by way of the Protection of Badgers Act 1992, and as such there is a risk of a breach of legislation if the species is impacted. Thus, in line with CIEEM guidance[1], badger is scoped into the assessment.	Local	Yes. Scoped into assessment as there is a risk of impact which could lead to legal offences being committed.
GCN	GCN are afforded protection under Annexes II and IV of the Habitats Regulations and Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). GCN is also listed on Section 41 of the	Local	Yes.

Feature	Rationale	Importance	Determination
	NERC Act 2006 as an SPI. GCN is also a priority species on the Barnsley LBAP[17]. The eDNA surveys could not be completed on all ponds within 250 m of the Site, therefore GCN presence cannot be ruled out and so there is a risk of a breach of legislation afforded to protect GCN, and they are therefore scoped into the assessment.		Scoped into the assessment as there is a risk of impact which could lead to legal offences being committed.
Otter	Otter was recorded on one of the camera traps, however no active resting sites were confirmed. Otter is afforded protection via Annex IV of the Habitats Directive, Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and are listed on Section 41 of the NERC Act 2006 as a Species of Principal Importance; as well as being listed as a priority species on the Barnsley BAP. The Fifth Otter Survey of England[43] advises that in South Yorkshire and North East Derbyshire, that there has been a significant expansion of otter range in these areas, though distribution is still patchy. In addition, the fifth otter survey of England[43] also advises that Yorkshire as a region has shown a major increase in both positive sites and otter distribution. This suggests that otter is widespread locally, and so the population using the Site will be of local importance. Usually, any ecological feature deemed to be of less than regional importance would be scoped out of the assessment; however, with	Local	Yes. Scoped into assessment as there is a risk of impact which could lead to legal offences being committed.

[43] Environment Agency (2011) *The Fifth Otter Survey of England 2009 – 2010*. The Environment Agency, Bristol, UK.

Feature	Rationale	Importance	Determination
	otter potentially being present within the Site there is a risk of otter being harmed which would constitute a legal offence. Therefore, as per CIEEM guidelines[1], otter is scoped into the assessment.		
Reptiles	Grass snake was recorded using the Site during the reptile surveys. Reptiles are afforded protection through the Wildlife and Countryside Act 1981 (as amended), with grass snake, common lizard (*Zootoca vivipara*) slow-worm (*Anguis fragilis*) and adder (*Vipera berus*) listed as SPI under the NERC Act 2006, with grass snake, common lizard and slow-worm being listed as priority species on the Barnsley LBAP[17]. Grass snakes are found throughout England and Wales[44], and thus the population within the Site is likely of local importance. Usually, any ecological feature deemed to be of less than regional importance would be scoped out of the assessment; however, with otter potentially being present within the Site there is risk of otter being harmed which would constitute a legal offence. Therefore, as per CIEEM guidelines[1], reptiles are scoped into the assessment	Local	Yes. Scoped into assessment as there is a risk of impact which could lead to legal offences being committed.
Water vole	No water vole or signs of water vole were recorded during surveys; therefore, the species is considered absent from the Site and scoped out of the assessment.	Less than Local	Not important. Scoped out from further assessment.
Breeding birds	There were seven species of conservation importance confirmed as likely to be breeding or holding territory, with a total of 22	Local	Yes.

[44] Froglife (2024) *Grass Snake* [Online] Available at: Grass Snake (Accessed 15 November 2024)

Feature	Rationale	Importance	Determination
	territories recorded in the BBS completed by ERM in 2024: mallard whitethroat, stock dove, wren, song thrush, dunnock and grey wagtail. Kingfisher, which is a species afforded protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) was recorded within the Site, though habitat within the River Dove seemed unsuitable for nesting. Using the information above, birds are of Local importance; however as all nesting birds are afforded protection under the Wildlife and Countryside Act 1981 (as amended), there is a risk of a legal breach if nesting birds are impacted, and because of this, as per CIEEM guidelines[1], birds are scoped into the assessment.		Scoped into assessment as there is a risk of impact which could lead to legal offences being committed.

5. ASSESSMENT OF POTENTIAL EFFECTS

This assessment considers effects from the Proposed Development within the Site and immediate surrounds. Examples of the potential effects considered which can be positive or negative include:

- Loss of habitat or species of flora and fauna from permanent or temporary land take;
- Disturbance to, or displacement of, a species from the Site because of permanent or temporary land take;
- Impacts to adjacent habitats (and the species that use them) that are not directly required for construction or operation (e.g., through movements of vehicles and site personnel, lighting, dust, noise and vibration, discharges to water, alteration to drainage regimes.);
- Fragmentation of habitat or severance of ecological corridors (such as watercourses, hedgerows and flyways); and
- Creation of new habitat and the introduction of species because of reinstatement works and landscaping.

Sections 7.3 to 7.6 provide an assessment of the significance of the residual effects that takes account of the design and best practice measures committed to by the Proposed Development as detailed in Section 7.2.

5.1 EMBEDDED MITIGATION

During the design of the Proposed Development, ecological survey results were provided to the design team to ensure that, where possible, effects on protected species were avoided, and where they could not be avoided, measures were implemented to reduce the effect in line with the mitigation hierarchy. The following section details the application of embedded mitigation by both design and by practice, which includes those methods implemented before or during construction.

5.1.1 MITIGATION BY GOOD PRACTICE: DESIGN

The following measures have been included within the design to avoid impacts to protected and / or priority habitats and species:

- Areas outside of the Site boundary are excluded from development infrastructure, and any temporary works areas required for construction;
- Development infrastructure has been designed to be more than 8 m from watercourses;
- A Root Protection Zone (RPZ) will be applied to trees within and adjoining the Site to avoid incidental damage during construction. RPZ will be specified by a competent arborist or landscape professional. No works or vehicle movements will be permitted within the RPZ without written permission from a qualified arborist or landscaping professional;
- In line with good practice[45] any permanent lighting will be designed to minimise disruption to nocturnal and crepuscular animals (e.g., bats, badger, and otter), with any lighting design agreed in advance with an ecologist. In addition, lighting proposals will take note of the following measures during construction, operation and decommissioning:

[45] Institution of Lighting Professionals (2023) *Guidance Note GN 08/23 Bats and Artificial Lighting at Night*. Institution of Lighting Professionals, Rugy, Warwickshire, UK.

- Motion-sensitive security lighting and avoidance of floodlighting
- Avoidance of lighting with ultra-violet (UV) components in areas where lighting is required for public safety purposes, UV light is particularly disruptive to bat behaviour.
- Use of flat-glass protectors on luminaires to help reduce light spill above angles greater than 70º from the vertical plane.
- Avoiding light spill on surrounding habitats by using accessories such as shields and cowls (i.e. maintaining dark corridors).
- Construction works (including any advanced works) will be designed to avoid working between sunset and sunrise to minimise potential disturbance to local biodiversity.

5.1.2 MITIGATION BY GOOD PRACTICE: CONSTRUCTION

5.1.2.1 ECOLOGICAL CLERK OF WORKS

A suitably qualified and experienced Ecological Clerk of Works (ECoW) will be appointed by the Applicant to provide ecological advice and support to the Principal Contractor during construction, including monitoring of compliance with recommendations of this EcIA.

5.1.2.2 PRECONSTRUCTION SURVEYS

Pre-construction surveys for protected species will be undertaken within the working areas and appropriate buffers to identify changes in the distribution and abundance of protected species from baseline conditions. Updated ecological information gathered from these surveys will inform the scope of any supporting Species Protection Plans (SPP), or Precautionary Methods of Working that will form part of a Construction and Environment Management Plan (CEMP) and / or mitigation licensing. The following protected species surveys will be required pre-construction:

- A suitably experienced ecologist will conduct an otter survey of the Site and a 200 m buffer around it prior to the commencement of the works.
- A badger survey of the Site and a 30 m buffer around it will be required to ascertain if any setts are present, and if present, are setts in use.
- A survey of the Site and immediate surroundings for INNS.
- A check for nesting birds.

5.1.2.3 AVOIDANCE MEASURES WITHIN THE CEMP

During the construction phase, avoidance and mitigation measures for IEFs will be implemented via a CEMP, which will be developed by the appointed contractor. Contractors will take into account the following good practice:

- All staff will be briefed by a suitably qualified ecologist (e.g., via toolbox talk) on the importance of protected species conservation (with reference to bats, badger, otter, GCN, reptiles and breeding birds), and what to do if signs of these species are found.
- Any excavations deeper than 0.5 m should be covered, and if left exposed overnight will have a mammal ramp installed at an angle of no more than 45 degrees to allow trapped individuals to escape.
- Vehicles and materials will be inspected prior to use each day to identify individuals which may have taken shelter. Any individuals identified will be able to leave the area naturally.

Sightings of animals within these areas will be reported to the Project Ecologist (or appointed ECoW) as soon as it is safe to do so, and works will not re-commence until the Project Ecologist (or appointed ECoW) has confirmed whether any additional mitigation is required.

- The creation of large stockpiles of soil will be avoided as these may attract badger and / or other animals to establish new setts / burrows during the construction phase. Should any new mammal burrows be identified, works in the area will cease and the Project Ecologist (or appointed ECoW) will be contacted for advice.
- End caps will be added to cable or drainage tubes that are left on-site to avoid mammals being trapped overnight.
- Building materials will be stored above ground on pallets. Best available techniques (BAT) and measures will be implemented to avoid water pollution and run–off, these will include, for example:
  - BAT measures to reduce the run-off of any potential contaminated surface water directly or indirectly into any watercourse or downstream receptor.
  - BAT measures will be implemented for the correct and appropriate storage of fuels and chemicals on Site.
  - Infrastructure of the Proposed Development will be sited out a minimum of 10 m buffer from any watercourse to avoid pollution and run-off and adhering to best practice guidelines.
- Construction noise will be minimized where practicable, following guidance set out in Section 8 of BS 5228-1: Code of Practice on Noise Control. BS5228-1 describes measures to control noise at source including for example:
  - Substitution of plant and activities by less noisy ones
  - Modification of plant or equipment to reduce noise emissions
  - The use of noise enclosures
  - The siting of equipment and its method of use
  - Equipment maintenance
- No work will be completed during the night (between the hours of sunset and sunrise).
- A thorough biosecurity procedure will be included as part of the CEMP. This should include the following:
  - All plant and footwear will be regularly inspected and cleaned to prevent the introduction of INNS to the Site. The check-clean-dry methodology will be followed as far as practicable.
  - All plant and footwear will be checked and cleaned prior to entry to the Site, and prior to leaving the Site at the end of each working day.
  - Any invasive non-native plants will be cordoned off and disturbance avoided where practicable.

Contractors will adhere to a Precautionary Method of Working or Species Protection Plan (SPP) in relation to reptiles taking into account the following measures:

- Site clearance works will be supervised by the appointed ECoW and preceded by a thorough hand search, check, and removal of surface debris to ensure reptiles are not killed or injured.

- The works will only be carried out when animals are active. This is usually March to October in temperatures of 9ºC and above in weather conditions which lack heavy rain or a strong breeze. All works will be supervised by the ECoW and if weather conditions become unsuitable for reptiles, works will cease, until weather conditions improve.
- Vegetation clearance will be undertaken using hand-tools only and vegetation will be removed from the Site, or stored in an area that is separated from works activities or routes that will not be subjected to further disturbance.
- Vegetation will be subject to a two-stage cut, where vegetation is higher than 10 cm. The first stage will reduce the height to 10 cm in the morning, followed by a second cut at least 24 hours later, to reduce sward to ground level. The sward will need to be cut in one direction towards suitable adjacent, retained habitat. This will be supervised by an ECoW.

A Non-Licensed Method Statement (NLMS) will be required in respect of GCN to avoid harm to the species during construction. This should include measures for vegetation clearance as per reptiles above.

Contractors will adhere to Precautionary Method of Working of SPP in relation to birds taking account of the following measures:

- The removal of vegetation, during the peak bird breeding season (March to August inclusive) will be avoided where possible or will be subject to a pre-construction check by the appointed ECoW no more than 48 hours prior to works commencing. If any nesting birds are found to be present, an appropriate buffer zone will be required, within which works are excluded for the duration of the breeding attempt.

Contractors will adhere to a Precautionary Method of Works or SPP in relation to bats taking account of the following measures:

- Any trees to be removed that were assessed as PRF-I for bats will need to be soft-felled under supervision from a bat licensed ecologist, avoiding the maternity season of May to August.

5.1.3 MITIGATION BY GOOD PRACTICE: OPERATION

Maintenance activities (including routine maintenance of vegetation) are anticipated to be extremely localised in scale, complexity, and duration. The embedded mitigation measures described in Section 5.1.1 and 5.1.2 are considered appropriate for safeguarding ecological features during the operational phase.

In addition to Sections 5.1.1 and 5.1.2 above, the following measures are recommended to both compensate for habitat loss required to facilitate the Proposed Development and provide enhancement measures for a variety of species:

- Planting of a species-rich wildflower grassland mix for the areas between the panels, this will increase floral diversity and pollen sources which will be beneficial to invertebrates and bats. This should be detailed within a Landscape and Ecological Management Plan (LEMP).
- Arisings from vegetation removal should be arranged into brash piles once the works are complete to create hibernacula for small mammals, amphibians and reptiles. This will help promote species biodiversity across the Site.
- Willow tit enhancements, though none were recorded and habitat within the Site is suboptimal. They are a feature of a Dearne Valley Wetlands SSSI, so are assumed to be

present within the wider area and enhancements are proposed to support the local population. Willow tits require damp woodland containing dead wood to nest in. If lacking dead wood, specialist nest boxes can be put up for this species. These nest boxes should be positioned 1.5 m from the ground. It is important not to use standard nest boxes, as this species does not use them and by installing them, competitive species may be attracted to the area and out-compete any willow tits present. Additionally, any standing or fallen deadwood should be retained in situ. If deadwood and brash needs to be removed, it can be moved to small piles.

- Butterfly scrapes to be added within the ground, this will benefit invertebrates, birds, bats and reptiles on which they rely.
- Vehicles should be limited to the areas of infrastructure only during maintenance activities, and a reduced speed limit on the Site should apply, to reduce the risk of harm to any fauna.

5.1.4 MITIGATION BY GOOD PRACTICE: DECOMMISSIONING

Decommissioning activities are anticipated to be of a similar nature to the construction phase in terms of scale and duration. Although any enhancements may mean that the importance of some ecological features may change from current levels, the embedded mitigation measures described in Section 5.1.2 are considered appropriate for safeguarding ecological features during the decommissioning phases.

5.2 DESIGNATED SITES

5.2.1 DEARNE VALLEY WETLAND SSSI

5.2.1.1 CONSTRUCTION

The Dearne Valley Wetland SSSI lies approximately 171 m southwest of the Site at its nearest point, and due to its distance from the Site there will be no direct or indirect impact upon the habitats within the SSSI, thus effects are considered negligible and not significant. As the works occur outside of the SSSI and are not likely to damage the SSSI, no assent from Natural England is required.

The nature, scale and timing of human activities can result in disturbance of birds at a level which can affect behaviour, such as changes to feeding or roosting behaviour. Construction of the Proposed Development could lead to temporary increases in noise, light, sound, and vibration, and although the habitat within the Site is unsuitable for the qualifying features, surrounding areas could be used by qualifying features during the breeding and non-breeding seasons, as such the presence of qualifying species cannot be ruled out. Construction will be limited to within the Site only for a period of six to eight weeks. This means there is a low risk of disturbance to qualifying species of the Dearne Valley Wetlands SSSI during this period should they be using adjacent areas; however, any effects will be temporary, reversible of negligible magnitude and not significant.

5.2.1.2 OPERATION

Operation and maintenance of the Proposed Development will be limited to areas within the Site and would not result in the loss of any habitat. It is likely that there will be periodic vehicle movements and human presence throughout the operational period, as site personnel

and security staff undertake temporary maintenance works and inspections. This will be limited to development infrastructure, with no disturbance of the surrounding environment anticipated. Therefore, there will be a low risk of disturbance to qualifying features of the Dearne Valley Wetlands SSSI, should they be using adjacent fields; however, any effects will be temporary, reversible of negligible magnitude and not significant.

5.2.1.3 DECOMMISSIONING

Decommissioning activities are believed to be of a similar nature to those of construction; therefore, there is potential for temporary and localised elevations in noise, vibration, traffic, and human presence. However, with the adoption of relevant good practice and legal requirements, broadly following the mitigation measures detailed within Section 5.1, any effects are likely to be temporary, reversible, of negligible magnitude and not significant.

5.3 PROTECTED SPECIES

5.3.1 BATS

5.3.1.1 CONSTRUCTION

There were no records of bats returned within the data search, however there was an EPSML allowing destruction of a soprano pipistrelle roost returned within the data search. This was approximately 50 m from the Site. There were several trees identified as holding bat roosting potential, with the Site being considered of moderate suitability for foraging and commuting bats. Therefore, bats are likely present within the Site.

During construction, vegetation will be removed and there will be an increase in vehicles and personnel within the Site. There is risk of harm or fatality to bats, disturbance to bats within their resting places, and loss or damage to bat resting places, all of which are offences under the legislation afforded to protect bats. Should this occur this has the potential to reduce the number and distribution of bats locally; however with the embedded mitigation measures detailed in Section 5.1, the risk of harm or fatality to bats, disturbance to bats within their resting places, and loss or damage to bat resting places is considered negligible and thus effects to bats during construction is considered temporary, reversible, of negligible magnitude and not significant at the Local level.

5.3.1.2 OPERATION

Operation and maintenance of the Proposed Development is not anticipated to involve the loss of habitat, but there will be occasional vehicle movements and human presence throughout. The movement of vehicles represents a low risk of disturbance, harm or fatality to bats, particularly if maintenance activities occur during the hours of darkness. However, with vehicles travelling a reduced speed on Site the risk of disturbance, harm or fatality to bats is negligible, and any effects are considered temporary, reversible of negligible magnitude and not significant at the Local level.

Habitats lost to the Proposed Development will be compensated for through the LEMP and will include the sowing of a species-rich grassland underneath and between the panels, which will provide an increase in habitats available for invertebrates, which in turn will provide an increase in the prey available for bats. This has the potential to increase the number and

distribution of bats at the Site level, which represents a permanent, positive, significant effect at the Site level.

5.3.1.3 DECOMMISSIONING

Impacts from decommissioning works are anticipated to be of a similar nature to the construction phase impacts to bats. However, with the adoption of relevant good practice and legal requirements, broadly following the mitigation measures detailed within Section 5.1 effects are likely to be temporary, reversible of negligible magnitude and not significant at the Local level.

5.3.2 OTTER

5.3.2.1 CONSTRUCTION

Otter was recorded on one of the camera traps, however, no active resting sites were confirmed. During construction, vegetation will be removed and there will be an increase in vehicles and personnel within the Site. Therefore, otter could be disturbed and/or harmed/killed during the construction of the Proposed Development, and there is a risk of destruction or damage of an otter resting place, should one become established prior to commencement of construction. These impacts would constitute offences under the legislation afforded to protect otter. Aural and visual disturbance, harm or fatality to otter, and/or loss/damage of otter resting sites could lead to a reduction in the number and distribution of otter locally; however with the embedded mitigation measures detailed in Section 5.1, the risk of impact to otter is considered negligible and thus effects to otter during construction is considered temporary, reversible, of negligible magnitude and not significant at the Local level.

5.3.2.2 OPERATION

Operation and maintenance of the Proposed Development is not anticipated to involve the loss of habitat or works within, or close to, the riparian zone; however, it is likely that operation and maintenance will result in occasional vehicle movements and human presence throughout the operational period. This will be limited to development infrastructure, with no disturbance of surrounding environments, including riparian habitats anticipated. Therefore, there is a low risk of disturbance, harm or fatality to otter, particularly during winter months when light levels are low. However, with mitigation measures including vehicles travelling at reduced speed on Site, and any maintenance works to be conducted during the day rather than at night, the risk of disturbance, harm or fatality to otter is negligible and any effects are considered temporary, reversible of negligible magnitude and not significant at the Local level.

5.3.2.3 DECOMMISSIONING

This is as per 5.3.1.3 therefore effects upon otter from decommissioning of the Proposed Development is temporary, reversible of negligible magnitude and not significant at the Local level.

5.3.3 REPTILE

5.3.3.1 CONSTRUCTION

Grass snake was recorded using the Site during the reptile surveys undertaken by ERM in July and August 2024; therefore, there is a risk of harm, disturbance or fatality during construction.

However, the avoidance measures detailed within Section 5.1.2 will reduce this risk significantly, and provided these measures are adhered to, effects to reptiles are considered temporary, reversible of negligible magnitude and not significant at the Local level.

5.3.3.2 OPERATION

Operation and maintenance of the Proposed Development is not anticipated to involve the loss of habitat, but there will be occasional vehicle movements and human presence throughout the operational period, though this will be limited to development infrastructure. The movement of vehicles represents a low risk of disturbance, harm or fatality to reptiles. However, with vehicles travelling a reduced speed on Site for any maintenance, the risk of disturbance, harm or fatality to reptiles is negligible, and any effects are considered temporary, reversible of negligible magnitude and not significant at the Local level.

Any habitat lost during the construction of the Proposed Development during the construction phase would be compensated for during the operational phase through implementation of the LEMP, which would involve the following measures:

- Planting of a species-rich wildflower grassland mix for the areas between the panels; and
- Arisings from vegetation removal will be arranged into brash piles once the works are complete to create hibernacula for reptiles.

The planting of a species-rich wildflower grassland mix, for areas between the panels will provide additional habitat for invertebrates, which in turn provides an increased foraging resource for reptiles. Furthermore, the arisings from vegetation removal, and arrangement into brash piles will increase the number of available hibernacula for reptiles locally. With these measures in place, there is potential for the number and distribution of reptiles to increase locally, this would represent a significant, permanent, positive effect at the Local level.

5.3.3.3 DECOMMISSIOINING

This is as per 5.3.1.3 therefore any effect to reptiles from decommissioning of the Proposed Development is considered temporary, reversible, of negligible magnitude and not significant at the local level.

5.3.4 GREAT CRESTED NEWT

5.3.4.1 CONSTRUCTION

Information about risk of physical harm/fatality/disturbance during construction is as per reptiles (Section 5.3.3.1). Therefore, effects to GCN are considered temporary, reversible of negligible magnitude and not significant at the local level.

There is a possibility of pollution to GCN breeding during construction, which could lead to harm/fatality of GCN and potential loss of breeding sites, all of which are offences under the legislation afforded to protect GCN. However, provided avoidance measures detailed in 5.1.2.3 are adhered to during construction, the risk of pollution to waterbodies is negligible and so effects to GCN are considered negligible and not significant at the Local level.

5.3.4.2 OPERATION

The disturbance of harm to GCN during construction is as per reptiles (Section 5.3.3.2), with effects considered temporary, reversible of negligible magnitude and not significant at the Local level.

Habitat loss and compensation for GCN is as per reptiles (Section 5.3.3.2), which represent a significant, positive, permanent effect at the Local level.

5.3.4.3 DECOMMISSIONING

This is as per 5.3.1.3 therefore any effect to GCN from decommissioning of the Proposed Development is considered temporary, reversible, of negligible magnitude and not significant at the Local level.

5.3.5 BIRDS

5.3.5.1 CONSTRUCTION

A total of 45 species were recorded during the BBS. Of these, 19 were species of conservation importance (as defined in Section 124.1.6) including seven that showed evidence of breeding or holding territory within the Site or immediate surrounds, as shown in Table 6.2; therefore, a total of 22 territories were recorded of seven species of conservation importance. Kingfisher was observed using the Site, though no nesting sites were recorded. No willow tits were recorded during the surveys. Whilst willow tit could pass through the Site, habitats were considered unsuitable for nesting willow tit.

The nature, scale and timing of human activities can result in disturbance of birds at a level which can affect behaviour, such as changes to feeding or roosting behaviour. Construction of the Proposed Development could lead to temporary increases in noise, light, sound, and vibration. Habitat within the Site is suitable for a variety of bird species for both breeding and foraging, however, construction will be limited to within the Site only for a period of six to eight weeks, and providing mitigation detailed within Section 5.1.2 is adhered to, effects from disturbance to birds will be temporary, reversible of negligible magnitude and not significant.

Vegetation clearance during construction has the potential to harm or kill birds whilst nesting, destroy their nests, eggs and young, which are offences under the Wildlife and Countryside Act 1981 (as amended). Mitigation detailed in 5.1 will reduce this risk to negligible; therefore, effects upon nesting birds are considered negligible and not significant.

Regarding kingfisher, temporary increases in noise, light, sound, and vibration could cause disturbance to the species whilst nesting, which would constitute an offence under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). Therefore, pre-construction checks for kingfisher should be undertaken to check for suitable habitat for kingfisher. The checks should be completed within the winter months when banksides are more visible. Provided these nesting checks take place the risk of disturbance to nesting kingfisher is negligible; therefore, effects upon nesting kingfisher are considered negligible and not significant.

5.3.5.2 OPERATION

Operation and maintenance of the Proposed Development will be limited to areas within the Site and would not result in the loss of any habitat. It is likely that there will be periodic vehicle movements and human presence throughout the operational period, as site personnel

and security staff undertake temporary maintenance works and inspections. This will be limited to development infrastructure, with no disturbance of the surrounding environment anticipated. Therefore, there will be a low risk of disturbance to birds, however, any effects will be temporary, reversible of negligible magnitude and not significant at the Local level.

The following compensation and enhancement measures are proposed to be incorporated into a Landscape Management Plan prepared by the Applicant, which would be of benefit to birds:

- Planting of a species-rich wildflower grassland mix for the areas between the panels.
- Willow tit nest boxes and retention of standing or fallen deadwood where it is safe to do so.
- Addition of butterfly scrapes will provide additional habitats for invertebrates, which will provide additional foraging for birds.

The planting of species-rich wildflower grassland mix will provide an increase in invertebrates and thus foraging resource for some bird species; as well as providing suitable habitat for ground nesting species. This would provide a permanent, positive, significant effect at the Site level for birds.

Furthermore, the addition of willow tit nest boxes, and retention of standing or fallen deadwood, will provide an increased nesting resource for willow tit, this may increase the number and distribution of willow tit, which would represent a permanent, positive, and significant effect.

5.3.5.3 DECOMMISSIONING

This is as per 5.3.1.3 therefore any effect to birds from decommissioning of the Proposed Development is considered temporary, reversible, of negligible magnitude and not significant at the Local level.

5.3.6 BADGER

5.3.6.1 CONSTRUCTION

Two outlier setts were recorded during surveys undertaken by RSK in 2022, and camera traps recorded badger using the Site on 09 June 2024. During construction there is potential for badgers to be harmed or killed, and their setts being damaged or destroyed, which would constitute offences under the Protection of Badgers Act (1992). However, with the avoidance measures detailed in Section 5.1, the risk of construction impacts to badger are low; therefore, construction effects to badger are considered temporary, reversible, of negligible magnitude and not significant at the Local level.

5.3.6.2 OPERATION

Grassland and scrub will be affected by the Proposed Development; however, it is recommended that species-rich grassland is sown underneath and between the panels, which will provide greater ecological diversity and species diversity than the existing habitats. This will provide an increase in the number of fruiting flora and invertebrates on which badger can feed. This represents an increase in foraging habitat for badger in the locale, which in turn provides the potential for an increase in the number and distribution of badger locally, which represents a significant permanent positive effect at the Local level in respect of badger during the operational phase of the Proposed Development.

5.3.6.3 DECOMMISSIONING

This is as per 5.3.1.3 therefore effects upon badger are likely to be temporary, reversible of negligible magnitude and not significant at the Local level.

6. CUMULATIVE EFFECTS

This assessment has considered cumulative effects which can result from individually insignificant but collectively significant actions taking place over a period of time concentrated in a location (e.g., where the ZoI of other projects overlap with the Proposed Development).

Due to the small-scale nature of the Proposed Development, and that the Site is situated beyond the core operational assets with Worsbrough WWTW compound, no significant cumulative effects are predicted.

7. RESIDUAL EFFECTS

This report has considered the effects of the Proposed Development on IEFs, and following the implication of the embedded mitigation, residual effects are considered temporary, reversible of negligible magnitude and not significant. However, with the implementation of appropriate landscape planting, via a LEMP, there will be a permanent, beneficial positive effect for the following IEFs (geographic scale in brackets):

- Bats (Site level)
- Badger (Local level)
- Reptile (Local level)
- GCN (Local level)
- Birds (Site level)
- Willow tit (Local level)

7.1 REPORT LIFESPAN

Unless otherwise agreed with Barnsley Metropolitan Borough Council, the details of this report are valid for a period of two years from the date of the Field Surveys; in accordance with current CIEEM guidelines[46]. In the event that construction activities do not commence within this timescale, a professional ecologist will need to undertake a site visit and, following any updated desk study, review the validity of this report and advise on whether some or all of the ecological surveys may need to be updated.

[46] CIEEM. (2019) *Advice Note on the Lifespan of Ecological Reports and Surveys* [online]. Available from: https://cieem.net/. Accessed: 29/11/2024.

APPENDIX A FIGURES

FIGURE 1 SITE LOCATION PLAN

FIGURE 2 HABITAT SURVEY AREA PLAN

FIGURE 3 GCN SURVEY AREA PLAN

FIGURE 4 OTTER CAMERA TRAP SURVEY PLAN

FIGURE 5 REPTILE REFUGIA LOCATION PLAN

FIGURE 6 DESIGNATED SITES WITHIN 2 KM

FIGURE 7 HABITATS OF PRINCIPAL IMPORTANCE PLAN

FIGURE 8 HABITAT SURVEY PLAN

FIGURE 9 GCN RESULTS PLAN

FIGURE 10 REPTILE SURVEY RESULTS PLAN



Site Boundary

JA Solar 545Wp - Landscape 20 deg.

Fencing

PV Supply - By Others

Fence

0 20 40 60 80 100

Metres

N

SCALE: See Scale Bar	VERSION: A03
SIZE: A4	DRAWN: WB
PROJECT: 0733950	CHECKED: DM
DATE: 29/11/2024	APPROVED: DM

Figure 1
Site Location and Development Layout Plan
Ecological Impact Assessment (EcIA)

ERM

Downing

PROJECTION: British National Grid

Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft

Path: \\uksprdgisfs01\Data\London\Projects\0733950 - Worsbrough\Maps\0733950 - Worsbrough.aprx\0733950 - Worsbrough - ECIA - Figure 1 - Site Location Plan - A03



Site Boundary

Habitat Study Area - 50 m Buffer of Site Boundary

0 20 40 60 80 100

Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
PROJECT: 0733950	CHECKED: CR
DATE: 22/11/2024	APPROVED: DM

Figure 2
Habitat Survey Area Plan
Ecological Impact Assessment (EcIA)

ERM

Downing

PROJECTION: British National Grid

Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft

Path: \\UKSPRDGISFS01\Data\London\Projects\0733950 - Worsbrough\Maps\0733950 - Worsbrough.aprx\0733950 - Worsbrough - ECIA - Figure 2 - Habitat Survey Area Plan - A01



Site Boundary

GCN Survey Area - 250 m Buffer of Site Boundary

Pond Locations

Short Name	Name
P1	Pond 1
P2	Pond 2
P3	Pond 3
P4	Pond 4
P5	Pond 5
P6	Pond 6
SuDS	SuDS
DP	Duck Pond
GP1	Garden Pond 1
GP2	Garden Pond 2
GP3	Garden Pond 3
S	Soakaway

0 50 100 150 200
Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: CR
PROJECT: 0733950	CHECKED: DM
DATE: 25/11/2024	APPROVED: AB

Figure 3
GCN Survey Plan
Ecological Impact Assessment (EcIA)

ERM Downing

PROJECTION: British National Grid

Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft

Path: \\UKSPRDGISFS01\Data\London\Projects\0733950 - Worsbrough\Maps\0733950 - Worsbrough.aprx\0733950 - Worsbrough - ECIA - Figure 3 - GCN Survey Area Plan - A01



Site Boundary

GCN Survey Area - 250 m Buffer of Site Boundary

Otter Camera Trap Deployment

0 50 100 150 200

Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: CR
PROJECT: 0733950	CHECKED: DM
DATE: 22/11/2024	APPROVED: AB

Figure 4
Otter Camera Trap Survey Plan
Ecological Impact Assessment (EcIA)

ERM

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Site Boundary

Reptile Refugia Locations

0 10 20 30 40 50

Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: CR
PROJECT: 0733950	CHECKED: DM
DATE: 22/11/2024	APPROVED: AB

Figure 5
Reptile Refugia Location Plan
Ecological Impact Assessment (EcIA)

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Site Boundary

2 km Study Area

Site of Special Scientific Interest (SSSI)

Local Wildlife Site (LWS)

Local Nature Reserves

0 250 500 750 1,000 1,250

Metres

N

SCALE: See Scale Bar	VERSION: A02
SIZE: A4	DRAWN: DN
PROJECT: 0733950	CHECKED: CR
DATE: 29/11/2024	APPROVED: DM

Figure 6
Designated Sites within 2 km of the Site Boundary
Ecological Impact Assessment (EcIA)

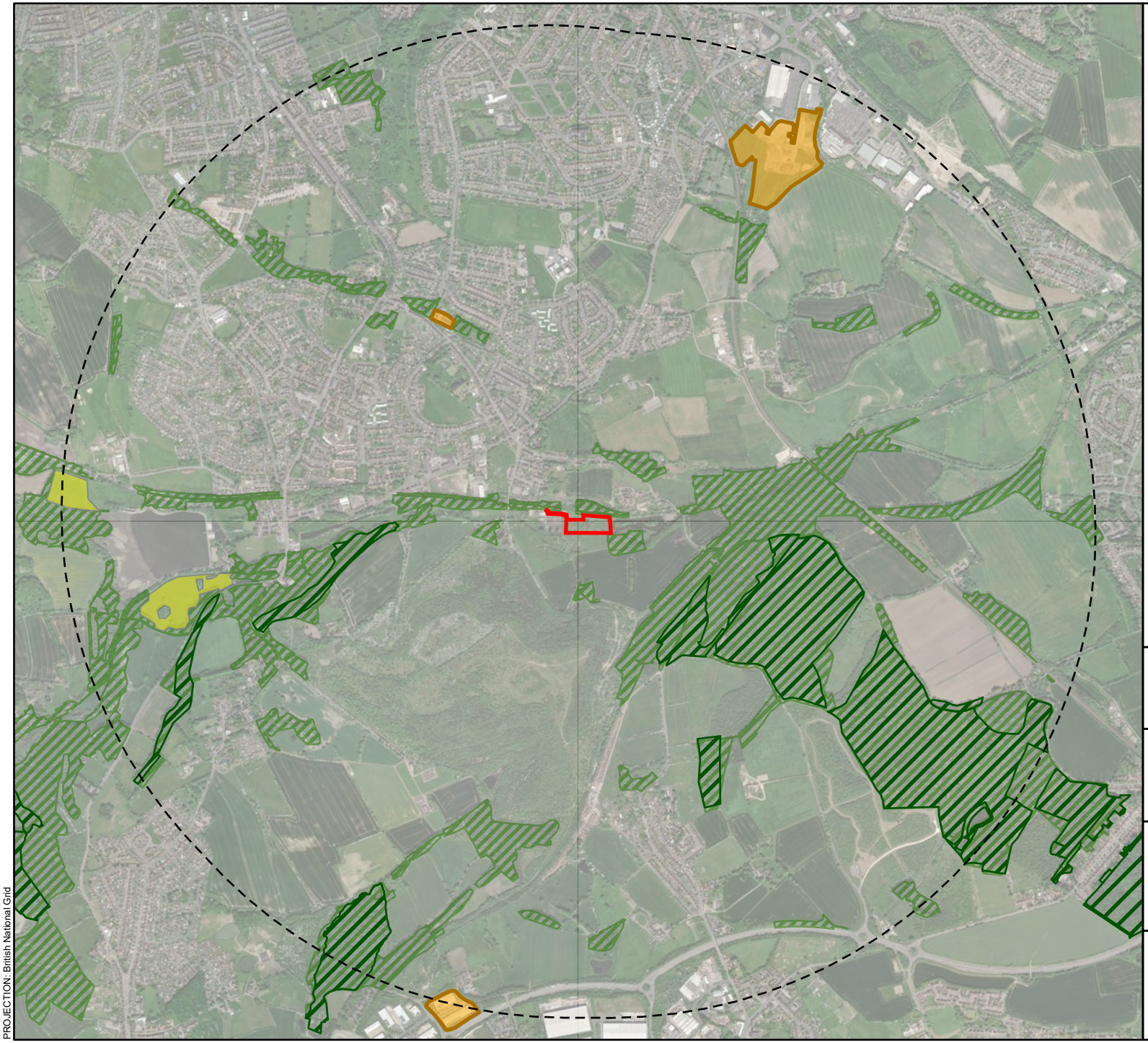
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Site Boundary
2 km Study Area
Priority Habitat:
Deciduous Woodland
Lowland Meadows
Open Mosaic Habitat
Ancient Woodland Inventory (AWI)

0 250 500 750 1,000 1,250
Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
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Figure 7
Habitats of Principal Importance and Ancient Woodland
Ecological Impact Assessment (EcIA)

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Secondary Code	Description
10	Scattered scrub
11	Hedgerow with trees
16	Tall forbs
32	Scattered trees
33	Line of trees
81	Ruderal or ephemeral
82	Vacant or derelict land
106	Mown
112	Earthbank
839	Track

Site Boundary

Habitat Study Area - 50 m Buffer of Site Boundary

Target Note

UK Habitat Classification:

- g3c - other neutral grassland
- g4 - modified grassland
- h3h - mixed Scrub
- r1g - other standing water
- r2 - rivers and lakes
- u1b - developed land, sealed surface
- u1b5 - buildings
- u1c - artificial unvegetated unsealed surface
- u1f - sparsely vegetated urban land
- w1g - other woodland, broadleaved
- w1g - Other broadleaved woodland
- h2a - Native hedgerow

0 20 40 60 80 100

Metres

N

SCALE: See Scale Bar	VERSION: A02
SIZE: A4	DRAWN: DN
PROJECT: 0733950	CHECKED: CR
DATE: 22/11/2024	APPROVED: AB

Figure 8
UK Habitat Classification Survey Results and Target Notes
Ecological Impact Assessment (EcIA)

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PROJECTION: British National Grid

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Site Boundary

GCN Survey Area - 250 m Buffer of Site Boundary

GCN Survey Results

- Positive
- Negative
- Conditions Too Dry: Not Completed
- Pond Inaccessible for Survey
- No Access to Pond: Not Completed

Short Name	Name
P1	Pond 1
P2	Pond 2
P3	Pond 3
P4	Pond 4
P5	Pond 5
P6	Pond 6
SuDS	SuDS
DP	Duck Pond
GP1	Garden Pond 1
GP2	Garden Pond 2
GP3	Garden Pond 3
S	Soakaway

0 50 100 150 200
Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: CR
PROJECT: 0733950	CHECKED: DM
DATE: 25/11/2024	APPROVED: AB

Figure 9
GCN Survey Results
Ecological Impact Assessment (EcIA)

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Site Boundary

Reptile Mat Placement

Reptile Survey Observations

Grass Snake

Toad

0 5 10 15 20 25

Metres

N

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: DN
PROJECT: 0733950	CHECKED: CR
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Figure 10
Reptile Survey Results
Ecological Impact Assessment (EcIA)

ERM

Downing

PROJECTION: British National Grid

Maxar, Microsoft

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APPENDIX B IMPACT ASSESSMENT GUIDANCE

B1. GEOGRAPHIC SCALES OF IMPORTANCE

Importance	Criteria
International	The population has little or no ability to absorb change without fundamentally altering its present character (i.e., the population of a rare and sensitive species in significant decline). An internationally designated site (e.g., a SAC), or a site meeting criterion for international designation. Species present in internationally important numbers (>1 % of international population).
National (England)	The population has low ability to absorb change without fundamentally altering its present character (i.e., the population of an uncommon or rare species in decline, or common species in significant decline). A nationally designated site (e.g., a Site of Special Scientific Interest (SSSI)) or a site meeting criterion for national designation. Species present in nationally important numbers (> 1 % of English population).
Regional (North East)	The population has a moderate capacity to absorb change. Without significantly altering its present character (i.e., an uncommon or rare, but stable species, or a common / widespread but declining species). Species present in regionally important numbers (> 5% of the population within Yorkshire and the North East). Sites do not meet criteria for SSSI selection, but greater than the county criteria below.
County (Yorkshire)	The population has a moderate capacity to absorb change. Without significantly altering its present character (i.e., an uncommon or rare, but stable species, or a common / widespread but declining species). Species present within important numbers for the county of North Yorkshire, (i.e. > 5 % of the population in North Yorkshire). Priorities within the Local Biodiversity Action plan (LBAP) where they occur in sufficient abundance to maintain local resource. Sites meet criteria for County Wildlife Sites (CWS).
Local (Barnsley)	Sites where there is no significant connectivity to international, national, regional or county designations or a site not meeting criterion for such a designation. The population is tolerant of change without detriment to its character (a common / widespread species that is stable, or uncommon species that is improving). A species or habitat of low conservation value, but with very limited presence. Priorities within the LBAP, where they occur in low abundance. Local Wildlife Trust (LWS) sites, Local Nature Reserves (LNRs) and Sites of Importance for Nature Conservation (SINCs). Areas of habitat or species considered to appreciably enrich the ecological resource within the area local to the Site.
Less than Local (Site)	The population is resistant to change (any population that is improving its range and abundance). Population of little conservation value, or of local conservation value but with very limited presence. Usually widespread and common habitats and species. Loss of such species from the Site, would not be detrimental to the ecology of the local area.

B2. IMPACT CHARACTERISATION

In line with CIEEM guidelines[1] the assessment described the relevant characteristics required to identify potential effects:

- Beneficial or adverse: these are determined according to whether the change is in accordance with nature conservation objectives and policy. A positive impact is a change that improves the quality of the environment and may include halting or slowing an existing decline in the quality of the environment. A negative impact is a change that reduces the quality of the environment;
- Extent: a spatial or geographical area over which the impact may occur;
- Magnitude: the size, amount, intensity and volume of the impact, which should be quantified if possible (see below) and expressed in absolute or relative terms (e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population);
- Duration: this is defined in relation to ecological characteristics in addition to human timeframes. Impacts may be described as short, medium, long-term, permanent, or temporary;
- Frequency and timing: this will consider the number of times an activity will occur in a limited period that may influence the resulting impact. The timing and frequency of an activity or change may result in an impact if it coincides with seasonal ecological elements (such as protected species' breeding season); and,
- Reversibility: an irreversible impact is one from which recovery is not possible within a reasonable timescale, or there is no reasonable chance of action being taken to reverse it. A reversible impact is one from which spontaneous recovery is possible or which may be counteracted by mitigation.

Magnitude	Criteria
High	A fundamental change to the baseline condition, leading to a total loss or major alteration of baseline condition.
Medium	A material, partial loss, or alteration of baseline condition.
Low	A slight, detectable alteration of the baseline condition.
Negligible	A barely distinguishable change from baseline condition.

APPENDIX C TARGET NOTES

Target Note	Photos
TN1 OTHER BROADLEAVED WOODLAND Strip of broadleaved woodland on the north of the site. • Bramble *Rubus fruticosus agg*. • Butterfly-bush *Buddleja davidii* • Common nettle *Urtica dioica* • Hawthorn *Crataegus monogyna* • Oak *Quercus sp.* • Poplar *Populus sp*. • Silver birch *Betula pendula* • Sycamore *Acer pseudoplatanus* • Wood avens *Geum urbanum* • Willow *Salix sp.*	

Target Note	Photos
TN2 OTHER NEUTRAL GRASSLAND Other neutral grassland with tall forb and scattered scrub adjacent to the woodland. • American willowherb *Epilobium ciliatum* • Black medick *Medicago lupulina* • Bramble *Rubus fruticosus agg*. • Butterfly-bush *Buddleja davidii* • Common knapweed *Centaurea nigra* • Common nettle *Urtica dioica* • Creeping buttercup *Ranunculus repens* • Creeping cinquefoil *Potentilla reptans* • Creeping thistle *Cirsium arvense* • False oat-grass *Arrhenatherum elatius* • Great willowherb *Epilobium hirsutum* • Hawthorn *Crataegus monogyna* • Ragwort *Jacobaea vulgaris* • Red fescue *Festuca rubra* • Vetch *vicia sp.* • Wild teasel *Dipsacus fullonum* • Yorkshire-fog *Holcus lanatus*	

Target Note	Photos
TN3 OTHER NEUTRAL GRASSLAND Other neutral grassland with tall forb and scattered scrub adjacent to the woodland on the northeast of the site. Where stands of the invasive Himalayan balsam was present. • Black medick *Medicago lupulina* • Bramble *Rubus fruticosus agg*. • Common nettle *Urtica dioica* • Creeping buttercup *Ranunculus repens* • Creeping cinquefoil *Potentilla reptans* • Creeping thistle *Cirsium arvense* • Elder *Sambucus nigra* • Forget-me-nots *Myosotis sp*. • Great willowherb *Epilobium hirsutum* • Hawthorn *Crataegus monogyna* • Hemlock *Conium maculatum* • Indian balsam *Impatiens glandulifera* • Ragwort *Jacobaea vulgaris*	

Target Note	Photos
TN4 MIXED SCRUB Dogwood scrub on the on the northeast of the site. • Bramble *Rubus fruticosus agg.* • Dogwood *Cornus sanguinea* • Hawthorn *Crataegus monogyna*	

Target Note	Photos
TN5 SPARSELY VEGETATED URBAN LAND ON TRACK Section of sparsely vegetated urban land on disused track. • American willowherb *Epilobium ciliatum* • Black medick *Medicago lupulina* • Bramble *Rubus fruticosus agg.* • Bristly Oxtongue *Helminthotheca echioides* • Butterbur *Petasites hybridus* • Creeping buttercup *Ranunculus repens* • Creeping cinquefoil *Potentilla reptans* • Creeping thistle *Cirsium arvense* • Daisy *Bellis perennis* • Forget-me-nots *Myosotis sp.* • Meadow grass *Poa sp.* • Ragwort *Jacobaea vulgaris* • Red fescue *Festuca rubra* • Selfheal *Prunella vulgaris* • Silverweed *Potentilla anserina* • Vetch *Vicia sp*. • White clover *Trifolium repens* • Wild teasel *Dipsacus fullonum* • Yorkshire-fog *Holcus lanatus*	

Target Note	Photos
TN6 MIXED SCRUB Mixed scrub on the center of the site. • Elder *Sambucus nigra* • Hawthorn *Crataegus monogyna* • Sycamore *Acer pseudoplatanus* • Willow *Salix sp*.	
TN7 ARTIFICIAL UNVEGETATED, UNSEALED SURFACE Mounds of earth on east of the site where some earthworks had taken place. A dirt track was also present leading from the entrance of the site to the earthworks.	

Target Note	Photos
TN8 OTHER NEUTRAL GRASSLAND Other neutral grassland with tall forb and scattered scrub, which forms most of the site. • Bramble *Rubus fruticosus agg.* • Common nettle Urtica dioica • Creeping buttercup Ranunculus repens • Creeping cinquefoil Potentilla reptans • Dock Rumex sp. • Elder Sambucus nigra • Great willowherb Epilobium hirsutum • Hemlock Conium maculatum • Hogweed Heracleum sphondylium • Hawthorn Crataegus monogyna • Red fescue *Festuca rubra* • Rosebay willowherb *Chamerion angustifolium* • Vetch *vicia sp*. • Willow *Salix sp.* • Yorkshire-fog *Holcus lanatus*	

Target Note	Photos
TN9 MODIFIED GRASSLAND Modified grassland surrounding the waterworks infrastructure adjacent to site. • Black medick *Medicago lupulina* • Common mouse-ear *Cerastium fontanum* • Common nettle *Urtica dioica* • Creeping buttercup *Ranunculus repens* • Creeping cinquefoil *Potentilla reptans* • Creeping thistle *Cirsium arvense* • Curled dock *Rumex crispus* • Henbit *Lamium amplexicaule* • Perennial rye-grass *Lolium perenne* • Ragwort *Jacobaea vulgaris* • Ribwort plantain *Plantago lanceolata* • Wavy bittercress *Cardamine flexuosa* • Yorkshire-fog *Holcus lanatus*	

Target Note	Photos
TN10 OTHER NEUTRAL GRASSLAND WITH TALL FORBS Other neutral grassland with tall forb surrounding the pond. • Bramble *Rubus fruticosus agg*. • Creeping thistle *Cirsium arvense* • Cleavers *Galium aparine* • Great willowherb *Epilobium hirsutum* • Hemlock *Conium maculatum*	
TN11 LINE OF TREES Line of Poplar *Populus sp.* trees on the east boundary.	

Target Note	Photos
TN12 Line of Trees Line of Poplar *Populus sp*. trees on the center of site.	
TN13 Native hedgerow with trees • Bramble *Rubus fruticosus agg.* • Common nettle *Urtica dioica* • Hawthorn *Crataegus monogyna* • Poplar *Populus sp.* • Willow *Salix sp.*	

Target Note	Photos
TN 14 Invasive Species Himalyan balsam *Impatiens glandulifera*	
TN 15 Pond (P2) Pond to the west of the site.	

Target Note	Photos
TN 16 Pond (P4) Pond to the west of site.	
TN 17 Pond (P5) Pond to the west of site.	

Target Note	Photos
TN 18 Pond (P6) Pond to the west of site.	
TN 19 Pond (S) Pond to the south of site - Dry	

Target Note	Photos
TN 20 Badger	
TN 21 Reptile Refugia	

Target Note	Photos
TN 22 Bat Tree Tree covered in ivy may obscure features.	

Target Note	Photos
TN23 Mammal path	

Target Note	Photos
TN 24 WWTW Infrastructure	

Target Note	Photos
TN 25 Artificial unvegetated sealed surface	

Target Note	Photos
TN 26 Building	

Target Note	Photos
TN 27 WWTW infrastructure	

APPENDIX D GCN EDNA ANALYSIS RESULTS

Environmental DNA Report

Great Crested Newt



Order number	SO04048
Prepared for	Environmental Resources Management Ltd
Project	0733950 YW Solar - Worsbrough
Number of samples	4
Sampling dates	2024/06/19 - 2024/06/27
Report ID	GCN-VPL849
Date of report	2024/07/26

Thank you for choosing NatureMetrics

Welcome to your report. We are the leading provider of powerful, scalable biodiversity data delivered using environmental DNA.

Your sample(s) have been processed in accordance with the protocol set out in Appendix 5 of Biggs et al. (2014). Results are based on the samples as supplied by the client to the laboratory. Incorrect sampling methodology may affect the results. Note that a negative result does not preclude the presence of GCN at a level below the limits of detection.

A results interpretation guide and a glossary of terms highlighted throughout this report can be found at the end of the report.

GCN Detection Results

Pond ID	Inhibition	Degradation	GCN Score	Result
Pond 25	No	No	0	Negative
Pond 73	No	No	0	Negative
Pond 77	No	No	0	Negative
Pond 98	No	No	0	Negative

Sample Information

Pond ID	Kit ID	Sampling Date	Received Date
Pond 25	GCN-24-03064	2024/06/27	2024/07/18
Pond 73	GCN-24-03062	2024/06/27	2024/07/18
Pond 77	GCN-24-03069	2024/06/27	2024/07/18
Pond 98	GCN-24-03071	2024/06/19	2024/07/18

Methods

eDNA was precipitated via centrifugation at 14,000 x g and then extracted using Qiagen DNeasy Blood and Tissue extraction kits. qPCR amplification was carried out in 12 replicates per sample, using GCN specific primers and probe (developed by Thomsen et al. (2012) and adopted by Biggs et al. (2014)), in the presence of extraction negative controls, qPCR positive controls, and qPCR negative controls. A score is given for the number of positive replicates out of 12.

The qPCR method follows the recommendations set out by NatureMetrics for Natural England in the qPCR validation project and helps improve the reliability of the interpretation of the data.

Results from the GCN assay are considered to have a high confidence rating according to our Validation Scale (Harper et al. 2021).

The quality control methods exceed the requirements outlined in Appendix 5 of Biggs et al. (2014). These consist of the use of kit blanks, additional extraction negative controls, qPCR negative controls, and qPCR positive controls. Using these controls ensures assay performance is as expected and increases confidence in any weak or late amplifications.

The extraction and qPCR negative controls analysed alongside your samples showed no target amplification and the triplicate positive controls performed as expected.

END OF REPORT

Contact: **team@naturemetrics.co.uk**

Result Interpretation Guide

Positive

Target DNA has been detected in this sample, meaning that at least 1 of the 12 qPCR replicates has amplified. This is not a quantitative test, so you should not interpret a high eDNA score (e.g. 12/12) as necessarily indicating a larger population of GCN than a low eDNA score (e.g. 1/12).

Negative

No target DNA has been detected in this sample, but the internal and external controls worked as expected. This tells us that if there had been GCN DNA in the sample, we would have detected it, so we can be confident in its absence from the sample provided.

Inconclusive

No GCN DNA was detected in the sample, but the internal controls failed to amplify as expected. This means that any GCN DNA in the sample might also have failed to amplify properly, so we cannot have confidence in this negative result. Inconclusive results can be caused by the degradation of the DNA (as indicated by delayed or no amplification of the DNA marker contained in the ethanol in the kits) or by inhibition of the reaction (as indicated by delayed or no amplification of the DNA marker added in the lab) caused by certain chemicals or organic compounds that may be present in the water sample.

Validation Scale

We have developed our own confidence assessment tool for qPCR eDNA assays that builds upon the Thalinger et al. (2021) validation scale and helps end-users to interpret the qPCR outputs but also contextualise these with the level of validation that the assay itself has gone through. Briefly, the level of confidence that can be assigned to results coming from an assay is derived from several validation steps:

- Basic analysis - can the assay work in principle on the computer?
- PCR protocol - has the protocol been optimised in the lab?
- Specificity analysis - has the assay been tested in the lab against other co-inhabiting and/or closely related species?
- How extensively has the assay been tested with natural samples?
- Have the theoretical limits of detection been established?
- Have detection probabilities been estimated with extensive site occupancy modelling?
- Have external factors affecting detectability been extensively tested (e.g. seasonality, spatial heterogeneity)?

- Low

Results from these assays are difficult to interpret with confidence. It is impossible to conclusively tell if the target species is present or absent because of the limited amounts of *in silico*, *in vitro*, and *in vivo* testing.

- Medium

Assays with this rating have been tested *in silico*, have optimised lab protocols, specificity and sensitivity tested in and out of the lab, but with no estimates of detection probabilities or extensive testing of external factors that may affect the detectability of the target. Positive results can be interpreted as meaning the target species' DNA is present (assuming the correct sampling conditions), but negative results could mean that the target is absent or that external

factors such as ecology, seasonality, and spatial scales are influencing the detections.

- High High rating assays have everything that a Medium assay has, in addition to site occupancy modelling and extensive testing of external effects such as ecological, temporal and spatial factors. Positive results can be conclusively interpreted, and negative results can be interpreted as meaning the target species' DNA is absent (assuming the correct sampling conditions). In some instances, a probability of target species presence at a site and in a sample can be given.

Glossary

Controls Controls are used to monitor both the performance of the assays but also any contamination. Controls are treated in the same way as a normal sample. This is particularly important given the sensitivity of eDNA qPCR methods. Our full complement of controls enables us to fully monitor the whole GCN eDNA process from kits to data.

Kit blank Used to determine if the kits are contaminated but also to monitor the early stages of the pipelines, e.g. sample reception. These samples also act as uninhibited samples that can be used as a baseline to compare against. This is an additional control not specifically mentioned in the Biggs et al. (2014) protocol.

Extraction negative Extraction blank. Used to monitor potential contamination during the DNA extraction process.

qPCR negative Template negative control. Used to monitor potential contamination during the qPCR setup process. For every qPCR reaction, we include more qPCR negative controls than are prescribed in the Biggs et al. (2014) protocol.

qPCR positive Used to determine whether the qPCR run performed as expected. In addition to the 4 standard dilutions prescribed by the Biggs et al. (2014) protocol, we include an additional standard dilution and amplify all standards in triplicate. The increased number of standard dilutions and replicates allow us to generate standard curves to assess run performance and assay sensitivity.

Limit of detection The lowest standard positive control concentration at which 95 % of technical replicates amplify. Target amplification below the LOD cannot automatically be considered as negative but should be further investigated as spurious amplifications are more prevalent at these low concentrations.

eDNA Short for ‘environmental DNA’. Refers to DNA deposited in the environment through excretions and secretions, such as mucus, skin cells, saliva, faeces, urine etc. This can be collected in environmental samples (e.g. water, sediment) and used to identify the organisms that it originated from. eDNA in water is broken down by environmental processes over a period of days to weeks. It can travel some distance from the point at which it was released from

	the organism, particularly in running water. eDNA is sampled in low concentrations and can be degraded (i.e. broken into short fragments), which limits the analysis options.
Inhibitors	Chemicals/compounds that reduce or prevent DNA amplification, potentially resulting in false-negative results. Common inhibitors include tannins, humic acids and other organic compounds. Inhibitors can be overcome by either diluting the DNA (and the inhibitors), but dilution carries the risk of reducing the DNA concentration below the limits of detection.
qPCR	Stands for 'quantitative PCR'. A PCR reaction incorporating a coloured dye that fluoresces during DNA amplification, allowing a machine to track the progress of the reaction. Often used with species-specific primers and probe where amplification is used to infer the presence of the target species' DNA in the sample. If the species is not present in the sample, no fluorescence will be detected.
Primers	Short sections of synthesised DNA that bind to either end of the DNA segment to be amplified by qPCR.
Probe	A short section of synthesised DNA that binds to a specific section of the target species' DNA within the section flanked by the primers. The probe is designed to be totally specific to that species. The probe is labelled such that it fluoresces during amplification, which is used to infer the presence of the target species' DNA in the sample.

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