
Chapter 15

Biodiversity:

Terrestrial Ecology

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15.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes and presents an assessment of the likely significant effects of the N2 Slane Bypass and Public Realm Enhancement Scheme (hereafter referred to as the 'Proposed Scheme') on terrestrial biodiversity. The assessment examines the potential impacts during the construction and operational/maintenance phases of the Proposed Scheme. The Proposed Scheme is described in **Chapter 4 – Description of the Proposed Scheme** and **Chapter 5 – Description of the Construction Phase**.

This chapter should be read in conjunction with the following EIAR chapters in particular due to overlapping considerations e.g. in terms of assessment and mitigation:

- **Chapter 16 – Biodiversity: Aquatic Ecology:** This chapter covers biological water quality indicators and physicochemical conditions that support aquatic ecology, as well as fisheries and fishery habitats, and the hydromorphological conditions that support aquatic ecology. However, certain species who rely on the aquatic environment, namely otter (*Lutra lutra*) and kingfisher (*Alcedo atthis*), are covered within this **Chapter 15**;
- **Chapter 17 – Water:** Baseline descriptions and impact assessment relating to other aspects of the surface water environment such as hydrology, flood risk and Water Framework Directive considerations. The assessment set out in this chapter is relevant to the habitats and species dependent on the aquatic environment or hydrology for all or part of their life cycle; and
- **Chapter 18 – Land, Soils, Geology and Hydrogeology:** Baseline descriptions and impact assessment relating to groundwater and hydrogeology.

There are also clear linkages between the Environmental Impact Assessment and Appropriate Assessment processes. This chapter should therefore be read in conjunction with the Stage 1 – Appropriate Assessment Screening and Stage 2 – Natura Impact Statement for the Proposed Scheme which have been prepared with reference to European sites; these are available under separate cover as part of the overall application for development consent to An Bord Pleanála (ABP).

These parallel but separate processes commonly overlap, but also differ in key respects. While the EIA and AA must clearly be distinguished in terms of their respective scope and conclusions, the processes have been carried out concurrently and draw on common data and information. The key findings of the AA are reflected in the relevant section(s) of this chapter of the EIAR.

15.2 Methodology

15.2.1 Legislation, Policy and Guidance

The assessment of the likely significant effects of the Proposed Scheme on terrestrial ecological features has taken account of the legislation, policy and guidance set out in the following sections.

15.2.1.1 EU Legislation

EIA Directive - Council Directive 2011/92/EU as amended by 2014/52/EU and the transposing Irish legislation as regards Roads Development of the nature of the N2 Bypass, notably Section 50 (2)(b)(ii) of the Roads Act, 1993 – 2023, as amended requires a description of the likely significant effects of the proposed road development on the environment including reference to biodiversity, flora and fauna as part of the EIAR. This EIA requirement is not limited to the assessment of protected habitats and species as is the case under the Habitats Directive and Birds Directive which requires a separate and distinct assessment process under the EU Habitats Directive.

EU Habitats Directive - Council Directive 92/43/EEC (1992), has been transposed into Irish law by Part XAB of the Planning and Development Acts, 2000 – 2022 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended ('the Habitats Regulations'). In Ireland, these sites are designated as European Sites and include SACs, established under the Habitats Directive 92/43/EEC for the protection of habitats and species.

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EU Birds Directive - Council Directive 2009/147/EC provides strict protection of protected bird species in Ireland, these sites are designated as European Sites and include Special Protection Areas (SPA), established under the EU Birds Directive (79/409/EEC, as codified by 2009/147/EC) for birds.

15.2.1.2 National Legislation

The Wildlife Act 1976 (as amended) and the Wildlife Amendment Act 2000 are the principal national legislation providing for the strict protection of wildlife and the control of some activities that may adversely affect wildlife. The aims of the Wildlife Act, 1976 (as amended) are to provide for the protection and conservation of wild fauna and flora, to conserve a representative sample of important ecosystems, to provide for the development and protection of game resources, to regulate their exploitation, and to provide the services necessary to accomplish such aims. Such species, where relevant, are considered as sensitive ecological receptors in this report.

Along with the Wildlife Act 1976 (as amended), the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) is one of the most important pieces of legislation underpinning biodiversity and nature conservation in Ireland. The European Communities (Birds and Natural Habitats) Regulations 2011 transpose the Habitats Directive and the Birds Directive. The 2011 regulations seek to conserve species of wild birds and require the designation of a network of habitats for birds, based on scientific criteria. These designated sites are known as Special Protected Areas (SPAs). The regulations also require the designation of Special Areas of Conservation (SACs) for the protection of certain habitats and species of plants and animals (other than birds).

The Flora (Protection) Order, 2022 provides protection to a wide variety of protected plant species in Ireland including vascular plants, mosses, liverworts, lichens and stoneworts. Under the Flora (Protection) Order, 2022 it is illegal to cut, uproot or damage species listed in any way or to alter, damage or interfere in any way with their habitats. Such species, where relevant are considered as sensitive ecological receptors in this report.

15.2.1.3 Policy

Consideration has been given to the following relevant policy documents in the preparation of this chapter:

- The National Biodiversity Action Plan (NBAP) 2017-2021 (Department of Culture, heritage and the Gaeltacht [DCHG], 2017) and fourth National Biodiversity Action Plan 2023-2027 [in draft for consultation] (Department of Housing, local Government and Heritage [DHLGH] 2022);
- Meath County Development Plan 2021-2027 (MCC, 2021); and
- County Meath Biodiversity Action Plan 2015-2020 (MCC, 2015).

15.2.1.4 Guidance

The methodology and associated impact assessment was conducted with regard to the general guidance regarding the undertaking of an EIA, as presented in **Section 1.3.3 of Chapter 1 – Introduction**, and the following key topic-specific guidance:

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management. Version 1.2 - Updated April 2022;
- EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports. Environmental Protection Agency;
- NRA (2009a) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. National Roads Authority;
- NRA (2009b) Guidelines for assessment of ecological impacts of national road schemes. Revision 2; and
- NRA (2003) Guidelines for assessment of ecological impacts of national road schemes, Revision 1.

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15.2.2 Zone of Influence

The terrestrial biodiversity study area (see **Figure 15-1**) and the Study Area for ornithology (i.e. bird species) (see

Figure 15-2) are determined by the Zone of Influence (Zol) for the Proposed Scheme. The Zol (or “*spatial extent of the impact*” as described in Annex III (3) of the EIA Directive) is the area over which habitats, species, and/or ecosystems (i.e. ecological features) may be subject to significant impacts and effects as a result of the Proposed Scheme.

The Zol is likely to extend beyond the boundary of a scheme, for example where there are hydrological links extending beyond site boundaries. It will also vary for different ecological features depending on their sensitivity to an environmental change. It is therefore appropriate to identify different Zols for different features. The features affected could include habitats, species, and the processes on which they depend. Zols are specified for different features, and types of potential impact.

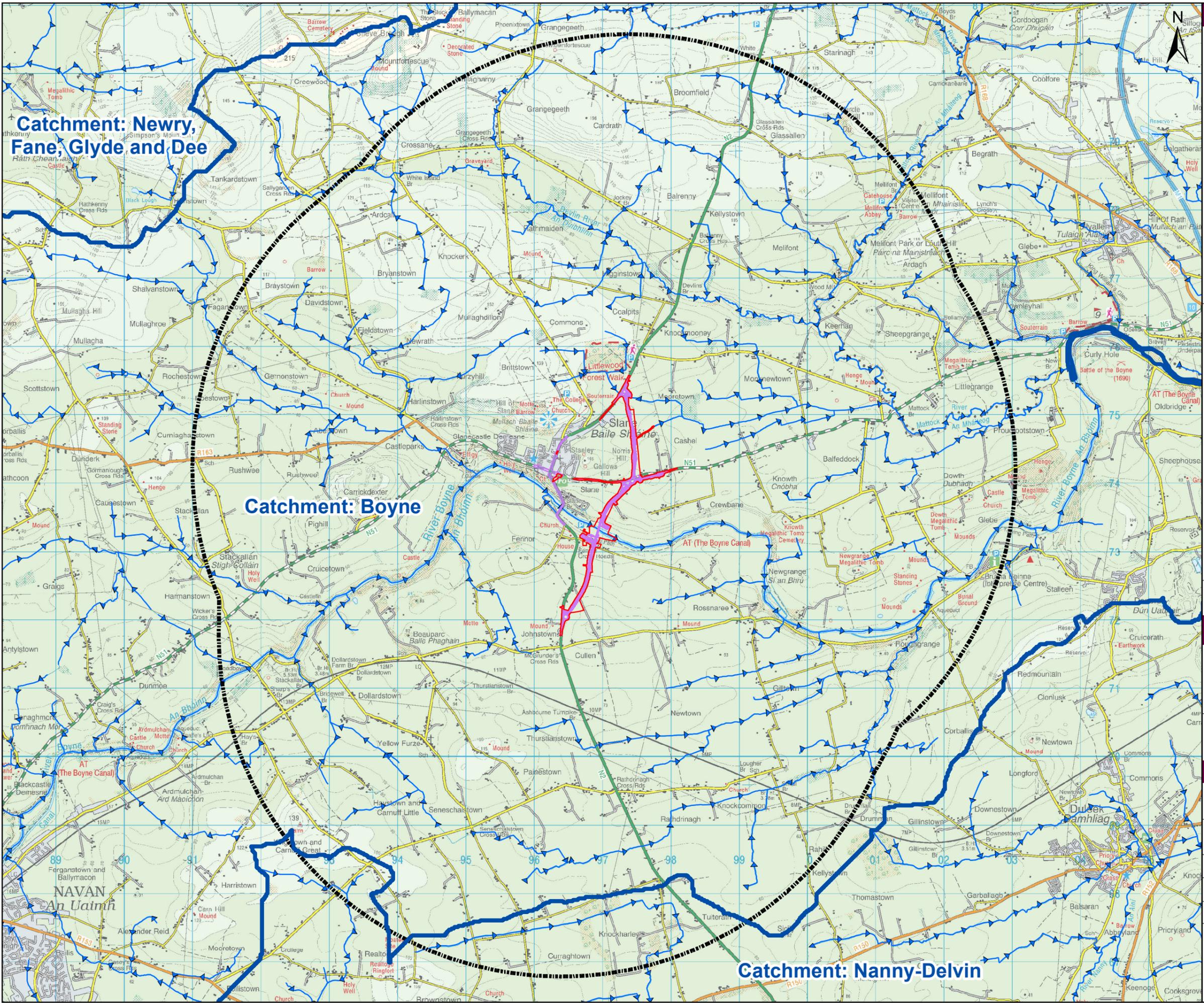
It is also important to acknowledge, as per the Environmental Protection Agency (EPA) guidance (EPA, 2022) “... *that the absence of a designation or documented feature (e.g. ecological) does not mean that no such feature exists within the site.*” As such, a Zol should be identified for all features potentially occurring within the site of the Proposed Scheme, in addition to any known to occur. Also as recommended by the CIEEM (2018) Guidelines, professionally accredited or published scientific studies were used to determine Zol for this Proposed Scheme, where available.

Through the incorporation of relevant Zols for the Proposed Scheme, the terrestrial biodiversity study area (see **Figure 15-1**) and the ornithology study area (see

Figure 15-2) are determined to extend outside the footprint of the Proposed Scheme, to include the following ecological features as set out in **Table 15-1**.

Table 15-1: Study Area and Zone of Influence for different Ecological Features

Ecological Features	Study Area for Desk Study	Zone of Influence Identified
Sites designated for nature conservation (as outlined in Section 15.3)	Catchment Management Unit (CMU)	All sites with connectivity to the Proposed Scheme
Habitats, rare, threatened, and protected flora, and invasive alien plant species	5 km	Redline boundary of the Proposed Scheme and relevant adjoining habitats
Otter	5 km	Up to 150 m buffer from the redline boundary of the Proposed Scheme
Badger	5 km	Up to 500 m buffer from the redline boundary of the Proposed Scheme
Bats	5 km	Redline boundary of the Proposed Scheme and adjoining habitats
Birds	5 km	Redline boundary of the Proposed Scheme and relevant adjoining habitats; and 2 km buffer of the redline boundary of the Proposed Scheme
Invertebrates	5 km	Redline boundary of the Proposed Scheme and relevant adjoining habitats
Amphibians	5 km	Suitable habitat (i.e. Boyne Navigation Canal and wet grassland)
Other mammals	5 km	Redline boundary of the Proposed Scheme and relevant adjoining habitats

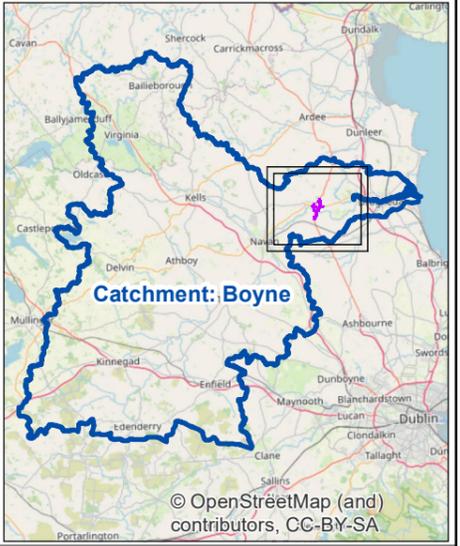


Legend

- Proposed Scheme
- Proposed Scheme Boundary
- WFD Catchment
- 5 km Buffer
- River Water Bodies

Data Source: Environmental Protection Agency (EPA)
WFD River Waterbodies - Cycle 3 2022
WFD Catchments 2021

0 0.5 1 2
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.1

Terrestrial Biodiversity Study Area

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-3028

Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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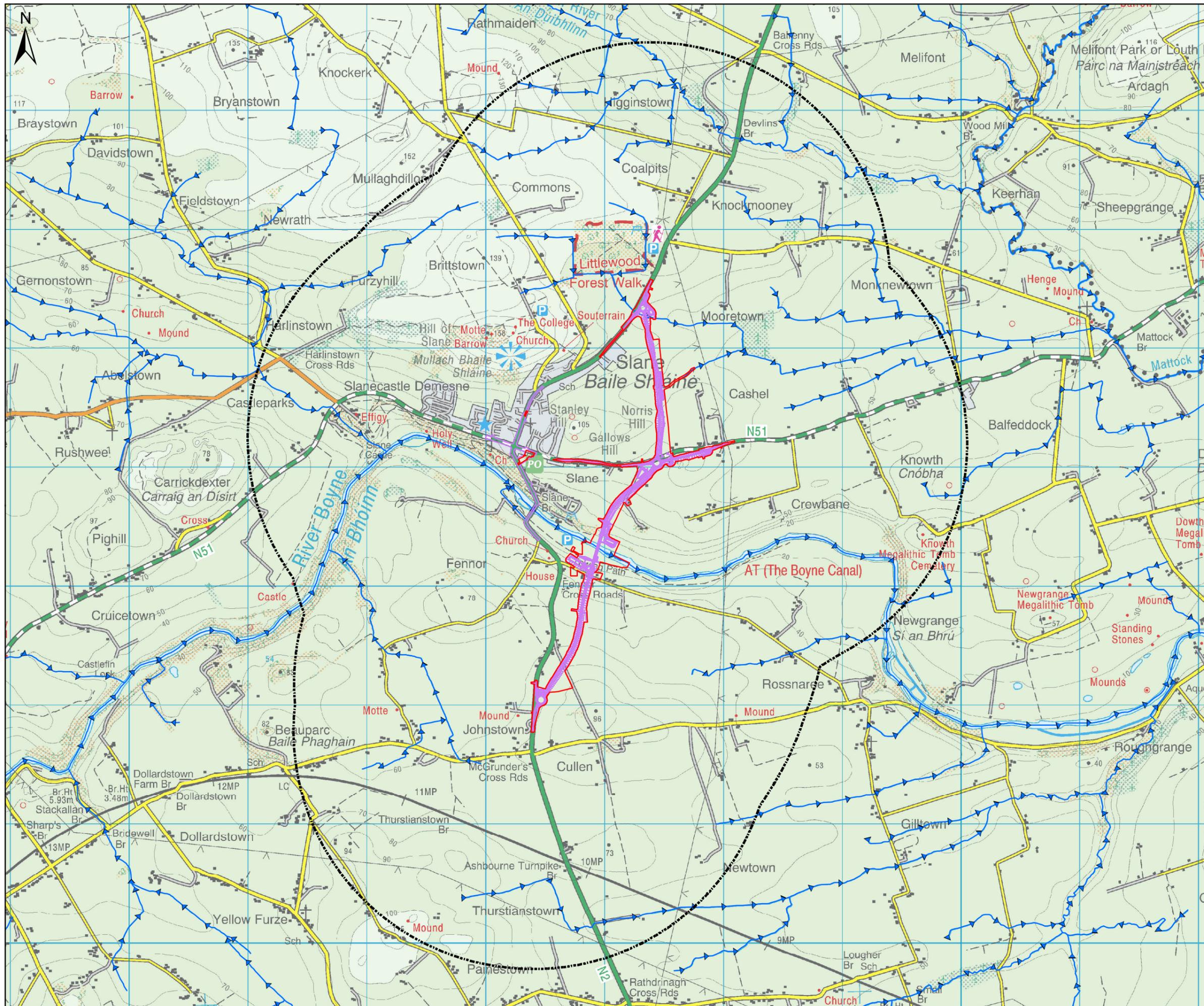
Drawn: NR	Date: 24/05/2023
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Checked: HF	Scale: 1:52,000 (A3)
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Approved: RR	Projection: ITM
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- 2km Buffer
- River Waterbodies

Data Source: Environmental Protection Agency (EPA)
WFD River Waterbodies - Cycle 3 2022

0 0.25 0.5 1
Kilometres

Client: **Meath County Council**

N2 Slane Bypass and Public Realm Enhancement Scheme

Title: **Figure 15.2**

Ornithology Study Area

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File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-3029

Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
Drawn: NR	Date: 24/05/2023	
Checked: HF	Scale: 1:30,000 (A3)	
Approved: RR	Projection: ITM	

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15.2.3 Sources of information to inform assessment

Information on ecological receptors within the terrestrial biodiversity and ornithology study areas was collected through a combination of detailed desktop review of existing studies and datasets, site-specific surveys, and consultation with relevant bodies.

15.2.3.1 Desktop study

Information on biodiversity within the Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in **Table 15-2** below. The National Biodiversity Data Centres (NBDC) online database was searched for records of invasive species, protected flora (including under the Flora (Protection) Order, 2022) and protected fauna under the EU Habitats Directive (92/43/EEC), Birds Directive (2009/147/EC) and Wildlife Acts (1976 as amended) within a 5 km radius of the Proposed Scheme.

Table 15-2: Summary of Key Desktop Reports

Title	Year ¹	Author/Source
Map of Irish Wetlands	2022	Wetlands of Ireland
Surface and groundwater quality status, and river catchment boundaries	2022	EPA
Designated areas spatial data	2022	National Parks and Wildlife Services (NPWS)
Distribution records for protected species and habitats (including suitability index for bats) held online by the National Biodiversity Data Centre (NBDC), NPWS, and Heritage Council.	2011-2022	NBDC NPWS Heritage Council Lundy et al. (2011)
Checklists of protected and threatened species in Ireland	2019	Nelson et al. (2019) Kingston et al. (2012)
Red Lists	1998, 2006, 2009, 2010, 2011, 2012, 2016, 2019, 2020, 2021	Curtis and Gough (1988), Fitzpatrick et al. (2007), Marnell et al. (2009), Regan et al. (2010), King et al. (2011), Clarke et al. (2016), Wyse Jackson et al. (2016), Marnell et al. (2019), Gilbert et al. (2021)
Status of EU Protected Habitats and Species in Ireland, Volume 1, 2, and 3	2019a 2019b 2019c	NPWS
National Biodiversity Action Plan 2017-2021	2017	Department of Culture, Heritage, and the Gaeltacht (DCHG)
Meath County Development Plan 2021-2027	2021	Meath County Council (MCC)
Meath Biodiversity Action Plan 2015-2020	2015	MCC
Protected Sites in Ireland	2019d	NPWS

15.2.3.2 Site-specific surveys

Based on desktop studies, high level assessment of potential impact pathways and preliminary site visits to establish impact pathways and ecological potential, site-specific surveys were undertaken as outlined in **Table 15-3**. All field surveys were undertaken using professional interpretation and application of the guidance, systems and methods referred to in the text describing each survey method. The NRA Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2009a) was also considered with regard to appropriate survey seasons and methods for many of Ireland's protected species. For further information on the results of the site-specific surveys, see **Section 15.3.3**.

¹ Note that the year provided for website sources refers to the last time it was checked. For published sources, dates are variable.

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Table 15-3: Site-Specific Surveys

Field survey focus	Extent of Survey	Overview of survey	Surveyor	Date(s)
Habitats	Footprint of the Proposed Scheme and adjoining lands	Habitat classification to Fossitt (2000)	RPS Ecology	October and December 2017; January, June, September and November 2018; June 2019; July 2020; and March 2022.
Protected and Notable Flora	Footprint of the Proposed Scheme	Assessment of potential for species listed in Flora (Protection) Order 2022, and Red Lists (Wyse Jackson et al., 2016; Lockhart et al., 2012)	RPS Ecology	
Invasive Alien Plant & Animal Species (IAPS)	Footprint of the Proposed Scheme	Identification of Third Schedule Species of European Communities (Birds and Natural Habitats) Regulations 2011 (as amended))	RPS Ecology	
Badger	Footprint of the Proposed Scheme including all accessible land within 500 m ² outside the footprint of the Proposed Scheme	Assessment for evidence of sett entrances and field signs (e.g., scat, hair, trails, prints and snuffle holes)	RPS Ecology	September 2018; January 2020; August 2021, and April-May 2023
Otter	Bankside Assessment of River Boyne & Mattock (Mooretown) Stream.	Assessment for evidence of holts and field signs (e.g., spraint, slides, trails, prints and couches)	RPS Ecology	June, September 2018; January 2020; August, September 2021 and April-May 2023.
	Boat survey of River Boyne (d/s Boyne Br). Surveys included 150 m outside the footprint of the Proposed Scheme			November 2018 and November 2021.
	Survey of the River Boyne to inform a proposed greenway project. Data relevant to Proposed Scheme provided to RPS.	Assessment for evidence of holts and field signs (e.g., spraint, slides, trails, prints and couches)	Atkins	May and June 2023.
Bats – Suitability for roosting, commuting and foraging habitats	Footprint of the Proposed Scheme and environs	Suitability assessments completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016)	RPS Ecology & FGE Consulting	January 2020; May 2021 (RPS); and July 2021 (FGE).
Bats- Roosting	Site specific locations as identified during suitability for roosting assessment	Emergence and re-entry surveys with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016)	RPS Ecology & FGE Consulting	August 2020; May-August 2021 (RPS); and July 2021 (FGE).

² The surveys completed in 2018 to 2021 include a survey area of all land within the footprint and up to 150 m of the footprint of the Proposed Scheme. Following consultation with NPWS, this survey area was extended to include all accessible land within 500 m of the footprint of the Proposed Scheme

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Field survey focus	Extent of Survey	Overview of survey	Surveyor	Date(s)
Bats - Activity	Site specific locations as identified during suitability for commuting and foraging assessment	Activity assessments completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016) and the Bat Mitigation Guidelines for Ireland (Kelleher and Marnell, 2006)	RPS Ecology	August 2020; and May-August 2021.
Breeding Birds	Footprint of the Proposed Scheme	Identification of calls, sightings, and breeding behaviours during timed vantage points	RPS Ecology (Belfast)	May – July 2020; April – July 2021; and April – July 2022.
Kingfisher	Site specific locations along the River Boyne (two sections adjacent to the proposed bridge crossing)	Identification of calls, sightings, and breeding behaviours during timed vantage points	RPS Ecology (Belfast)	June, September, November and December 2018; January, February, March, June and July 2019; May – July 2020; April – July 2021; and April – July 2022.
Wintering Birds	Site specific locations as identified during the preliminary walkover	Identification of calls, sightings, and breeding behaviours during: <ul style="list-style-type: none"> • Timed vantage points at Hill of Slane and Slane Valley (wintering birds); • Transects (wintering farmland birds); and • Within the footprint and 2 km of the Proposed Scheme (Overwintering wildfowl) 	RPS Ecology (Belfast)	November 2019 – March 2020, November 2020 – March 2021, and December 2021 – March 2022.
Other protected mammals	Footprint of the Proposed Scheme and environs	Incidental evidence of field signs (e.g. prints, scat, hairs) observed during other field surveys	RPS Ecology	All dates listed above.
Amphibians	eDNA Sampling of Canal and suitable features within wet grassland within flood plain of the Boyne River	eDNA analysis of freshwater sample for presence of target species	RPS Ecology Analysed by SureScreen Scientifics	May 2023.

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15.2.3.2.1 Habitats and Flora Survey

Initial site surveys for the Proposed Scheme were carried out in October and December 2017, January, September and November 2018 and June 2019. Follow-on site visits were completed in July 2020 and March 2022 to update data collected during the initial site visits.

The aim of these surveys was to classify habitats using the Heritage Council's habitat classification system (Fossitt, 2000) for terrestrial habitats occurring within the footprint and adjoining habitats of the Proposed Scheme. The mapping of habitats had cognisance of the Heritage Council's mapping methodology (Smith et al., 2011). The information gained from the survey was used to describe habitat features and to direct further habitat and species-specific survey work to inform this assessment. 'Target Notes' were recorded as necessary on maps in the field to identify the location of ecological features noted during the field surveys.

Habitat surveys recorded all evident plant species including indicator species for different habitat types or conditions and rare or declining species identified on relevant Red Lists (Wyse Jackson et al., 2016; Lockhart et al., 2012). Vascular plant nomenclature follows that of the Botanical Society of Britain and Ireland (BSBI) 'Complete list of taxon names from the BSBI's database'. As such, any name changes, including those outlined in Stace (2010), are not included.

Habitats were also assessed for their affinity to Annex I habitat in line with Fossitt (2000) and the EU habitats interpretation manual (EC, 2013).

15.2.3.2.2 Invasive Alien Plant and Animal Species

The presence and location of any invasive alien plant species (IAPS) and invasive alien animal species (IAAS) were recorded during habitat surveys in October and December 2017, January, June, September and November 2018, and June 2019. Subsequent data was later required to update data collected in 2018/2019, and these surveys were carried out in July 2020 and March 2022. For the purpose of this assessment, IAPS and IAAS are those contained within the third schedule to the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

15.2.3.2.3 Bats

Preliminary Ground-level Roost Assessment – Trees

A preliminary ground-level roost assessment was carried out during daylight hours, using close focusing binoculars. The focus area for the preliminary bat roost assessment was the trees proposed for removal associated with the Proposed Scheme. Surveys were conducted by two RPS ecologists on the 10-12 May 2021.

Trees within or adjoining the footprint of the Proposed Scheme were assessed for the presence of features with suitability for roosting bats including cavities, frost cracks, trunk and branch splits, rot holes and hollow sections of trunk and branches. Trees were also assessed for evidence of use by bats (e.g. staining and splashed, bat specimens, and droppings) in the vicinity of suitable trees/features.

The results of this assessment were used to grade trees as having negligible, low, moderate, or high suitability for roosting bats with reference to the Bat Conservation Trust's (BCT) Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016).

Bat Emergence and Re-entry Surveys – Trees

Bat emergence and re-entry surveys were carried out in May 2021 (one dusk emergence survey) and July and August 2021 (two dawn re-entry surveys), using full spectrum digital-recording bat detectors (Elekon Batlogger M2 detectors, Anabat Swift and Anabat Scout).

The timing and survey effort for the emergence and re-entry surveys were completed with reference to the recommendations set out in BCT guidance (Collins, 2016) with respect to trees assessed visually as having 'Moderate' bat roost potential. No trees of 'High' bat roosting potential were identified. Emergence (dusk) surveys start 15 minutes before sunset and finish 1.5-2 hours after sunset. Re-entry (dawn) surveys start 1.5-2 hours before sunrise and finish 15 minutes after sunrise.

Trees classed as having 'Moderate' bat suitability were surveyed twice including one dusk emergence and a separate dawn re-entry survey. The emergence/re-entry surveys were completed on the suitable features

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identified during the preliminary roost assessment (i.e. suitable entry/exit points on moderate features for bats).

Preliminary Ground-level Roost Assessment – Structures

An initial preliminary ground-level roost assessment was carried out during daylight hours using close focusing binoculars. The focus area for the preliminary bat roost assessment was the buildings/structures proposed for removal associated with the Proposed Scheme. Surveys were conducted by two RPS ecologists on the 10-12 May 2021.

Where access allowed, buildings and structures were assessed internally and externally for features with suitability for roosting bats including rafters, stonework, chimney breasts, ridge and hip beams and other beams, mortise and tenon joints, and the junction of roof timbers. Buildings were also assessed for evidence of use by bats (e.g. staining and splashed, bat specimens, and droppings).

The results of this assessment were used to grade buildings/structures as having negligible, low, moderate or high suitability for roosting bats with reference to the BCT Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016).

Following an initial preliminary ground-level roost assessment by RPS, a subsequent detailed roost assessment was carried out by Finch Geospatial and Environmental (FGE) Consulting on two structures that were identified as having bat roosting suitability. The internal and external inspection of the two derelict buildings was carried out using a systematic approach to identify potential or actual bat access points, roosting places, and any evidence of bats usage. This survey was conducted on 15 July 2021 by two ecologists from FGE Consulting on two derelict buildings, one located along the N51 and the other along the existing N2. The first structure (53.706901, -6.527466) is located across from the Ledwidge Cottage Museum, east of Slane village, and the second structure is located along the N2 approx. 500 m south (53.719053, -6.526792) of Littlewood Forest (see **Section 15.3.4** and **Figure 15.8**).

The exterior of the building was assessed from the ground (using high powered torches and an endoscope) for the presence of features with suitability for roosting bats including:

- Potential access points;
- Windowsills and windowpanes;
- Walls;
- Behind paintwork or lifted rendering;
- Eaves, soffit boxes and fascia's;
- Gaps in brickwork or stonework; and
- Under tiles/slates.

The interior of the building was assessed (using combination of head & handheld torches and an endoscope) for the presence of evidence of bats (live or dead bats, accumulation of bat droppings, urine, oily residue stains and feeding remains (e.g. moth/butterfly wings) by assessing the following features:

- Both sides of rafters;
- Ceilings;
- The top of all walls;
- All beams;
- The junction of roof timbers;
- Window frames and staircases;
- All floors;
- All walls; and
- Furniture and debris.

The results of this assessment were used to grade the structures as having Negligible, Low, Moderate, or High suitability for roosting bats in accordance with the BCT Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016).

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Bat Emergence and Re-entry Surveys – Structures

Bat emergence and re-entry surveys for the two derelict structures identified were carried out by two ecologists from FGE Consulting on the 15 July 2021, using the evidence gathered during the initial daylight site inspections at each potential roost feature. Dusk/dawn roost surveys were then conducted using Echo Meter Touch Pro full spectrum recording bat detectors. A dusk survey was conducted at 15 mins before dusk until 1.5-2 hours after dusk and a dawn survey was conducted 1.5-2 hours before dawn until 15 mins after dawn. The dusk/dawn surveys were carried out in optimal weather conditions (e.g. mild temperatures, no to light winds and no rainfall), in order to maximise the results of the roost surveys (Kelleher and Marnell 2006; Collins 2016).

Bat Activity Surveys

Bat activity surveys were conducted within the footprint of the Proposed Scheme, using a combination of walked and car-based transects. The aim of the surveys was to characterise the bat activity within and adjacent to the footprint of the project in terms of the range of species active and the general levels of activity across the survey area.

A pre-determined transect route as illustrated in **Figure 15.9** was walked a total of four times over four nights in August 2020, and May and July 2021 during suitable weather conditions (i.e. temperature greater than 10°C, low wind, and no rain). Weather details likely to influence bat activity (e.g. temperature, wind and rain) were recorded at the beginning and end of each survey. Bat activity surveys were carried out with cognisance of good practice guidelines (Kelleher & Marnell, 2006; Collins, 2016), where dusk activity surveys commenced at sunset and ended a minimum of two hours after sunset, and pre-dawn activity surveys commenced two hours before sunrise and ended at sunrise.

Two surveyors listened for bats using full spectrum recording bat detectors (Anabat Scout in 2020 and Elekon Batlogger M2 in 2021) with headphones/speaker. The surveyors walked a fixed transect with five Listening Points (LPs), where they detected statically for five-minute intervals. Direct observations of bat activity (e.g. direction of flight and foraging or commuting behaviours) were recorded during the transect surveys. For each survey, the transect was walked end-to-end and then reversed until the survey time was finished. The transect was started in opposite directions in each subsequent survey. Weather details likely to influence bat activity (e.g. temperature, wind and rain) were recorded at the beginning and end of each survey.

Car-based bat activity transect surveys were carried out with cognisance of Catto et al. (2004) and Roche et al. (2012), where a predetermined transect was driven at approx. 24 km/h with a full spectrum recording bat detector (Anabat Swift) on August 6 and 7 2020. The survey was carried out by two RPS ecologists, who drove the fixed transect and stopped at LPs, where they detected statically for a five-minute interval. The bat detector was clamped to the rear passenger door window and positioned at 45° down from the horizontal plane to the rear of the car to minimise background noise and interference. Dusk car-based transect surveys began 45 minutes after sunset and were completed within three hours after sunset. Dawn car-based transect surveys began three hours before sunrise and were completed within 15 minutes after sunrise. Where possible, surveyors listened for bats by connecting the phones output of the full spectrum recording detector (Anabat Swift) to the vehicle sound system. The car-based bat activity transects were undertaken in May and July 2021.

A static (i.e. passive/stationary/automated) full spectrum bat detector (Anabat Swift), which could stay in place for multiple nights was placed at locations where bat activity was expected based on an initial habitat suitability assessment. The static detectors were deployed from May 2021 - September 2021, in all weather conditions for a total of 74 nights. The detectors were checked, data retrieved, and batteries replaced on a monthly basis. The locations of the static detectors during this time frame were as follows (see **Figure 15.9**):

- River Boyne (53.700811, -6.532147); and
- N51 adjacent to Ledwidge Cottage Museum (53.706705, -6.527075).

Incidental Bat Activity

Incidental bat activity was recorded during emergence/re-entry surveys. In addition, a walked transect survey was completed, whereby a pre-determined transect route was walked at a constant speed in order to observe, listen for and record bats in flight using full spectrum digital-recording bat detectors (Elekon Batlogger M2 detectors). Observations of bats such as number of bats, flight direction and behaviour (e.g. commuting or foraging) were recorded. The walked transect was completed immediately prior to the re-entry survey and again immediately after the emergence survey.

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Data Analysis

Recordings from the bat activity surveys were analysed with specialised software (Kaleidoscope Pro, Version 5.4.2) by an experienced ecologist to confirm the bat species present.

Kaleidoscope Pro software (Version 5.4.2) was used to compare the echolocation pulses to an integrated library of bat calls, and automatically identify species. Following the batch analysis of all calls, 10% of all *Pipistrellus* species (spp.) calls and noise files were manually checked. All calls of *Myotis* spp., *Nyctalus* spp. and calls with no auto-identification or with multiple bats within the same call were checked manually to confirm identification.

During manual analysis, calls were assigned to species according to their key parameters and where applicable their peak frequency, as shown in **Table 15-4** (Russ, 2021).

Table 15-4: Bat Species and their Call Frequency Parameters

Species	Latin Name	Call Frequency
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	FM/qCF calls above 2 kHz
Common Pipistrelle	<i>Pipistrellus pipistrellus</i>	FM/qCF calls between 40 kHz and 48 kHz
Nathusius Pipistrelle	<i>Pipistrellus nathusii</i>	FM/qCF calls below 40 kHz
<i>Pipistrellus</i> spp.	–	FM/qCF calls between 40 and 42 kHz; and, 48 and 52 kHz
Natterer's Bat	<i>Myotis nattereri</i>	FM call with wide range between 23 and 107 kHz
Daubenton's Bat	<i>Myotis daubentonii</i>	FM call with wide range between 30 and 81 kHz
<i>Myotis</i> spp.	–	FM calls greater than 30 kHz
Brown Long-eared Bat	<i>Plecotus auritus</i>	FM calls greater than 30 kHz with two harmonics
Leisler's bat	<i>Nyctalus leisleri</i>	qCF calls between 23 and 28 kHz
<i>Nyctalus</i> spp.	–	Low (less than 30 kHz) qCF or FM calls

Not all calls could be positively assigned to a species. Call frequencies and shapes can be shared by bat species within the same genus and can change according to the habitat they are flying such as open areas with no trees or structures, moorlands, cluttered environments which contain trees, areas of scrub, or linear features such as streams and conifer plantation/woodland edge. Bats adapt their call patterns within their habitats to enable prey detection and navigation and as such, the recordings may differ in parameters. For example, a bat was classified as *Myotis* species (spp.) if differences in call shape and frequency between Daubenton's bats and Natterer's bats (most likely *Myotis* spp. bat to be found in the area) could not be discerned.

15.2.3.2.4 Otter

Otter surveys as well as surveys for other mammals (see **Section 15.2.3.2.8**) were carried out with cognisance of the NRA publication 'Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes' (NRA, 2009a). The survey methodology had regard to NRA guidance (NRA, 2006b) and included searches for breeding or resting sites within suitable habitat within the footprint on the Proposed Scheme and up to 150 m upstream and downstream of the Proposed Scheme in areas of suitable habitat. Breeding and resting places are known as holts and couches, respectively. An otter can maintain numerous couches and holts within its territory and while they may be found some distance from freshwater, most are within the immediate area of riparian vegetation³. This distance accounts for the potential effect of disturbance from the Proposed Scheme on the QI species for the River Boyne and River Blackwater SAC and otter potentially occurring along the Mattock (Mooretown) Stream.

With regards to the public realm element of the Proposed Scheme, the 150 m survey area was not deemed necessary, owing to the small scale and localised nature of the works (i.e. breeding and resting sites will not be affected by traffic calming/management measures within an existing road network).

Evidence of otter, including spraints, footprints, or feeding remains was also searched for around the banks of the River Boyne, instream under Slane bridge, and the Boyne Canal located adjacent to the river and the

³ https://www.npws.ie/sites/default/files/publications/pdf/Otter_leaflet.pdf

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fields along the canal towpath. The Mattock (Mooretown) Stream was additionally searched for any evidence of otter.

As the River Boyne has high suitability to support otter, bankside assessments (as described below) were supplemented by dedicated boat-based surveys which enabled search and or access to areas where otter potential was identified but was not accessible (e.g. up close to vegetated banks and islands etc). Boat surveys were undertaken on 11 November 2018 and 3 November 2021, whereby two ecologists were required to complete the survey, to ensure all potential features were captured. Surveys were conducted using binoculars and recording GPS coordinates. Bankside otter surveys were completed in June and September 2018, January 2020, August (during aquatic sampling) and September 2021 and April-May 2023. Visual assessments were undertaken from both banks of watercourses where possible and at other suitable water features.

Additionally, camera trapping was undertaken whereby six trail cameras (No. 1 - 6) were set up in pairs at various locations relevant to the Proposed Scheme boundary to monitor otter activity along the River Boyne. Two cameras (No.1 & 2) were located north of the River Boyne within a woodland copse (c. 65 m from the northern bank of the River Boyne) adjacent to a known badger sett, to determine whether otter were using the sett as a holt owing to its proximity to the River Boyne. Two trail (No. 3 & 4) cameras were located along the northern bank of the River Boyne with the remaining two trail cameras (No. 5 & 6) located on the canal bank, south of the River Boyne. Other than confirming whether the badger sett was used by otters, the camera trapping was completed in order to characterise the general level of activity by otter along the river and canal where intersected by the Proposed Scheme. The location and duration of camera trapping is provided in **Table 15-15**.

Table 15-5: Otter camera trapping locations and duration

Camera No.	Location	GPS Coordinates	Deployment Period
1	Woodland north of Boyne	53.701730, -6.532746	10 th – 24 th April
2	Woodland north of Boyne	53.701644, -6.532497	10 th – 24 th April
3	Riverbank north of Boyne	53.701016, -6.532886	24 th April – 8 th May
4	Riverbank north of Boyne	53.700819, -6.532156	24 th April – 8 th May
5	Canal bank south of Boyne	53.699753, -6.534628	8 th May – 17 th May
6	Canal bank south of Boyne	53.699597, -6.533564	8 th May – 17 th May

Vantage point surveys undertaken during bird surveys maintained an incidental watching brief for otter activity.

15.2.3.2.5 Badger

The European badger (*Meles meles*) survey methodology recorded any signs of badger activity, including the presence of setts, foraging evidence, access runs, tracks and prints, with cognisance of Scottish Badgers (2018) and Harris et al. (1989). Where setts were discovered, usage of potential sett entrances and direction of tunnelling was also recorded, in accordance with SNH (2003).

Badger surveys as well as other mammals, were carried out with cognisance of the NRA publication 'Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes' (NRA, 2009a). Guidance from the NRA (2005) states that activities such as piling may cause disturbance to badger setts (triggering licencing) at distances of up to 150 m from the source.

The footprint of the scheme and land outside the footprint of the Proposed Scheme were surveyed. The surveys were completed during September 2018, January 2020, August 2021 and April-May 2023. Outside the footprint of the proposed scheme, accessible land within 150 m of the footprint were surveyed in 2018 to 2021. This was extended to all accessible land within 500 m of the footprint of the proposed scheme for the 2023 survey following consultation with NPWS. Any signs of badger activity were noted, including the presence of setts, foraging evidence, access runs, tracks and prints.

In addition, and as detailed in **Section 15.2.3.2.4** with respect to otter, a badger sett located c. 65 m to the north of the River Boyne was subject to camera trapping between the 10 and 24 April 2023. The primary focus of that survey was to determine potential use of the sett by otters, however the survey could also be used to determine the level of use of the sett by badgers.

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15.2.3.2.6 Terrestrial Invertebrates

During walkover surveys for the Proposed Scheme conducted between 2018 and 2020, potentially suitable habitat for the larval food plants of marsh fritillary butterfly (*Euphydryas aurinia*) i.e. devil's bit scabious (*Succisa pratensis*), and of small blue butterfly (*Cupido minimus*) i.e. kidney vetch (*Anthyllis vulneraria*) was recorded.

15.2.3.2.7 Birds

Breeding Bird Survey

The survey method employed was an adapted version of the British Trust for Ornithology (BTO) Common Bird Census (CBC) methodology of Bibby et al. (2000) and Gilbert et al. (1998), which aims to capture breeding bird activity within a survey area.

Four monthly visits were made across each breeding season in 2020 (May to July), 2021 (April to July) and 2022 (April to July), where the ornithologist slowly walked transects through the survey area, stopping at regular intervals to scan with binoculars and to listen for calls or song. Transects chosen ensured the observer passed within at least 75-100 m of all parts of the survey area.

Survey visits were made in the early morning to coincide with the peak period of bird activity and all species seen or heard in the survey area and immediate environs were recorded, including those in flight. Visits were made during favourable weather conditions.

All species encountered during survey were mapped and coded using standard BTO species codes and if breeding activity was observed, an additional code was assigned using the BTO codes for breeding evidence which allows the species to be classified into one of four categories; non-breeding, possible breeder, probable breeder and confirmed breeding (see **Appendix 15.1**).

Kingfisher Survey

The methodology employed was based on Cummins et al. (2010) which required a competent ornithologist to conduct vantage point watches on two sections of the River Boyne, adjacent to the proposed bridge crossing. These sections were chosen as they covered both the proposed crossing point of the new by-pass, as well as the kingfisher nest site that was identified during 2019 surveys.

Four visits were made across the breeding season in 2020 (May to July), 2021 (April to July) and 2022 (April to July) in addition to a survey in July 2019. The vantage point watches lasted for three hours and all activity of target species (i.e. kingfisher), as well as any potential disturbance events, were recorded. For more detail on this survey, see **Appendix 15.1**.

Wintering Bird Surveys

Three types of surveys methodologies were employed for the survey of wintering birds. These included:

- Vantage point surveys;
- Transect surveys (farmland wintering birds); and
- The so-called 'look-see' method (wildfowl).

Wintering Bird Survey - Vantage Point Surveys

Guidance developed by Scottish Natural Heritage (SNH) for onshore wind farm ornithology surveys was followed (SNH, 2017). Vantage point surveys were completed to record the movements of waterfowl during the 2019/2020 winter season (total: 22) and 2020/2021 winter season (total: 24). These were conducted from two vantage points: the Hill of Slane [Grid ref: IN961751] and Slane Valley [Grid ref: IN975728] overlooking the proposed crossing point.

For the 2021/2022 survey period, surveys did not begin until late December 2021 due to timing of appointment. During the 2021/2022 survey period, a total of 16 vantage point surveys were undertaken between December 2021 and March 2022, eight at VP1 – Hill of Slane and eight at VP2 – Slane Valley. A total of 66 survey hours were conducted between November 2019 and March 2020, 72 survey hours were conducted between November 2020 and March 2021, and 48 survey hours were conducted between December 2021 and March 2022. The locations of VPs and the survey results can be found in **Appendix 15.2**.

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The protocol followed during surveys was a systematic 180° scan (including overhead) for birds in flight. The primary target species were geese, swans, waders and Annex I raptors: with secondary target species being ducks, cormorants, herons and all other and birds of prey. Data collected for each observation included:

- Time of observation;
- Species;
- Flock size;
- Flight height, using bands (1 = 0-20 m, 2 = 20-100 m, 3 = 100-300 m);
- Flight direction; and
- Flight-lines drawn onto maps, which were later digitised in GIS (primary target species only).

Wintering Bird Survey - Farmland Birds Transect Surveys

The methodology employed was based on the BTO's CBC technique of Bibby et al. (2000) and Gilbert et al. (1998), which aims to capture overwintering bird activity within a site. Surveys along the Proposed Scheme were conducted across the 2019/2020, 2020/2021 and 2021/2022 winter seasons. Five visits were carried out across the 2019/2020 winter season, four visits across the 2020/2021 winter season, and four visits were carried out across the 2021/2022 winter season for the purposes of surveying wintering farmland birds. A total of 25 survey hours were conducted between December 2019 and March 2020, 17 survey hours were conducted between November 2020 and February 2021, and 17 survey hours were conducted between December 2021 and March 2022.

Transects chosen were walked slowly by a competent ornithologist and ensured the observer passed all parts of the site location and Proposed Scheme corridor. Species encountered (seen and heard) were mapped and recorded using standard BTO species codes. Further details and survey results can be found in **Appendix 15.2**.

Wintering Bird Survey - 'Look-see' Survey Method

In addition to conducting VPs and transect surveys for wintering birds, surveys specific for overwintering wildfowl were carried out. Ten visits were carried out across the 2019/2020 winter season, nine visits were carried out across the 2020/2021 winter season and four visits were carried out across the 2021/2022 winter season. A total of 58 survey hours were conducted between November 2019 and March 2020, 47 survey hours were conducted between November 2020 and mid-March 2021, and 12 survey hours were conducted between December 2021 and March 2022. Numbers of all waterbird species, as defined by Wetlands International (Rose and Scott, 1994), were recorded.

The methodology employed was based on the BTO's wetland bird survey (WeBS) and BirdWatch Ireland's I-WeBS Core Counts which use the so-called 'look-see' method of Bibby et al. (2000) and BirdWatch Ireland, whereby the observer, familiar with the species involved, surveys the whole of a predefined area. For the purposes of this study, the survey area was defined as the proposed by-pass route and all lands within a 2 km buffer. Target species for the purposes of this survey included includes divers, grebes, cormorants, herons, swans, geese, ducks, rails, cranes, waders and kingfisher. Further details and survey results can be found in **Appendix 15.2**.

15.2.3.2.8 Smooth Newts

Habitat with the potential to support smooth newt was identified as a result of the habitat surveys which were completed to inform the Proposed Scheme. Environmental DNA (eDNA) sampling was conducted on freshwater samples taken from two locations within the study area. The first sample was obtained from the Boyne Navigation Canal and the second sample was obtained from within the FS1 Reed and large sedge swamps habitat located north of the Boyne Navigation Canal, adjacent to an area of GS4 Wet grassland. These locations were chosen owing to the suitable habitat present for amphibians.

Both locations tested positive for the presence of smooth newt (*Lissotriton vulgaris*). Freshwater samples were collected by members of the RPS ecology team, and then delivered to SureScreen Scientifics where they were analysed for the presence of target species eDNA following scientifically published eDNA assays and protocols which have been thoroughly tested, developed, and verified for use by SureScreen Scientifics.

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific

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molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified.

15.2.3.2.9 Other Protected and Notable Species

Incidental records of sightings and secondary evidence of other fauna were sought during all visits. The potential was also noted for habitats of other protected fauna species to occur including hedgehog (*Erinaceus europaeus*), stoat (*Mustela erminea Hibernica*), pygmy shrew (*Sorex minutus*), red squirrel (*Sciurus vulgaris*), Irish hare (*Lepus timidus hibernicus*) and common lizard (*Zootoca vivipara*). However, on the basis of **Chapter 4** and **Chapter 5** of the EIAR, no significant impacts are considered to occur in relation to the above listed species. Therefore, site-specific surveys for these species have been scoped out of this report.

15.2.4 Key Parameters for Assessment

The activities that have potential to result in likely significant effects on ecological receptors are outlined in the following sections.

15.2.4.1 Construction phase

The key activities which have potential to result in likely significant effects on ecological receptors during the construction phase are:

- Archaeological testing and Ground Investigation (GI) works;
- Site clearance and enabling works including the removal of vegetation and trees;
- Demolition of the existing buildings;
- Earthworks and construction activities including grading of slopes for working areas, the construction of cofferdams and work platforms, construction compounds, piling, bridge foundations and associated infrastructure, and access routes;
- Surface water run-off during construction, with potential to carry suspended silt or contaminants into local watercourses and associated habitat deterioration effects upon terrestrial habitats;
- Earthworks with potential for changes to groundwater quality, yield and/or flow paths;
- Air pollution during construction with the potential to generate dust and air-borne contaminants which may negatively affect local terrestrial and aquatic environments (i.e. smothering effects); and
- Habitat destruction and fragmentation during construction, which may negatively affect sensitive ecological receptors in both the terrestrial and aquatic environment.

15.2.4.2 Operational Phase

The key activities which have potential to result in likely significant effects on ecological receptors during the operational phase, including maintenance activities, are:

- Operational activities including the maintenance of attenuation and retention ponds, the maintenance of the proposed bypass and realigned N51 roads, cycle/pedestrian bridge, and the River Boyne bridge crossing;
- Operational activities including maintenance tasks such as painting, deck surfacing, sediment and oil removal of vortex grit chambers and petrol/oil interceptor cleaning; and
- Disturbance including noise, vibration and human presence during the operational phase due to the presence of road users, the movement of operational and maintenance staff and vehicles and lighting associated with the Proposed Scheme and with vehicles using same.

15.2.5 Assessment Criteria and Significance

15.2.5.1 Important Ecological Features

Having defined the relevant baseline conditions within the Terrestrial Biodiversity Study Area and Ornithology Study Area, ecological features therein are valued and Important Ecological Features (IEFs) identified, in advance of commencing the assessment of potential impacts and effects on IEFs.

The methodology used to value ecological features is in accordance with the geographic frames of reference outlined by the NRA (2009b).

It is possible that features which are, in and of themselves, of negligible ecological value (e.g. improved grassland of negligible floristic value) may be of high value in the resource they provide to other features (e.g. a significant resource of invertebrates breeding in the grasslands, which are an important food source for local badgers). In some cases, therefore, habitats and species of negligible value may nevertheless be considered of greater importance due to their value to protected species.

IEFs, as termed in CIEEM (2018), are defined here as those ecological features which are valued at Local Importance (Higher Value) or above. Ecological features below this value have been scoped out of further ecological impact assessment, as any potential impact is deemed to be of Local Importance (Lower Value) or negligible.

15.2.5.2 Description of Impacts

Impacts on IEFs are characterised with the following qualitative terms as defined in CIEEM (2018):

- **Positive or Negative (adverse):** Positive and negative (adverse) impacts and effects were determined according to whether the change is in accordance with nature conservation objectives and policy:
 - Positive – a change that improves the quality of the environment (e.g. by increasing species diversity, extending habitat or improving water quality). This may also include halting or slowing an existing decline in the quality of the environment.
 - Negative (adverse) – a change which reduces the quality of the environment (e.g. destruction of habitat, removal of foraging habitat, habitat fragmentation, pollution).
- **Extent:** The extent is the spatial or geographical area over which the impact/effect may occur under a suitably representative range of conditions (e.g. noise transmission under water).
- **Magnitude:** Magnitude refers to size, amount, intensity and volume. It was quantified if possible 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:** Duration was defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. For example, five years, which might seem short-term in the human context or that of other long-lived species, would span at least five generations of some invertebrate species.
- **Frequency and Timing:** The number of times an activity occurs will influence the resulting effect. For example, a single person walking a dog will have very limited impact on nearby waders using wetland habitat, but numerous walkers will subject the waders to frequent disturbance and could affect feeding success, leading to displacement of the birds and knock-on effects on their ability to survive. The timing of an activity or change may result in an impact if it coincides with critical life-stages or seasons (e.g. bird nesting season).
- **Reversibility:** An irreversible effect 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 effect is one from which spontaneous recovery is possible or which may be counteracted by mitigation.

There may be any number of possible impacts on IEFs arising from a scheme. However, it is only necessary to describe in detail the impacts that are likely to be significant. Impacts that are either unlikely to occur, or if they did occur are unlikely to be significant, are scoped out. If in doubt, the precautionary principle is applied, and the potential impact will be assessed.

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When assessing the significance of an effect and for the purposes of this assessment, the significance of an effect is simply any effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a scheme. For the purposes of ecological impact assessment, a 'significant effect' is defined as an effect that either supports or undermines the biodiversity conservation for the IEF. These significant effects are qualified with reference to an appropriate geographical scale e.g. for plants this could be within metres of its location but for birds this could be considerably further such as downstream to the Boyne coast and estuary.

The approach to determining significance does not utilise a matrix of degrees of impact significance (such as EPA (2022)), but instead follows the industry standard for ecological impact significance (CIEEM, 2018) where impacts/effects are determined to be 'significant' or 'not significant.'

15.2.6 Data Limitations

15.2.6.1 Desk Study

Sources of desk study information are neither exhaustive nor necessarily easily available, and an extensive effort was made to obtain ecological data in the public domain to inform the description of the baseline environment and its assessment. Additional information, not in the public domain, is likely to exist, but could not be obtained or assessed here. This has been acknowledged and accounted for in the biodiversity impact assessments undertaken in **Chapter 15 – Biodiversity: Terrestrial Ecology** and **Chapter 16 – Biodiversity: Aquatic Ecology**.

15.2.6.2 Field Study

The receiving environment (i.e. baseline condition) may naturally vary through seasons and between years (NRA, 2009a). All reasonable effort has been made to address this (e.g. combined use of desk and field survey data), and the limitation is acknowledged and addressed in most cases through update surveys completed over multiple years for most habitats and species. This limitation is deemed to not affect the certainty or predictability of the assessment.

15.2.6.3 Otter Activity

During the boat survey carried out in November 2021 to observe otter activity along the River Boyne, it was deemed unsafe by the Meath River Rescue team accompanying ecologists to vacate the boat and survey small islands within the watercourse. This was due to a combination of fast flowing water, potentially soft ground and difficult access due to a build-up of floating vegetation and timber. It was therefore not considered appropriate or safe. Every effort was made by the Ecology Team to ensure detailed survey of the area using close focusing binoculars. This limitation is acknowledged and is deemed to not affect the certainty or predictability of the assessment.

15.2.6.4 Bat Data Collection

During the collection of static bat data between the months of May and September 2021, occasional equipment errors occurred. These were a result of battery, memory card, and Global Positioning System (GPS) issues which are not untypical with respect to the use and deployment of such equipment. The regular maintenance visits (c. 2–4-week intervals) to the static detector units limited any loss of data. This data loss limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

15.2.6.5 Badger Data Collection

During badger surveys in April and May 2023, a 500 m survey area was searched. However, owing to landowner access permissions this 500 m survey extent was reduced in certain areas. This limitation is acknowledged and is deemed to not affect the certainty or predictability of the assessment. All reasonable efforts were made to gain access for surveys.

15.3 Description of Existing Environment (Baseline Scenario)

15.3.1 Designated Sites for Nature Conservation

Designated ecological sites within the Proposed Scheme's ZOI are shown in **Figure 15.3**. The site of the Proposed Scheme is located within and adjacent to both nationally and internationally designated ecological sites (see **Figure 15.4**).

The Proposed Scheme is located within the Boyne (07_01) Catchment Management Unit (CMU), which supports connectivity to ten SAC's (White Lough, Ben Loughs And Lough Doo SAC, Boyne Coast And Estuary SAC, Lough Bane And Lough Glass SAC, River Boyne And River Blackwater SAC, Lough Lene SAC, Girley (Drewstown) Bog SAC, Wooddown Bog SAC, Mount Hevey Bog SAC, Killyconny Bog (Cloghbally) SAC and Raheenmore Bog SAC) and three SPAs (River Boyne and River Blackwater SPA, Boyne Coast and Estuary SPA and the North-west Irish Sea SPA). However, owing to the location of many of these sites upstream or their separation through groundwater bodies (i.e. no hydrological pathway), they have been excluded from further assessment.

European sites which support connectivity to the Proposed Scheme include the River Boyne and River Blackwater SAC, the Boyne Coast and Estuary SAC, the River Boyne and River Blackwater SPA, the Boyne Estuary SPA and the North-west Irish Sea SPA.

The River Boyne and River Blackwater SAC is located within the footprint of the Proposed Scheme. This site is of international importance as it contains two Annex I habitats of the EU Habitats Directive, namely Alkaline fens and Alluvial forests with alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*) (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (Annex I Priority Habitat). Alkaline fens are not considered in this report as they are concentrated in the vicinity of Lough Shesk, Freehan Lough and Newtown Lough which are all located upstream of the Proposed Scheme in the upper reaches of the Stonyford River, near Delvin. The Proposed Scheme does not support connectivity to this priority habitat. Additionally, Alkaline fen habitat was not identified within the footprint of the Proposed Scheme. The River Boyne and River Blackwater SAC is also designated for three qualifying interest (QI) species, namely river lamprey (*Lampetra fluviatilis*), Atlantic salmon (*Salmo salar*), and otter.

Alongside the above SAC, the River Boyne and River Blackwater SPA is also located within the footprint of the Proposed Scheme. The River Boyne and River Blackwater SPA is designated for the protection of a single special conservation interest (SCI⁴), the kingfisher, which is listed on Annex I of the EU Birds Directive. The boundaries of the SAC and SPA are not contiguous.

The Boyne Coast and Estuary SAC is located approximately 13.6 km from the Proposed Scheme and has several Annex I habitats associated with it. The site is of conservation interest as a coastal complex that supports good examples of eight habitats that are listed on Annex I of the EU Habitats Directive, including one which is listed with priority status (Fixed coastal dunes with herbaceous vegetation). It is also notable for the important bird populations that it supports.

The Boyne Estuary SPA is located 13.2 km downstream of the Proposed Scheme. The Boyne Estuary SPA supports important wintering waterfowl populations. Three species that regularly occur at this site are listed on Annex I of the EU Birds Directive namely golden plover (*Pluvialis fulva*), bar-tailed godwit (*Limosa lapponica*) and little tern (*Sternula albifrons*).

The North-west Irish Sea SPA is located 17.8 km downstream of the Proposed Scheme. The North-west Irish Sea SPA constitutes an important resource for marine birds, is ecologically connected to and adjoins twelve existing SPAs already designated for the protection of birds along the east coast, and is designated for 21 SCI species.

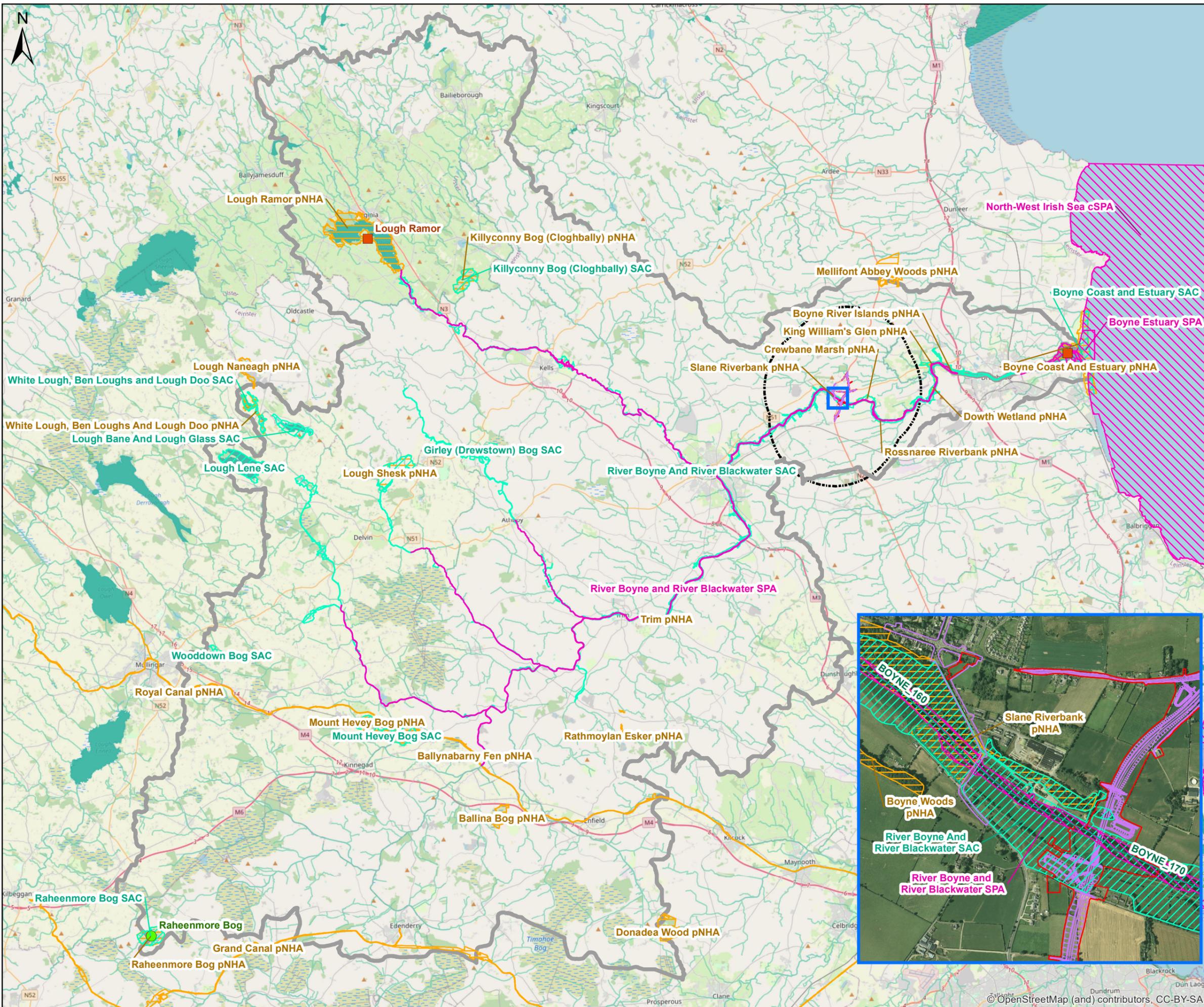
There are no Ramsar sites, OSPAR Marine Protected Areas or National Parks within the terrestrial biodiversity or ornithology study areas. There are 31 National sites within the CMU, 23 of which are proposed Natural Heritage Areas (pNHAs), and eight of which are NHA's. Of these 31 National sites, eight pNHAs have hydrological connectivity with the Proposed Scheme, namely: Slane Riverbank pNHA, Boyne woods pNHA, Crewbane Marsh pNHA, Rossnaree Riverbank pNHA, Dowth Wetland pNHA, River Boyne Island pNHA,

⁴ Note the abbreviation SCI in the context of the Habitats Directive can refer to a number of different matters, notably species of Community Interest and sites of Community importance. In the context of this EIAR, all reference to SCI refers to species of Community interest.

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King Williams Glen pNHA and the Boyne Coast and Estuary pNHA. All NHA's within the CMU are located upstream of the Proposed Scheme.

One Nature Reserve and two Wildfowl Sanctuaries are also located within the CMU, namely: Raheenmore Bog Nature Reserve, Raheenmore Bog Wildfowl Sanctuary and Boyne Estuary Wildfowl Sanctuary. Connectivity has been identified with the Boyne Estuary Wildfowl Sanctuary. Designated sites for nature conservation within the terrestrial biodiversity and ornithology study areas are detailed in **Appendix 15.3**.



Legend

- Proposed Scheme
- 5km Buffer
- Boyne Catchment
- River Waterbodies
- Proposed Scheme Boundary
- Wildfowl Sanctuaries
- Raheenmore Bog Nature Reserve

International Sites

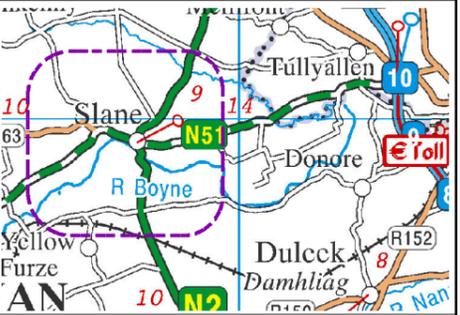
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

National Sites

- Proposed Natural Heritage Areas (pNHA)

Data Source: Environmental Protection Agency (EPA)
 WFD River Waterbodies - Cycle 3 2023
 WFD Catchments 2023
 Special Areas of Conservation 2023 (NPWS)
 Special Protection Areas 2023 (NPWS)
 Proposed Natural Heritage Areas 2015 (NPWS)
 Nature Reserves 2016 (NPWS)
 Wildfowl Sanctuary 2013 (NPWS)

0 3.5 7 14
Kilometres



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N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.3**

Designated Ecological Sites within the Proposed Scheme's Zone of Influence

West Pier
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Issue Details

File Identifier:
 MDT0806-RPS-00-N2-DR-Z-AG-3075

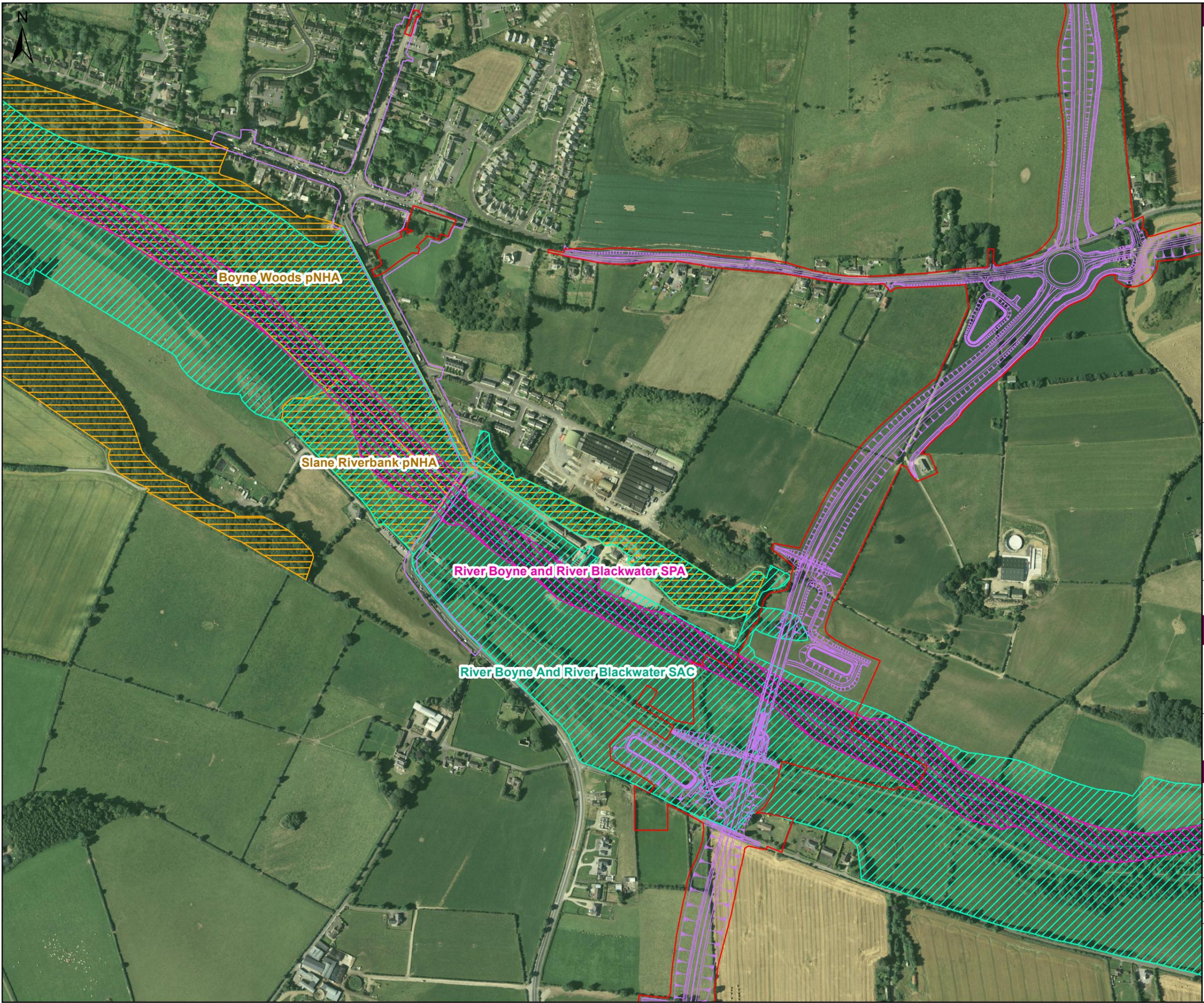
Status:	Rev:	Model File Identifier:
A1	C02	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn:	NR	Date:	14/11/2023
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Approved:	RR	Projection:	ITM
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- River Waterbodies

Internation Sites

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

National Sites

- Proposed Natural Heritage Areas (pNHA)

Data Source: Environmental Protection Agency (EPA)
 WFD River Waterbodies - Cycle 3 2021
 Special Areas of Conservation 2023 (NPWS)
 Special Protection Areas 2023 (NPWS)
 Proposed Natural Heritage Areas (NPWS)
 OSi Orthophotography Tiles 2019

0 0.075 0.15 0.3
Kilometres

Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.4

Designated Ecological Sites within and adjacent to the Proposed Scheme

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Issue Details

File Identifier:
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Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
Drawn: NR	Date: 24/05/2023	
Checked: HF	Scale: 1:6,000 (A3)	
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15.3.2 Water Bodies

The Proposed Scheme is located within the subcatchments Boyne_SC_110 and Boyne_SC_120 which form part of the Boyne_07_01 CMU. The Proposed Scheme intersects two EPA river water bodies, namely the River Boyne and Mattock (Mooretown) Stream. Both water bodies flow west to east through, and broadly perpendicular to, the Proposed Scheme.

Further detail on the aquatic ecology aspects relating to water bodies are covered in **Chapter 16**. Further detail on water bodies including Water Framework Directive (WFD) Ecological Status, risk of meeting WFD objectives and the WFD impact assessment for the proposed Scheme are covered in **Chapter 17**.

15.3.3 Habitats and Flora

Habitats detailed during the field study within the Zol of the Proposed Scheme are illustrated in **Figure 15.5** with linear habitats further illustrated in **Figure 15.6**; this includes the relevant habitat codes from Fossitt (2000). The habitats that were recorded across the study area reflect the agricultural nature of the Proposed Scheme, coupled with a number of road intersections as well as a low-lying Boyne valley where the banks of the River Boyne and the Boyne Navigation Canal provide much of the floristic interest.

Not all habitats are mapped owing to their relative extent (linear or discrete) within the study area or by virtue of their potential changing nature (e.g. BC4 Flower beds and borders). A description of the principal habitats that could be potentially impacted by the Proposed Scheme is presented in this section including a short summary of additional habitats not mapped, but which are occasionally found within the proposed Scheme.

With the exception of the corridor of the River Boyne, the site is typically comprised of habitats of low ecological and nature conservation value. None of the identified habitats corresponded to EU Annex I habitats. The following habitats were recorded.

15.3.3.1 Habitats

Grassland

The majority of the grasslands encountered across the study area are heavily modified and managed for agricultural purposes, either arable or tillage, with only small elements of other grassland variants recorded in parts of fields or where the ground conditions were seasonally wetter.

GA1 Improved agricultural grassland

A large number of the lands to be intersected by the Proposed Scheme are characterised by fields of improved agricultural grassland bounded by hedgerows or treelines. This habitat was mainly grazed by livestock, primarily cattle but also some sheep. Some fields were given over to silage production also with cattle grazing later in the season. The vegetation is typically species-poor, dominated by perennial ryegrass (*Lolium perenne*), with herbs including white clover (*Trifolium repens*), red clover (*Trifolium pratense*), dandelion (*Taraxacum* agg.) and creeping buttercup (*Ranunculus repens*). Depending on the extent of management and/or dereliction such as around field edges or in occasionally derelict parts, species such as thistles (*Cirsium* spp.), ragwort (*Senecio jacobaea*), stinging nettle (*Urtica dioica*) and docks (*Rumex* spp.) are locally abundant. Transitions to, and mosaics with, other wet grasslands or more neutral grasslands where underlying ground conditions supported these habitats.

GS4 Wet grassland

Given the intensive nature of much of the agricultural lands, wet grassland habitat was rarely extensive, although patches were occasionally noted along field edges and under hedge line cover. The habitat is typically characterised by wet organic soils occurring locally alongside drainage ditches and in low-lying land that can be subject to periodic inundation from heavy rain or rising river water. The habitat is botanically more diverse compared to the surrounding agricultural grasslands. Larger areas of the habitat, where they occurred were often rank in nature, as well as subject to reduced grazing regime (typically horses). Grasses and rushes as well as wetland herbaceous species are important. Floristically, elements of the wet grasslands contained species commonly recorded from adjacent grassland swards. However additional

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WN5 Riparian woodland

Although this habitat does not occur within the footprint of the Proposed Scheme it was recorded on the instream islands to the west of the proposed bridge crossing and in a small area on the northern bank of the River Boyne. These areas were typically dominated by *Salix* spp. However, none of the aforementioned areas of woodland correspond to the residual alluvial forest [91E0] Annex I Priority Habitat type on the basis that indicator species were absent (i.e. alder and ash).

However, downstream, c. 12.6 km east of the Proposed Scheme, Annex I alluvial forest habitat as mapped by the NPWS (2020) and designated as part of the River Boyne and River Blackwater SAC also occurs.

WL1 Hedgerows

Many of the fields within the study area are bounded by hedgerows, although field gaps, fencing or scrub could be interspersed throughout. Notwithstanding the age or condition of older hedges, owing to the linear nature of most, they were established as stockproof boundaries or townland divides rather than as naturally occurring features. Despite the nature and agricultural use of the landscape, the hedges varied in management and structure from gappy woody vegetation to more dense woody vegetation and broadleaved herbs, less than 5 m in height and species poor. In general, particularly in agricultural lands which are intensively managed - hedges were kept low and narrow through cutting. Elsewhere mature hedgerows were noted in areas with many hedgerows also exhibiting evidence of regular cutting. Occasionally, dry drainage ditches and sometimes wet ditches occurred alongside hedgerows, whilst in other areas access tracks underlain by hardcore ran alongside the hedges.

Floristic diversity is constrained mainly by management and adjacent species poor habitats as a seed source. Commonly recorded species noted included hawthorn, blackthorn, bramble and gorse (*Ulex europeus*). Rose species such as dog rose (*Rosa canina*) were locally abundant. In places the hedgerows had scatterings of canopy or sub-canopy forming trees species including mature ash, oak, sycamore, beech and horse chestnut with smaller willows, birch as well as holly which was locally abundant. The understorey or herbaceous species was poorly represented and the area alongside the narrow hedge was often heavily trampled by livestock with the result that aside from bare ground or grasses, notable herbs include pioneer species such as linear features of nettles.

Other species occasionally noted in less intensively managed hedges included: ivy (*Hedera helix*), honeysuckle (*Lonicera periclymenum*), vetch (*Vicia* spp.), primrose (*Primula vulgaris*) and common hogweed (*Heracleum sphondylium*) as well as grasses and herbs from adjacent grassland. Other plants occasionally noted within hedgerows included non-native or planted species, often as garden escapes. These included cherry laurel (*Prunus laurocerasus*), cotoneaster (*Cotoneaster* spp.), fuchsia (*Fuchsia*; L. spp.), privet (*Ligustrum* spp.) and griselinia (*Griselinia* spp.).

Fruit, shrubs and trees were locally recorded in hedgerows with the majority associated with garden escapes or from vector material that originated from there. Species included commonly cultivated gooseberry (*Ribes uva-crispa*), blackcurrant (*Ribes* spp.), and raspberry (*Rubus idaeus*). In one long boundary hedge, a single crab apple (*Malus sylvestris*) was recorded among blackthorn, hawthorn, and bramble. This was the only noted record along the survey corridor.

WL2 Treelines

Treelines are often associated with hedgerows. They are characterised by linear rows or occasionally two rows of closely growing planted trees, sometimes native but often planted. All of the treelines that were noted comprised mature or veteran trees. Unlike hedgerows which can include semi-mature and mature trees as an integral component, treelines are planted, with trees regularly spaced. The key trees identified included beech, followed by oak, and sycamore. Some discrete conifer treelines comprising leyland cypress (*Cupressus leylandii*) were noted in several areas, often screening private residences.

WS1 Scrub and WS3 Ornamental/non-native scrub

Scrub habitat is typically, although not always, characterised by low botanical diversity. In many instances it is characterised by the presence or dominance of a single species and occasionally non-native or garden escapes. Elsewhere the development of scrub vegetation is associated with linear screening (e.g. walls and fences that screen private residences). In many instances bramble was the main component of the scrub habitat throughout the study area and at times was an extension of some hedgerows. Other areas of scrub

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dominated by a single species included: gorse scrub; occasional hazel scrub at edges of smaller woodland copses; and cherry laurel. The latter species is often a relic from older estates or screening hedge around private residences.

Disturbed and man-made ground

BL3 Built land

This anthropogenic habitat represents all hard, made surfaces and is associated with existing infrastructure - mainly the public road networks within the Proposed Scheme site as well as some boundary walls and buildings. Flora is rarely a feature of well-maintained hard surfaces, although small pioneer herbs and/or bryophytes/lichens can become established on suitable situations or where patches of soil accumulate in sheltered crevices.

Owing to the extensive occurrence of this habitat throughout the Proposed Scheme, which hold little to no floristic value, built land has not been mapped.

ED2 Spoil and bare ground & ED3 Recolonising bare ground

Two habitats often related to human disturbance are spoil and bare ground and recolonising bare ground. Both of these habitats can be linked depending on the nature and extent of the exposed ground. Ground that is not in obvious agricultural production but is nonetheless bare of vegetative cover is often transient in nature or subject to disturbance such as field hedge clearance. Over time and with a reduction in disturbance, the seedbank within the bare ground can develop. Typically, the species are ruderals or fast-growing pioneer species which may or may not be replaced over time by more stable graminoids species typical of the surrounding landscape. The largest area of recolonising/bare ground is located towards the southern end of the Proposed Scheme, where a considerable area (approx. 0.24 ha) of overburden has been removed in the corner of an improved pasture.

GA2 Amenity grassland (improved)

Similar in many respects to improved agricultural grassland in terms of floristic diversity, although they differ in terms of regular mechanical mowing rather than livestock grazing or mowing for silage. This habitat was of limited distribution throughout the study area, associated with private gardens and maintained verges along the N51 towards Slane. There was one considerable area of this habitat associated with an area of parkland towards the northern end of Slane village.

Owing to the infrequent occurrence of this habitat within the study area, this habitat has not been mapped.

GS2 Dry meadows and grassy verges

The dry meadows and grassy verges habitat is not well represented within the study area and only two fields were ascribed to the habitat. However, elements of grassy verges, discontinuous in nature, were noted along some sections of the public road network. The verges, which for the most part are narrow in extent occurring immediately alongside the road network, are less intensively maintained. They can transition to maintained GA2 habitat or BC4 flower beds and borders and this is noticeable along rural parts of the N51.

Grassy verges occur at a scale unsuitable for mapping.

BC4 Flower beds and borders/WS3 Ornamental/non-native shrub

Of limited extent across the study area, both flower beds and borders and ornamental/non-native shrubs are closely linked with garden or formal planting. As such they are limited in extent across the bulk of the study area and are mainly located fronting houses along the local road network. There is considerable variability in the floristic diversity. Some of it is long established and maintained, whilst in other areas it is regularly altered. Elements of this habitat were occasionally noted having expanded their range into adjacent hedge lines.

This habitat occurs at a scale unsuitable for mapping.

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BL1 Stone walls and other stonework

Stone walls and other stoneworks were present in discrete locations. There is evidence of older estate walls among some old field boundaries. Much of this stonework has largely been subsumed by hedgerows. However, there are examples throughout the study area including remnant or derelict walls. The habitat, where exposed, was largely devoid of vegetative cover although ivy was locally abundant.

This habitat occurs at a scale unsuitable for mapping.

Aquatic habitats

FW2 Depositing lowland river

The River Boyne is classified as a depositing lowland river. The river at the proposed crossing point is approx. 40 m wide and has no islands, although located both upstream and downstream of the proposed bridge crossing are a small number of instream islands, characterised by rank grassland with some development of willow. The instream islands are not considered wholly natural, with historical evidence showing remnants of a fish weir (see **Chapter 13: Archaeological and Cultural Heritage** - site AH31 of the heritage inventory). The River Boyne is characterised at its southern bank by a vertical face (approximately 1 m deep in July 2020), although in winter months the water levels rise to break the bank and partially flood the adjacent sward. The northern bank of the River Boyne sweeps down to the edge of the watercourse and is characterised by taller grassland sward outside of the electric fence.

There are sporadic occurrences of individual willows, although based on the lack of obvious alluvium and species compositions, these singular trees do not correspond to riparian woodland. In the centre of the flowing river, there is occasional floating vegetation, typically seen sub surface including occasional water crowfoot (*Ranunculus aquatilis*). The bulk of the instream vegetation corresponds to the edge of the watercourse where linear swathes of reed and sedge occur.

FW1 Eroding/upland river

Two eroding/upland river watercourses occur within the terrestrial biodiversity study area, the Mattock (Mooretown) Stream and Thurstianstown stream.

The Mattock (Mooretown) Stream rises within Littlewoods Forest, a short distance to the north, crosses under the proposed tie-in with the existing N2 at the northern end of the study area. This narrow watercourse is characterised by shallow water level of rocky substrate with overhanging hedge line along the banks. The downstream side of the tie in is characterised by densely overgrown scrub and semi-mature trees. There was little or no instream vegetation noted during the habitat survey. The Thurstianstown stream rises near Boyle Road where it travels in north westerly direction, discharging into the River Boyne after passing through Rockwood to the south of Slane Castle Demesne. This watercourse is heavily shaded, characterised by coarse substrates such as cobble and pebble as it approaches the River Boyne.

FS1 Reed and large sedge swamps

The proposed bridge crossing is characterised by little instream or floating vegetation along the River Boyne. However, along the Boyne Navigation Canal, summer growth results in a linear development of species poor tall herbaceous vegetation dominated by common club rush (*Schoenoplectus lacustris*) with some flowering rush (*Butomus umbellatus*). Elsewhere species such as cattail (*Typha* spp), canary grass (*Phalaris canariensis*), reed sweet grass (*Glyceria maxima*), and great willowherb (*Epilobium hirsuta*) are present. This habitat was also noted to occur north of the Boyne Navigation Canal adjacent to an area of GS4 Wet grassland, which included species such as reed canary-grass (*Phalaris arundinaceae*), reed sweet-grass, yellow flag, meadow sweet, greater pond sedge (*Carex riparia*) and kingcup (*Caltha palustris*).

It is also noted that reed and large sedge swamps habitat has affinity to the Annex I habitat '6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels', however the habitat within the study area would not meet the criteria for this Annex I habitat.

However, downstream, c. 4 km and 9 km east of the Proposed Scheme, Annex I Hydrophilous tall herb fringe habitat as mapped by the NPWS (2020) occurs, which is not designated as a QI of the Boyne River and Blackwater River SAC.

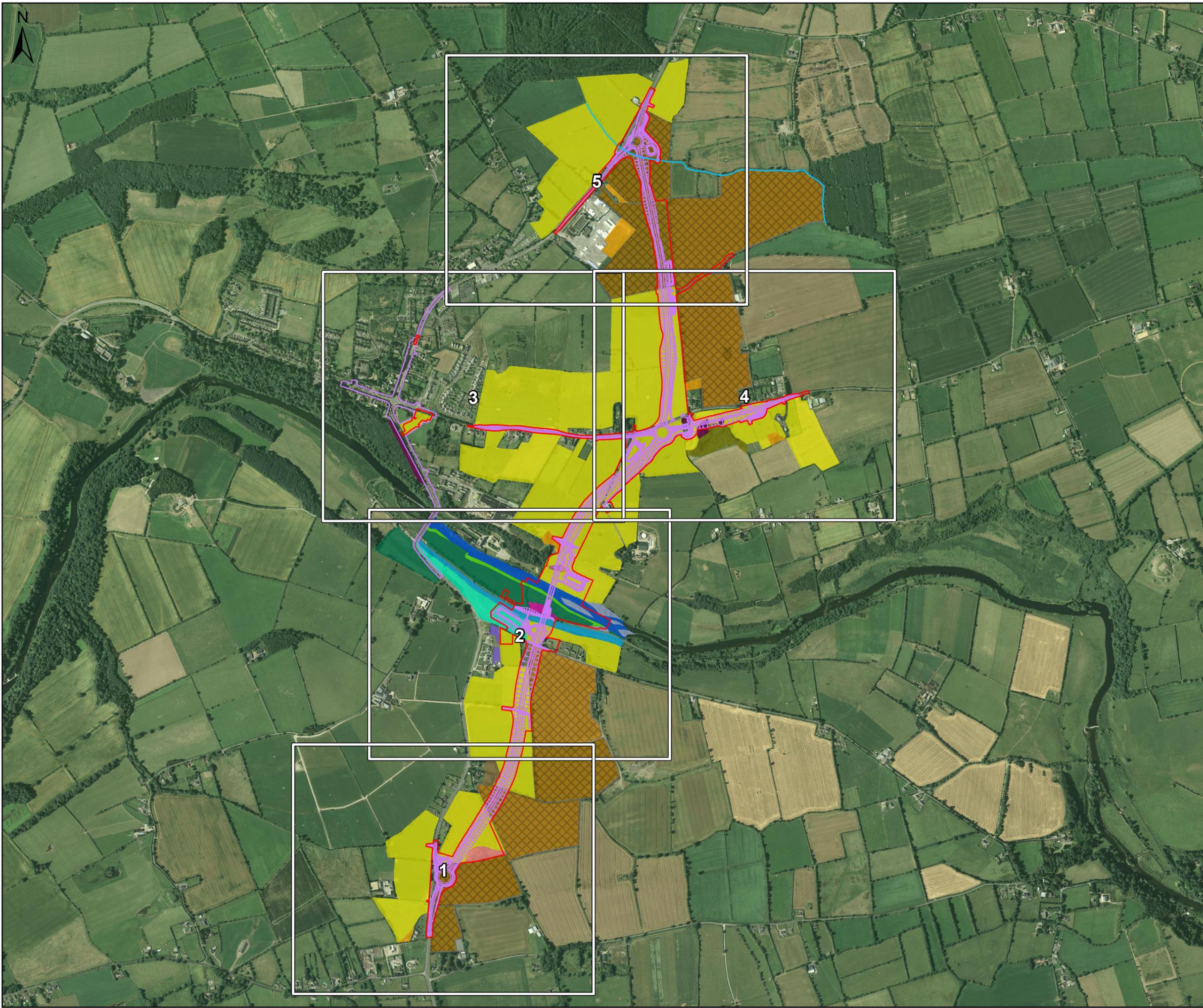
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FW3 Canals

In the southern part of the low-lying Boyne Valley, there is a derelict section the Boyne Navigation Canal alongside the towpath. Although retaining water, there is little open water and no obvious surface flow. Taller vegetation includes yellow flag, reed sweet grass along with patches of reed canary grass (*Phalaris arundinacea*) as well as water mint (*Mentha aquatica*), duckweed (*Lemna* spp.), water-starwort (*Callitriche* spp.), great willowherb (*Epilobium hirsutum*), water forget-me-not (*Myosotis scorpioides*), marsh horsetail (*Equisetum fluviatilis*). Occasionally along the edge of the canal, species typical of managed grasslands as well as discrete patches of sub-canopy trees occur.

FW4 Drainage ditches

Typically associated with field boundaries, particularly between different landholdings, drainage ditches may be wet or dry, but they are always narrow and where water is present may not be continuous, in that a flow path could not always be followed. This habitat has not been mapped. Floristically, the ditches are characterised by surrounding hedgerow and unmanaged field edge vegetation and were often overgrown. However, some drainage ditches had aquatic vegetation, typically discontinuous in distribution comprising minor amounts of floating sweet grass (*Glyceria fluitans*), water-starwort and duckweeds species. Occasionally modified to improve drainage through scrubbing out overgrown vegetation, thus temporarily clearing any distinctive flora.



Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Map Sheets

Habitat

- BC1
- ED2, ED3, WS1
- FS1
- FW2
- FW3, GM1, FS1
- GA1
- GA1, GS4
- GA2, BC3, WL1, WS1
- GM1, GS4
- GS2
- GS3, WS1
- GS4
- WD1
- WD2
- WN5
- WS1
- FW1

Data Source: OSi Orthophotography tiles 2019

0 0.2 0.4 0.8
Kilometres

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N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.5**

Habitats within Proposed Scheme's Footprint: Overview

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Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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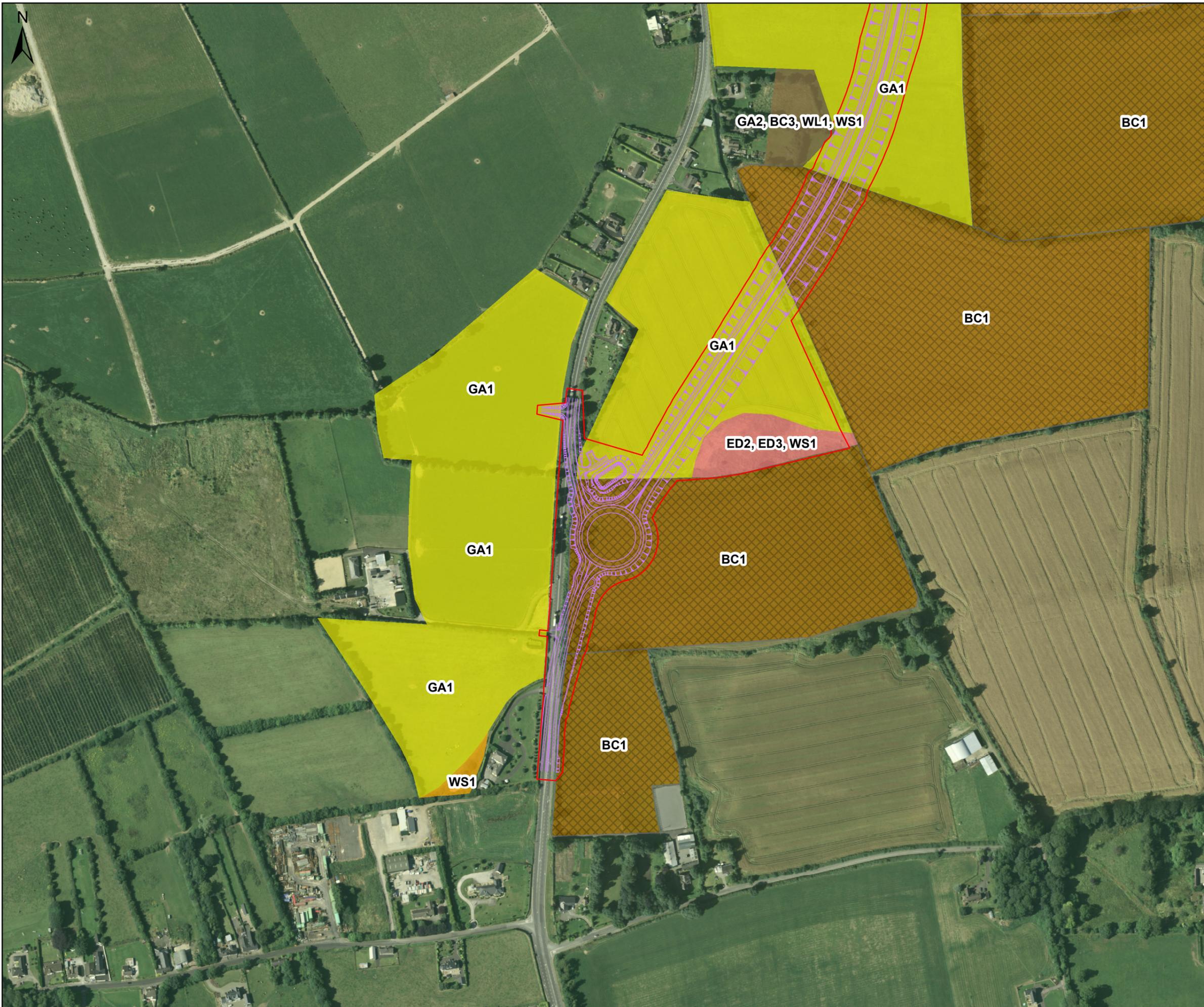
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Approved: RR	Projection: ITM
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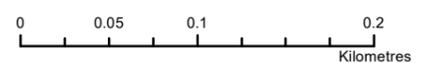
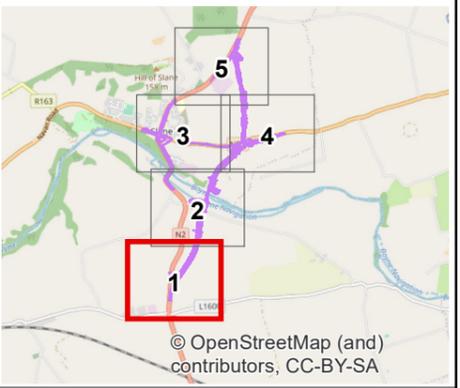
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Legend

-  Proposed Scheme
-  Proposed Scheme Boundary
- Habitat**
-  BC1
-  ED2, ED3, WS1
-  GA1
-  GA2, BC3, WL1, WS1
-  WS1

Data Source: OSi Orthophotography tiles 2019

Client **Meath County Council**

N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.5**

Habitats within Proposed Scheme's Footprint: Map 1 of 5

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File Identifier:
 MDT0806-RPS-00-N2-DR-Z-AG-3034

Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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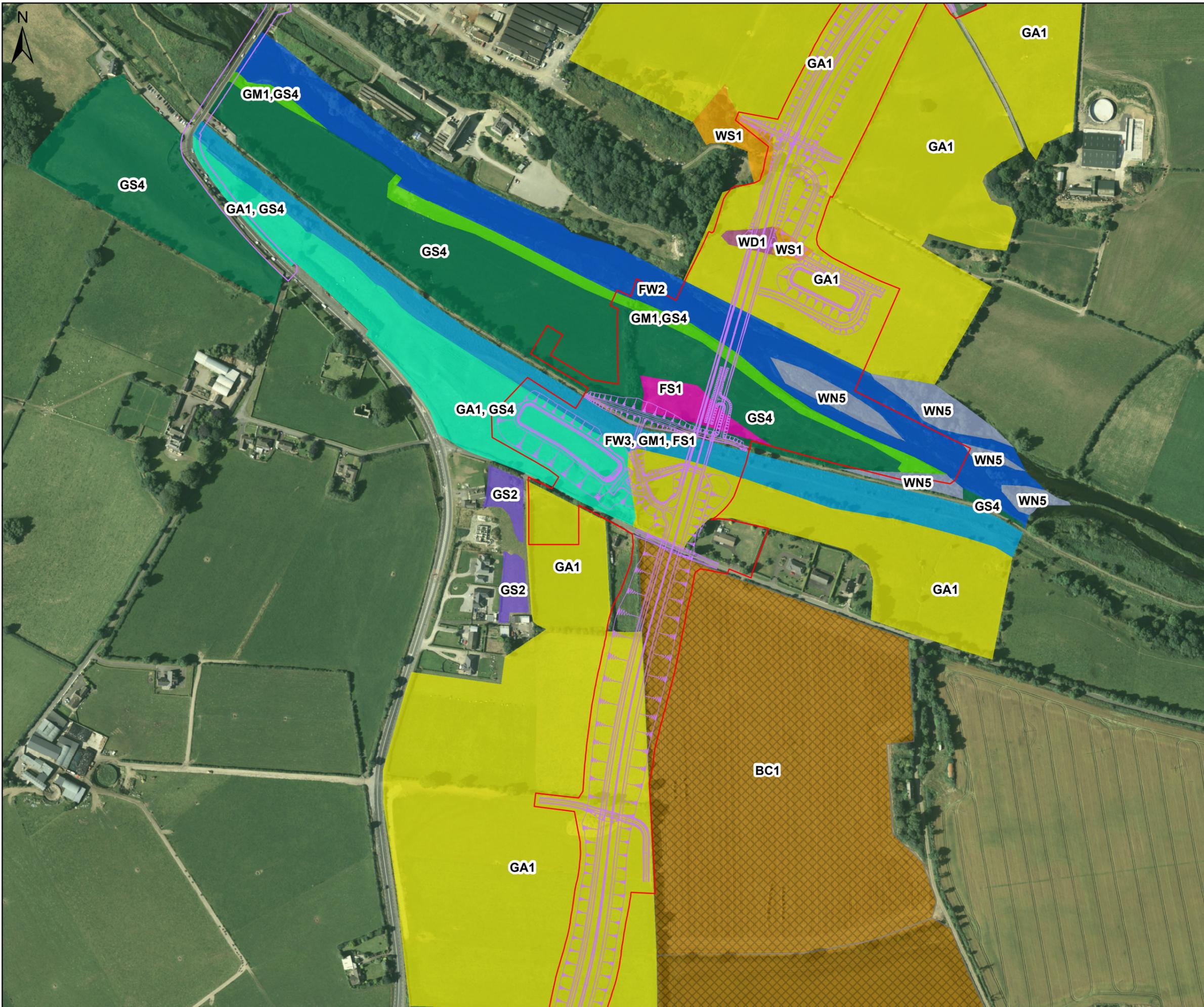
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Legend

- Proposed Scheme
- Proposed Scheme Boundary

Habitat

- BC1
- FS1
- FW2
- FW3, GM1, FS1
- GA1
- GA1, GS4
- GA2, BC3, WL1, WS1
- GM1, GS4
- GS2
- GS4
- WD1
- WN5
- WS1

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0 0.05 0.1 0.2
Kilometres

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N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.5

Habitats within Proposed Scheme's Footprint: Map 2 of 5

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File Identifier:
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Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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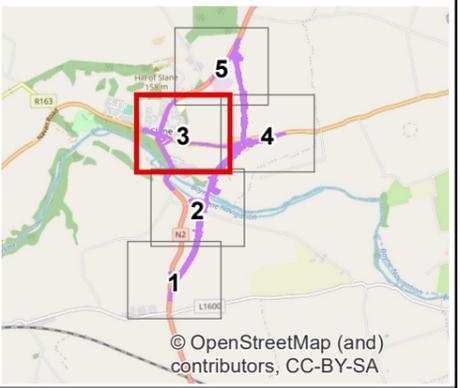


Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Habitat**
- BC1
- FW2
- GA1
- WD1
- WD2

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
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Client **Meath County Council**

N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.5**

Habitats within Proposed Scheme's Footprint: Map 3 of 5

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File Identifier:
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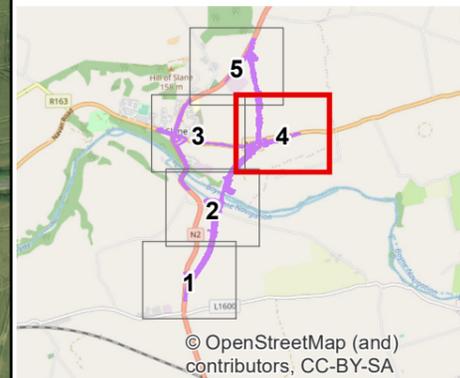
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Habitat**
- BC1
- GA1
- GS3, WS1
- WD1
- WD2
- WS1

Data Source: OSi Orthophotography tiles 2019



Client **Meath County Council**

N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.5**

Habitats within Proposed Scheme's Footprint: Map 4 of 5

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Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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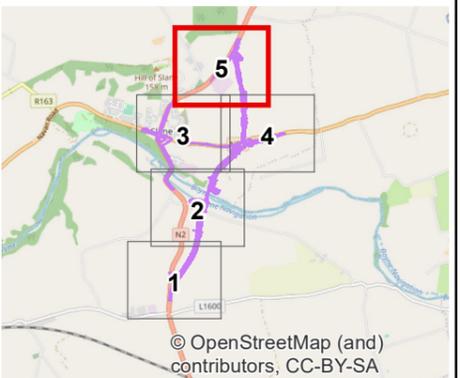


Legend

-  Proposed Scheme
-  Proposed Scheme Boundary
-  FW1
- Habitat**
-  BC1
-  GA1
-  WS1

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
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N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.5**

Habitats within Proposed Scheme's Footprint: Map 5 of 5

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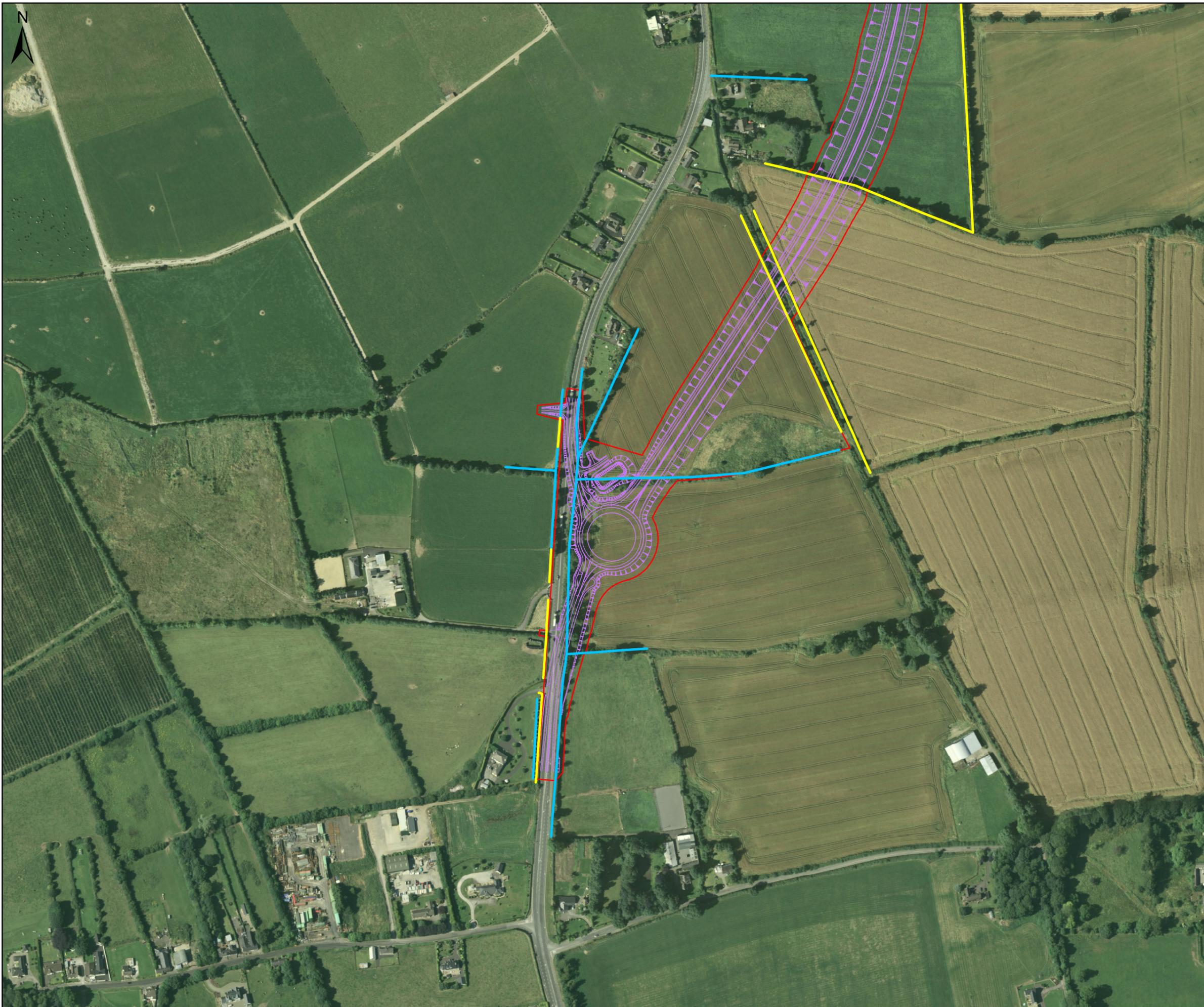
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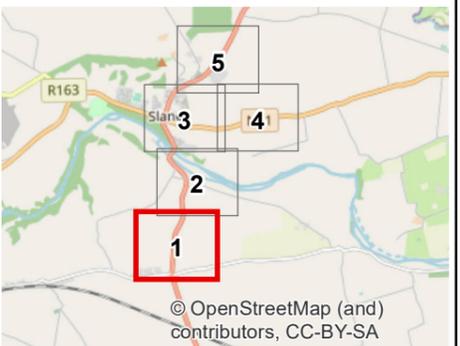


Legend

- Proposed Scheme
- Proposed Scheme Boundary
- WL1
- WL2

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



Client
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N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.6

Hedgerows and Treelines within the Proposed Scheme's Footprint
Map 1 of 5

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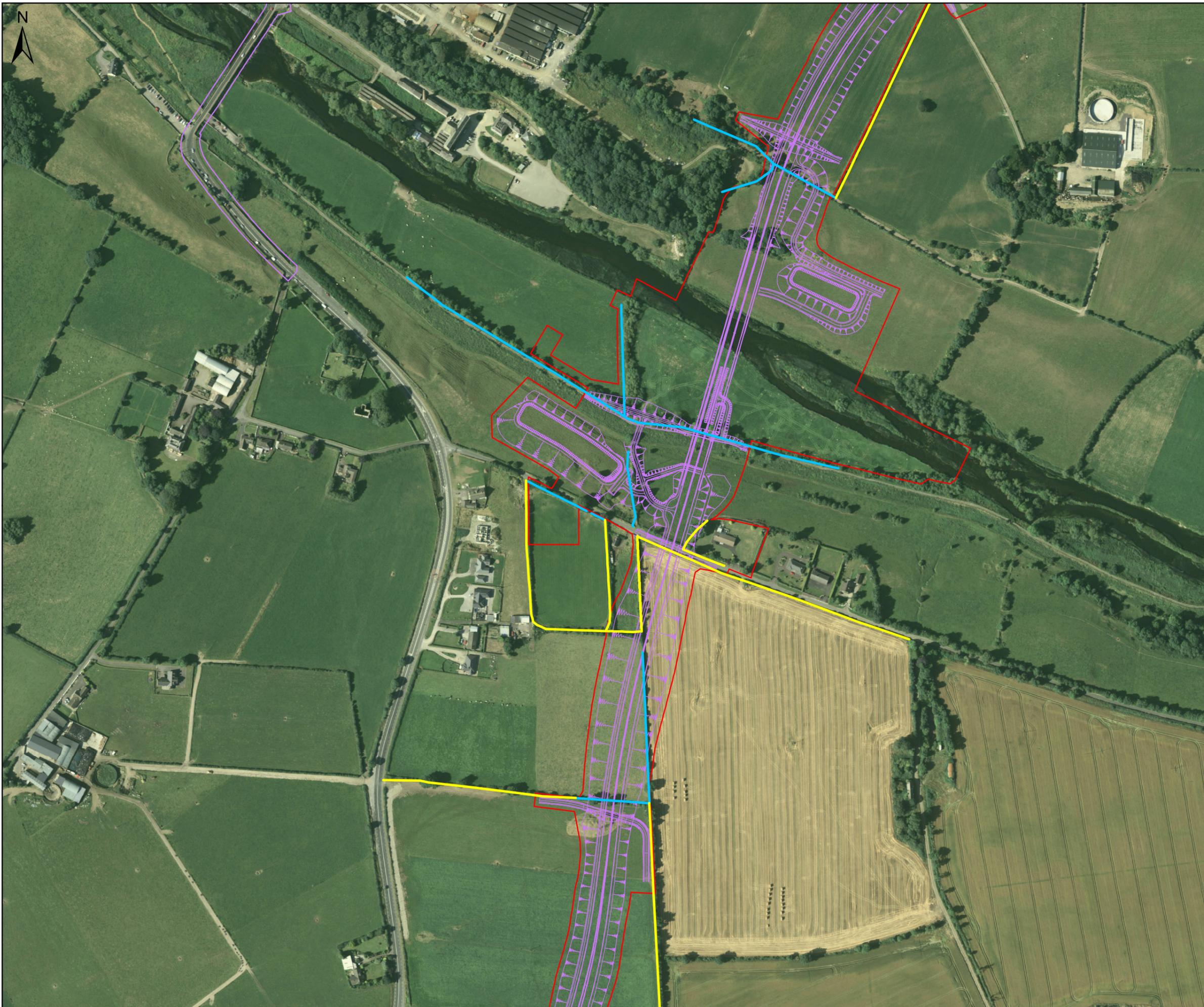
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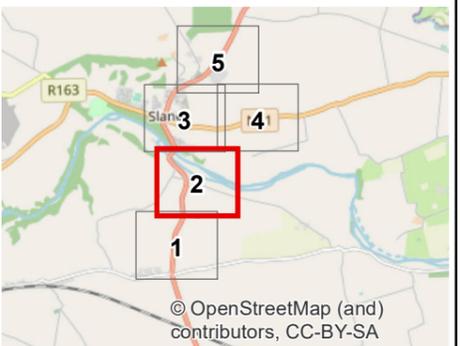


Legend

- Proposed Scheme
- Proposed Scheme Boundary
- WL1
- WL2

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.6

Hedgerows and Treelines within the Proposed Scheme's Footprint
Map 2 of 5

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Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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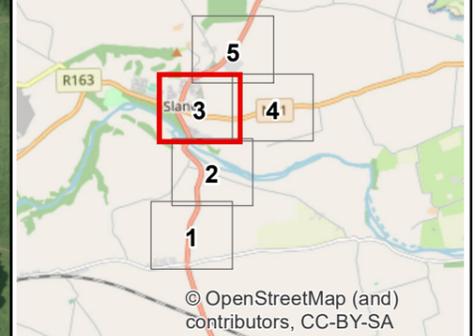
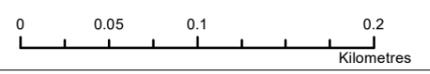
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- WL1
- WL2

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N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.6
Hedgerows and Treelines within the Proposed Scheme's Footprint
Map 3 of 5

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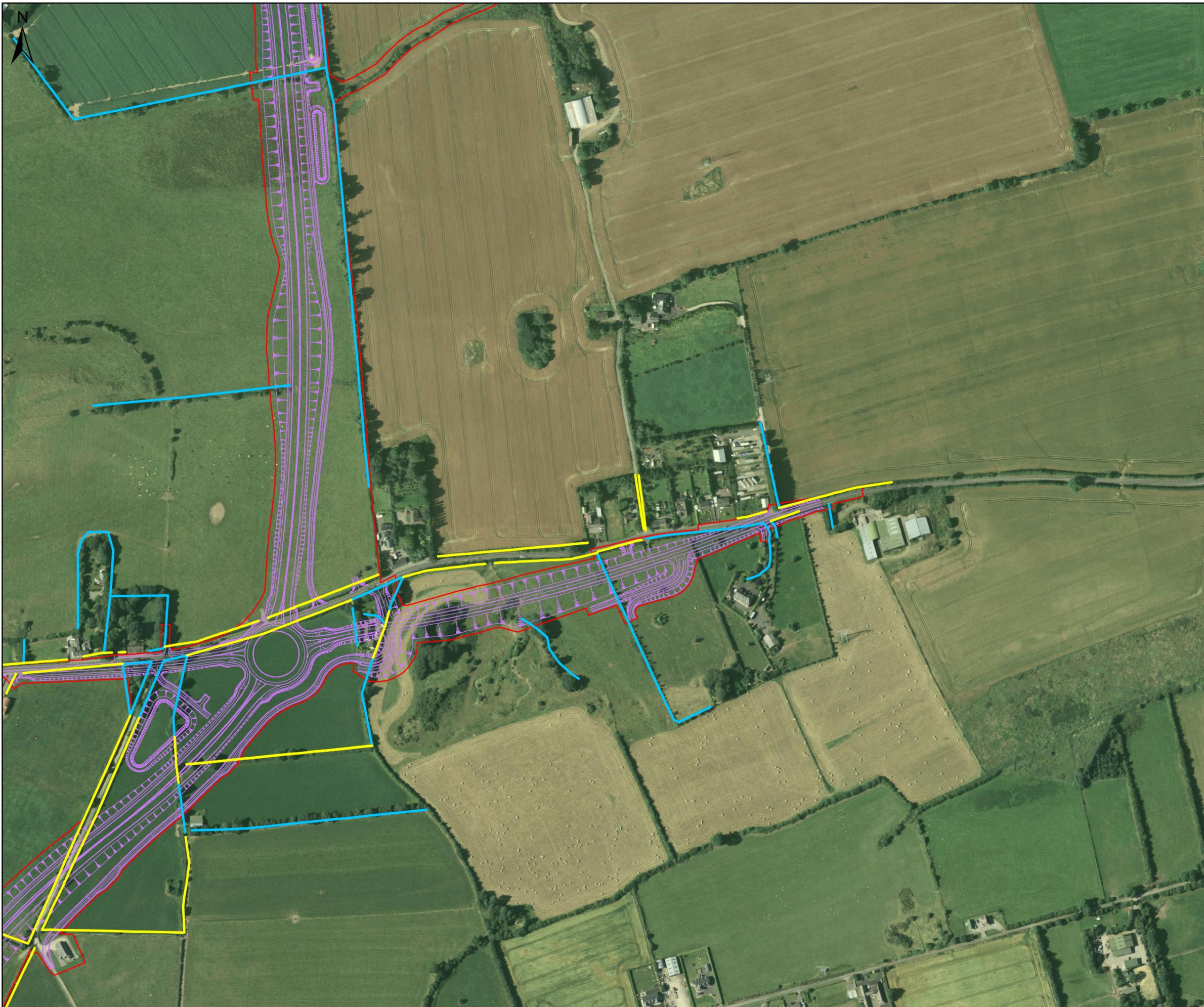
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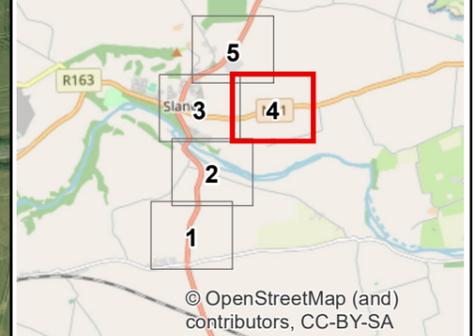
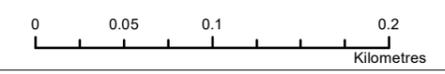
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- WL1
- WL2

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Title
Figure 15.6
Hedgerows and Treelines within the Proposed Scheme's Footprint
Map 4 of 5

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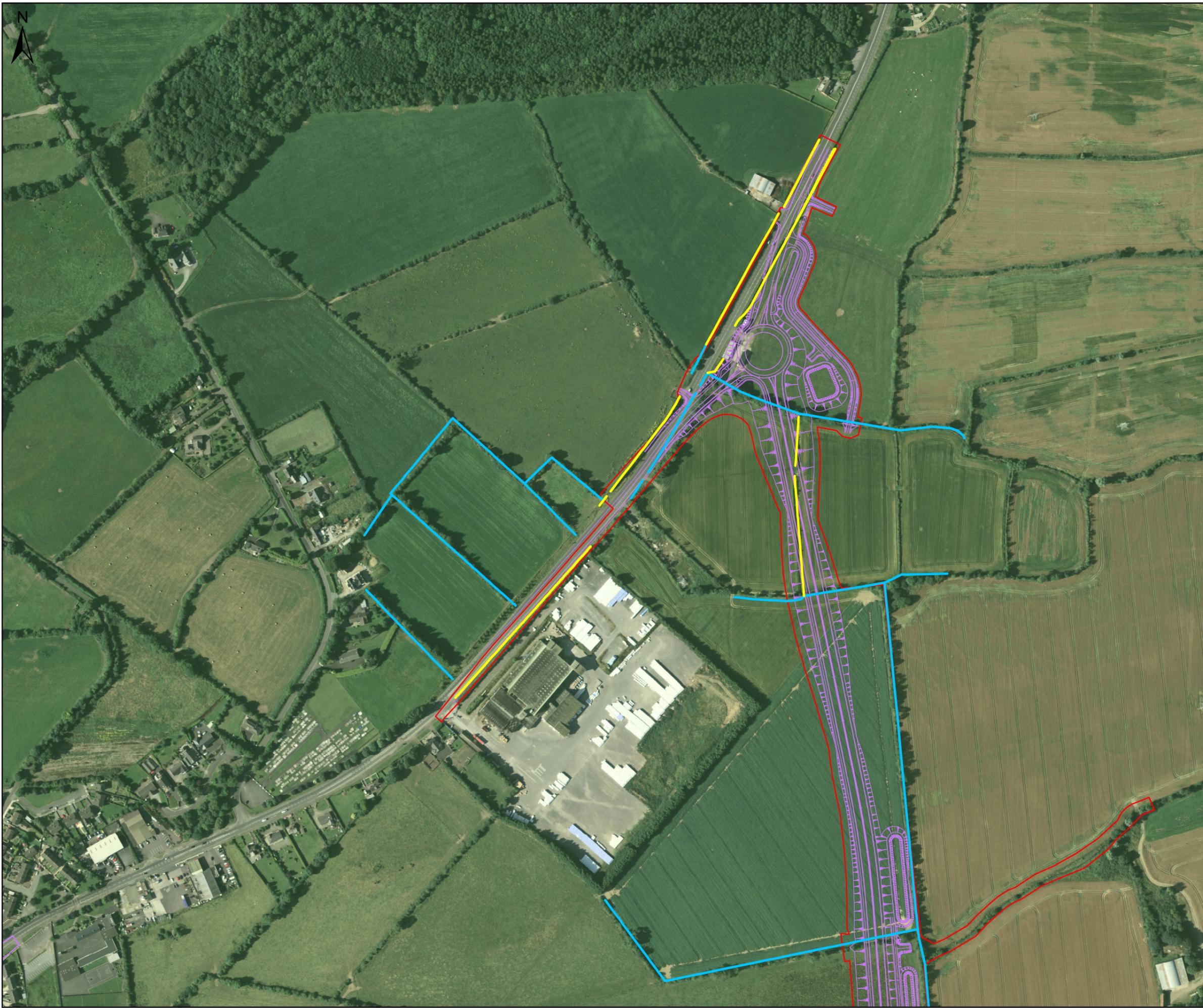
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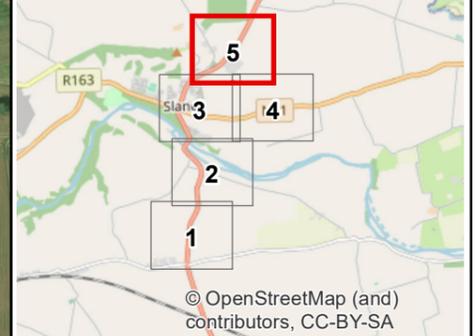
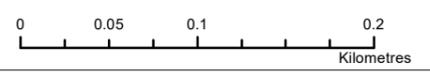
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- WL1
- WL2

Data Source: OSi Orthophotography tiles 2019



Client
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Title
Figure 15.6
Hedgerows and Treelines within the Proposed Scheme's Footprint
Map 5 of 5

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Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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Drawn: NR	Date: 24/05/2023
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15.3.3.2 Flora

Protected Flora

Round leaved wintergreen (*Pyrola rotundifolia*) and round-fruited rush (*Juncus compressus*) are both Flora (Protection) Order, 2022 species, and are noted from the River Boyne and River Blackwater SAC NPWS site synopsis (NPWS, 2014). Round leaved wintergreen is noted as occurring around Newtown Lough; its only location in Meath. It is a species of restricted distribution in Ireland (Cross, 1986) and is a wetland species that is prone to drainage and land reclamation. As the bulk of the habitats are already given over to intensive agriculture, there is no significant potential for this species to occur within or immediately adjacent to the footprint of the Proposed Scheme and it was not recorded during any of the survey work completed to inform the Proposed Scheme.

The round-fruited rush is noted as occurring in three counties only, including Meath, where it is known from alluvial pasture on Rossnaree riverbank. This area is approximately 3.5 – 4 km downstream of the Proposed Scheme and the species was not recorded during searches in July 2020 within the footprint of the Proposed Scheme.

Invasive Alien Plant Species (IAPS)

A search of the National Biodiversity Data Centre (NBDC) database returned records of the presence of one scheduled invasive alien plant species: Himalayan balsam (*Impatiens glandulifera*). The field surveys also recorded the presence of Japanese knotweed (*Fallopia japonica*), Himalayan balsam (*Impatiens glandulifera*) and giant hogweed (*Heracleum mantegazzianum*) within the environs of the Proposed Scheme.

Giant hogweed and several stands of Himalayan balsam were recorded 2.5 km upstream and to the rear of Slane Castle where it borders with the River Boyne. However, no works are proposed in this area and therefore they will not be interfered with and are not considered as part of this report. Several other stands of Himalayan balsam and Japanese knotweed do however occur within the immediate environs of the scheme. Details of their location in relation to the Proposed Scheme are listed in **Table 15-6** below.

Table 15-6: Third Schedule IAPS recorded during Field Surveys within the vicinity of the Proposed Scheme

Species Name	Description	Location (ITM) Easting/Northing	Distance from Proposed Scheme
Japanese Knotweed <i>Fallopia japonica</i>	Four stands of the invasive plant species located along track (off Fennor road) which borders with a small pond. Large patches are also noted surrounding this water body.	697082.44, 772925.69	0.28 km west
		697083.69, 772908.75	
		697085.25, 772889.64	
		697098.67, 772876.31	
	Suspected report provided by MCC located along the L5606 on the northern side of the road at Monknewtown.	698884.80, 775957.10	1.6 km northeast
	Suspected stand located approx. 13 m from the existing N2 road along the public realm element of the scheme.	696201.53, 774103.65	0.013 km northeast
Himalayan Balsam <i>Impatiens glandulifera</i>	Located along left-hand bank and walking trail.	695979.25, 773976.59	1.8 km upstream (u/s) of proposed bridge crossing
	Located along the canal channel, approx. 150 m u/s of the existing Slane bridge.	696193.15, 773721.96	0.7 km u/s of proposed bridge crossing
	Located on willow dominated vegetated island, approx. 18 m u/s of the existing Slane Bridge.	696300.76, 773651.14	0.6 km u/s of proposed bridge crossing
	Located along left-hand bank within bare mud.	697110.90, 773185.22	0.25 km downstream (d/s) of proposed bridge crossing

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Species Name	Description	Location (ITM) Easting/Northing	Distance from Proposed Scheme
	Located amongst some willow trees, Noted as recently cut.	697110.94, 773170.96	0.25 km d/s of proposed bridge crossing
	Located at the end of the willow stand described above along left-hand bank.	697141.45, 773163.10	0.29 km d/s of proposed bridge crossing
	Located under and throughout willow dominated alluvial vegetation.	697290.57, 773105.01	0.45 km d/s of proposed bridge crossing
	Located along edge of left-hand bank approx. 10 m northeast of the stand located beneath willow.	697310.10, 773106.38	0.46 km d/s of proposed bridge crossing
	Stand located on island 1.8 m from left hand bank.	697445.86, 773051.74	0.61 km d/s of proposed bridge crossing
	Located along right-hand bank within vegetated willow patch.	697119.30, 773269.50	0.24 km d/s of proposed bridge crossing
	Willow tree surrounded by balsam located along the right-hand bank.	697614.92, 773119.50	0.75 km d/s of proposed bridge crossing

15.3.4 Fauna

Protected and rare fauna species returned from the desk study within a 5 km radius of the Proposed Scheme are detailed in **Appendix 15.4 – Protected and Rare Species**.

15.3.4.1 Bats

15.3.4.1.1 Bat Roosting – Trees

The preliminary ground level roost assessments identified 31 trees with features suitable for roosting bats. Of these 31 trees, the visual assessment categorised 25 trees as having ‘Low’ bat roosting suitability and six as having ‘Moderate’ bat roosting suitability. No trees with ‘High’ roosting suitability were identified. A list of trees and their suitability for roosting bats are provided in **Appendix 15.5** and mapped in **Figure 15.7**.

The six trees identified as having ‘Moderate’ bat roosting suitability (BT12, BT17, BT28, BT35, BT37, and BT44) were therefore subject to bat emergence and re-entry surveys. No bats were recorded emerging or re-entering from any of the potential bat roost features. The dates, timing, and weather conditions for the bat emergence/re-entry surveys completed are detailed in **Table 15-7** below. The trees surveyed, the survey type and the number of surveyors required during emergence/re-entry surveys on trees are summarised in

Table 15-8.

Table 15-7: Dates, Timings and Weather Conditions for Presence/Absence Surveys – Trees

Date	Sunset/ Sunrise Time	Start Time of Survey	End Time of Survey	Cloud Cover (%)	Precipitation	Wind (0-7)	Temp. (°C)
11/05/2021	21:15	21:00	23:15	60	None	1	10
12/05/2021	21:17	21:02	23:17	20	None	0	8
28/07/2021	03:35	03:35	05:50	60	None	1	11
13/08/2021	06:02	04:02	06:17	25	None	2	12

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Table 15-8: Summary of Surveys Completed on Trees

Date	Survey Type	Feature type	Feature name/code	No. of surveyors required
11/05/2021	Emergence	Tree	BT17	3
	Emergence	Tree	BT35	1
	Emergence	Tree	BT37	1
	Emergence	Tree	BT44	1
12/05/2021	Emergence	Tree	BT12	2
	Emergence	Tree	BT28	2
28/07/2021	Re-entry	Tree	BT12	2
	Re-entry	Tree	BT28	2
13/08/2021	Re-entry	Tree	BT17	3
	Re-entry	Tree	BT35	1
	Re-entry	Tree	BT37	1
	Re-entry	Tree	BT44	1

15.3.4.1.2 Bat Roosting – Structures

The preliminary ground level roost assessment of structures was completed by RPS which included the assessment of six structures. Two of these structures were considered to support potential for bat roosting, the remaining were considered 'negligible' (see **Figure 15.8**).

The two buildings identified to support potential for bat roosting were further assessed by FGE Consulting. Based upon the results of the visual roost survey, and considering the local context, these two structures- Building A (derelict agricultural stone building at the northern tie-in) and Building B (derelict gatehouse, west of the N51) (see **Figure 15.8**), were considered to be of 'Low' likelihood to support roosting bats.

Potential roosting locations were identified in Building A both within and surrounding the chimney, as well as between the wooden boards at the apex of the roof. There were holes in the wire mesh in the windows and a large gap between the door and the wall above it, which would allow access to the building. Some roosting potential was also identified in Building B, mainly the small cracks between the walls and ceilings (where present), as well as within an area beside the fireplace which was enclosed apart from the lower half of the area (see **Appendix 15.6 Plate 7**).

Building A was subject to bat emergence and re-entry surveys. It should be noted that Building B was not deemed beneficial to survey for emergence/re-entry owing to the safety issues associated with the structure (i.e. loose tiles and difficult ground). Building B received an external and internal visual inspection during daylight hours in addition to static data collection and will be subject to appropriate mitigation measures at pre-construction stage (see **Section 15.5**).

No bats were recorded emerging from Building A during the emergence survey. During the surveys, a low level of bat activity was detected foraging and commuting around Building A. Three species were observed being active on the survey site including Leisler's, common pipistrelle and soprano pipistrelle.

The dates, timing, and weather conditions for the bat emergence/re-entry surveys completed for Building A are detailed in **Table 15-9** below. The survey type and the number of surveyors required are summarised in **Table 15-10**.

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Table 15-9: Dates, Timings and Weather Conditions for Presence/Absence Surveys – Buildings (FGE)⁵

Date	Sunset/ Sunrise Time	Start Time of Survey	End Time of Survey	Cloud Cover (%)	Precipitation	Wind (km/hr)	Temp. (°C)
11/05/2021	21.48	21.29	23.20	20	Dry	1.4-2.5	18.6-18.8

Table 15-10: Summary of surveys completed on Buildings

Date	Survey Type	Feature type	Feature name/code	No. of surveyors required
11/05/21	Emergence	Building	Building A	2

15.3.4.1.3 Commuting and Foraging Habitats

As part of the desk study (see **Section 15.2.3.1**), a bat habitat suitability index (ranging from 0-100) identified the site of the Proposed Scheme to be within a suitability index area of 31.33 for all bat species combined (**Table 15-11**).

Table 15-11: Summary of Bat Habitat Suitability Scores obtained from NDBC Online Mapping within the Proposed Scheme

Bat Species	Habitat Suitability Score (1 = lowest & 100= highest suitability)
All Bats	31.33
Soprano pipistrelle (<i>Pipistrellus pygmaeus</i>)	45
Brown long-eared (<i>Plecotus auratus</i>)	38
Common pipistrelle (<i>Pipistrellus pipistrellus</i>)	48
Lesser horseshoe bat (<i>Rhinolophus hipposideros</i>)	0
Leisler's noctule (<i>Nyctalus leisleri</i>)	47
Whiskered bat (<i>Myotis mystacinus</i>)	21
Daubenton's bat (<i>Myotis daubentonii</i>)	40
Nathusius's pipistrelle (<i>Pipistrellus nathusii</i>)	6
Natter's bat (<i>Myotis nattereri</i>)	37

The desk study returned records for seven bat species, namely: brown Long-eared bat (*Plecotus auritus*), Daubenton's bat (*Myotis daubentonii*), lesser noctule (*Nyctalus leisleri*), Nathusius's pipistrelle (*Pipistrellus nathusii*), natterer's bat (*Myotis nattereri*), common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*). Based on **Table 15-11**, the highest suitability index scores were recorded for common pipistrelle and Leisler's bat (*Nyctalus leisleri*), which had a moderate landscape and habitat suitability index score.

15.3.4.1.4 Bat Activity (Transect and Static)

The dates, timing, and weather conditions for the bat activity transect surveys are detailed in **Table 15-12** below.

⁵ The dates, timings and weather conditions for presence/absence surveys on buildings were completed by FGE consulting, and therefore the survey summary attributes may differ slightly in format (e.g. FGE consulting measure wind in km/hr, while RPS measure wind on a scale of 0-7).

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Table 15-12: Dates, Timings and Weather Conditions for Bat Activity Transect Surveys

Date	Sunset/ Sunrise Time	Start Time of Survey	End Time of Survey	Cloud Cover (%)	Precipitation	Wind (0-7)	Temp. (°C)
06/08/20	21.13	21.13	00.49	75	0	2-3	19
26/05/21	21.39	21.39	00.53	25	0	2	13
22/07/21	05.25	02.25	05.40	10	0	0	11

The results of the bat activity transect surveys are detailed below. A total of five species of bat were recorded foraging and/or commuting within the area of the Proposed Scheme. Data from the bat activity transects (see **Table 15-13** and **Figure 15.9**) indicate that the site offers a foraging and commuting source for soprano pipistrelle (42% of passes), common pipistrelle (33% of passes) and Leisler's (18% of passes) with relatively few records of brown long-eared bat (0.2% of passes) and Daubenton's bat (0.3% of passes).

Table 15-13: Bat Activity Transect Results – Number of Passes

Bat Scientific Name (Common Name)	Number of Passes	% of Passes
<i>Pipistrellus pipistrellus</i> (Common pipistrelle)	330	33%
<i>Pipistrellus pygmaeus</i> (Soprano pipistrelle)	414	42%
<i>Pipistrellus</i> spp.	60	6%
<i>Plecotus auratus</i> (Brown long-eared)	2	<1%
<i>Nyctalus leisleri</i> (Leisler's noctule)	186	19%
<i>Myotis daubentonii</i> (Daubenton's bat)	3	<1%
<i>Myotis</i> spp.	5	0.5%

The static detector survey nights per month and per location are detailed in **Table 15-14**. Detectors were deployed and recording for a minimum of 36 nights (River Boyne) and maximum of 38 nights (N51) between May and September 2021 with the results set out in **Table 15-15**.

Table 15-14: Static Detector Deployment per Location

Location	Number of Nights Deployed per Month					Total Night Deployed
	May	June	July	August	September	
River Boyne	6	30	–	–	–	36
N51 adjacent to Francis Ledwidge Cottage	–	–	–	31	7	38

Table 15-15: Bat Static Results – Number of Passes and Bat Passes Per Night (BBPN)

Bat Scientific Name (Common Name)	May/June (River Boyne)	Total %	BPPN	August/September (N51)	Total %	BPPN
<i>Pipistrellus pipistrellus</i> (Common pipistrelle)	2391	19	66.4	10929	60	287.6
<i>Pipistrellus pygmaeus</i> (Soprano pipistrelle)	7701	61	213.9	5886	32	154.9
<i>Pipistrellus</i> spp.	568	4	15.8	363	3	9.6
<i>Pipistrellus nathusii</i> (<i>Nathusius' pipistrelle</i>)	4	<1	0.1	5	<1	0.1
<i>Nyctalus leisleri</i> (Leisler's noctule)	1975	16	54.9	1040	6	27.4
<i>Myotis daubentonii</i> (Daubenton's bat)	0	0	0	5	<1	0.1
<i>Myotis</i> spp.	41	<1	1.1	8	<1	0.2

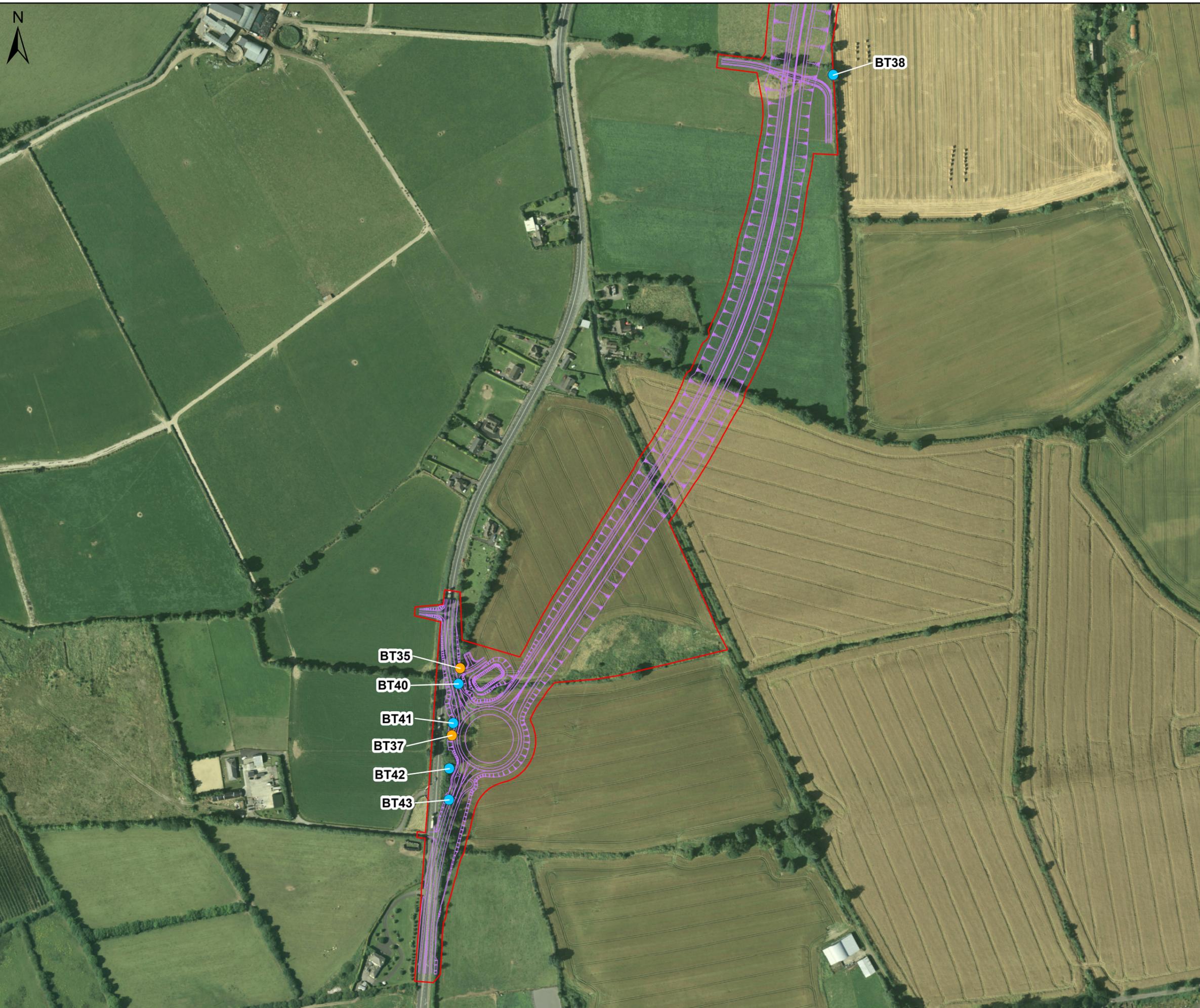
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A total of six species of bat (Leisler's bat, Nathusius' pipistrelle, common pipistrelle, soprano pipistrelle, and Daubenton's) were identified foraging and/or commuting in the vicinity of the static detector deployment locations. In addition, unidentified *Myotis* species and *Pipistrellus* species were also recorded.

The N51 survey location had the highest total passes across the survey timeframe, which were dominated by common pipistrelle (59.93%) and soprano pipistrelle (32.28%). This was the only location to have confirmed identification of Daubenton's bat.

The River Boyne survey location was dominated by soprano pipistrelle passes (60.73%), with a small proportion of *Myotis* species (0.32%) and Nathusius' pipistrelle (0.03%). The River Boyne location also had smaller proportions of Leisler's bat (15.58%) and common pipistrelle (18.86%).

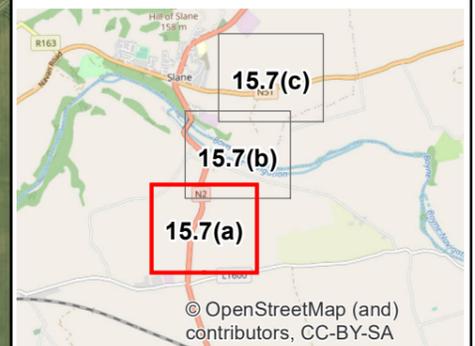
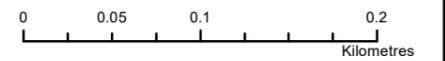
It is notable to point out that the number of common pipistrelles recorded during the period of May/June is much greater than those recorded for soprano pipistrelles within the same period. These peaks then seem to 'flip' during the time period of August/September, where the number of soprano pipistrelles recorded are evidently much greater than those recorded for common pipistrelles. It is difficult to state any one reason for this apparent seasonal change, however it is possible that a soprano pipistrelle roost location may occur close to where the bat detector was placed along the River Boyne, and a common pipistrelle roost location may occur close to where the bat detector was placed along the N51. Again, this is difficult to ascertain. Overall peak BPPN was observed at the N51 survey location (adjacent to Ledwidge Cottage Museum) in August/September 2021 (287.6 BPPN). The most frequently recorded species were soprano pipistrelle and common pipistrelle followed by Leisler's bat.



Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Trees with Bat Roost Potential**
- Moderate Potential
- Low Potential

Data Source: OSI Orthophotography Tiles 2019



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.7(a)

Trees suitable for Roosting Bats identified during the Preliminary Level Roost Assessment

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Drawn: NR	Date: 24/05/2023
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Approved: RR	Projection: ITM
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NOTE:

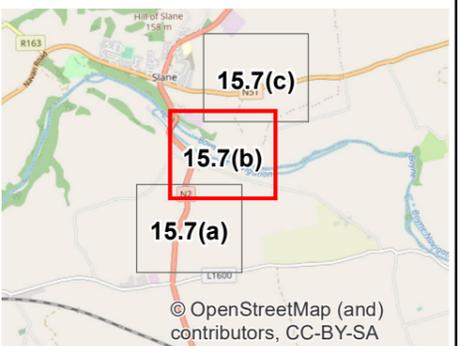
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Trees with Bat Roost Potential**
- Moderate Potential
- Low Potential

Data Source: OSI Orthophotography Tiles 2019



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.7(b)

Trees suitable for Roosting Bats identified during the Preliminary Level Roost Assessment

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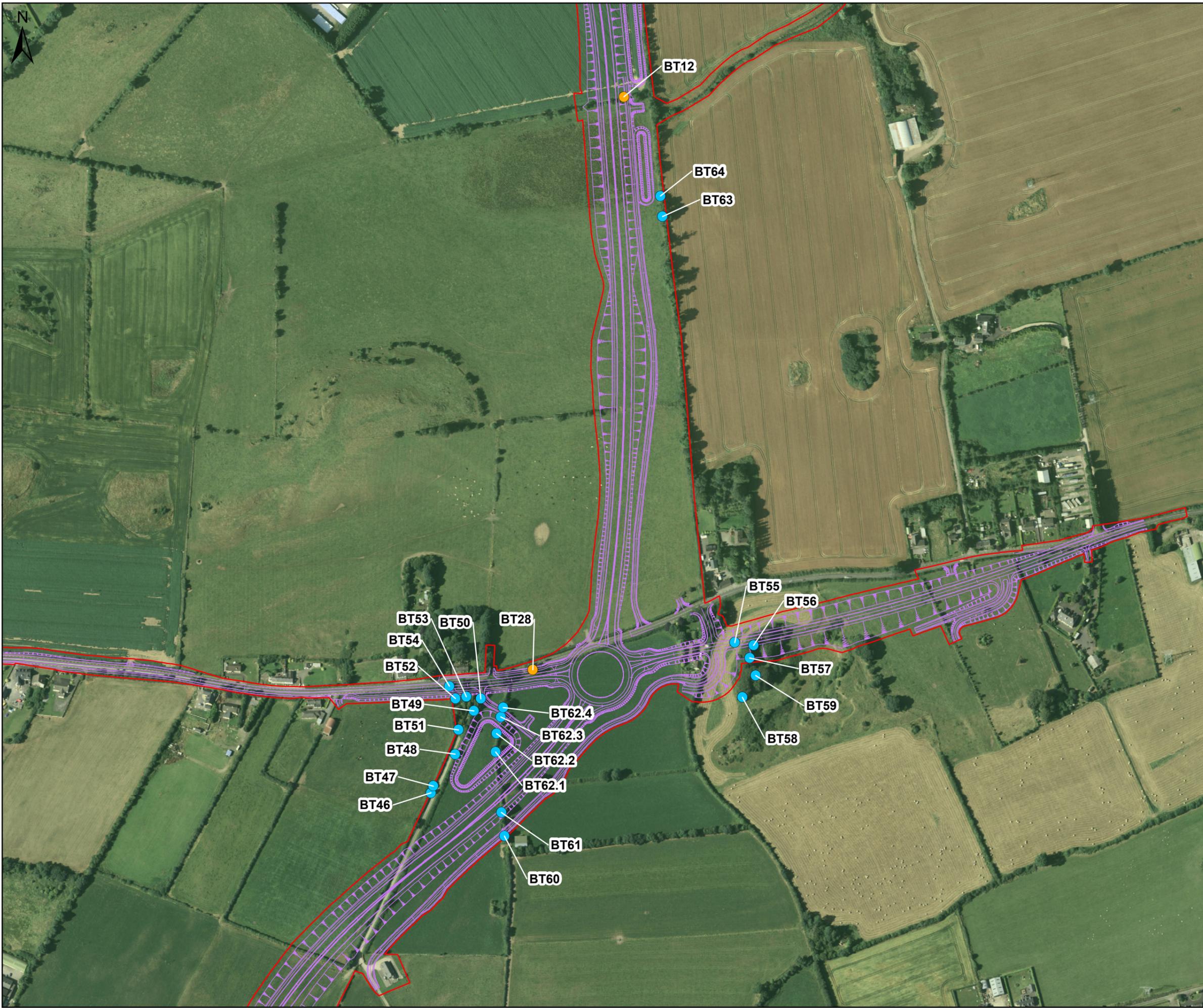
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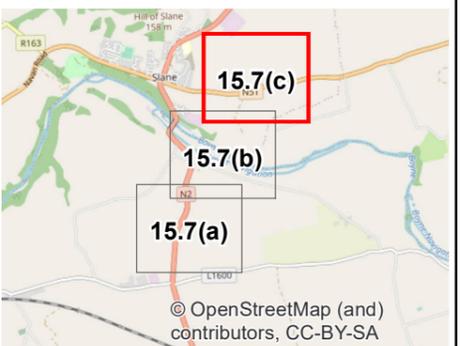


Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Trees with Bat Roost Potential**
- Moderate Potential
- Low Potential

Data Source: OSI Orthophotography Tiles 2019

0 0.05 0.1 0.2
Kilometres



Client
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N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.7(c)

Trees suitable for Roosting Bats identified during the Preliminary Level Roost Assessment

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Approved: RR	Projection: ITM
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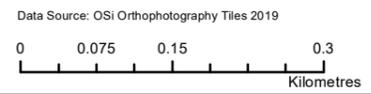
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Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Structures Assessed for Roosting Bats**
- Low
- Negligible



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N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.8

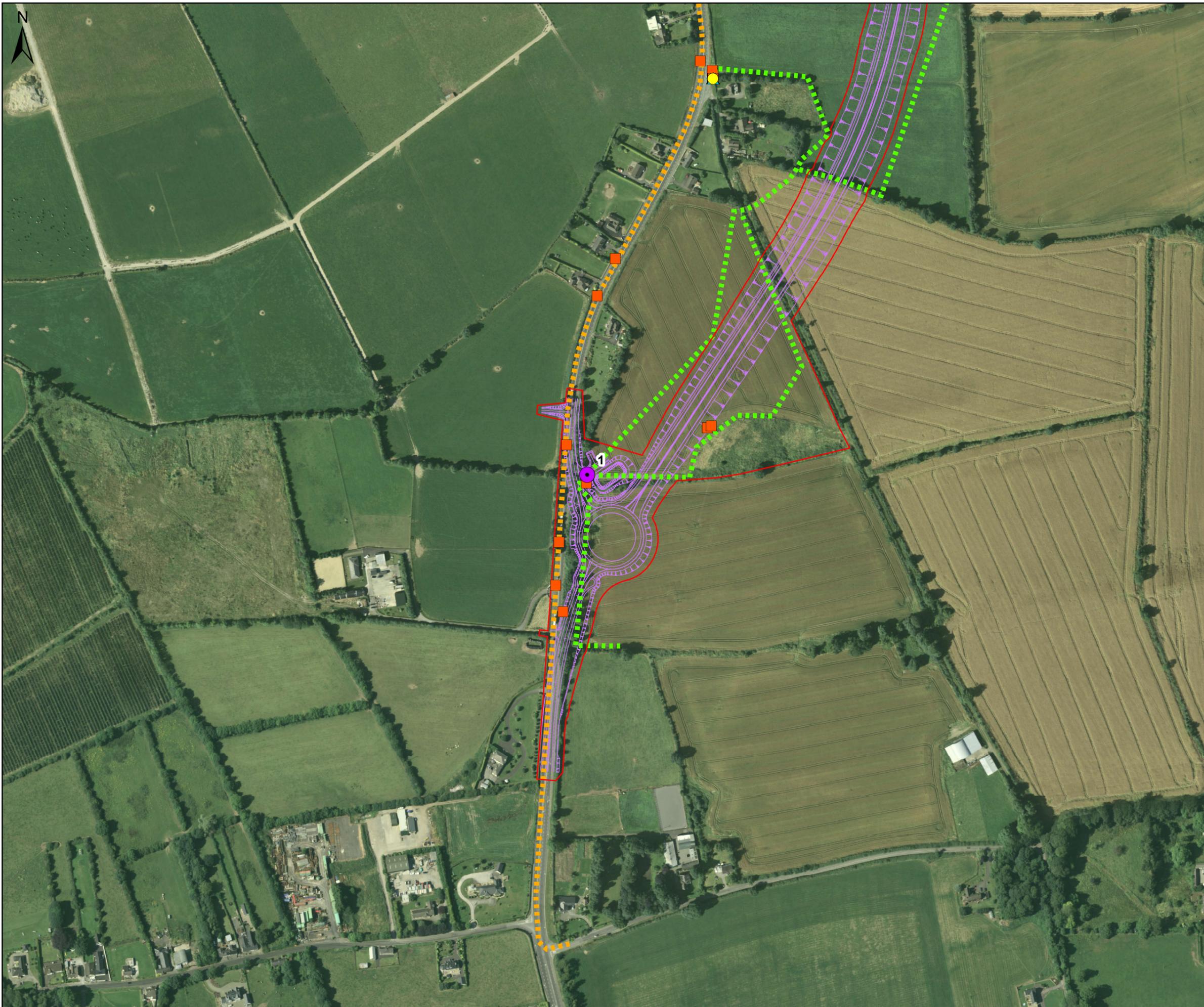
Structures assessed for Roosting Bats during the Preliminary Ground Level Roost Assessment

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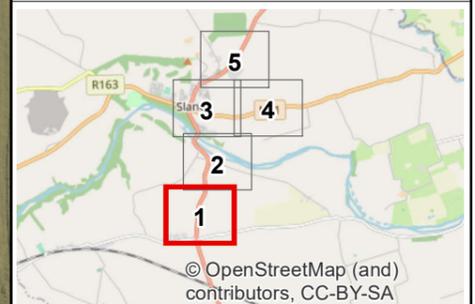
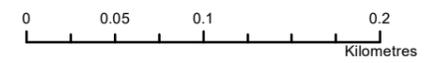
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Legend

- Proposed Scheme
- ▭ Proposed Scheme Boundary
- Static Detector Locations
- Listening Points
- Bat Species**
- ◆ Daubenton's bat (*Myotis daubentoniid*)
- Leisler's noctule (*Nyctalus leisleri*)
- ◆ Nathusius's pipistrelle (*Pipistrellus nathusii*)
- Common pipistrelle (*Pipistrellus pipistrellus*)
- ▲ Soprano pipistrelle (*Pipistrellus pygmaeus*)
- Walked Transects
- Driven Transects

Data Source: OSi Orthophotography tiles 2019



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Title
Figure 15.9

**Bat Activity Survey and Results
Map 1 of 5**

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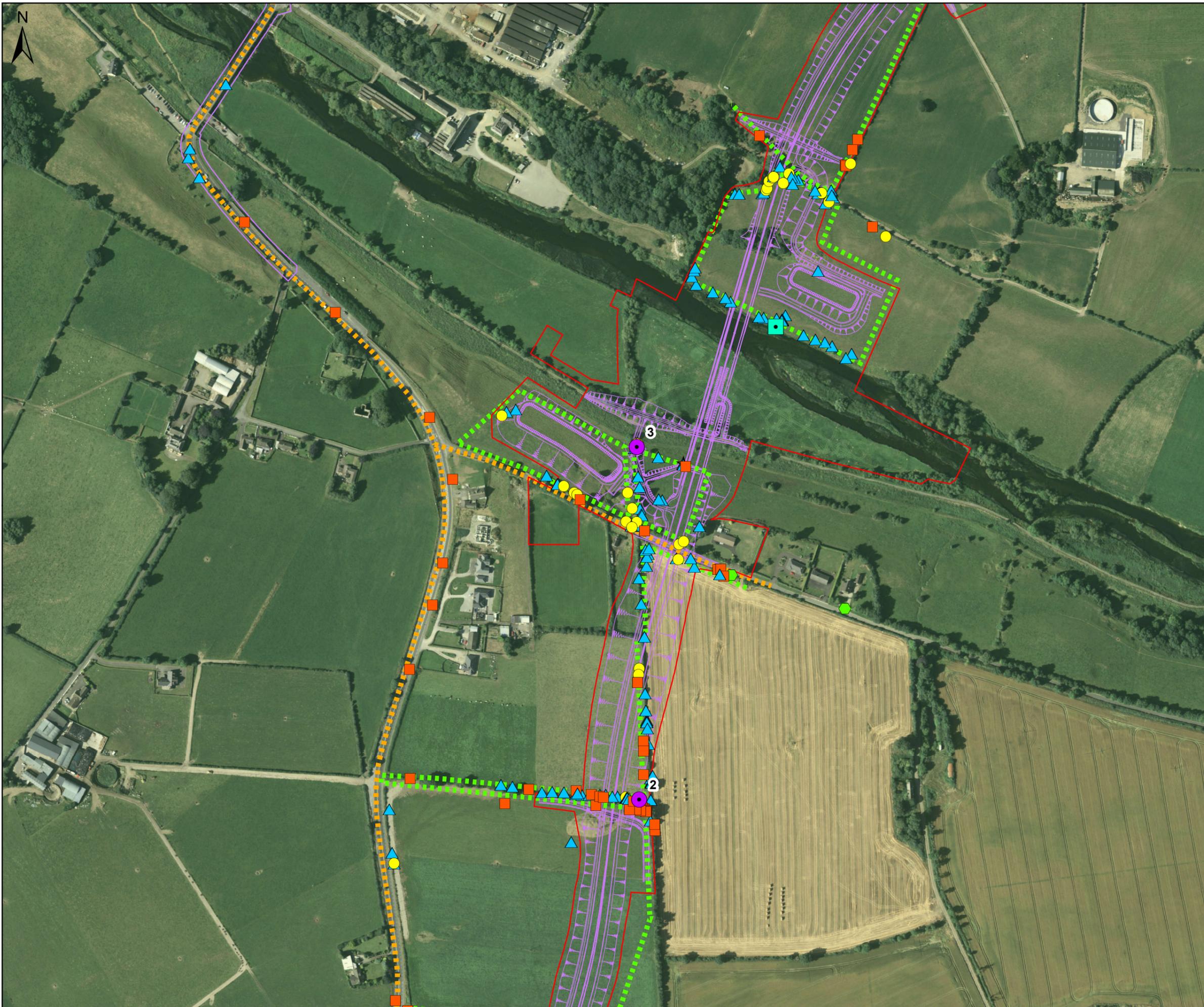
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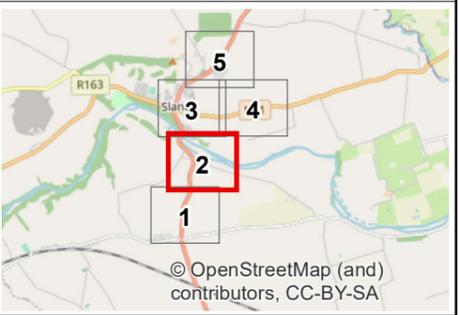


Legend

- Proposed Scheme
 - Proposed Scheme Boundary
 - Static Detector Locations
 - Listening Points
- Bat Species**
- Leisler's noctule (*Nyctalus leisleri*)
 - ⬡ Nathusius's pipistrelle (*Pipistrellus nathusii*)
 - Common pipistrelle (*Pipistrellus pipistrellus*)
 - ▲ Soprano pipistrelle (*Pipistrellus pygmaeus*)
 - ★ Brown long-eared (*Plecotus auratus*)
- - - Walked Transects
- - - Driven Transects

Data Source: OSi Orthophotography tiles 2019

0 0.05 0.1 0.2
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N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.9**

Bat Activity Survey and Results
Map 2 of 5

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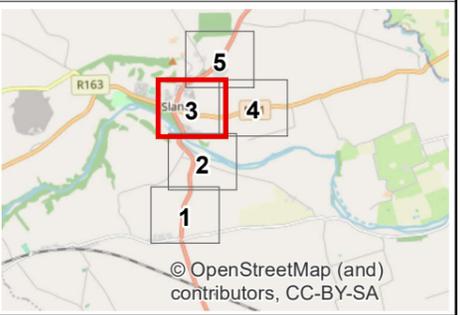


Legend

- Proposed Scheme
 - Proposed Scheme Boundary
 - Static Detector Locations
- Bat Species**
- Leisler's noctule (*Nyctalus leisleri*)
 - Common pipistrelle (*Pipistrellus pipistrellus*)
 - ▲ Soprano pipistrelle (*Pipistrellus pygmaeus*)
 - - - Walked Transects
 - - - Driven Transects

Data Source: OSI Orthophotography tiles 2019

0 0.05 0.1 0.2
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Client **Meath County Council**

N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.9**

**Bat Activity Survey and Results
Map 3 of 5**

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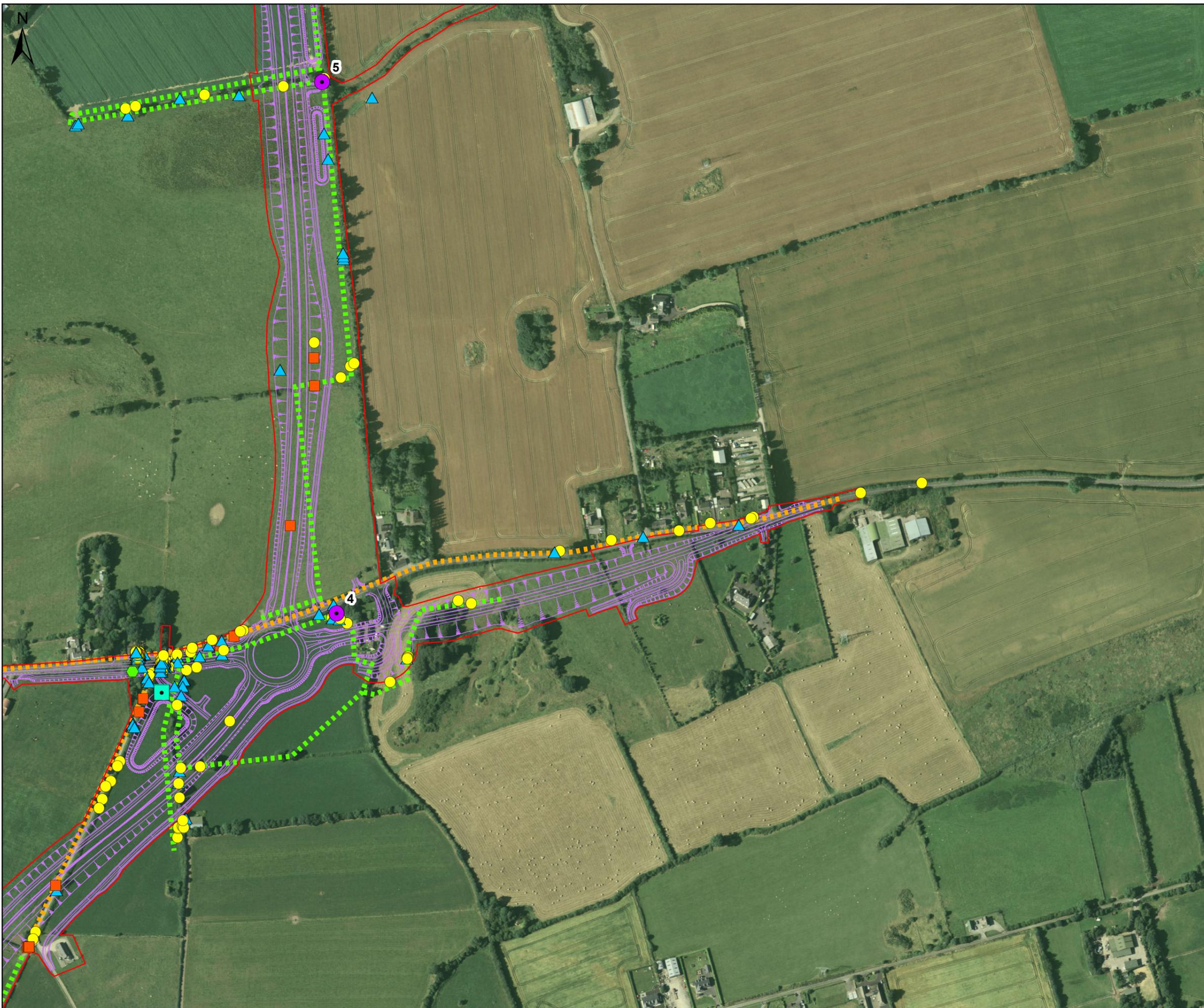
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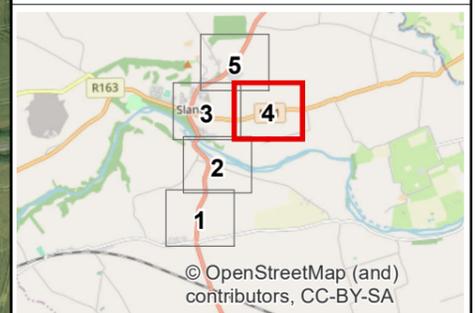
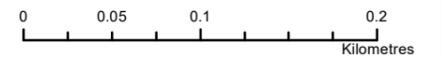
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Legend

- Proposed Scheme
 - Proposed Scheme Boundary
 - Static Detector Locations
 - Listening Points
- Bat Species**
- ◇ Daubenton's bat (*Myotis daubentoniid*)
 - Leisler's noctule (*Nyctalus leisleri*)
 - ◇ Nathusius's pipistrelle (*Pipistrellus nathusii*)
 - Common pipistrelle (*Pipistrellus pipistrellus*)
 - ▲ Soprano pipistrelle (*Pipistrellus pygmaeus*)
 - ★ Brown long-eared (*Plecotus auratus*)
- - - Walked Transects
 - - - Driven Transects

Data Source: OSI Orthophotography tiles 2019



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N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.9

Bat Activity Survey and Results
Map 4 of 5

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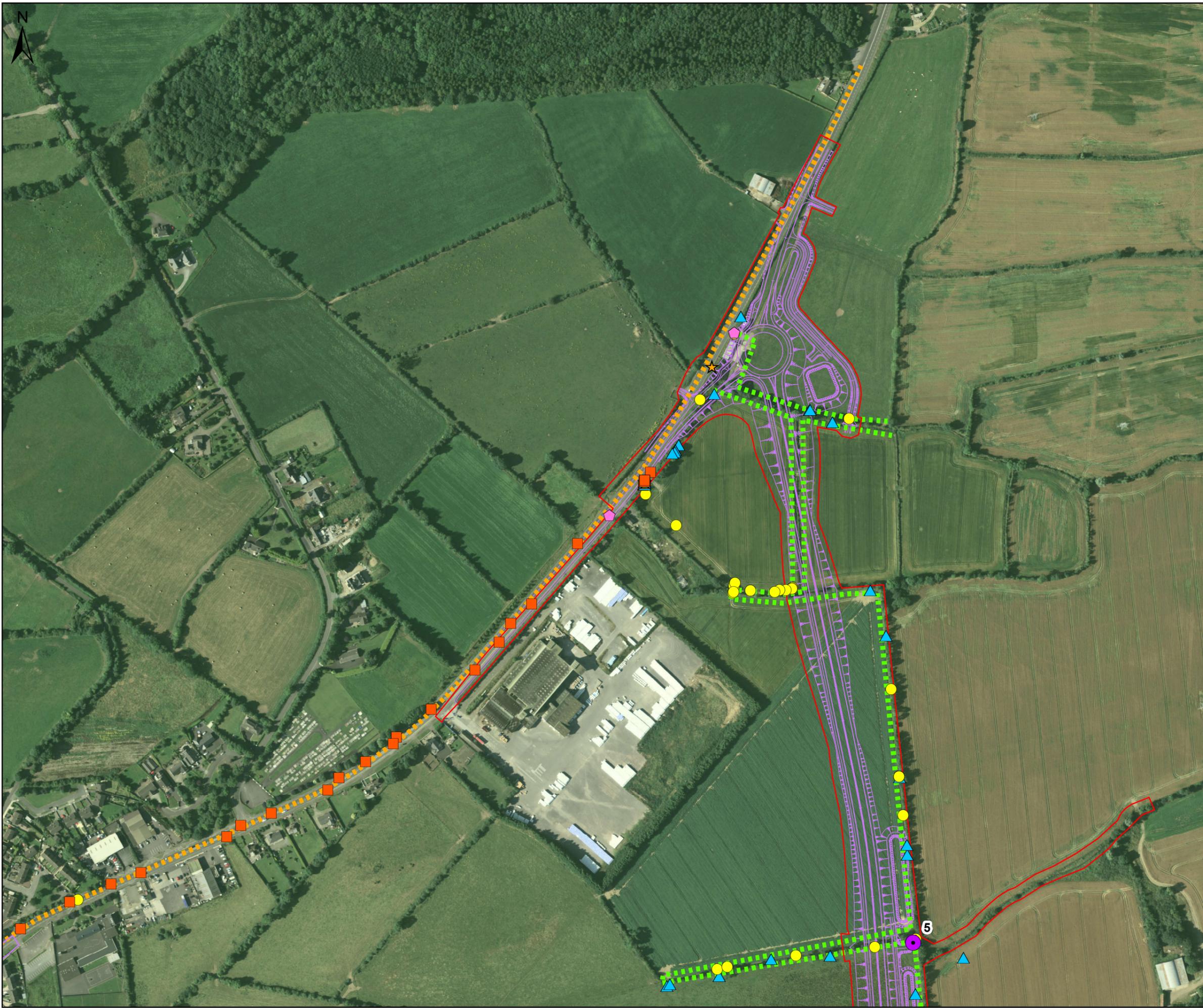
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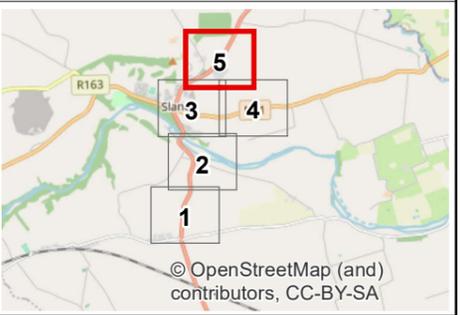


Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Static Detector Locations
- Listening Points
- Bat Species**
- ▭ Daubenton's bat (*Myotis daubentoniid*)
- Leisler's noctule (*Nyctalus leisleri*)
- Common pipistrelle (*Pipistrellus pipistrellus*)
- ▲ Soprano pipistrelle (*Pipistrellus pygmaeus*)
- ★ Brown long-eared (*Plecotus auratus*)
- - - Walked Transects
- - - Driven Transects

Data Source: OSI Orthophotography tiles 2019

0 0.05 0.1 0.2
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Client **Meath County Council**

N2 Slane Bypass and Public Realm Enhancement Scheme

Title **Figure 15.9**

Bat Activity Survey and Results
Map 5 of 5

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15.3.4.2 Otter

During RPS bankside assessment and boat surveys, evidence of otter activity, including spraints, slides, prints and possible couching sites, were found along the River Boyne, both upstream and downstream of the proposed River Boyne crossing point. No holts have been located despite searches on land in winter and summer and by boat in winter when vegetation dieback allowed for clearer examination of bankside potential. The surveys were also completed over multiple years.

During surveys completed by Atkins to inform a proposed greenway project during 2023, evidence of otter activity including spraints, slides and couching were also found. An otter holt was also identified c. 1.3 km upstream of the Public Realm proposals. The Proposed Scheme will not impact directly on this holt location.

No photographic or video evidence of otter was identified on trail cameras deployed (including at the known badger sett located north of the River Boyne) between April and May 2023.

Mapping and a full list of otter evidence recorded during the RPS bankside and boat surveys, and Atkins surveys are provided in **Appendix 15.7**.

15.3.4.3 Badger

Evidence of badger activity was locally abundant but often obscured through presence of tillage etc. Badger trails were noted across the site, typically in grassland and in close proximity to setts for which there is evidence of activity. Trails at which there was no definitive evidence of badger present were also recorded and were noted as mammal trails. Several snuffle holes and prints were also recorded across the study area (see **Table 15-16**).

Table 15-16: Badger evidence within Zol of the Proposed Scheme

Date	Feature Type	Approx. Distance from Lands Made Available (LMA) Boundary
23/01/2020	Badger print & leads across rd.	0.025 km
23/01/2020	Badger prints	0.030 km
23/01/2020	Linear feature possibly rabbit/fox	0.005 km
23/01/2020	Snuffle hole	0.090 km
23/01/2020	Badger prints	Within LMA
23/01/2020	Badger print	0.690 km
23/01/2020	Bedding/print nearby	0.080 km
25/06/2019	Badger trail (noted during habitat survey in June 2019)	0.017 km
25/06/2019	Badger trail (noted during habitat survey in June 2019)	Within LMA
25/06/2019	Badger trail (noted during habitat survey in June 2019)	0.021 km
22/01/2020	Mammal trail and Snuffle holes	Within LMA
22/01/2020	Snuffle holes and latrine	Within LMA
22/01/2020	Trails	0.041 km
22/01/2020	Badger trials via hedge (200 m)	0.043 km
23/01/2020	Trails (likely fox)	0.042 km
05/04/2023	Badger trail and prints	0.309 km
05/04/2023	Badger trail	Within LMA
05/04/2023	Latrine	0.001 km
05/04/2023	Badger prints	0.364 km
05/04/2023	Badger prints	0.368 km
05/04/2023	Badger trail	0.192 km
05/04/2023	Latrine	0.304 km

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Date	Feature Type	Approx. Distance from Lands Made Available (LMA) Boundary
05/04/2023	Badger prints	0.306 km
05/04/2023	Latrine	0.305 km
05/04/2023	Latrine	0.175 km
05/04/2023	Latrine	Within LMA
05/04/2023	Mammal trail	0.263 km
05/04/2023	Mammal trail	0.269 km
05/04/2023	Mammal trail	0.208 km
05/04/2023	Snuffle hole	0.174 km
05/04/2023	Snuffle hole	0.162 km
05/04/2023	Snuffle hole	0.249 km
05/04/2023	Mammal trail	Within LMA
05/04/2023	Mammal trail	0.055 km
05/04/2023	Mammal trail	0.083 km
12/04/2023	Latrine	Within LMA
12/04/2023	Latrine	0.484 km
12/04/2023	Latrine	0.120 km
12/04/2023	Badger trail	0.248 km
12/04/2023	Badger trail	0.321 km
12/04/2023	Mammal trail	0.191 km
12/04/2023	Mammal trail	0.390 km
13/04/2023	Mammal trail	0.496 km
13/04/2023	Badger prints	0.354 km
13/04/2023	Badger scat	0.321 km
03/05/2023	Latrine	Within LMA
03/05/2023	Badger trail	Within redline boundary
04/05/2023	Latrine	Within redline boundary
04/05/2023	Latrine	0.068 LMA
04/05/2023	Latrine	Within LMA
04/05/2023	Latrine	Within LMA
17/05/2023	Badger trail	Within LMA
17/05/2023	Badger prints	0.030 km
17/05/2023	Latrine	Within redline boundary
17/05/2023	Badger trail	0.013 km
17/05/2023	Badger trail	0.083 km
17/05/2023	Badger trail	0.284 km
17/05/2023	Mammal trail	Within LMA
17/05/2023	Mammal trail	0.112 km
17/05/2023	Mammal trail	Within LMA
17/05/2023	Mammal trail	Within LMA

In total, 51 badger setts were identified within approx. 500 m of the Proposed Scheme boundary. The setts have been classified by the conventions shown in the following table (**Table 15-17**), as per the *Surveying for Badger – Best practice Guidelines* by SNH (2018). Sett types classified as unknown are within similar distances of two main setts and therefore cannot be assigned to one with confidence. The setts identified range from single isolated holes to a series of holes, likely interconnected underground. Four main setts

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have been identified with a number of the other setts recorded as subsidiary or annex setts to these main setts. Of the 51 setts, 42 were considered active at the time of survey (see **Table 15-18**).

Table 15-17: Classification of Badger Setts (Definition as per SNH, 2018)

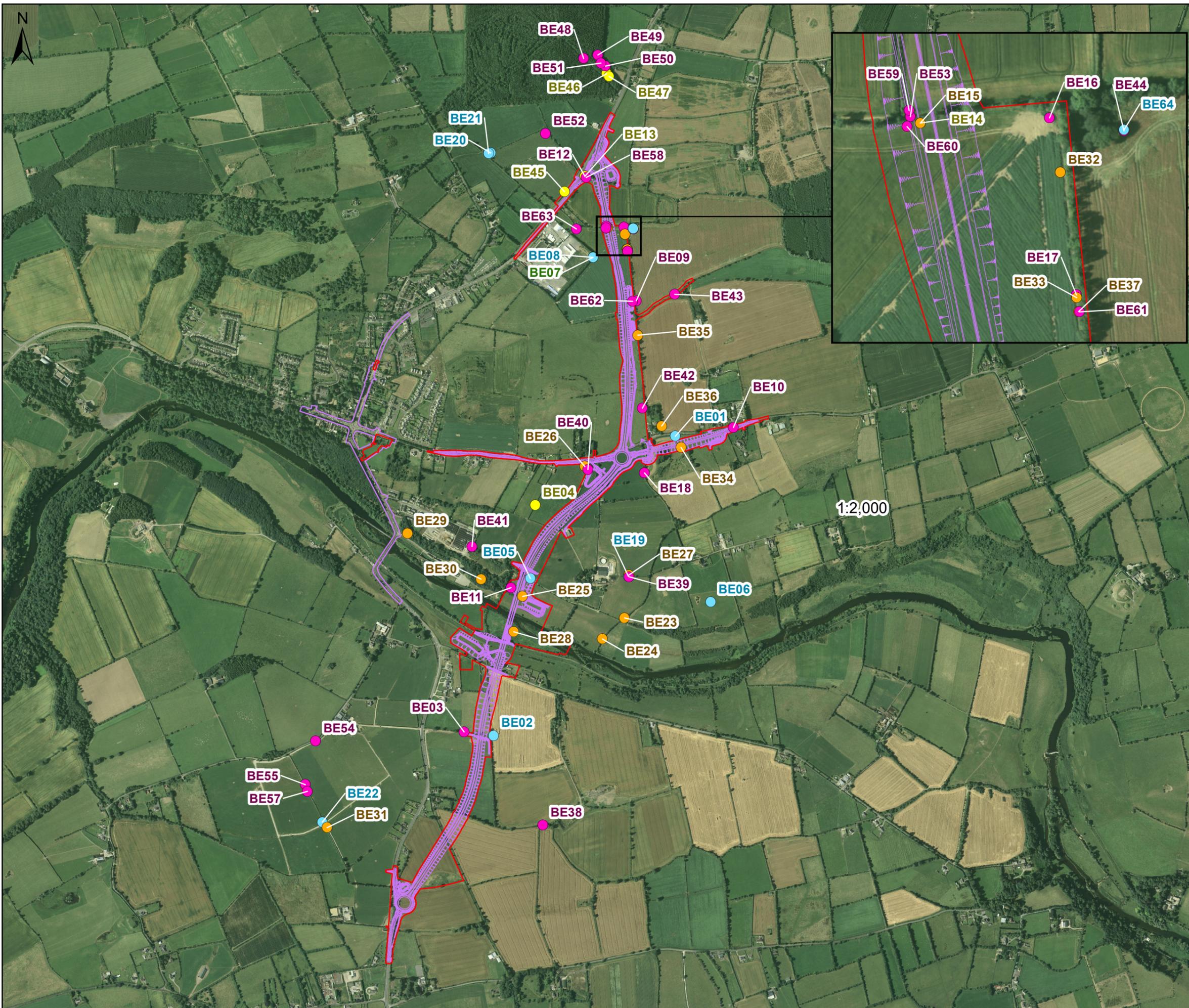
Sett Type	Definition
Main	Several holes with large spoil heaps and obvious paths emanating from and between sett entrances
Annex	Normally less than 150 m from main sett, comprising several holes. May not be in use all the time, even if main sett is very active
Subsidiary	Usually at least 50 m from main sett with no obvious paths connecting to other setts. May only be used intermittently.
Outlier	Little spoil outside holes. No obvious paths connecting to other setts and only used sporadically. May be used by foxes and rabbits.

Table 15-18: Status of Badger Setts within Zol of the Proposed Scheme

Sett Code	Sett Status	Sett Usage	No. of Sett Entrances	Sett Type	Approx. Distance from Redline Boundary
BS01	Active	Partially used	2	Subsidiary to BS20	0.127 km
BS02	Not active	Disused	1	N/A	0.105 km
BS03	Not active	Disused	1	N/A	0.07 km
BS04	Active	Well-used	1 (possibly more)	Subsidiary BS20	Within redline boundary
BS05	Not active	Disused	1	N/A	0.25 km
BS06	Active	Partially used	1	Subsidiary to BS09	0.131 km
BS07	Active	Partially used	1	Annexed to BS09	Within redline boundary
BS08	Active	Well used	4	Annexed to BS09	Within redline boundary
BS09	Active	Well-used	8	Main sett	Within redline boundary
BS10	Active	Partially used	1	Subsidiary to BS09	0.061 km
BS11	Active	Partially used	1	Subsidiary to BS09	0.13 km
BS12	Active	Well-used	2	Unknown	0.04 km
BS13	Active	Well-used	1	Unknown	Within redline boundary
BS14	Active	Well-used	5	Subsidiary to BS37	Within redline boundary
BS15	Not active	Disused	1	N/A	0.132 km
BS16	Active	Partially used	1	Unknown	Within redline boundary
BS17	Active	Partially used	2	Unknown	0.035 km
BS18	Active	Partially used	1	Outlier to BS20	Within redline boundary
BS19	Active	Well-used	2	Unknown	0.304 km
BS20	Active	Well used	6	Main sett	0.285 km
BS21	Active	Well used	1	Outlier to BS20	Within redline boundary
BS22	Active	Partially used	1	Outlier to BS20	Within redline boundary
BS23	Not active	Disused	1	N/A	0.189 km
BS24	Active	Well used	2	Unknown	0.074 km
BS25	Active	Well used	1	Unknown	0.107 km
BS26	Active	Partially used	2	Unknown	0.179 km
BS27	Active	Partially used	1	Outlier to BS09	0.093 km
BS28	Active	Partially used	1	Subsidiary to BS09	Within redline boundary
BS29	Active	Partially used	1	Subsidiary to BS09	0.06 km
BS30	Not active	Disused	1	N/A	0.067 km
BS31	Active	Well used	2	Outlier to BS09	0.367 km

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Sett Code	Sett Status	Sett Usage	No. of Sett Entrances	Sett Type	Approx. Distance from Redline Boundary
BS32	Active	Well used	1	Outlier to BS09	0.335 km
BS33	Active	Well used	4 (possibly more)	Outlier to BS37	0.379 km
BS34	Not active	Disused	1	N/A	0.418 km
BS35	Active	Partially used	1	Outlier to BS43	0.217 km
BS36	Active	Well used	2	Outlier to BS43	0.302 km
BS37	Active	Well used	4	Main Sett	0.25 km
BS38	Active	Partially used	1	Annexed to BS37	0.29 km
BS39	Active	Well used	2	Annexed to BS37	0.302 km
BS40	Active	Partially used	1	Annexed to BS37	0.327 km
BS41	Active	Well used	7	Subsidiary to BS43*	0.414 km
BS42	Active	Well used	2	Annexed to BS43	0.126 km
BS43	Active	Well used	7	Main sett	0.117 km
BS44	Active	Partially used	1	Annexed to BS43	0.116 km
BS45	Active	Well used	4	Annexed to BS43	0.117 km
BS46	Active	Well used	2	Annexed to BS43	0.122 km
BS47	Not active	Disused	1	N/A	0.077 km
BS48	Not active	Disused	1	N/A	Within redline boundary
BS49	Active	Well-used	1	Annexed to BS09	Within redline boundary
BS50	Active	Partially used	1	Annexed to BS09	Within redline boundary
BS51	Active	Well used	2	Annexed to BS09	Within redline boundary



Legend

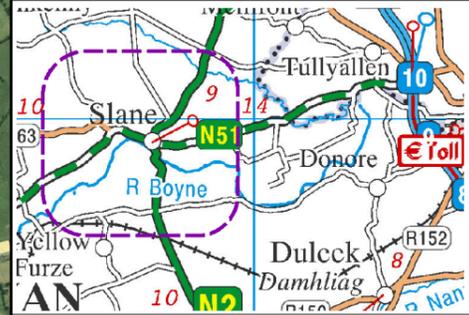
- Proposed Scheme
- Proposed Scheme Boundary

Badger Evidence

- Bedding
- Latrine
- Print
- Snuffle hole
- Trails

Data Source: OSI Orthophotography Tiles 2019

0 0.2 0.4 0.8
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 15.10

Badger Evidence within Zol of the Proposed Scheme

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-3080

Status: A1	Rev: C01	Model File Identifier: MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
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Drawn: NR	Date: 26/06/2023
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Checked: HF	Scale: 1:16,000 (A3)
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Approved: RR	Projection: ITM
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15.3.4.4 Other Mammals

While there was no direct evidence of Irish hare, deer, fox (*Vulpes vulpes*), rabbit (*Oryctolagus cuniculus*), stoat, pine marten, pygmy shrew or hedgehog during the field study, these species are presumed to occur within grassland, woodland and hedgerow along the Proposed Scheme and within adjoining habitats. Furthermore, the desk study returned records for pine marten, hedgehog and red squirrel. Consultation feedback from locals at open day events for the Proposed Scheme mentioned for example sightings of deer around Littlewoods Forest to the north of the study area and on the northern bank of the Boyne, around that proposed northern bridge abutment. Separately, there has also been local anecdotal evidence that there was a pine marten sighting east of the Proposed Scheme, near Crewbane.

Mink (*Mustela vison*) activity (a third schedule invasive species) was evident (i.e. scat) during otter surveys along the canal towpath in earlier surveys along with mammal trails.

There were no visual sightings or field signs of hedgehog observed during field surveys; however, these are nocturnal, and field signs are less frequently observed than for other mammals.

Hedgehog are presumed to occur within grassland, woodland, and hedgerow adjoining the footprint of the Proposed Scheme. Breeding is from May to October (Hayden and Harrington, 2001) and it is considered possible that there may be numerous territories within the adjacent adjoining grassland habitat and also at the scrub within the Proposed Scheme. There are no known national or county population estimates for the species in Ireland where they are common and assigned a conservation status of Least Concern (Marnell et al., 2019).

Rodents typically comprised rat (*Rattus* spp.), characterised by distinctive claw prints that were observed along the River Boyne bank side in muddy substrate, although it is probable that other small mobile mammals such as fieldmice (*Apodemus sylvaticus*) and pygmy shrew might also be encountered. Pygmy shrews were not recorded but their presence cannot be ruled out. The species nests in long grasses in dense vegetation (including damp conditions) or under rocks or logs, occurring wherever adequate insect food supplies exist. This species breeds from April to October. There are no known national or county population estimates for the species in Ireland as it is common.

15.3.4.5 Birds

15.3.4.5.1 Breeding Birds

During the 2022 breeding season, a total of 43 species were recorded within or in flight over the survey area (see **Appendix 15.1**), including several species such as, Bullfinch (*Pyrrhula pyrrhula*), cormorant (*Phalacrocorax carbo*), feral pigeon (*Columba livia domestica*), great black-backed gull (*Larus marinus*), greenfinch (*Chloris chloris*), herring gull (*Larus argentatus*), mallard (*Anas platyrhynchos*), moorhen (*Gallinula chloropus*), peregrine falcon (*Falco peregrinus*) and spotted flycatcher (*Muscicapa striata*).

Out of the 43 species recorded during the 2022 breeding season, 21 were observed showing behaviour which led to them being classified as 'probable' or 'confirmed' breeding. Six of these 21, are species included on one or more of the schedules or lists (see **Appendix 15.1**) and therefore considered to be species of conservation concern.

During the 2021 breeding season, a total of 51 species were recorded within or in flight over the survey area (see **Appendix 15.1**), including several species such as curlew (*Numenius arquata*), great black-backed gull (*Larus marinus*), lesser black-backed gull (*Larus fuscus*), peregrine falcon and raven (*Corvus corax*), all of which were observed flying over the survey area. Feral pigeon, reed bunting (*Emberiza schoeniclus*), and stock dove (*Columba oenas*) were species observed within the survey area or lands immediately adjacent to it.

Out of the 51 species recorded during the 2021 breeding season, 26 were observed showing behaviour which led to them being classified as 'probable' or 'confirmed' breeding. Nine of these 26 are species included on one or more of the schedules or lists (see **Appendix 15.1**) and therefore considered to be species of conservation concern. Goldcrest (*Regulus regulus*), greenfinch (*Carduelis chloris*), linnets (*Carduelis cannabina*), mallard, meadow pipit (*Anthus pratensis*) and yellowhammer (*Emberiza citinella*) were all categorised as 'probable' breeders. House sparrow (*Passer domesticus*), mute swan (*Cygnus olor*) and starling (*Sturnus vulgaris*) were all confirmed breeding within the survey area. All three species are amber-listed Birds of Conservation Concern in Ireland (BoCCI) for their breeding populations.

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During the 2020 breeding season, a total of 50 species were recorded within or in flight over the survey area (see **Appendix 15.1**), including several species such as, black-headed gull (*Larus ridibundus*), coot (*Fulica atra*), grey wagtail (*Motacilla cinerea*), jay (*Garrulus glandarius*), kestrel (*Falco tinnunculus*), kingfisher (*Alcedo atthis*), little egret (*Egretta garzetta*), longtailed tit (*Aegithalus caudatus*) and sparrowhawk (*Accipiter nisus*), all of which were observed flying over the survey area.

Out of the 50 species recorded during the 2020 breeding season, 26 were observed showing behaviour which led to them being classified as 'probable' or 'confirmed' breeding. Eight of these 26 are species included on one or more of the schedules or lists in (see **Appendix 15.1**) and therefore considered to be species of conservation concern. Goldcrest, house sparrow (*Passer domesticus*), linnet, mistle thrush (*Turdus viscivorus*) and water rail (*Rallus aquaticus*) were all classed as 'probable' breeders. Mute Swan, robin (*Erithacus rubecula*), and starling were all confirmed breeding within the survey area. Mute swan and starling are both amber-listed BoCCI species for their breeding populations.

A full list of birds observed throughout the survey seasons are provided in **Appendix 15.1**.

The species and numbers recorded along the Proposed Scheme during breeding bird surveys are typical of the habitats found in the Boyne Valley. The vast majority of the Proposed Scheme is open, improved grassland habitat which offers little breeding opportunities for birds. Evidence of breeding activity was primarily confined to vegetation along field boundaries and buildings within the survey area.

15.3.4.5.2 Kingfisher survey

Kingfisher is an SCI of the River Boyne and River Blackwater SPA. During field surveys, it was identified that there is no optimal vertical soft-substrate nesting habitat for kingfisher within the immediate footprint of the Proposed Scheme. Some suitable nesting habitat was noted 0.42 km upstream however there was no evidence of kingfisher found.

Various records of kingfisher perching along both northern and southern banks and commuting and foraging were noted in both 2019 and 2020 surveys, up and downstream of the Proposed Scheme. Whilst commuting and foraging, kingfisher was noted to fly under the existing Slane bridge therefore exhibiting avoidance behaviour. A breeding location was confirmed during 2020 surveys, approx. 400 m from the public realm element of the scheme and approx. 1.6 km upstream of the proposed Boyne bridge crossing (see **Appendix 15.1**, Figure 2). Although a breeding location and sightings of kingfisher were identified in 2019 and 2020, it has not been recorded breeding since, but perching material has been described as plentiful (although not within the footprint of the scheme) throughout the River Boyne.

During breeding bird surveys in 2021, despite making visits across the season, no observations of kingfisher were made in either dedicated kingfisher survey, breeding bird surveys or casual observations. However, during 2021 wintering bird surveys three records of the species were noted between January and March along the River Boyne. Separately, there has also been anecdotal evidence from walkers and kayakers that there have been no observations of the bird made in 2021. It was noted however, that in the past kingfisher had regularly been seen approx. 600 m upstream of the location of the Proposed Scheme. During breeding bird surveys in 2022, a total of twelve kingfisher flights were recorded and no breeding was confirmed.

15.3.4.5.3 Wintering Birds - Vantage Point Surveys

Thirteen flights of five target species were recorded during vantage point surveys across the 2019/2020 winter season. Species recorded were curlew (*Numenius arquata*), golden plover, lapwing (*Vanellus vanellus*), mute swan and peregrine falcon. A total of 65 flights of seven secondary species were recorded, including cormorant, three birds of prey, two species of heron, and one species of duck.

As illustrated in Figure 5 and Figure 6 of **Appendix 15.2 Ecological Survey for Wintering Birds**, curlew and mute swan were recorded flying up and downstream along the River Boyne corridor. No collisions were noted with the existing Slane bridge crossing; therefore curlew and mute swan were exhibiting avoidance behaviour (i.e. flying over or under the existing Slane bridge). Forty records of seven target species were observed during vantage point surveys across the 2020/2021 winter season. Species recorded were curlew, greenshank (*Tringa nebularia*), lapwing, mute swan, peregrine falcon, snipe and whooper swan (*Cygnus cygnus*). A total of 103 flights of eight secondary species were recorded including cormorant, three birds of prey, two species of heron, one species of duck and one species of rail.

As illustrated in Figure 7 and Figure 8 of **Appendix 15.2 Ecological Survey for Wintering Birds**, northern lapwing, whopper swan and mute swan were recorded flying up and downstream along the River Boyne

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corridor. No collisions were noted with the existing Slane bridge crossing, therefore northern lapwing, whopper swan and mute swan were exhibiting avoidance behaviour (i.e. flying over or under the existing Slane bridge).

Four records of one target species, namely mute swan, were observed during vantage point surveys across the 2021/2022 winter season. A total of 61 flights of six secondary species were recorded including cormorant, three birds of prey, one species of heron and one species of duck.

As illustrated in Figure 9 of **Appendix 15.2 Ecological Survey for Wintering Birds**, mute swan was recorded flying up and downstream along the River Boyne corridor. No collisions were noted with the existing Slane bridge crossing, therefore mute swan was exhibiting avoidance behaviour (i.e. flying over or under the existing Slane bridge).

Wintering Bird - Farmland Bird Survey

All species seen or heard, including those in flight over the site, were recorded during wintering farmland surveys. A total of 52 species were recorded within or in flight over the site during the winter 2019/2020 surveys, 51 species were recorded during the winter 2020/2021 surveys and 39 species were recorded the site during the winter 2021/2022 surveys.

Wintering Bird Survey – ‘Look-see’ Survey

A total of 10 species were recorded within the survey area during overwintering wildfowl surveys in the 2019/2020 winter season, including two species of swan, two heron species, four species of wader, mallard and little grebe (see **Appendix 15.2**).

During the 2020/2021 season, a total of 14 species were recorded within the survey area compared to ten species in the 2019/2020 season, including two species of swan, two heron species, four species of wader, two duck species, two species of rail, kingfisher and cormorant (see **Appendix 15.2**).

No target species were recorded within the survey area during the overwintering wildfowl surveys in the 2021/2022 season (see **Appendix 15.2**).

15.3.4.6 Amphibians

Both samples obtained from the reed and large sedge swamp habitat and the Boyne Navigation Canal tested positive for the presence of smooth newt (*Lissotriton vulgaris*) and, anecdotally, European eel (*Anguilla anguilla*); see **Table 15-19**. The number of positive qPCR replicates is scored out of a series of 12, where if one or more of these are found to be positive, the sample is declared positive for species presence. Both samples tested recorded maximum scores of 12/12.

Table 15-19: Smooth Newt and European Eel eDNA results

Site Name	OS Reference	Positive Replicates
Smooth newt (<i>Lissotriton vulgaris</i>)		
Swamp	53.7000000, -6.534479	12/12
Canal	53.699677, -6.533584	12/12
European eel (<i>Anguilla Anguilla</i>)		
Swamp	53.7000000, -6.534479	12/12
Canal	53.699677, -6.533584	12/12

Incidental records noted include a common frog sighting during the bankside otter survey in September 2021 and April 2023. The 2021 sighting was observed in a field located next to the River Boyne on the western side of the river (53.700478, -6.532678) and the 2023 sighting was observed along the Boyne Navigation Canal (53.699835, -6.534602). No spawn was found in watercourses or ditches during the wintering bird transect surveys.

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15.3.4.7 Invertebrates

A search of vegetation and host plants (i.e. Devils bit scabious and kidney vetch) did not identify any potential for marsh fritillary or small blue butterfly. Limited potential was identified for habitats of protected invertebrate species to occur, including marsh fritillary and small blue.

15.3.4.8 Invasive Alien Animal Species (IAAS)

Invasive animal species returned from the desk study within a 5 km radius of the Proposed Scheme are detailed below in **Table 15-20**. As noted above, Mink (*Mustela vison*) activity was recorded during otter surveys along the canal towpath. No other evidence of invasive alien animal species was recorded during site surveys of the Proposed Scheme.

Table 15-20: Third Schedule Alien Animal Species Returned from NBDC Data Search and Field Surveys

Species Name	Study Type	Record Count	Date of Last Record	Risk of Impact	Third Schedule (S.I. No. 477/2011, as amended)
Eastern Grey Squirrel (<i>Sciurus carolinensis</i>)	Desk	6	31/12/2012	High	Yes
Mink (<i>Mustela vison</i>)	Field	0 (Direct evidence of presence)	16/09/2021	High	Yes

Note: Invasive Alien Animal Species Risk Impact: Available from NBDC prioritization risk assessment:

<http://invasivespeciesireland.com/wp-content/uploads/2013/03/Risk-analysis-and-prioritization-29032012-FINAL.pdf>

15.3.5 Important Ecological Features (IEF)

All ecological features identified within the ZoI (described above) for the Proposed Scheme have been identified and assessed as to whether they are considered IEFs to be scoped into the impact assessment. All aquatic ecological features are dealt with in **Chapter 16**, however this chapter also discussed both SCI kingfisher and QI otter, owing to their designation as part of the River Boyne and River Blackwater SPA and the River Boyne and River Blackwater SAC.

The evaluation of the ecological features is detailed in **Table 15-21**. The identification of IEFs scoped into the impact assessment is based on their ecological evaluation combined with whether or not they are at risk of significant negative impact from the Proposed Scheme.

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Table 15-21: Summary Valuation of Ecological Features within the ZoI of the Proposed Scheme

Group	Ecological Features	Highest Ecological Valuation within ZoI ^{Note 1}	Potential Impacts and Effects of the Proposed Scheme	IEFs (Scoped into impact assessment)
Designated Sites for Nature Conservation	River Boyne and River Blackwater SAC, and River Boyne and River Blackwater SPA.	International	<p>Yes. Potential direct and indirect impacts and effects to these sites have been identified, as:</p> <ul style="list-style-type: none"> • A direct pathway due to spatial overlap between the Proposed Scheme and this SAC and SPA (i.e. habitat deterioration, alteration, fragmentation and loss, air pollution). • A pathway for accidental killing/injury of QI species. • A pathway for surface water pollution via the River Boyne • A pathway for groundwater pollution via the Trim groundwater body (underlies the River Boyne and River Blackwater SAC/SPA). • A pathway for disturbance and/or displacement of QI/SCI species. • A pathway for change in hydrological regime associated with downstream habitat dependent on river levels. • A pathway for collision risk associated with kingfisher via the River Boyne at Slane as a commuting corridor. However, given the low numbers of kingfisher recorded during field surveys, the presence of the existing Slane bridge (i.e. no collisions recorded during surveys, flight paths recorded as below the existing bridge) and the design of the proposed bridge crossing (i.e. freeboard available for free movement), kingfisher are not considered an IEF to be taken forward to assessment of significant effects. 	Yes
	Boyne Coast and Estuary SAC, and Boyne Estuary SPA.	International	<p>Yes. Potential indirect impacts and effects to these sites have been identified, as:</p> <ul style="list-style-type: none"> • A pathway for water pollution within the SPA and SAC via the outflow of the River Boyne into the SPA and SAC. • A pathway for disturbance and/or displacement of SCI species. A pathway for surface water pollution via the River Boyne. • With respect to the SPA, a pathway for collision risk associated with northern lapwing has been identified via the River Boyne at Slane as a commuting corridor. However, given the low numbers of northern lapwing recorded during field surveys, the presence of the existing Slane bridge (i.e. no collisions recorded during surveys, flight paths recorded both above and below the existing bridge) and the design of the proposed bridge crossing (i.e. freeboard available for free movement), northern lapwing are not considered an IEF to be taken forward to assessment of significant effects in relation to collision risk. No other relevant SCI species were recorded during field surveys. 	Yes

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Group	Ecological Features	Highest Ecological Valuation within ZOI ^{Note 1}	Potential Impacts and Effects of the Proposed Scheme	IEFs (Scoped into impact assessment)
	White Lough, Ben Loughs and Lough Doo SAC, Lough Bane And Lough Glass SAC, Lough Lene SAC, Girley (Drewstown) Bog SAC, Wooddown Bog SAC, Mount Hevey Bog SAC and Killyconny Bog (Cloghbally) SAC, Raheenmore Bog SAC).	International	No. No direct or indirect impacts and effects to these sites are not predicted since no pathways or connectivity from the Proposed Scheme to the IEFs have been identified.	No
	Slane Riverbank pNHA, Boyne woods pNHA, Crewbane Marsh pNHA, Rossnaree Riverbank pNHA, Dowth Wetland pNHA, Boyne River Island pNHA and the Boyne Coast and Estuary pNHA.	National	<p>Yes. Potential direct and indirect impacts and effects to these sites have been identified, as:</p> <ul style="list-style-type: none"> • A pathway for habitat loss due to spatial overlap between the Proposed Scheme and the Boyne Woods pNHA. • A pathway for water pollution via the River Boyne and Boyne canal on those sites that are located adjacent to (Slane riverbank) or lie downstream (Crewbane Marsh, Rossnaree Riverbank, Dowth Wetland, Boyne River Island and the Boyne Coast and Estuary pNHA) of the Proposed Scheme. • A pathway for air pollution via the construction of the Public Realm elements of the Proposed Scheme on those sites located adjacent to (Slane Riverbank and Boyne Woods pNHA) the Proposed Scheme. 	Yes
	Killyconny Bog (Cloghbally) pNHA, Lough Ramor pNHA, Ballina Bog pNHA, Lough Shesk pNHA, Rathmoylan Esker pNHA, Raheenmore Bog pNHA, Trim pNHA, Donadea Wood pNHA, Mellifont Abbey Woods pNHA, Ballynabarny Fen pNHA, Mount Hevey Bog pNHA, White Lough, Ben Loughs and Lough Doo pNHA, Lough Naneagh pNHA, Royal Canal pNHA, Grand Canal pNHA and King Williams Glen pNHA.	National	No. No direct or indirect impacts and effects to these sites predicted since there are no pathways or connectivity between the Proposed Scheme and the various pNHAs.	No

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Group	Ecological Features	Highest Ecological Valuation within Zol ^{Note 1}	Potential Impacts and Effects of the Proposed Scheme	IEFs (Scoped into impact assessment)
	Black Castle Bog NHA, Wooddown Bog NHA, Jamestown Bog NHA, Carbury Bog NHA, Hodgestown Bog NHA, Girley Bog NHA, Molerick Bog NHA and Milltownpass Bog NHA.	National	No. No direct or indirect impacts and effects to these sites predicted since there are no pathways or connectivity between the Proposed Scheme and the various NHAs.	No
	Boyne Estuary Wildfowl Sanctuary	National	Yes. Potential indirect impacts and effects to this site has been identified, as: <ul style="list-style-type: none"> A pathway for water pollution within the Wildfowl Sanctuary via the outflow of the River Boyne into the Wildfowl Sanctuary. A pathway for collision risk at the Proposed Scheme via the River Boyne as a commuting corridor. However, given the low numbers of birds recorded during field surveys, the presence of the existing Slane bridge (i.e. no collisions recorded during surveys, flight paths recorded both above and below the existing bridge) and the design of the proposed bridge crossing (i.e. freeboard available for free movement), wildfowl associated with the sanctuary are not considered an IEF to be taken forward to assessment of significant effects in relation to collision risk. The Boyne Estuary Wildfowl Sanctuary shares the same boundary (in part) as the Boyne Estuary SPA.	Yes
	Lough Ramor Wildfowl Sanctuary	National	No. Direct or indirect impacts and effects to this site are not predicted since: <ul style="list-style-type: none"> No pathway or connectivity within the Zol of the Proposed Scheme has been identified. 	No
	Raheenmore Bog Nature Reserve	National	No. Direct or indirect impacts and effects to this site are not predicted since: <ul style="list-style-type: none"> No pathway or connectivity within the Zol of the Proposed Scheme has been identified. 	No
Habitats and Flora - Annex I Habitat (Undesignated)	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	National	Yes. Potential indirect impacts and effects to this feature has been identified, as: <ul style="list-style-type: none"> A pathway for surface water pollution via the River Boyne. 	Yes

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Group	Ecological Features	Highest Ecological Valuation within ZOI ^{Note 1}	Potential Impacts and Effects of the Proposed Scheme	IEFs (Scoped into impact assessment)
Habitats and Flora – Fossitt Habitats/Non-Annex I Habitat	GA1 Improved Grassland, GA2 Amenity Grassland, GS3 Dry-humid Grassland	Local (Lower Value)	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> • Biodiversity loss, fragmentation, and alteration. • Disturbance from noise, vibration, lighting, and human presence. • Pollution to water, air, and/or soil. <p>Although potential direct and indirect effects have been identified the ecological features are valued as Local (lower) value and are not considered an IEF which will be taken forward to assessment of significant effects.</p>	No
Habitats and Flora – Fossitt Habitats/Non-Annex I Habitat	GM1 Marsh, FW2 Depositing Lowland River, FS1 Reed & Large Sedge Swamp, and FW3 Canals, GS4 Wet Grassland	International; due to being habitats predominantly located within the River Boyne and Blackwater SAC	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> • Biodiversity loss, fragmentation, and alteration. • Disturbance from noise, vibration, lighting, and human presence. • Pollution to water, air, and/or soil. <p>Depositing Lowland River is the River Boyne and River Blackwater SAC/SPA which the Proposed Scheme directly affects owing to its footprint within the boundary of both the SAC and SPA. It provides supporting habitat for QI/SCI species of this SAC and SPA.</p>	Yes
	FW1 Eroding/Upland River, FW4 Drainage Ditch	Local (Higher Value)	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> • Biodiversity loss, fragmentation, and alteration. • Disturbance from noise, vibration, lighting, and human presence. • Pollution to water, air, and/or soil. <p>Although individual habitats are deemed to be of Local (lower) value individually, collectively they have been valued as Local (higher) due to their connectivity to the River Boyne and River Blackwater SAC/SPA and the supporting habitat they provide to the QI/SCI species of those designations.</p>	Yes
	ED2 Spoil & Bare ground, ED3 Recolonising bare ground, BC1 Arable Land, BC3 Tilled Land, BL3 Buildings and artificial surfaces	Local (Lower Value)	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> • Biodiversity loss, fragmentation, and alteration. • Disturbance from noise, vibration, lighting, and human presence. • Pollution to water, air, and/or soil. <p>Although potential direct and indirect effects have been identified the ecological features are valued as Local (lower) value and are not considered an IEF which will be taken forward to assessment of significant effects.</p>	No

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Group	Ecological Features	Highest Ecological Valuation within ZoI ^{Note 1}	Potential Impacts and Effects of the Proposed Scheme	IEFs (Scoped into impact assessment)
	WD1 Mixed Broadleaved Woodland, WD2 Mixed Broadleaved/Conifer Woodland, WL1 Hedgerows, WL2 Treelines, WN5 Riparian Woodland, WS1 Scrub	Local (Higher Value)	Yes. Potential direct and indirect impacts and effects to these features have been identified, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Pollution to water, air, and/or soil. <p>Although individual habitats are deemed to be of Local (lower) value individually, collectively these habitats have been valued as Local (higher) due to the supporting habitat they provide to the QI/SCI species of the River Boyne and River Blackwater SAC/SPA, and due to their collective contribution to habitat connectivity within the landscape.</p>	Yes
	Protected Flora/Species of Conservation Concern	–	No. Direct or indirect impacts and effects to these species are not predicted since: <ul style="list-style-type: none"> There are no protected flora or species of conservation concern present, or no pathway, or connectivity within the ZoI of the Proposed Scheme has been identified. 	No
Fauna	Bats (roosting)	–	No. Potential direct and indirect impacts and effects to this feature have not been identified. The presence of roosting bats was not confirmed during baseline data collection. However, as bat species are mobile, occurring within a dynamic and changing environment, the precautionary principle has been applied and mitigation measures to account for potential changes in the baseline are provided in Section 15.5 .	No
	Bats (commuting and foraging)	National	Yes. Potential direct and indirect impacts and effects to these features have been identified, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Disturbance from noise, vibration, lighting, and human presence. 	Yes
	Badger (breeding, commuting and foraging)	National	Yes. Potential direct and indirect impacts and effects to these features have been identified, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Disturbance from noise, vibration, lighting, and human presence. 	Yes
	Otter (breeding, commuting and foraging)	International; due to it being QI of River Boyne and Blackwater SAC	Yes. Potential direct and indirect impact and effects to these features have been identified, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Disturbance from noise, vibration, lighting, and human presence. Pollution to water, air, and/or soil. 	Yes
	Other protected mammals (e.g. hedgehog, pygmy shrew, pine marten, Irish	Local (Lower value)	Yes. Direct impacts and effects to this feature are predicted, as: <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. 	No

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Group	Ecological Features	Highest Ecological Valuation within ZOI ^{Note 1}	Potential Impacts and Effects of the Proposed Scheme	IEFs (Scoped into impact assessment)
	stoat, red squirrel, Irish hare, and deer species)		<ul style="list-style-type: none"> Disturbance from noise, vibration, lighting, and human presence. <p>Although records of these species were returned from the data search, incidental evidence of populations were limited during the field surveys with evidence being largely anecdotal. Furthermore, although it is recognised that supporting habitat is available within the Proposed Scheme footprint, these species are mobile and are not considered to be at risk of significant effects. These ecological features are valued as Local (lower) value and are not considered an IEF.</p>	
	Birds (breeding)	Local (Higher Value)	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Disturbance from noise, vibration, lighting, and human presence. Collision risk. 	Yes
	Birds (wintering)	Local (Higher Value)	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Disturbance from noise, vibration, lighting, and human presence. Collision risk. 	Yes
	Kingfisher	International	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Disturbance from noise, vibration, lighting, and human presence. Collision risk. 	Yes
	Amphibians (common frog and smooth newt)	Local (Higher Value)	<p>Yes. Potential direct and indirect impact and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> A pathway for surface water pollution. Disturbance from noise, vibration, lighting, and human presence. 	Yes
	Other Protected and Notable Species such as Reptiles (common lizard).	Local (Lower Value)	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> Biodiversity loss, fragmentation, and alteration. Disturbance from noise, vibration, lighting, and human presence. <p>It is assumed that the Proposed Scheme site is suitable for foraging and resting behaviour for a wide range of other protected and notable species. These ecological features are valued as Local (lower) value and are not considered an IEF.</p>	No

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Group	Ecological Features	Highest Ecological Valuation within ZOI ^{Note 1}	Potential Impacts and Effects of the Proposed Scheme	IEFs (Scoped into impact assessment)
	Invertebrates (terrestrial)	Local (Lower Value)	<p>Yes. Potential direct and indirect impacts and effects to these features have been identified, as:</p> <ul style="list-style-type: none"> • Biodiversity loss, fragmentation, and alteration. • Disturbance from noise, vibration, lighting, and human presence. <p>It is assumed that the Proposed Scheme site is suitable for foraging and breeding behaviour for a wide range of common terrestrial invertebrates. Although records of these species were returned from the data search and field survey, and suitable habitat was present, these ecological features are valued as Local (lower) value and are not considered an IEF.</p>	No

Note 1: Based on level of legal protection

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15.3.6 Evolution of the Environment in the Absence of the Proposed Scheme

In the event that the Proposed Scheme does not go forward, an assessment of the future baseline conditions has been carried out and is described within this section. **Table 15-22** outlines the likely evolution of the environment (i.e. the IEFs) in the absence of the Proposed Scheme.

Table 15-22: Likely Evolution of the Environment in the absence of the Proposed Scheme

Important Ecological Features		Likely Evolution of the Baseline in the absence of the Proposed Scheme
Designated Sites	European Sites	Designated sites within the Zol of the Proposed Scheme would likely remain as described in the baseline section of this report into the medium-term future. In the absence of the Project, it is expected that the lands within the Proposed Scheme would largely remain under the same management regimes. No significant changes to the habitats are likely to occur. The current pressures and threats affecting these sites would remain.
	National Sites	
Habitats and Flora – Annex I Habitat (Undesignated)	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Habitats within the Zol of the Proposed Scheme would likely remain as described in the baseline section of this report into the medium-term future. In the absence of the Project, it is expected that the lands within the Proposed Scheme would largely remain under the same management regimes. No significant changes to the habitats are likely to occur. The current pressures and threats affecting these sites would remain.
Habitats & Flora – Fossitt Habitat	FW1 Eroding/Upland River	Habitats within the Zol of the Proposed Scheme would likely remain as described in the baseline section of this report into the medium-term future. In the absence of the Project, it is expected that the lands within the Proposed Scheme would largely remain under the same management regimes. No significant changes to the habitats are likely to occur. The current pressures and threats affecting these habitats would remain.
	FW2 Depositing Lowland River	
	FW3 Canals	
	FW4 Drainage Ditch	
	FS1 Reed & Large Sedge Swamp	
	GM1 Marsh	
	WD1 Mixed Broadleaved Woodland	
	WD2 Mixed Broadleaved/Conifer Woodland	
	WL1 Hedgerows	
	WL2 Treelines	
	WS1 Scrub	
WN5 Riparian Woodland		
Fauna	Otter (breeding, commuting and foraging)	Fauna within the Zol of the Proposed Scheme would likely remain as described in the baseline section of this report into the medium-term future. In the absence of the Project, it is expected that the lands within the Proposed Scheme would largely remain under the same management regimes, and therefore no significant changes to the fauna present are likely to occur. The current pressures and threats affecting these species would remain.
	Bats (roosting)	
	Bats (commuting and foraging)	
	Birds (breeding)	
	Birds (wintering)	
	Kingfisher	
	Badger (breeding, commuting and foraging)	
	Amphibians (common frog and smooth newt)	

15.4 Description of Likely Significant Effects

Section 15.4.1 and **15.5.4** provide a description of the likely significant effects of the Proposed Scheme on biodiversity – terrestrial ecology in cumulation with other existing development in the area. A description of the likely significant effects in cumulation with approved development i.e., development not yet built, is presented in **Section 15.4.3** based on the detailed methodology for CIA included in **Chapter 25**.

The impact interactions between biodiversity – terrestrial ecology and other environmental factors are identified and described in **Chapter 26** and assessed throughout **Sections 15.4.1** to **15.4.3**.

The assessment of significant effects has been completed with reference to the description of the Proposed Scheme set out in **Chapter 4** and based against the IEFs identified from the baseline described in **Section 15.3** above. The assessment has been completed initially without consideration of any avoidance, minimisation, mitigation or compensation measures other than those 'built-in' to the design of the Proposed Scheme (e.g. the design of the proposed bridge crossing over the River Boyne).

15.4.1 Construction Phase

The key construction activities likely to give rise to ecological impacts are set out below in **Table 15-23**. As noted in **Chapter 5 Construction Description** of the EIAR, the construction duration is estimated to be in the order of 36 months.

Table 15-23: Construction Phase Impacts

Impact Source	Construction Activity	Potential Ecological Impact and Effects
Habitat loss, degradation and/or fragmentation	Vegetation removal and earthworks	The habitats within the study area comprise a mosaic of terrestrial and aquatic habitats including a river, canal, stream and drains, agricultural grassland, arable crops, semi-natural grassland, marsh and woodlands. Vegetation removal and earthworks during site clearance will result in the loss of habitat and its supporting function for a number of species within the footprint of the Proposed Scheme. This activity will also result in potential for habitat degradation due to impacts and effects such as polluted run-off, dust generation, disturbance from construction and spread of invasive species. Such degradation could also result in effects on species dependent on this habitat.
	Construction of structures and hard surfaces	Permanent loss of habitat; creation of impermeable layers which will alter drainage patterns and drainage quantity and quality in the immediate vicinity (surface water and groundwater impacts are discussed in Chapter 17 – Water and Chapter 18 – Land, Soils, Geology and Hydrogeology). Potential for pollution events during the construction (e.g. from hydrocarbons or cement).
	Construction of permanent/ temporary or complete/ partial barriers to wildlife movements such as bridges, berms, fences and median barriers	Changes to movement of mobile species through the landscape, including potential to result in fragmentation and changes in local populations.
Disturbance	Pre-construction GI surveys and archaeological investigations	Potential to cause disturbance to wildlife through noise, vibration and human presence during ground investigation works and archaeological testing.
	Excavations causing high levels of noise and vibration	Excavations can cause disturbance of animal species, especially significant during breeding season; high levels of noise and vibration may also result in avoidance of the local area by faunal species
	Artificial lighting	Lighting used during night working at the construction stage may cause disturbance to bats and other foraging mammals in the area such as Otter and Badger.

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Impact Source	Construction Activity	Potential Ecological Impact and Effects
		Artificial lighting can affect emergence and foraging regimes in addition to prey abundance/availability for Bats. It can also affect greater predation rates for small mammals and avifauna.
	Movement of construction personnel, plant and vehicles	Potential to cause disturbance to wildlife through noise, vibration and human presence.
Pollution to water and air	Pre-construction surveys and investigations	Run-off of pollutants from early ground investigation works and archaeological testing may have an indirect impact on habitats and species, especially those which are water-dependant. Pollutants including silts, hydrocarbons and cement (surface water and groundwater impacts are discussed in Chapter 17 – Water and Chapter 18 – Land, Soils, Geology and Hydrogeology).
	Construction site drainage	Run-off of pollutants may have an indirect impact on habitats and species, especially those which are water-dependant. Pollutants including silts, hydrocarbons and cement (surface water and groundwater impacts are discussed in Chapter 17 – Water and Chapter 18 – Land, Soils, Geology and Hydrogeology).
	Air pollution and dust deposition	Localised air pollution and dust deposition may have a negative effect on any habitats or species of conservation value in the area. The principal pollutants of concern which originate from road developments are the nitrogen oxides (NO _x) and Particulate Matter (PM), in terms of impact on sensitive ecosystems. Nitrogen oxides (NO _x) may have a positive or negative impact by acting as a fertiliser or a phytotoxicant. Particulate matter can have negative effects resulting in physical smothering of vegetation, affecting their function and survival. It may also cause local smothering of nearby aquatic receptors. Effects are mainly on vegetation growth, photosynthesis and nitrogen assimilation/metabolism (air pollution and dust deposition levels are assessed in Chapter 10 – Air Quality).
Accidental killing/injury	Construction compounds and open excavations	Potential for killing and/or injury during the construction activities as a result of open excavations
Spread of invasive species	Movement of construction personnel, vehicles and construction materials; including any excavated spoil.	Potential to cause the spread of invasive species.

15.4.1.1 Designated Sites: Statutory

IEF 1 – River Boyne and River Blackwater SAC

The River Boyne and River Blackwater SAC has been assessed for significant effects associated with pre-construction archaeological and GI surveys, and construction phase activities.

Archaeological and GI surveys will be undertaken within the LMA in advance of the construction phase in order to characterise existing archaeological and ground conditions. These advance works may give rise to disturbance and run-off of pollutants due to local excavations and associated machinery.

The Proposed Scheme itself will include the construction of a new road bridge over the River Boyne and the construction of both a temporary and permanent access bridge over the Boyne Navigation Canal which lies to the south of the River Boyne and which outflows into the river downstream of the crossing point. There is a significant construction footprint within the floodplain of the River Boyne, however there are no significant in-river works (other than the surface water drainage outfalls into the River Boyne and the single outfall into the Boyne Canal) within the channel of the river and there will be no construction within 10 m of the banks of

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the River Boyne (other than for construction of the outfalls). The bridge design provides an open and ecologically permeable structure which will ultimately allow connectivity of habitats and species under the bridge deck. In addition to the road crossing of the river, all the construction footprint lies within the surface water catchment of the River Boyne, either directly via the slopes into the Boyne valley or indirectly via the Mattock (Mooretown) Stream or the canal. The construction of the Proposed Scheme will result in the permanent loss of 2.8 ha of land designated as SAC located within the land acquisition boundary; none of which is identified as QI habitat of the SAC.

Considering the QIs of the SAC, the potential impacts and effects of the Proposed Scheme are defined as follows:

- Disturbance and run-off of pollutants (ground and surface water) during pre-construction surveys and investigations;
- The degradation of Alluvial Forest (QI) approx. 12.6 km downstream of the Proposed Scheme due to changes in water flow (i.e. hydrological regime) and water quality (surface and groundwater) during construction. There is no Alluvial Woodland within or immediately adjacent to the Proposed Scheme and therefore there will be no loss or alteration of this QI habitat as a result of the construction activity;
- The temporary loss of otter foraging habitat and the localised disturbance/displacement of otter activity in the immediate vicinity of the construction activities within and adjacent to the River Boyne and the Boyne Navigation Canal. Based on the current baseline, no holts or resting places will be lost or subject to disturbance during the construction activities;
- Potential for otters to be killed and/or injured as a result of construction activities (i.e. open excavations);
- Degradation of water quality, and disturbance (hydroacoustic effects), affecting river lamprey and salmon;
- Spread of invasive alien plant species altering the vegetation composition and extent of both QI and non-QI habitats located within the River Boyne and River Blackwater SAC; and
- Air pollution (i.e. dust) causing local smothering of both QI and non-QI habitat located within the River Boyne and River Blackwater SAC.

Alluvial forest – hydrological regime

Expanding on the above, the downstream alluvial forest is hydrologically connected to the Proposed Scheme via the River Boyne and the QI habitat is dependent on the hydrological function of the River Boyne (e.g. flow, water quality) to maintain its interest.

With reference to **Chapter 17 – Water**, there will be no significant change in downstream water flow within the River Boyne, particularly with respect to seasonal flooding patterns, during construction phase. Based on this and given the distance downstream at which the nearest Alluvial Forest habitat is located - approx. 12.6 km - it is considered that there will be no loss or degradation of this habitat as a result of changes in downstream water flow during the construction phase;

Alluvial forest – water quality

The construction footprint of the Proposed Scheme lies within the catchment of the River Boyne. This includes the River Boyne itself, with significant construction within the floodplain of the river and on the slopes leading down to the floodplain, and also with respect to the Mattock (Mooretown) Stream and the Boyne Navigation Canal. Due to the extent of construction, there is significant risk that the construction activity will result in significant adverse changes in surface water quality immediately adjacent to the construction footprint and downstream of the Proposed Scheme. Such changes include the release of sediments and other pollutants (e.g. hydrocarbons, cement and other chemicals used in the construction process) into the Boyne, either directly or indirectly via the Mattock (Mooretown) Stream or the canal. It is considered unlikely, due to the distance downstream of the Alluvial Forest from the Proposed Scheme, that such changes would reach the Alluvial Forest however, the risk remains in the absence of appropriate mitigation. These impacts also have the potential to occur during pre-construction surveys and investigations.

The risk relates to the potential degradation of the Alluvial Forest habitat; the potential extent of such degradation is difficult to quantify both in extent, duration and magnitude. It is considered that if such an impact and effect was to arise that it would be temporary and reversible, however as a worst case and in the absence of mitigation measures to protect surface water quality, it would be considered a **significant, adverse impact at an International geographical scale**.

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With respect to groundwater deterioration, potential risks to groundwater were identified in the event of an accidental spillage associated with fuels, chemicals and concrete (i.e. pre-construction surveys and investigations, concreting during road and bridge construction and during the installation of culverts). This may result in impacts on soils and groundwater underlying the Proposed Scheme if inappropriately handled or stored during the construction phase. Potential contaminants could migrate through the subsoils and impact underlying groundwater. Applying the precautionary principle, such pollution could occur during the early stages of construction resulting in soil and/or groundwater contamination migrating into nearby receiving waters and downstream Alluvial Forest habitat within the River Boyne and River Blackwater SAC.

The extent of the potential effect would be to the Trim groundwater body (IE_EA_G_002). The magnitude of the effect is considered to be the potential degradation of this groundwater body and the surface water bodies to which it connects. The duration of the impact will align with that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months where groundwater levels are higher are more likely to result in interaction with these habitats). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a potential short-term and reversible effect on this IEF, which in the absence of mitigation measures would be considered **significant adverse at an International geographic scale**.

Otter – foraging and commuting habitat; and disturbance/displacement

With respect to otter (QI), the Proposed Scheme will not result in the loss of any known breeding sites or resting places; therefore, there is no significant effect on such features. However, it is recognised that otters are mobile species living in dynamic environments. Precautionary mitigation measures are therefore included in latter sections of this EIAR/chapter to account for any changes in baseline between assessment/consenting stage and construction stage.

A national otter survey of Ireland carried out in 2010-2012 found that otter incidence in the Boyne catchment declined significantly by 37.3% from 1980-81 to 2004-05 and then increased by an estimated 42.8% by 2010-11 (Reid et al., 2013). The Irish population is also listed as being of Least Concern in the 'Ireland Red List No. 12: Terrestrial Mammals' (Marnell et al., 2019) due to certain population recoveries in recent years. However, the Red List still identifies the Irish population as being of international importance.

The main impacts on otters during construction are a partial loss of foraging and commuting habitat as a result of the construction footprint within the floodplain of the River Boyne. Therefore disturbance (e.g. noise, vibration, occasional night-time working) could occur impacting, on the localised east/west otter movement along the Boyne valley. Disturbance and displacement also have the potential to occur during pre-construction surveys and investigations (albeit to a lesser degree). East-west otter movement along the river will be restricted to a 10 m buffer either side of the river during the construction period. However, otter is generally nocturnal in habit and construction works will typically be undertaken during normal daylight working hours and, in addition, there is evidence that otters are tolerant to a level of human disturbance, including construction activities. Otters range over large territories (VWT, 2022), therefore a localised temporary loss of habitat and a short period of temporary disturbance during the 36-month construction period is not considered to result in a significant adverse effect on the otter populations along the River Boyne.

In the absence of mitigation and mindful of the significant construction footprint proposed within the floodplain of the River Boyne, it is considered that there is a significant risk of otters being killed or injured during the construction activities e.g. falling into open excavations. It is considered that in the absence of mitigation measures, such impacts could affect the population of otters locally; resulting in a temporary **significant, adverse impact at an International geographical scale**.

River Lamprey and Salmon

With respect to River Lamprey and Salmon (both QIs) the potential impacts and effects to these species are addressed in **Chapter 16 – Biodiversity: Aquatic Ecology**.

Non-QI Habitat

All the habitat within or immediately adjacent to the Proposed Scheme is not considered to be QI Alluvial Forest or QI Alkaline Fens, however these non-QI habitats do provide a supporting function to maintaining the QI interests of the SAC, particularly with respect to Otter. The non-QI habitats identified as IEFs for the purposes of assessment within the SAC include: FW2 Depositing Lowland River, FW3 Canals, FS1 Large Reed and Sedge Swamp, GM1 Marsh and GS4 Wet grassland (see also **Chapter 15**). These habitats occur

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either individually and/or as part of a mosaic. For example, FW2 and GS4 occur individually, while FW3, GM1, FS1 occur as a mosaic, as does GM1 and GS4. In addition to the potential impacts and effects on QI habitats and species, there are similar impacts and effects on these non-QI habitats. These include:

- Habitat loss and fragmentation due to the construction footprint, which includes the construction area required for the construction of the bridge, the access (temporary and permanent) required to access the construction area (including over the Boyne Navigation Canal) and the construction of the temporary and permanent surface water drainage infrastructure; and
- Habitat degradation due to the construction activities; these are summarised as follows:
 - Degradation due to unintended incursion by construction personnel, equipment and/or materials;
 - Surface water deterioration due to release of sediments, hydrocarbons, cement or other chemicals associated with construction activities;
 - Groundwater deterioration due to construction activities;
 - Spread of invasive species as a result of construction activities; and
 - Air pollution including dust/vegetation smothering and emissions from construction traffic.

Expanding on the above, the construction of the Proposed Scheme within this SAC will result in the permanent loss⁶ of approx. 0.27 ha of mosaic habitat -FW3 Canals, FS1 Large Reed and Sedge Swamp, GM1 Marsh. However, this loss is largely associated with the attenuation pond south of the River Boyne, as the proposed cycle/pedestrian link bridge over-sails the Boyne Navigation Canal. The scheme will also result in the permanent loss of approx. 0.32 ha of GS4 Wet grassland habitat.

There will be no loss of any FW2 (Depositing Lowland River) habitat during construction due to the clear-span design of the bridge over the River Boyne and that the construction footprint is designed to be set back at least 10 m from the top of the banks of the river. With respect to FW3 (Canals), the impact and effect on the habitat will be minimised through the use of a prefabricated bailey bridge which will be lifted into position in order to facilitate access across it to enable the construction of the main River Boyne crossing.

Although these habitats provide a potential supporting function to the QI habitat and species of the River Boyne and River Blackwater SAC, the loss of these habitats are not considered significant.

The loss of these habitats would result in potential fragmentation of similar River Boyne habitats upstream and downstream of the Proposed Scheme. Although localised, the extent of fragmentation would be considered a **significant, adverse impact at an International geographical scale**.

In the absence of mitigation, there is potential for accidental incursion due to pre-construction surveys and investigations and beyond the construction footprint by construction personnel, vehicles, equipment and materials. This could lead to **significant adverse impacts at an International geographical scale**. All of the construction footprint of the Proposed Scheme lies within the catchment of the River Boyne. This includes the River Boyne itself, with significant construction within the floodplain of the river and on the slopes leading down to the floodplain, and also with respect to the Mattock (Mooretown) Stream and the Boyne Navigation Canal. Due to the extent of construction, there is significant risk that the construction activity will result in significant adverse changes in water quality immediately adjacent to the construction footprint and downstream of the Proposed Scheme including with respect to FW2, FW3, FS1 and GM1 habitats. Such changes include the release of sediments and other pollutants (e.g. hydrocarbons, cement and other chemicals used in the construction process) into the Boyne, either directly or indirectly via the Mattock (Mooretown) Stream or the Boyne Navigation Canal, could lead to the degradation of these habitats. It is considered in the absence of mitigation measures to protect water quality, that if such an impact and effect was to arise, that it would be temporary and reversible, however as a worst case it would be considered to be **significant, adverse at an International geographical scale** by virtue of their supporting function within the SAC.

Habitat degradation in relation to groundwater is as described under this IEF for “Alluvial forest – water quality” habitat degradation in relation to the spread of invasive species as a result of construction activities is as described below under “Invasive Alien Plant Species” and habitat degradation in relation air pollution

⁶ Habitat loss within the footprint of the River Boyne and River Blackwater SAC has been calculated on a worst case scenario basis, within the land acquisition boundary. The 10 m set back zone from the River Boyne has not been included in calculations.

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(i.e. dust/vegetation smothering and emissions from construction traffic), is as described below under “Air pollution”.

Invasive Alien Plant Species

In relation to invasive alien plant species, the footprint of the Proposed Scheme is not located within any locations where invasive plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 occur. However, the Proposed Scheme is located adjacent to several stands of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge). In addition, some invasive species are easily spreadable and therefore the baseline could change over time.

During construction, accidental spread or introduction of the aforementioned species could affect the extent, structure, distribution and vegetation composition of habitats located within the River Boyne and River Blackwater SAC. This includes the areas of QI alluvial forest within the River Boyne and River Blackwater SAC which are located downstream of the Proposed Scheme. In the absence of mitigation, the potential impact on IEFs would be considered a permanent, **significant, adverse impact at an International geographic scale**.

Air pollution

In relation to dust during construction, such emissions due to construction activities (i.e. excavation, earthworks and the movement of plant/machinery) could impact adjacent QI and non-QI habitats within the River Boyne and River Blackwater SAC. The extent of the effect is the River Boyne water body and the Boyne Navigation Canal within 200 m of any dust generating construction activity. The magnitude of the effect is considered to be the localised degradation of these watercourses and their habitats. The duration of the effect will match that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works may influence the magnitude (e.g. weather condition such as wind and rain). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at an International geographic scale**.

IEF 2 – River Boyne and River Blackwater SPA

The River Boyne and River Blackwater SPA has been assessed for significant effects associated with archaeological and GI surveys, and construction phase activities.

The Proposed Scheme will over sail this SPA owing to the fact that the SPA boundary is limited to the banks of the River Boyne. No pre-construction surveys and investigations or construction works are proposed within the SPA boundary or within 10 m of the northern or southern bank of the River Boyne other than the outfalls as part of the surface water drainage design of the Proposed Scheme. Therefore, none of the habitats within this SPA will be directly impacted significantly during construction of the Proposed Scheme.

However, pre-construction surveys and investigations, and the construction of the Proposed Scheme could affect the sole SCI species of the River Boyne and River Blackwater SPA i.e. kingfisher, and its supporting wetland habitats.

Kingfisher are currently amber-listed BoCCI (Gilbert *et al.*, 2021). According to available I-WeBS data, there was a total of 385 records of kingfisher across the 2009/10 and 2015/16 period. These were recorded across 7 seasons and 69 sites in Ireland, with a peak count of 12 individuals (Lewis *et al.*, 2019). Population changes for this SCI species, All-Ireland and International threshold are not available for this species from Lewis *et al.* (2019).⁷

Currently there is no evidence of breeding by the species within the section of the Boyne located within the Proposed Scheme. In 2020, a breeding location was confirmed, approx. 400 m from the public realm element of the scheme and approx. 1.6 km upstream of the proposed Boyne bridge crossing (see **Section 15.3.4**). However, this has not been recorded since. In 2022, a territory was held across the season at Slane Demesne, approximately 125 m upstream from the 2020 breeding site. This breeding site and territory are outside the footprint of the Proposed Scheme and are deemed not vulnerable to disturbance. The habitats along the banks of the River Boyne were deemed unsuitable for breeding (i.e. no optimal vertical soft-substrate nesting habitat) during field surveys. Based on existing evidence, there are no direct impacts from

⁷ https://www.npws.ie/sites/default/files/publications/pdf/IWM_106_Irelands_Wintering_Waterbirds.pdf

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the Proposed Scheme to the breeding activity of the species. Furthermore, the NIS prepared for the Proposed Scheme concluded, beyond reasonable scientific doubt, that the Proposed Scheme will not result in disturbance on the population of kingfisher designated within the River Boyne and River Blackwater SPA and will have no adverse effects on the integrity of any European Site (see NIS prepared for the Proposed Scheme). However, it is recognised that the species is mobile within a habitat which itself is dynamic. Therefore, precautionary mitigation measures have been incorporated into subsequent sections to ensure that pre-commencement surveys for the species are completed and the species-specific mitigation reviewed to respond to any changes in baseline.

The following potential impacts and effects on kingfisher have been identified related to habitat degradation and knock-on effects during construction activities:

- Disturbance/displacement (i.e. noise and vibration) affecting the use of the section of the River Boyne within the Proposed Scheme;
- Degradation of habitat due to unintended incursion by construction personnel, equipment and/or materials into the River Boyne or 10 m buffer (other than for construction of outfalls);
- Surface and/or groundwater deterioration due to the release of sediments, hydrocarbons, cement or other chemicals associated with construction activities;
- Spread of invasive species as a result of construction activities; and
- Air pollution (i.e. dust and pollutants) from construction activities resulting in the local smothering of vegetation.

Disturbance/displacement

During pre-construction surveys and investigations, excavations and the movement of personnel and machinery could disturb and therefore displace foraging or commuting kingfisher within the River Boyne. During construction, the piling of cofferdams as well as noise and vibration due to excavations, earthworks and movement of construction vehicles could disturb and therefore displace foraging or commuting kingfisher within the River Boyne. Potential effects to commuting and foraging SCI kingfisher could be limited to a local level for the duration of construction (i.e. foundations will be constructed during a 5-month period, and piling activities are expected to occur over a time frame less than this).

The extent of the effect is the River Boyne water body (and surrounding floodplain) and the Boyne Navigation Canal. The magnitude of the effect is considered to be the potential for multiple individuals of the population locally. The duration of the effects will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works will not influence the magnitude. This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on Kingfisher, which in the absence of mitigation measures, would be considered **significant adverse at an International geographic scale**.

Habitat degradation

In the absence of mitigation, there is potential for accidental incursion beyond the construction footprint by construction personnel, vehicles, equipment and materials. In the absence of mitigation measures, this could lead to a localised deterioration and disturbance of the habitat along the affected section of the River Boyne. This could lead to **significant adverse impacts at an International geographical scale**.

Water quality

As per the SAC above, all of the construction footprint of the Proposed Scheme lies within the catchment of the River Boyne. This includes the River Boyne itself, with significant construction within the floodplain of the river and on the slopes leading down to the floodplain, and also with respect to the Mattock (Mooretown) Stream and canal. Due to the extent of construction, there is significant risk that the construction activity will result in significant adverse changes in water quality immediately adjacent to the construction footprint and downstream of the Proposed Scheme either through changes to surface or groundwater. This could result in adverse change in habitat quality, affecting the local population's breeding success particularly due to the quality of foraging habitat. Such changes include the release of sediments and other pollutants (e.g. hydrocarbons, cement and other chemicals used in the construction process) into the Boyne, either directly or indirectly via the Mattock (Mooretown) Stream, the canal or via groundwater, which could lead to the degradation of these habitats. These impacts also have the potential to occur during pre-construction surveys and investigations. It is considered that if such an impact and effect was to arise in the absence of

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mitigation measures, it would be temporary and reversible. However, as a worst case it would be considered to be **significant, adverse at an International geographical scale**.

Invasive Alien Plant Species

With respect to invasive species, during construction and as detailed with respect to the SAC, accidental spread or introduction of the aforementioned species could affect the extent, structure, distribution and vegetation composition of habitats located within the River Boyne and River Blackwater SPA. This could in turn affect habitat quality locally for kingfisher. In the absence of mitigation, the potential impact on IEFs would be considered permanent, **significant, and adverse at an International geographic scale**.

Air pollution

Dust from excavations, construction sites and the movement of plant/machinery has the potential to have significant effects on vegetation. Dust from construction works can also deteriorate habitats by increasing the turbidity of watercourses which may indirectly affect commuting and foraging kingfisher. The extent of the effect is the River Boyne water body and the Boyne navigation canal within 200 m of any dust generating construction activity. The magnitude of the effect is considered to be the localised degradation of habitats and watercourses. The duration of the effect will match that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works may influence the magnitude (e.g. weather condition such as wind and rain). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at an International geographic scale**.

IEF 3 – Boyne Estuary SPA

With respect to the Boyne Estuary SPA, two pathways of effect are considered, namely:

- Potential for downstream changes in water quality which affects the habitats of the SPA upon which the SCI bird species are dependent; and
- Disturbance and/or displacement of SCI species within the footprint of the Proposed Scheme, species which could be potentially ex-situ populations which utilise the SPA.

In relation to the downstream changes in water quality, although a theoretical impact pathway exists, the risk of a detectable effect on the SPA is considered to be, at most, low, due to the spatial distance between the source of any impact and the receptor, the potential for dilution of any adverse changes in water quality during construction and also, with respect to sediments, the natural function of estuarine habitats with respect to the input, mobilisation and deposition of sediments. It is considered that a significant and persistent pollution event would have to occur as a result of the Proposed Scheme to have any detectable effect on the designated interests of the SPA. However, a precautionary approach has been adopted and the theoretical impacts and effects of downstream changes in water quality within the SPA have been assessed by this assessment.

Water Quality

The potential for water quality impacts during pre-construction surveys and investigations and activities during the construction phase have been identified via indirect theoretical pathway to the Boyne Estuary SPA. The SPA is located approx. 13.2 km downstream of the Proposed Scheme, and is designated for a number of SCI birds, including shelduck (*Tadorna tadorna*), oystercatcher (*Haematopus ostralegus*), grey plover (*Pluvialis squatarola*), knot (*Calidris canutus*), sanderling (*Calidris alba*), black-tailed godwit (*Limosa limosa*), turnstone (*Arenaria interpres*), little tern, golden plover, lapwing and redshank (*Persicaria maculosa*). The Boyne Estuary provides supporting habitat for these species in the form of intertidal (i.e. mudflats and sand flats) and coastal habitat (dune systems). As discussed under the River Boyne and River Blackwater SAC (IEF 1), the River Boyne is considered to be the primary receptor of surface water run-off. Any elevated concentrations of suspended sediments or polluting events arising during the construction phase will likely decrease as a result of dispersion and dilution in the water column over time and with distance before reaching the first transitional water body; the Boyne Estuary. Furthermore, given the spatial separation of the Proposed Scheme from the SPA and the contribution of dilution, it is not considered that any impacts as a result of the Proposed Scheme would be so significant to result in detectable habitat deterioration, modification or alteration as a result of water pollution. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SPA.

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Therefore, the risk to SCI birds and their supporting habitat as part of the Boyne Estuary SPA is considered negligible and therefore not significant. However, impact and potential effects have been assessed on a precautionary basis. Of the birds designated as part of the Boyne Estuary SPA, the majority are strictly coastal birds and are unlikely to occur within the footprint of the Proposed Scheme. These SCI species include redshank, shelduck, oystercatcher, grey plover, knot, sanderling, black-tailed godwit and turnstone, all of which may be subject to potential downstream changes in water quality.

The extent of the effect is the Boyne Estuary. The magnitude of the effect is considered to be multiple individuals, based on the baseline. The duration of the impact will align with that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months where groundwater levels are higher are more likely to result in interaction with water bodies). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at an International geographic scale**.

Disturbance/displacement

With respect to disturbance and displacement, this impact during pre-construction surveys and investigations and the construction phase is connected via indirect pathway to the SPA. Of the birds designated as part of the Boyne Estuary SPA, the majority are strictly coastal birds and are unlikely to occur within the footprint of the Proposed Scheme. However, the footprint of the Proposed Scheme does support habitat for two SCI species, namely golden plover and northern lapwing (i.e. grassland and arable land). Golden plover and lapwing are both currently red-listed BoCCI (Gilbert *et al.*, 2021). Peak counts of 12,213 golden plover and 4,750 lapwing were recorded within the Boyne Estuary across 2011-2015 period (Lewis *et al.*, 2019). The most recent population data for these SCI species indicate that golden plover are of favourable conservation condition with an increase of 35.7% in the Boyne Estuary SPA over a 12-year period from 1994–2007. Lapwing are of unfavourable conservation condition, with a decline of 45.9% in this SPA over the same period (Lewis *et al.*, 2019). Both species were recorded during field surveys and both species are at risk of disturbance. However, agricultural grassland and arable land are both considered widely distributed and available within the environs at Slane and while golden plover and northern lapwing are considered reliant on their supporting habitat, they are also highly likely to utilise alternative habitats at certain times (NPWS, 2012). During wintering bird surveys, lapwing and golden plover were primarily recorded flying over the Proposed Scheme area rather than using habitat within the footprint or immediate environs of the scheme. Only one lapwing was recorded roosting in a field on the northern bank at the proposed crossing point. The Boyne River is not deemed to be an important flight path for these species.

During construction, the piling of cofferdams as well as noise and vibration due to excavations, earthworks and movement of construction vehicles and personnel could displace Golden Plover and Northern Lapwing, given that these species have been recorded foraging/commuting at potentially ex-situ sites within the ZoI of the Proposed Scheme. However, disturbance and/or displacement effects associated with noise, vibration and human activity during construction of the Proposed Scheme will be short-term in nature. It is therefore unlikely that construction activities will affect the conservation status of the above SCI species within the ZoI of the Proposed Scheme. Furthermore, over-wintering avifauna displaced by the Proposed Scheme will be able to locate to other grassland or arable habitats within the local landscape which offer similar feeding opportunities.

The extent of the effect is the relevant habitats used by the SCI birds golden plover and lapwing. The magnitude of the effect is considered to be multiple individuals, based on the baseline. The duration of the effects will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works will not influence the magnitude. This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is **not significant**.

IEF 4 – Boyne Coast and Estuary SAC

With respect to the Boyne Coast and Estuary SAC, only the impact and effect of the following are considered:

- Potential for downstream changes in water quality which affects the QI habitats of the SAC.

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As per the Boyne Estuary SPA, in relation to the downstream changes in water quality, although a theoretical impact pathway exists, the risk of a detectable effect on the SCA is considered to be, at most, low, due to the spatial distance between the source of any impact and the receptor, the potential for dilution of any adverse changes in water quality during construction and also, with respect to sediments, the natural function of estuarine habitats with respect to the input, mobilisation and deposition of sediments. It is considered that a significant and persistent pollution event would have to occur because of the Proposed Scheme to have any detectable effect on the designated interests of the SAC. However, a precautionary approach has been adopted and the theoretical impacts and effects of downstream changes in water quality within the SAC have been assessed by this assessment.

Water Quality

The Boyne Coast and Estuary SAC is located 13.6 km downstream of the Proposed Scheme and is designated for a number of QI habitats including: Estuaries [1130], Mudflats and sandflats not covered by seawater at low tide [1140], Salicornia and other annuals colonizing mud and sand [1310], Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) [1330] and Mediterranean salt meadows (*Juncetalia maritimi*) [1410]. The Boyne Estuary SAC additionally provides supporting habitat for a number of SCI bird species.

As discussed under IEF1 - River Boyne and River Blackwater SAC, the River Boyne is considered to be the primary receptor of surface water run-off during pre-construction surveys and investigations and construction phase activities. Any elevated concentrations of suspended sediments or polluting events arising during the construction phase will likely decrease as a result of dispersion and dilution in the water column over time and with distance before reaching the first transitional water body, the Boyne Estuary.

However, in the absence of sediment/pollutant modelling this impact and potential effects have been assessed on a precautionary basis. The extent of the effect is the Boyne Estuary. The magnitude is considered to be the potential degradation of the surface water bodies to which the River Boyne connects. The duration of the impact will align with that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months where groundwater levels are higher are more likely to result in interaction with water bodies). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered a **significant adverse at an International geographic scale**.

15.4.1.2 Designated Sites: Non-Statutory

IEF 5 – Boyne Woods pNHA

This pNHA consists of a mosaic of broad-leaved woodland, freshwater marsh and canal. The site is reported in the Meath Biodiversity Action Plan 2010 as being important for swamp meadow-grass (*Poa palustris*). There is a small area of overlap (0.31 ha) between the public realm extent of the Proposed Scheme and the Boyne Woods pNHA. This overlap pertains to an area of BL3 built land along the existing N2 national road. The potential impacts and effects identified with respect to the pNHA are:

- Habitat loss; and
- Habitat degradation due to:
 - Spread of invasive species; and
 - Dust from construction activities (i.e. air pollution).

Habitat loss

With respect to habitat loss, the Proposed Scheme overlaps with the Boyne Woods pNHA. During construction, works will be confined to within the boundaries of the Proposed Scheme and more specifically, to the area of BL3 built land along the N2 existing National Road. As such, the Proposed Scheme will not result in the direct loss of any habitats of ecological importance within this pNHA during construction.

The extent of the effect is the existing Slane Bridge. The magnitude of the effect is approx. 0.31 ha of existing BL3 built land which is of negligible ecological value. The duration of the effect will match that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works will not influence the magnitude. This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the

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Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is **not significant**.

Habitat degradation

In relation to invasive alien plant species, the footprint of the Proposed Scheme is not located within any locations where invasive plant species, listed on the Third Schedule of the Birds and Natural Habitats Regulations 2011, as amended, occur. However, the Proposed Scheme is located adjacent to several stands of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge).

During construction, accidental spread or introduction of the IAPS could affect the extent, structure, distribution and vegetation composition of habitats located within the Boyne Woods pNHA.

Although IAPS identified during field surveys are located outside the footprint of the Proposed Scheme, there is legal conformance required in line with Birds and Natural Habitats Regulations 2011, as amended (non-native species subject to restrictions under *Regulations 49 and 50*) to prevent the spread of third schedule plants and animals. As such, a precautionary approach has been applied due to the location of Japanese Knotweed and Himalayan Balsam in proximity to watercourses, primarily the River Boyne. Measures are outlined in **Section 15.5** as part of the mitigation plan.

In the absence of mitigation, such effects would be considered **moderate adverse, temporary, reversible and significant at a National geographic scale**.

During construction, the emission of dust due to construction activities (i.e. excavation, earthworks and the movement of plant/machinery) could impact adjacent habitats within the Boyne Woods pNHA. In an extreme case, this could lead to the smothering of adjacent sensitive habitats and species.

The extent of the effect is the entire works area within the public realm element of the Proposed Scheme. The magnitude of the effect is considered to be the degradation of this habitat as a result of smothering and pollutant deposition. The duration of the effect will match that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works will not influence the magnitude. This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at a National geographic scale**.

IEF 6 – Crewbane Marsh pNHA

This site consists of one of the last remaining flood-plain marshes on the banks of the Boyne and, along with the adjacent woodland, is an important habitat for a variety of protected species such as otter, pine marten, stoat and badger. This pNHA is located approx. 0.85 km downstream of the Proposed Scheme (as a direct line measurement) and therefore will not be directly impacted during construction. However, this pNHA is hydrologically connected to the Proposed Scheme via the River Boyne (approx. 1 km downstream) and is periodically inundated by the annual rise of river levels. The Proposed Scheme will not result in any direct habitat loss within the pNHA.

The impacts and effects identified with respect to this pNHA are habitat degradation due to potential surface water pollution via the River Boyne and the downstream spread of invasive species due to pre-construction surveys and investigations and construction phase activities. Both impacts and effects are detailed above and both, in the absence of mitigation, would be likely to result in potentially **reversible, significant adverse effects at a National geographic scale**.

IEF 7 – Slane Riverbank pNHA

The Slane Riverbank pNHA is small area of wet grassland along the banks of the Boyne and supports the rare round-fruited rush; known from only two other counties in Ireland (MCC, 2010). Located along the boundary of the public realm element of the Proposed Scheme, it does not intersect the proposed works. The Proposed Scheme will not result in habitat loss during construction and no significant adverse effects from surface water pollution leading to habitat degradation are predicted. The only potential impact and effect considered pertinent to this pNHA is the potential for dust emissions from construction activities leading to habitat degradation. Given the limited extent and interaction with the Proposed Scheme (other than sharing a boundary) impacts are considered to be **not significant**.

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IEF 8 – Rossnaree Riverbank pNHA

The Rossnaree Riverbank pNHA is a small wetland on the banks of the Boyne. It is considered important since it contains the rare round-fruited rush. Meath is one of only three counties in Ireland with a record of this plant (MCC, 2010). This site is located approx. 4 km downstream via surface water and is generally periodically flooded during the winter months.

The Proposed Scheme will not result in any direct habitat loss within the pNHA. However, this pNHA is hydrologically connected to the Proposed Scheme via the River Boyne (approx. 4 km downstream) and is periodically inundated by the annual rise of river levels. The impacts and effects identified with respect to this pNHA are habitat degradation due to potential surface water pollution via the River Boyne and the downstream spread of invasive species due to pre-construction surveys and investigations and construction phase activities. Both impacts and effects are detailed above and both, in the absence of mitigation, would be likely to result in potentially **reversible, significant adverse effects at a National geographic scale**.

IEF 9 – Dowth Wetland pNHA

Dowth Wetland pNHA is an area of floodplain marsh along the banks of the Boyne that is augmented by a stand of deciduous woodland. The site also has a small herd of red deer (MCC, 2010). Dowth Wetland pNHA is located approx. 9.5 km downstream via surface water and is defined by flooding on an annual or semi-annual basis.

The Proposed Scheme will not result in any direct habitat loss within the pNHA. However, this pNHA is hydrologically connected to the Proposed Scheme via the River Boyne (approx. 9.5 km downstream) and is periodically flooded. The impacts and effects identified with respect to this pNHA are habitat degradation due to potential surface water pollution via the River Boyne and the downstream spread of invasive species due to construction activities. Both impacts and effects are detailed above and both, in the absence of mitigation, would be likely to result in potentially **reversible, significant adverse effects at a National geographic scale**.

IEF 10 – River Boyne Island pNHA

The River Boyne Island pNHA is an area of alluvial wet woodland. The River Boyne Islands are an example of gallery forests of willows (*Salicion albae*), which occur alongside river channels and on river islands, where tree roots are almost continuously submerged (NPWS, 2021). River Boyne Island pNHA is located approx. 12.5 km downstream via surface water.

The Proposed Scheme will not result in any direct habitat loss within the pNHA. However, this pNHA is hydrologically connected to the Proposed Scheme via the River Boyne and is periodically flooded. The impacts and effects identified with respect to this pNHA are habitat degradation due to potential surface water pollution via the River Boyne and the downstream spread of invasive species due to construction activities. Both impacts and effects are detailed above and both, in the absence of mitigation, would be likely to result in potentially **reversible, significant adverse effects at a National geographic scale**.

IEF 11 – Boyne Coast and Estuary pNHA

The Boyne Coast and Estuary pNHA covers largely the same area as the Boyne Estuary SAC. This site supports coastal and dune habitats, including red listed variegated horsetail. The Boyne Coast and Estuary pNHA is located approx. 13.8 km downstream via surface water. The affects and their significance are as reported for the Boyne Estuary SAC (above).

IEF 12 – Boyne Estuary Wildfowl Sanctuary

The Boyne Estuary Wildfowl Sanctuary (WFS-41) shares the same boundary (in part) as the Boyne Estuary SPA. The affects and their significance are as reported for the Boyne Estuary SPA, above, as it relates to water quality impacts and effects.

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15.4.1.3 Habitats & Flora

IEF 13 – FW1 Eroding Upland River

The Proposed Scheme will result in the permanent loss of approx. 99 m of FW1 Eroding Upland River along the Mattock (Mooretown) Stream due to the installation of three new culverts (see **Chapter 4, Table 4-8**). This habitat was valued as being of Local Importance (Higher Value). However, based on a review of orthographic imagery of the surrounding area (outside the extents of the habitat map) there is a much greater length of this habitat present locally.

The extent of the effect is the Mattock (Mooretown) Stream. The magnitude of the effect is considered to be the loss of instream habitat within the Mattock (Mooretown) Stream. The duration of the effect will match that of the construction timeframe (and beyond) associated with proposed works and is considered to be long-term. The timing of the construction works will not influence the magnitude. This effect is considered to be irreversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at a Local (Higher) geographic scale**.

Consideration with respect to the water quality impacts on the downstream section of the Mattock (Mooretown) Stream are detailed in **Chapter 16**.

IEF 14– FW2 Depositing Lowland River

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC and **Chapter 16**.

IEF 15 – FW3 Canals

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC and **Chapter 16**.

IEF 16 – FW4 Drainage Ditch

Drainage ditches are found throughout the ZoI of the Proposed Scheme and are typically associated with field boundaries, particularly between different landholdings. These drainage ditches may be wet or dry, but they are always narrow and where water is present may not be continuous, in that a flow path could not always be followed.

The design of the Proposed Scheme includes drainage pipes and culverts that will maintain the functioning of drainage and surface water networks where these are crossed. However, the actual losses of drainage ditches cannot be fully quantified (due to their seasonal nature). Given the extensive drainage networks within the study area, any losses associated with the Proposed Scheme are not likely to affect the long-term presence or viability of this habitat type locally.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is difficult to measure. The duration of the effect will match that of the construction timeframe associated with proposed works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months where water levels are higher are more likely to result in interaction with this habitat). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 17 – FS1 Large Reed and Sedge Swamp

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC above.

IEF 18 – GM1 Marsh, GS4 Wet grassland

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC above.

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IEF 19 – WD1 Mixed Broadleaved Woodland, WD2 Mixed Broadleaved/Conifer Woodland, WN5 Riparian Woodland, WL1 Hedgerows, WL2 Treelines, WS1 Scrub

As previously described, WD1 Mixed broadleaved woodland, WD2 Mixed broadleaved/conifer woodland, WL1 Hedgerows, WL2 Treelines and WS1 Scrub as individual habitats are considered to be of local (lower) importance. However, once combined these habitats have been valued at local (higher) value. WS1 occurs both individually but also as a mosaic alongside ED2 Spoil and bare ground, ED3 Recolonising bare ground and GS3 Dry-humid acid grassland. The Proposed Scheme will result in:

- The loss of approx. 14 m and approx. 2318 m of WL1 Hedgerows as a result of temporary and permanent land take requirements (total: approx. 2332 m);
- The loss of approx. 227 m and approx. 1965 m of WL2 Treelines as a result of temporary and permanent land take requirements (total: approx. 2192 m);
- The loss of approx. 0.08 ha of WS1 Scrub as a result of temporary and permanent land take requirements;
- The loss of approx. 0.07 ha of WS1 Scrub occurring as a mosaic alongside GS3 as a result of temporary and permanent land take requirements.;
- The loss of approx. 0.12 ha of WD1 Mixed broadleaved woodland as a result of temporary and permanent land take requirements; and
- The loss of approx. 0.25 ha of WD2 Mixed broadleaved/conifer woodland as a result of permanent land take requirements.

There will be no loss of WN5 Riparian woodland, or WS1 Scrub where it occurs as a mosaic alongside ED2 and ED3.

The above equates to a loss of approximately 65% (WL1) and 54% (WL2) of the total area (within the land acquisition boundary) of WL1 Hedgerows, and WL2 Treelines, 55% of WD1 mixed broadleaved woodland, 72% of WD2 Mixed broadleaved/conifer woodland, 44% of standalone WS1 Scrub habitat and 61% of WS1 Scrub habitat where it occurs as a mosaic with GS3 habitat. However, based on a review of orthographic imagery of the surrounding area (outside the extents of the habitat map) there is a much greater extent of these habitat present locally, including areas within the boundaries of the River Boyne and River Blackwater SAC.

The extent of the effect is on these habitats occurring within the footprint of the Proposed Scheme. The magnitude of the effect is considered to be approx. 2332 m of WL1 Hedgerows, approx. 2192 m of WL2 treelines, approx. 0.12 ha of WD1 Mixed broadleaved woodland, approx. 0.25 ha of WD2 Mixed broadleaved/conifer woodland, and approx. 0.15 ha of WS1 Scrub. The duration of the effect is considered to be long-term. The timing of the construction works will not influence the magnitude. This effect is considered to be irreversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at a Local (Higher) geographical scale**.

In terms of pollution to air, the emission of dust due to construction activities (i.e. excavation, earthworks and the movement of plant/machinery) could impact the retained habitats owing to their location within and adjacent to the footprint of the Proposed Scheme. In an extreme case, this could lead to the localised smothering of these habitat types. The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the degradation of these habitat as a result of smothering and pollutant deposition. The duration of the effect will match that of the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works will not influence the magnitude. This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is **not significant**.

In terms of pollution to water, the release of contaminated surface water and/or an accidental pollution event during pre-construction surveys and investigations and the construction phase of the Proposed Scheme could have an impact on areas of WN5 Riparian Woodland which are located downstream of the Proposed Scheme, along the banks of the River Boyne. While it is unlikely that a pollution event of such a magnitude to cause irreparable damage would occur during construction, a precautionary approach is being taken in

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assuming a level of risk of water quality impacts. Mitigation measures are required to further minimise the risk of the Proposed Scheme having any significant effect on water quality during construction.

The magnitude of the effect is considered to be the potential degradation of the watercourse. The impact and effect is considered to be likely reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF. However, the effect could be more significant depending on the nature, duration, and extent of the impact. Therefore, it is considered that this impact and effect, in the absence of mitigation would be **significant adverse at a Local (Higher) geographic scale**.

IEF 20 – Annex I Habitat (Undesignated)

Undesignated Annex I habitat - Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430], has been assessed for significant effects associated with pre-construction archaeological and GI surveys and construction phase activities themselves.

Hydrophilous tall herb fringe communities, as mapped by the NPWS (2020), occurs c. 4 km and 9 km downstream of the Proposed Scheme, where a direct pathway has been identified with the Proposed Scheme via the River Boyne. Similar to the effects described under IEF-1, due to the extent of the construction footprint within the floodplain of the River Boyne, there is significant risk that the construction activity will result in significant adverse changes in surface water quality immediately adjacent to and downstream of the Proposed Scheme. These impacts also have the potential to occur during pre-construction surveys and investigations.

The risk relates to the potential degradation of undesignated Annex I Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]; the potential extent of such degradation is difficult to quantify both in extent, duration and magnitude. It is considered that if such an impact and effect was to arise that it would be temporary and reversible. However, as a worst case and in the absence of sediment modelling, it would be considered a **significant, adverse impact at a National geographical scale**.

15.4.1.4 Fauna

IEF 21 – Otter

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC above.

IEF 22 – Bats

I. Impacts on Bat Roosting (Trees)

During construction, there are eighteen trees within the boundary of the Proposed Scheme that will require felling. Of these trees, thirteen were assessed as having 'low' bat roost potential while five were assessed as 'moderate' bat roost potential during site investigations to inform this EIAR (see **Appendix 15.5**). The loss of trees with low bat roost potential is unlikely to impact on the local bat assemblage given their limited ability to support roosting bats and the presence of other suitable trees within the local landscape. However, precautionary measures are included as part of mitigation with respect to the felling of these trees since their potential for roosting could change over time.

At the five remaining trees, which were assessed as having 'moderate' bat roost potential, no bats were recorded emerging or re-entering from any of the notable features. Again, mindful that bats are mobile species and trees can be dynamic with changes in roosting features, precautionary measures are included as part of mitigation with respect to the felling of these trees since their potential for roosting could change over time; particularly given that these trees already support potentially suitable features.

As such, there will be no significant impact on roosting bats with respect to the trees proposed to be felled as part of the Proposed Scheme.

II. Impacts on Bat Roosting (Buildings)

During construction, there are six buildings within the boundary of the Proposed Scheme that will be demolished. All buildings were surveyed for the presence of roosting bats and assessed for potential roosting features during site investigations to inform this EIAR (see **Appendix 15.6**), two of which (Building A

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and Building B) were considered to support potential for bat roosting, with the remainder considered to provide ‘negligible’ potential for bat roosting. There were no roosting bats confirmed in either of the building considered to potentially support bat roosting features.

Furthermore, no bats were observed to be emerging during a follow-up emergence survey on Building A. The loss of these structures, which are of low bat roost potential, is unlikely to impact on the local bat assemblage. As Building B was deemed unsafe for activity surveys, the precautionary principle has been applied for the potential loss of unrecorded roosting bats.

Mindful that bats are mobile species and buildings can be dynamic with changes in roosting features and potential over time, precautionary measures are included as part of mitigation with respect to buildings since their potential for roosting could change over time.

As such, there will be no significant impact on roosting bats with respect to buildings proposed to be demolished as part of the Proposed Scheme.

III. **Bat Activity**

The construction activity will result in the loss, fragmentation and degradation of habitat currently used by the bat populations/assemblages recorded during surveys for foraging and commuting.

With respect to habitat loss, the landscape affected by the Proposed Scheme is not of equal value for bat activity. The corridor of the Boyne Valley provides a high-quality landscape for bat activity due to the range and structural complexity of habitats within it and abundance of foraging resources. The land to the north and south of the valley are more agricultural in nature with a reduced complexity of habitats, including linear features such as hedgerows and treelines of which approximately 4213 m are proposed to be removed. The extent of habitat loss to enable the Proposed Scheme, in particular for the works proposed within the Boyne Valley, are significant and will have a significant impact on the available habitat for the local bat populations and assemblages as there will be a local reduction in high quality habitat.

In addition, the Proposed Scheme will result in the loss of hedgerows and treelines to the north and south of the Boyne Valley which will further increase the significance of the local impact. The majority of the bat assemblage recorded locally consists of common and widespread, yet legally protected, species. Ultimately, once the new bridge crossing over the River Boyne is in place and the habitats below it restored, the available habitat will return and will, overtime reconstitute again to a high quality habitat along the Boyne. It is therefore considered that the habitat loss would result in a temporary, reversible yet **significant adverse impact to an IEF of National geographical scale**.

As detailed above (see **Figure 15.7**, **Figure 15.8** and **Figure 15.9**), the Proposed Scheme will intersect established foraging and/or commuting paths of several bat species which are generally common and widespread. As such, the construction of the Proposed Scheme will impact the local bat assemblage by establishing a barrier to foraging and/or commuting; particularly east/west and vice versa. This barrier effect will be evident from an early stage during construction works, as after site clearance works have taken place the presence of cleared land has the potential to act as a barrier itself. In addition, the removal of hedgerows and treelines (as discussed above) has the potential to alter the local landscape to the extent that it affects bat behaviour.

The records of bat activity obtained during surveys of the Proposed Scheme indicate that the barrier effect could be greatest at the following locations:

- The hedgerows/treelines along the improved grassland fields northeast of McGruder’s cross (i.e. east of the existing N2 national road and north of the Local Road L1600) [chainage (Ch.) 0-100];
- The hedgerows/treelines and wet grassland north of Rossnaree road/south of the Boyne Navigation Canal [Ch. 1100-1200];
- Along the Boyne Navigation Canal and the River Boyne, itself, including intervening habitats [Ch. 1200-1350];
- The hedgerows/treelines along the improved grassland fields east of Slane village (i.e. east of the existing N2 national road and north of the National Road N51) [Ch. 2250-2850]; and
- The treelines along the arable fields towards the northern tie-in of the Proposed Scheme (i.e. east of the existing N2 National Road and northeast of Slane village) [Ch. 2850-3450].

The extent of the effect will be on the hedgerows and treelines proposed for removal. The magnitude of effect on commuting and foraging bats is likely to be the loss of habitat connectivity for Leisler’s bat,

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Nathusius' pipistrelle, common pipistrelle and soprano pipistrelle. In the absence of mitigation, the duration of the effect is considered to be permanent. The timing of the construction works will not influence the magnitude. In the absence of mitigation, this effect is considered to be irreversible after construction works are completed. Due to the magnitude and the permanent loss of these linear features, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at a National geographic scale**.

With respect to artificial lighting, construction works, in general, will be undertaken during normal daylight working hours. However, a number of isolated instances of night-time working are expected to be required during construction of the Proposed Scheme. It is uncertain as to what time of year such lighting would be used. Such night-time works will be associated with pavement works along the proposed N51 improvements, public realm enhancement proposals and critical lifts associated with bridge construction. As such, night-time working where the use of floodlights is required to permit safe working conditions could potentially locally and temporarily displace bats from an illuminated area.

This effect is considered to be reversible and of short duration due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term impact which is not considered significant. However, as a precautionary measure, mitigation is proposed in order to ensure that artificial lighting is used in a controlled manner mindful of bat activity.

IEF 23 – Birds (Wintering & Breeding)

I. Impacts on Birds (Wintering)

Habitat Loss

With respect to habitat loss, the winter bird assemblage recorded within the Zol of the Proposed Scheme are primarily associated with freshwater, wetland and grassland mosaic habitats along the valley of the River Boyne and the Boyne Navigation Canal (i.e. mute swan, whooper swan) To a lesser extent species of improved grassland or arable habitats were also noted along route corridor (i.e. golden plover, northern lapwing). There will be some loss of habitat as a result of temporary and permanent land take within the River Boyne valley in addition to some loss of habitat as a result of temporary and permanent land take across the wider scheme during the construction phase. Such habitat will be required for the provision of temporary access tracks, working platforms, to facilitate construction of the proposed River Boyne crossing and N2 mainline, in addition to the shared cycle/pedestrian bridge over the Boyne Navigation Canal.

Habitat loss associated with the temporary land take will be short-term in nature, and habitat loss associated with permanent land take will be long-term in nature. As the habitat within the footprint of the Proposed Scheme is abundant throughout the wider area of Slane, over-wintering avifauna are likely to relocate to proximal habitat (i.e., other grassland or wetland habitats within the local and rural landscape) that offers similar feeding and roosting opportunities, any disturbance or displacement effects are only considered to be short-term and unlikely to affect the conservation status of wintering bird species within the Zol of the Proposed Scheme.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the loss of habitat used by wintering birds of a range of species. The duration of the effect is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. vegetation removal between October and March, inclusive, are more likely to disturb wintering birds). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is considered **not significant**. Impacts on SCI birds are detailed in **Section 15.3.1**.

Habitat Fragmentation

During construction, the earthworks, excavations, and site clearance works associated with the Proposed Scheme will result in the disturbance of the local landscape. This will include temporary fragmentation of the freshwater, wetland and grassland mosaic habitats along the valley of the River Boyne and the Boyne Navigation Canal habitats which the local wintering bird assemblage is primarily associated with. This will be required for the provision of temporary access tracks and working platforms to facilitate construction of the proposed River Boyne crossing and the shared cycle/pedestrian bridge over the Boyne Navigation Canal.

As such, any habitat fragmentation associated with construction of the Proposed Scheme will be temporary/short-term in nature. Any disturbance or displacement effects will also be short-term and unlikely

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to affect the conservation status of wintering bird species within the ZoI of the Proposed Scheme. Furthermore, over-wintering avifauna displaced by the Proposed Scheme will be able to locate to other grassland or wetland habitats within the local landscape which offer similar feeding opportunities.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the fragmentation of habitat used by wintering birds of a range of species. The duration of the effect is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. vegetation removal between October and March, inclusive, are more likely to disturb wintering birds). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is considered **not significant**.

Habitat Degradation: Surface Water Pollution

This impact during construction is connected via both direct and indirect pathway to this IEF. During construction, the accidental release of contaminated surface water and/or an accidental pollution event could affect surface water quality in the receiving environment which supports freshwater and wetland habitats. These habitats are potentially used as ex-situ foraging sites by over-wintering avifauna, given their recorded presence within the ZoI of the Proposed Scheme (**See Appendix 15.2**).

Therefore, construction of the Proposed Scheme could potentially affect over-wintering avifauna either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. impacts on food supply chain or supporting habitats) via surface water connectivity. In the case of a frequent and/or prolonged pollution event, this could potentially have an extensive and far-reaching impact, with potentially long-term effects.

While it is unlikely that a pollution event of such a magnitude would occur during construction, a precautionary approach is being taken in assuming a level of risk of water quality impacts. Detailed mitigation measures are required to further minimise the risk of the Proposed Scheme having any significant effect on water quality during construction.

The duration of the effect will align the construction timeframe associated with the proposed works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months where water levels are higher are more likely to result in interaction with this habitat). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant (adverse) at a Local (Higher) geographic scale**.

Disturbance – Noise & Vibration

This impact during construction is connected via indirect pathway to this IEF. The increased levels of noise and vibration during the construction of the Proposed Scheme and during pre-construction surveys and investigations (albeit to a much lesser extent), could potentially displace wintering birds from habitats within the ZoI of the Proposed Scheme. The magnitude of this effect will depend on the nature and duration of construction works. For example, general construction activities will have less impact than piling but will continue over a longer timeframe, possibly extending over multiple years and overwintering seasons.

Construction works associated with the Proposed Scheme will be both temporary and short-term in nature. Any disturbance or displacement effects will also be short-term and unlikely to affect the conservation status of wintering bird species within the ZoI of the Proposed Scheme. Furthermore, over-wintering avifauna displaced by the Proposed Scheme will be able to locate to other grassland or wetland habitats within the local, rural landscape which offer similar feeding opportunities.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of wintering birds of a range of species. The duration of the effects will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works between October and March, inclusive, are more likely to disturb wintering birds). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is considered **not significant**.

Disturbance – Human Presence

During construction, the increased presence of construction personnel and their activities in areas that were previously undisturbed prior to construction could cause displacement and/or disturbance of wintering birds

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within the Zol of the Proposed Scheme. However, construction works associated with the Proposed Scheme will be temporary/short-term in nature thus any disturbance or displacement effects will also be short-term. Furthermore, over-wintering avifauna displaced by the Proposed Scheme will be able to locate to other grassland or wetland habitats within the local landscape which offer similar feeding opportunities.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of wintering birds of a range of species. The duration of the effects will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works not will influence the magnitude. This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is considered **not significant**.

II. Impacts on Birds (Breeding; other than Kingfisher)

Direct Killing and Injuring of Nesting Birds, Young and Eggs

If site clearance works were to be undertaken during the breeding bird (March to August, inclusive) it is plausible that nest sites holding eggs or chicks will be destroyed and birds killed. As such, the mortality of breeding birds during site clearance of the Proposed Scheme (over what will probably be a single breeding bird season) has the potential to have a short-term effect on the breeding bird population locally. To comply with the legal protection afforded to Breeding Birds under the Wildlife Acts, a mitigation strategy has been developed as set out below.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the killing and/or injury of nesting birds and their young. The duration of the effect is considered to be long-term. The timing of the construction works will influence the magnitude (i.e. vegetation removal between March and August, inclusive, are more likely to disturb breeding birds). This effect is considered to be irreversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant (adverse) at a Local (Higher) geographic scale**.

Impacts on SCI birds are detailed in **Section 15.3.1**.

I. Habitat Loss

The footprint of the Proposed Scheme consists predominately of intensively managed agricultural lands, with little vegetation cover for breeding birds. The loss of these habitats during construction will be of little significance to the local breeding bird assemblage. There will be loss of semi-natural habitats around the River Boyne crossing and along the northern extents of the Proposed Scheme. This includes areas of; GS3 Dry Humid Grassland GS4 Wet Grassland, WS1 Scrub, WD1 (Mixed) broadleaved woodland and WD2 Mixed broadleaved/conifer woodland. Likewise, the loss of WL1 Hedgerows and WL2 Treelines across the footprint of the Proposed Scheme also has the potential to impact on the local breeding bird assemblage.

The loss of these habitats has the potential to lead to increased competition for resources both between and among breeding bird's species within the Zol of the Proposed Scheme. The full effect of this impact will be influenced by external factors such as future land use changes in the local landscape. The effect will also vary by species, with species with a larger home range being less severely impacted by habitat loss at the scale of the Proposed Scheme. Overall, the habitat loss attributable to construction of the Proposed Scheme forms a small proportion of a much greater area of these habitats present locally. To comply with the legal protection afforded to Breeding Birds under the Wildlife Acts, a mitigation strategy has been developed.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the loss of habitat used by breeding birds of a range of species. The duration of the effect is considered to be long-term. The timing of the construction works will influence the magnitude (i.e. vegetation removal between March and August, inclusive, are more likely to disturb breeding birds). This effect is considered to be irreversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at a Local (Higher)scale**.

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Disturbance – Noise & Vibration

The increased levels of noise and vibration during the construction of the Proposed Scheme and during pre-construction surveys and investigations (albeit to a much lesser extent), could potentially displace breeding birds from habitats within the ZoI of the Proposed Scheme. The magnitude of this effect will depend on the nature and duration of construction works. For example, general construction activities will have less impact than piling but will continue over a longer time frame, possibly extending over multiple years and breeding seasons.

Construction works associated with the Proposed Scheme will be temporary and short-term in nature. Any disturbance or displacement effects will also be short-term and unlikely to affect the conservation status of breeding bird species within the ZoI of the Proposed Scheme.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of breeding birds of a range of species. The duration of the effects will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. vegetation removal between March and August, inclusive, are more likely to disturb breeding birds). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is considered **not significant**.

Disturbance – Human Presence

The increased levels of human presence during construction could potentially displace breeding birds from habitats within the ZoI of the Proposed Scheme. However, construction works associated with the Proposed Scheme will be temporary and short-term in nature. Any disturbance or displacement effects attributable to an increased human presence during construction will also be short-term, and thus unlikely to affect the conservation status of breeding bird species within the ZoI of the Proposed Scheme.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of breeding birds of a range of species. The duration of the effects will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works will influence the magnitude. This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 24 – Badger

In total, 51 badger setts were recorded across the Terrestrial Biodiversity Study Area. Fifteen of these setts (BS04, BS07, BS08, BS09, BS13, BS14, BS16, BS18, BS21, BS22, BS29, BS48, BS49, BS50, BS51) were located within the LMA. Two setts (BS12, BS17) were located within the ZoI of general construction activities (i.e. within 50 m) and a further eighteen setts (BS01, BS02, BS03, BS06, BS10, BS11, BS15, BS24, BS25, BS27, BS29, BS30, BS42- BS47) were located within the ZoI for any potential piling or blasting works (i.e. within 150 m).

Based on interpretation of the survey results to inform this EIAR, the affected badger setts (BS04, BS07, BS08, BS09, BS13, BS14, BS16, BS18, BS21, BS22, BS29, BS48, BS49, BS50, BS51) are spread across four badger groups:

- BS07, BS08, BS09, BS28, BS49, BS50, BS51 are considered to be part of one badger group to the east of the Mill house, on the northern bank of the River Boyne (hereafter referred to as the Mill House Badger Group);
- BS14 and BS48 are considered to be part of a group located to the east of the existing N2 National Road and south of the River Boyne (hereafter referred to as the Cullen/Fennor Badger Group); and
- BS04, BS13, BS18, BS21 and BS22) are considered to be part of a group located to the east of the existing N2 National Road and north of the River Boyne (hereafter referred to as the Cashel Badger Group); and
- BS16 is not considered to be part of either of the aforementioned groups located north of the River Boyne, potentially belonging to a group further east, outside of the study area.

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These are only setts which are within the ZoI of general construction activities (50 m), with further setts belonging to the groups mentioned above located just outside this area. It must also be noted that there is one further main sett located south of the River Boyne, west of the Proposed Scheme, and existing N2 National Road. The group is believed to be using BS43 as their main sett (hereafter named the Johnstown Badger Group).

Furthermore, badgers could also potentially establish new setts within the ZoI of the Proposed Scheme before construction works commence. Applying the precautionary principle, this scenario will be accounted for in the mitigation strategy proposed.

Habitat Loss

During construction of the Proposed Scheme, there will be permanent loss of foraging habitat within the footprint of the Proposed Scheme due to earthworks, excavations and site clearance works. This loss of habitat will likely affect badgers within the study area by reducing the foraging area and feeding resource within existing territories. This reduction in feeding resource has the potential to lead to increased competition for resources and conflict between neighbouring badger groups, potentially impacting the conservation status of the local badger population.

However, suitable foraging habitat for badgers is locally abundant within the study area and is considered sufficient to sustain the local population in the long term. While the effect of the loss of foraging habitat cannot be quantified, affected badger groups would be expected to adapt to the altered landscape given the local abundance of alternative suitable habitat. As such, it is expected that there will be minimal impact on the conservation status of the local badger population.

The extent of the effect is the entire works area with suitable vegetation within the Proposed Scheme. The magnitude of the effect is considered to be the loss of foraging habitat available to badger. The duration of the effects is considered to be long-term. The timing of the construction works will not influence the magnitude. This effect is considered to be irreversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible adverse effect on this IEF, which is considered **not significant**.

Loss of Breeding/Resting Sites (Setts)

The Proposed Scheme will result in the permanent loss of fifteen (fourteen active) badger setts, affecting three badger groups: seven setts (BS07, BS08, BS09, BS28, BS49, BS50, BS51) of the Mill House badger group; two sett (BS14 and BS48) of the Cullen/Fennor Badger Group; five sett (BS04, BS13, BS18, BS21 and BS22) of the Cashel Badger group, one sett (BS16) which is not considered to be part of any badger group.

The significance of sett loss in relation to any badger group is based upon consideration of the type of sett, its importance to the badger group, and the availability of either alternative setts for affected badgers to relocate to or the availability of alternative suitable sett building habitat within the territory. Locally, the significance of sett loss with respect to badger groups is largely dependent on the presence of existing alternative setts within their territories. As discussed above in relation to loss of foraging habitat, sett loss may also lead to increased conflict with neighbouring badger groups if alternatives, in the form of existing setts or suitable habitat to construct setts, are not available within the existing territory. There is also the potential for badgers to be killed during site clearance works where setts are being removed, if removed in an uncontrolled manner.

The Mill House badger group will lose seven out of 14 setts (BS07, BS08, BS09, BS28, BS49, BS50, BS51) recorded within their territory. Five of the remaining seven setts (BS06, BS10, BS29, BS29, BS30) lie within the ZoI of significant disturbance effects resulting from the piling of cofferdams in the floodplain of the River Boyne during construction. When these factors are considered in combination, the Proposed Scheme has the potential for a long-term impact on this badger group. As such, the Proposed Scheme has the potential to negatively affect the conservation status of this badger group and result in a significant adverse effect.

The Cullen/Fennor badger group will lose five active sett recorded within their territory. Five setts, including the main sett, have been recorded within the study area for this group, as such, the Proposed Scheme is not likely to affect the species ability to maintain itself on a long-term basis locally. The remaining setts are located outside the ZoI of disturbance effects from any construction works involving pile driving. However, in line with the legal protection badger are afforded, the loss of a breeding/resting would be considered a significant adverse effect.

In relation to the Cashel badger group, the Proposed Scheme will result in the loss of a single outlier sett (BS18) within its territory. The main sett of this group is located c. 320 m east of BS18. There are four active

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setts within close proximity to this, presumed to be used by the same group given the relative locations and distance to the main sett: BS20. It's plausible that at least one of those setts is and would therefore provide a suitable alternative to BS18. Given there are alternative setts, and alternative suitable sett building habitat available beyond the ZoI of general construction activities, the loss of sett BS18 is not likely to affect the species ability to maintain itself on a long-term basis locally. Nor will it affect the conservation status of this badger group. Therefore, it will not result in a likely significant adverse effect.

The Johnstown badger group will not lose any setts during construction of the Proposed Scheme. However, six of the nine setts identified lie within the ZoI for disturbance effects resulting from any construction works involving pile driving. The six setts within this ZoI consist of the main sett and relevant annexed setts. Due to the number of setts within the relevant ZoI, and the importance of the setts in question, the Proposed Scheme has the potential to negatively affect the conservation status of this badger group and result in a significant adverse effect.

To comply with the legal protection afforded to badgers under the Wildlife Acts (which prohibits their intentional killing or injury, or the wilful interference with their breeding or resting places), a mitigation strategy has been developed as detailed below.

The extent of the effect is the suitable vegetation within the footprint of the Proposed Scheme. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will potentially extend further than the construction timeframe associated with works and is considered to be potentially long-term.. Due to the unmeasurable magnitude, the effect is considered to be irreversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant adverse at a National geographic scale**.

Direct and indirect killing and injuring of Badgers in Setts

During construction, works (i.e. site clearance, piling, excavations and earthworks) within the boundary of the Proposed Scheme could pose a risk of mortality to local badger populations. As described under 'Loss of Breeding/Resting Sites (Setts)', the Proposed Scheme will result in the permanent loss of fifteen badger setts, all of which pose risk of direct killing or injury to Badger. In addition, there is a risk that badgers could be killed and/or injured through falling into excavations within the construction footprint.

The extent of the effect is the loss of fifteen badger setts within the footprint of the Proposed Scheme. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will potentially extend further than the construction timeframe associated with works and is considered to be potentially long-term. Due to the unmeasurable magnitude, the effect is considered to be irreversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant (adverse) at a National geographic scale**.

Habitat Fragmentation (Barrier Effect)

During construction, the earthworks, excavations and site clearance works associated with the Proposed Scheme will result in the disturbance of the local landscape and fragmentation of existing badger territories. This fragmentation will be most apparent where the Proposed Scheme severs a network of setts or separates setts from adjacent foraging areas. However, this is expected to have an initial, temporary impact on the local badger population. The affected Badger groups are expected to habituate to the altered landscape given the abundance of alternative suitable habitat within the study area.

The extent of the effect is the areas of vegetation (e.g. hedgerows) for removal. The magnitude of effect on badger territories is likely to be the loss of habitat connectivity. The duration of the effect is considered to be long-term. The timing of the construction works will not influence the magnitude. This effect is considered to be irreversible after construction works are completed. Due to the magnitude and the permanent fragmentation of habitat potentially used by local badger populations, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant (adverse) at a National geographic scale**.

Disturbance – Noise & Vibration

This impact during construction is connected via direct pathway to this IEF. The increased levels of noise and vibration associated with construction works has the potential to displace badgers from both

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breeding/resting sites and foraging habitat within the Zol of the Proposed Scheme. In relation to foraging habitat, most construction works will be carried out during normal daylight working hours. Given that badgers are nocturnal, construction works are unlikely to displace badgers from areas of foraging habitat (outside of areas where foraging habitat is lost directly to the Proposed Scheme). As such, the displacement of badgers from foraging areas during construction of the Proposed Scheme is unlikely to affect local badger groups.

There are two Badgers setts (BS12 and BS17) that lie within 50 m of the boundary of the Proposed Scheme. These setts will not be directly lost to the Proposed Scheme, but given their location, will be subject to increased levels of noise and vibration associated with general construction works. As such, these setts will likely be subject to temporary displacement/disturbance during construction of the Proposed Scheme. This temporary displacement/disturbance will have a more significant effect if carried out during the breeding season (December – June inclusive) as the displacement of badgers from occupied setts may potentially affect breeding success.

A further eighteen setts (BS01, BS02, BS03, BS06, BS10, BS11, BS15, BS24, BS25, BS27, BS29, BS30, BS42- BS47) are located within 150 m of the Proposed Scheme. Given their location, these setts will be subject to noise and vibration associated with any blasting, rock breaking or pile driving works that are required during construction of the Proposed Scheme. Therefore, these setts will potentially be subject to temporary displacement/disturbance during the construction of the Proposed Scheme. As noted above, this impact will have a more significant effect if works are carried out during the breeding season as the displacement of badgers from occupied setts may potentially affect breeding success. To comply with the legal protection afforded to Badgers under the Wildlife Acts (which prohibits their intentional killing or injury, or the wilful interference with their breeding or resting places), a mitigation strategy has been developed.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of multiple individuals, based on the baseline. The duration of the effect will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works between December to June, inclusive, are more likely to disturb badger breeding season). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant (adverse) at a National geographic scale**.

Disturbance – Human Presence

The increased levels of human presence associated with construction of the Proposed Scheme has the potential to displace badgers from both breeding/resting sites and foraging habitat. In relation to foraging habitat, most construction works will be carried out during normal daylight working hours. Given that badgers are nocturnal, construction works are unlikely to displace badgers from areas of foraging habitat (outside of areas where foraging habitat is lost directly to the Proposed Scheme). As such, the displacement of badgers from foraging areas during construction of the Proposed Scheme is unlikely to affect local badger groups. Therefore, no significant adverse effect is envisaged.

There are two Badgers setts (BS12 and BS17) that lie within 50 m of the boundary of the Proposed Scheme. These setts will not be directly lost to the Proposed Scheme, but given their location, will be subject to increased levels of human presence associated with general construction works. As such, these setts will likely be subject to temporary displacement/disturbance during construction of the Proposed Scheme. This temporary displacement/disturbance will have a more significant effect if carried out during the breeding season (December – June inclusive) as the displacement of badgers from occupied setts may potentially affect breeding success. To comply with the legal protection afforded to Badgers under the Wildlife Acts (which prohibits their intentional killing or injury, or the wilful interference with their breeding or resting places), a mitigation strategy has been developed.

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of multiple individuals, based on the baseline. The duration of the effect will not extend further than the construction timeframe associated with the construction works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works between December to June, inclusive, are more likely to disturb badger breeding season). This effect is considered to be reversible after construction works are completed. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a short-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered **significant (adverse) at a National geographic scale**.

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IEF 25 – Amphibians

Amphibians been assessed for significant effects associated with pre-construction archaeological and GI surveys, and construction phase activities.

As detailed under the baseline environment (see **Section 15.3**), samples obtained from both the Boyne Navigation Canal and the large sedge swamp habitat north of this canal tested positive for smooth newt. Direct evidence of frogs was also noted. On this basis, there is potential for run-off of pollutants and disturbance. Due to the extent of the construction footprint within the floodplain of the River Boyne (large sedge swamp habitat), and the construction footprint along the Boyne Navigation Canal, there is significant risk that the construction activity will result in significant adverse changes in surface water quality immediately adjacent to the Proposed Scheme. Construction activities at these locations could also give rise to local disturbance of amphibians within these suitable habitats. The risk relates to the potential degradation of suitable habitat for amphibians; the potential effect of such degradation is difficult to quantify both in extent, duration and magnitude. It is considered that if such an impact and effect was to arise, that it would be temporary and reversible, however as a worst case and in the absence of sediment modelling, it would be considered a **significant, adverse impact at a Local (Higher) geographic scale**.

In addition to habitat degradation, there will be a loss of aquatic and terrestrial habitat for both smooth newt and common frog during the construction phase and mainly relates to the proposed construction works within the Boyne valley. In the absence of mitigation, it is considered that the loss will be significant, reversible and adverse impact at a Local (Higher) geographical scale.

15.4.2 Operational Phase

15.4.2.1 Designated Sites: Statutory

IEF 1 – River Boyne and River Blackwater SAC

I. Habitat loss, degradation and/or fragmentation (Annex I Habitats)

There are no areas of QI Annex I habitats within the River Boyne and River Blackwater SAC that lie within the footprint of the Proposed Scheme. As such, the Proposed Scheme will not result in the direct loss of any Annex I habitats within the River Boyne and River Blackwater SAC. During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme.

Operational phase run-off will however be directed via attenuation basins containing sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation prior to its release to outfalls. The Proposed Scheme design also provides for a treatment train incorporating grassed channels, vortex grit separators and petrol/oil interceptors. As such, these attenuation ponds/wetlands and drainage features will treat the run-off from the roadway before it is directed to watercourses.

It is also noted there is potential for water quality improvement of watercourses (i.e. River Boyne), which may arise by introducing modern road drainage features and removing significant sources of unattenuated (and consequently untreated) road run-off pollution from existing road surfaces that currently have inferior or no drainage treatment which would otherwise remain as sources of potential operational phase impact as traffic volumes increase into the future.

Maintenance activities will largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended. Aggregation of silt captured within drainage during cleaning may bring about increases in the siltation of surface water but is not considered to result in adverse effects.

As QI Alluvial Forest habitat is located downstream of the Proposed Scheme (approx. 12.6 km) and mindful of the suite of designed measures as part of the Proposed Scheme, pollution during the operational phase is unlikely to affect the water quality of this habitat causing habitat degradation and/or habitat fragmentation. Attenuated water greatly reduces the risk of pollutant-related impacts and effects on downstream waterbodies. Therefore, the impact and effects on QI alluvial forest is considered negligible.

The extent of the effect is the downstream QI alluvial forest. The magnitude of the effect is considered to be the degradation of this habitat. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will influence the magnitude (i.e. operational activities during the winter months where water levels are higher are more likely to result in interaction with

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this habitat). This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

II. Habitat loss, degradation and/or fragmentation (Non-Annex I Habitats)

This relates to FW2 Depositing Lowland River, GM1 Marsh, FS1 Large Reed and Sedge Swamp, FW3 Canals and GS4 Wet grassland. During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As these habitats are located immediately downstream, pollution during the operational phase could potentially negatively affect the water quality of these habitats, therefore impacting vegetation. Habitat deterioration can then contribute to a decline in habitat area and habitat distribution which may indirectly cause fragmentation and/or loss of these supporting habitats.

As detailed above, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will influence the magnitude (i.e. operational activities during the winter months where water levels are higher are more likely to result in interaction with this habitat). This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

III. Habitat Degradation – Altered Hydrological Regime (Non-Annex I Habitats)

No impact pathway identified to this IEF. A Stage III Flood Risk Assessment (FRA) was carried out by RPS to assess the permanent impact on flood risk elsewhere due to the presence of the bridge piers. A hydraulic model was built and calibrated to estimate water levels, out of bank flow paths and flood outlines. The results of the simulations show maximum increase in peak water levels of 4 mm and 5 mm for the 1% AEP and 0.1% AEP flow events respectively as a result of the proposed bridge piers being located within the predicted floodplain.

The location of the maximum increases in peak water levels are immediately upstream of the proposed River Boyne Bridge adjacent to the Mill House Hotel overflow carpark. The maximum increases in peak water levels were not deemed to be significant and do not contribute to an overall increase in predicted flood extents.

IV. Habitat Degradation – Invasive Species (QI Alluvial Forest and Non-Annex I Habitats)

In relation to invasive alien plant species, the footprint of the Proposed Scheme is not located within any locations where invasive plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 occur. Although the Proposed Scheme is located adjacent to a number of locations of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge), the spread of IAPS is not likely to occur owing to the nature of operational activities (i.e. IAPS will not contribute to sedimentation and a reduction in water quality). However, a precautionary approach has been applied due to their location in proximity to watercourses, primarily the River Boyne and due to the legal conformance required in line with S.I 477 of 2011, and measures to control the spread of IAPS should the issue arise, are provided in **Section 15.5**.

V. Habitat Degradation – Shading (Non-Annex I IEFs)

QI Otter, FW2 Depositing Lowland River

During operation, the proposed River Boyne crossing will cast a permanent shadow on a small area (0.10 ha) of FW2 Depositing Lowland River associated with the River Boyne. Shading can lead to both a reduction in sunlight and precipitation reaching plants beneath.

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Over time, this can potentially alter the aquatic flora present in the riverbed. However, shading can also have beneficial impacts. For example, Cocchiglia et al. (2012) reports that tree and shrub canopies provide shade and regulate watercourse temperatures. Thus, the shading effects of the proposed bridge crossing could potentially offer better cover and feeding opportunities for certain species such as fish; which in turn could be beneficial for other species such as Otter.

The extent of the effect is the River Boyne bridge crossing. The magnitude of the effect is considered to be the area of the River Boyne directly below and either side of the bridge. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be irreversible and potentially positive. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term, irreversible and positive effect on this IEF, which is considered **not significant**.

In relation to other habitats, during operation, the proposed River Boyne crossing will cast a permanent shadow on a small mosaic area (0.08 ha) of GM1 Marsh/FS1 Large Reed and Sedge Swamp/FW3 Canal associated with the Boyne Navigation Canal. The shading effect of the proposed River Boyne Crossing will likely affect the extent and species composition of the vegetation cover beneath the structure, reducing the quality of the remaining area of this mosaic.

However, in the context of the overall area of these habitats mapped within the study area, affecting the quality of such a small area is preferable to the loss of the area entirely and reduces the magnitude of the impact that the Proposed Scheme will have on these habitats.

The extent of the effect is the River Boyne bridge crossing. The magnitude of the effect is considered to be GM1 Marsh/FS1 Large Reed and Sedge Swamp/FW3 Canal habitat. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be irreversible and negative. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and irreversible adverse effect on this IEF, which is considered **not significant**.

VI. Otter (QI Species)

a. Habitat Loss, degradation and/or fragmentation

In the case of the proposed River Boyne bridge crossing, direct fragmentation of riverine/riparian habitat used by QI Otter will not arise as it is a clear span structure with adequate freeboard (approximately 12 m) above the median river levels. This freeboard, when combined with the clear span design of the proposed bridge crossing, is predicted to provide sufficient height above water and sufficient cross-sectional area to avoid any significant obstacle to QI Otter commuting and foraging along the River Boyne corridor.

The extent of the effect is the River Boyne bridge crossing. The magnitude of the effect is considered to be the ability for otter to freely commute and forage without obstruction along the River Boyne. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

b. Direct Killing/Injury

The operation of the Proposed Scheme could result in injury or mortality of otters coming into contact with vehicles travelling along the Proposed Scheme, however this is considered to be a low risk by virtue of the design of the proposed bridge crossing. In the absence of further design mitigation, this may result in otter entering the mainline and environs of the Proposed Scheme and attempting to cross the proposed bypass, thus increasing the potential for direct vehicle collision and mortality during the operational phase.

Roadkill of otters may be important on a local scale but it is not considered to be a significant threat to the long-term persistence of the species regionally or at a national level, especially considering the widespread distribution of otter in Ireland (Reid et al., 2013). While records of otter roadkill in Ireland are sparse, there is considered to be some potential for collision risk during the operational phase and for direct mortality to impact on the local distribution of otter. On a precautionary basis, direct mortality of otter could result in a significant effect.

The extent of the effect is the entire operational area of the Proposed Scheme. The magnitude of the effect is considered to be the potential for small numbers of individuals; based on the baseline. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the

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operational works will not influence the magnitude. This effect is considered to be irreversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which is considered to be **significant adverse at an International geographic scale**.

c. Disturbance – Noise and Vibration

This impact during operation is connected via indirect pathway to this IEF. There were no otter breeding sites identified within the Zol of the Proposed Scheme. Therefore, it is not predicted that there will be any disturbance or displacement of such sites during the operational phase of the Proposed Scheme.

Otter activity was widely recorded along the River Boyne (and along the Mattock (Mooretown) Stream). As such, the increased level of noise and vibration (associated with increased traffic volumes on the new road) during the operational phase of the Proposed Scheme has the potential to displace commuting or foraging otter. However, given the current use of the environment surrounding the River Boyne, otter populations in the area are considered to already be habituated to the presence of human activity and noise within the environment (i.e. anthropogenic factors).

The extent of the effect is the entire operational area of the Proposed Scheme. The magnitude of the effect is considered to be the potential for multiple individuals, based on the baseline. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

d. Disturbance – Lighting

Artificial lighting during the operational phase is associated with artificial illumination of the Proposed Scheme. However, light spill along the River Boyne corridor and any subsequent effects on the River Boyne and River Blackwater SAC shall not occur, owing to the fact that the proposed bridge crossing is to remain unlit during the operational phase. As there is no pathway of effect, no significant effects can occur.

e. Disturbance – Human Presence

There were no otter breeding sites identified within the Zol of the Proposed Scheme. Therefore, it is not predicted that there will be any disturbance or displacement on such sites during the operational phase of the Proposed Scheme.

Otter activity was widely recorded along the River Boyne corridor (and along the Mattock (Mooretown) Stream). As such, the increased presence of humans during the operational phase of the Proposed Scheme has the potential to displace commuting or foraging otter. Given the current use of the environment surrounding the River Boyne, otter populations in the area are considered to already be habituated to the presence of noise and vibration within the environment (i.e. anthropogenic factors), including that associated with the existing N2 road.

The extent of the effect is the entire operational area of the Proposed Scheme. The magnitude of the effect is considered to be the potential for multiple individuals, based on the baseline. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 2 – River Boyne and River Blackwater SPA

A Kingfisher nesting site was identified approx. 400 m from the public realm element of the scheme and approx. 1.6 km upstream of the proposed Boyne bridge crossing during surveys in 2020, however the species has not been recorded since. However, owing to the location of this nesting site, it is considered beyond the reach of any significant adverse effects. Therefore, it is not predicted that there will be fragmentation of such sites during the Proposed Scheme's operational phase.

During field surveys, kingfisher was recorded along the River Boyne corridor, although its occurrence limited. However, the presence of commuting and foraging kingfisher along the River Boyne (and the potential for the Proposed Scheme to lead to fragmentation of this commuting/foraging habitat) cannot be ruled out.

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I. Habitat Fragmentation

In the case of the proposed River Boyne bridge crossing, the bridge is approximately 12 m above median river levels. This freeboard, when combined with the clear span design of the proposed bridge crossing, is considered to provide sufficient height above water and sufficient cross-sectional area to avoid any significant obstacle to SCI Kingfisher commuting and foraging along the River Boyne corridor.

Given the presence of the existing Slane bridge and the location of the proposed bridge crossing approx. 600 m east of this, it is not anticipated that the proposed bridge will contribute to any new significant impact on SCI Kingfisher. It is considered that SCI kingfisher are already habituated to the presence of man-made structures at this location and throughout the River Boyne (e.g. Newgrange Monument bridge crossing, Mary McAleese Boyne Valley Bridge, Drogheda Bridge crossings and Boyne Viaduct etc).

The extent of the effect is the River Boyne bridge crossing. The magnitude of the effect is considered the loss of connectivity between foraging/commuting habitat available to kingfisher. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be irreversible. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and irreversible adverse effect on this IEF, which is considered **not significant**.

II. Habitat Degradation: Surface Water Pollution

During the operation of the Proposed Scheme, potential impacts associated with run-off from drainage systems (i.e. pollutants, silt and heavy metals) and attenuation ponds may impact on food availability of Kingfisher.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the downstream River Boyne water body. The magnitude of the effect is considered to be the degradation of this watercourse and its supporting habitats to SCI kingfisher. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

III. Disturbance – Noise & Vibration

Given this current use of the environment surrounding the River Boyne, commuting and foraging kingfisher populations in the area are considered to already be habituated to the presence of noise and vibration within the environment (i.e. anthropogenic factors).

The extent of the effect is the entire operational area of the Proposed Scheme. The magnitude of the effect is considered to be the potential for multiple individuals. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which is considered **not significant**.

The extent of the effect is the entire operational area of the Proposed Scheme. The magnitude of the effect is considered to be the ability for kingfisher to freely commute and forage without obstruction along the River Boyne. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IV. Disturbance – Lighting

This impact during operation is connected via indirect pathway to this IEF. In relation to artificial lighting associated with the Proposed Scheme, light spill has the potential to deter or alter the behaviour/movement of SCI Kingfisher within the River Boyne and River Blackwater SPA. BTO (2014) have suggested that

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artificial lighting can be associated with several aspects of changes to bird behaviour and could disrupt the long-term circadian rhythm that dictates the onset of the breeding season.

However, light spill along the River Boyne corridor and any subsequent effects on SCI bird species shall not occur, owing to the fact that the proposed bridge crossing is to remain unlit during the operational phase. The impact and effect is **not significant** given the context of the Proposed Scheme to the SPA.

V. **Disturbance – Human Presence**

Given this current use of the environment surrounding the River Boyne, commuting and foraging kingfisher populations in the area are considered to already be habituated to the presence of human activity within the environment (i.e. anthropogenic factors).

The extent of the effect is the entire operational area of the Proposed Scheme. The magnitude of the effect is considered to be the potential for multiple individuals. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 3 – Boyne Estuary SPA

I. **Habitat Degradation: Surface Water Pollution**

During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As this Boyne Estuary SPA is located downstream of the Proposed Scheme (approx. 13.6 km), the operation of the Proposed Scheme could theoretically negatively affect the water quality (potentially over the long term) in receiving watercourses and consequently impact upon aquatic/wetland habitats within the SPA.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The theoretical magnitude of the effect is considered to be the degradation the habitats within the SPA upon which the SCI bird species are dependent. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered to be **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

I. **Habitat Fragmentation**

This is pertinent to three of the bird species which are also SCIs of the SPA, namely Golden Plover, Lapwing and Redshank. In the case of the proposed River Boyne bridge crossing, the bridge is approximately 12 m above median river levels. This freeboard, when combined with the clear span design of the proposed bridge crossing, is predicted to provide sufficient height above water and sufficient cross-sectional area to avoid any significant obstacle to SCI birds (Golden Plover, Lapwing and Redshank) commuting and foraging along the River Boyne corridor.

Furthermore, given the presence of the existing Slane bridge and the location of the proposed bridge crossing approx. 600 m east of this, it is not anticipated that the proposed bridge will contribute to any new significant impact on these SCI species. It is considered that these SCI species are already habituated to the presence of man-made structures at this location and throughout the River Boyne (e.g. Newgrange Monument bridge crossing, Mary McAleese Boyne Valley Bridge, Drogheda Bridge crossings and Boyne Viaduct etc).

Therefore, **no significant adverse effect** is envisaged (in terms of fragmentation of foraging/commuting habitat utilised by these SCI birds) during the Proposed Scheme's operational phase with respect to the three species which could form part of the SPA population.

II. **Disturbance – Lighting**

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This is pertinent to three of the bird species which are also SCIs of the SPA, namely Golden Plover, Lapwing and Redshank. Light spill has the potential to deter or alter the behaviour/movements of birds of the Boyne Estuary SPA that forage and/or commute at ex-situ along the River Boyne corridor. However, light spill along the River Boyne corridor and any subsequent effects on SCI bird species shall not occur, owing to the fact that the proposed bridge crossing is to remain unlit during the operational phase. The impact and effect is **not significant** given the context of the Proposed Scheme to the SPA.

III. Disturbance – Human Presence

This is pertinent to three of the bird species which are also SCIs of the SPA, namely Golden Plover, Lapwing and Redshank. Disturbance can temporarily impact local population abundances and trends by causing changes in the behaviour/movements of golden plover, northern lapwing and redshank within the immediate River Boyne corridor. Given the presence and location of the current bridge at Slane, high traffic volumes and walking trails along the River Boyne which have a high public presence, it is not anticipated that increased human presence during the operational phase will have a negative effect on these SCI species.

Furthermore, given this current use of the environment surrounding the River Boyne, commuting and foraging SCI (golden plover, lapwing and redshank) populations in the area are considered to already be habituated to the presence of human activity and noise within the environment (i.e. anthropogenic factors). Therefore, **no significant adverse effect** (in terms of disturbance from human presence) is envisaged during the operation of the Proposed Scheme on the populations of these species for which the SPA is designated.

IEF 4 – Boyne Coast and Estuary SAC

II. Habitat Degradation: Surface Water Pollution

During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As this Boyne Coast and Estuary SAC is located downstream of the Proposed Scheme (approx. 13.6 km), the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in receiving watercourses and consequently impact upon aquatic/wetland habitats within SAC.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The theoretical magnitude of the effect is considered to be the degradation of these watercourses and the SAC. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered to be **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

15.4.2.2 Designated Sites: Non-statutory

IEF 5 – Boyne Woods pNHA

I. Habitat Degradation: Air Pollution

This impact during operation is connected via direct pathway to this IEF. During operation, the emission of particulate matter and nitrogen oxides (NO_x) (i.e. traffic), could impact adjacent habitats within the Boyne Woods pNHA. As detailed in **Chapter 10 – Air Quality**, NO₂ and PM₁₀ concentrations are predicted to increase with a localised negligible impact on air quality in areas and an overall positive impact in air quality within Slane Village.

Additionally, as NO₂ is a principal pollutant of concern, a nitrogen deposition assessment has been carried out as per the TII Guidelines given the ecological sensitivity of the ecosystems in the vicinity of the proposed route. This assessment concluded the predicted increase in nitrogen deposition levels to sensitive habitats adjacent to the Proposed Scheme is negligible (see **Chapter 10 – Air Quality, Section 10.4.2.4**).

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The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the degradation of this habitat as a result of pollutant deposition. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible and overall, positive. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 6 – Crewbane Marsh pNHA

III. Habitat Degradation: Surface Water Pollution

During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As this pNHA is located downstream of the Proposed Scheme (approx. 1.3 km) and is periodically inundated by the annual rise of river levels, the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in receiving watercourses and consequently impact upon aquatic/wetland habitats within the Crewbane Marsh pNHA.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the River Boyne water body and the Boyne navigation canal. The magnitude of the effect is considered to be the degradation of these watercourses. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered to be **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

IV. Habitat Degradation: Non-native Invasive species

In relation to IAPS, the operational footprint of the Proposed Scheme is located adjacent to a number of stands of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge). However, the spread of IAPS is not likely to occur owing the nature of operational activities and effects are considered to be **not significant**.

However, a precautionary approach has been applied due to their location in proximity to watercourses, primarily the River Boyne and due to the legal conformance required in line with S.I 477 of 2011, and measures to control the spread of IAPS should the issue arise, are provided in **Section 15.5**.

V. Habitat Degradation: Air Pollution

This impact during construction is connected via indirect pathway to this IEF. During operation, the emission of particulate matter and nitrogen oxides (NO_x i.e. traffic), could impact local habitats within the Crewbane Marsh pNHA. As detailed in **Chapter 10 – Air Quality**, NO₂ and PM₁₀ concentrations are predicted to increase with a localised negligible impact on air quality in areas and an overall positive impact in air quality within Slane Village.

Additionally, as NO₂ is a principal pollutant of concern, a nitrogen deposition assessment has been carried out as per the TII Guidelines given the ecological sensitivity of the ecosystems in the vicinity of the proposed route. This assessment concluded the predicted increase in nitrogen deposition levels to sensitive habitats adjacent to the Proposed Scheme is negligible (see **Chapter 10, Section 10.4.2.4**).

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the degradation of this habitat as a result of pollutant deposition. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible and overall, positive. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which in the absence of mitigation measures, would be considered to be **not significant**.

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IEF 7 – Slane Riverbank pNHA

I. Habitat Degradation: Air Pollution

This impact during operation is connected via direct pathway to this IEF. During operation, the emission of particulate matter and nitrogen oxides (NO_x i.e. traffic), could impact adjacent habitats within the Slane Riverbank pNHA. As detailed in **Chapter 10**, NO₂ and PM₁₀ concentrations are predicted to increase with a localised negligible impact on air quality in areas and an overall positive impact in air quality within Slane Village.

Additionally, as NO₂ is a principal pollutant of concern, a nitrogen deposition assessment has been carried out as per the TII Guidelines given the ecological sensitivity of the ecosystems in the vicinity of the proposed route. This assessment concluded the predicted increase in nitrogen deposition levels to sensitive habitats adjacent to the Proposed Scheme is negligible (see **Chapter 10, Section 10.4.2.4**).

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the degradation of this habitat as a result of pollutant deposition. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible and overall, positive. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 8 – Rossnaree Riverbank pNHA

I. Habitat Degradation: Surface Water Pollution

During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As this pNHA is located downstream of the Proposed Scheme (approx. 3 km) which is generally periodically flooded during the winter months, the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in receiving watercourses and consequently impact upon aquatic/wetland plant species (i.e. *Juncus compressus*) within the Rossnaree Riverbank pNHA.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the Boyne Estuary, which includes a pathway via the River Boyne water body and the Boyne Navigation Canal and which includes the Rossnaree Riverbank pNHA. The magnitude of the effect is considered to be the degradation of these watercourses. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

II. Habitat Degradation: Air Pollution

This impact during operation is connected via direct pathway to this IEF. During operation, the emission of particulate matter and nitrogen oxides (NO_x i.e. traffic), could impact local habitats within the Rossnaree Riverbank pNHA. As detailed in **Chapter 10**, NO₂ and PM₁₀ concentrations are predicted to increase with a localised negligible impact on air quality in areas and an overall positive impact in air quality within Slane Village.

Additionally, as NO₂ is a principal pollutant of concern, a nitrogen deposition assessment has been carried out as per the TII Guidelines given the ecological sensitivity of the ecosystems in the vicinity of the proposed route. This assessment concluded the predicted increase in nitrogen deposition levels to sensitive habitats adjacent to the Proposed Scheme is negligible (see **Chapter 10, Section 10.4.2.4**).

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the degradation of this habitat as a result of pollutant deposition. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational

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works will not influence the magnitude. This effect is considered to be reversible and overall, positive. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which in the absence of mitigation measures, would be considered **not significant**.

IEF 9 – Dowth Wetland pNHA

I. Habitat Degradation: Surface Water Pollution

During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As this pNHA is located downstream of the Proposed Scheme (approx. 6.5 km) the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in receiving watercourses and consequently impact upon wetland habitat within Dowth Wetland pNHA.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the Boyne Estuary which includes a pathway via the River Boyne water body and the Boyne Navigation Canal and which includes the Dowth Wetland pNHA. The magnitude of the effect is considered to be the degradation of these watercourses. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

IEF 10 – River Boyne Island pNHA

I. Habitat Degradation: Surface Water Pollution

During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As this pNHA is located downstream of the Proposed Scheme (approx. 7.5 km) the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in receiving watercourses and consequently impact upon submerged vegetation within the River Boyne Island pNHA.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the Boyne Estuary which includes a pathway via the River Boyne water body and the Boyne Navigation Canal and which includes the River Boyne Island pNHA. The magnitude of the effect is considered to be the degradation of these watercourses. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

IEF 11 – Boyne Coast and Estuary pNHA

As per Boyne Coast and Estuary SPA (above) given that the two designations are broadly contiguous.

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IEF 12 – Boyne Estuary Wildfowl Sanctuary

As per Boyne Coast and Estuary SPA (above) given that the two designations are broadly contiguous.

15.4.2.3 Habitats & Flora

IEF 13– FW1 Eroding Upland River

I. Habitat Degradation: Surface Water Pollution

This impact during operation is connected via indirect pathway to this IEF. As outlined above, during the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. This includes the Mattock (Mooretown) Stream. As such, the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in this watercourse. This could consequently impact upon the quality of the FW1 Eroding Upland River habitat associated with the Mattock (Mooretown) Stream.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the downstream Mattock (Mooretown) Stream. The magnitude of the effect is considered to be the degradation of this watercourse and its habitats. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

II. Habitat Degradation: Altered Hydrological Regime

Culverts to be installed as part of the Proposed Scheme (including those on the Mattock (Mooretown) Stream) are designed in accordance with the OPW requirements and hence, shall not restrict the hydraulic conveyance of the watercourses.

The extent of the effect is the Mattock (Mooretown) Stream. The magnitude of the effect is considered to be the degradation of these features. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

III. Habitat Degradation: Non-native Invasive species

In relation to IAPS, the operational footprint of the Proposed Scheme is located adjacent to a number of locations of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge). However, the spread of IAPS is not likely to occur as a result of operational activities (i.e. maintenance of attenuation/retention ponds, painting, deck surfacing, sediment and oil removal of vortex grit chambers and petrol/oil interceptor cleaning etc.). Operational activities will not interfere with known locations of IAPS as part of the current baseline. This is in the absence of mitigation measures and considered not significant. However, mindful that the environment is dynamic, a precautionary approach has been applied due to their location in proximity to watercourses, primarily the River Boyne and due to the legal conformance required in line with S.I 477 of 2011, and measures to control the spread of IAPS should the issue arise, are provided in **Section 15.5**.

IEF 14 – FW2 Depositing Lowland River

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC above.

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IEF 15 – FW3 Canals

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC above.

IEF 16 – FW4 Drainage Ditch

I. Habitat Degradation: Surface Water Pollution

During operation there will be outfalls to drainage ditches within the vicinity of the Proposed Scheme. As such, the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in these features.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the drainage ditches and interceptor drainage ditches as listed in **Chapter 4, Table 4-8**. The magnitude of the effect is considered to be the degradation of these features. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

II. Habitat Degradation: Altered Hydrological Regime

This impact during operation is connected via direct pathway to this IEF. Culverts to be installed as part of the Proposed Scheme (including those on the drainage ditches) are designed in accordance with the OPW requirements and hence, shall not restrict the hydraulic conveyance of the watercourses.

The extent of the effect is the drainage ditches and interceptor drainage ditches as listed in **Chapter 4, Table 4-8**. The magnitude of the effect is considered to be the degradation of these features. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 17 – FS1 Reed and Large Sedge Swamp

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC above.

IEF 18– GM1 Marsh, GS4 Wet grassland

See assessment of impacts on IEF1 River Boyne and River Blackwater SAC above.

IEF 19 – WD1 Mixed Broadleaved Woodland, WD2 Mixed Broadleaved/Conifer Woodland, WN5 Riparian Woodland, WL1 Hedgerows, WL2 Treelines, WS1 Scrub

No operational phase impacts will occur so as to cause a significant effect on WD1 Mixed broadleaved woodland, WD2 Mixed broadleaved/conifer woodland, WL1 Hedgerows, WL2 Treelines, WS1 Scrub, as all impacts are associated with the construction phase of the Proposed Scheme. However, potential water quality impacts could affect WN5 Riparian woodland habitat associated with the River Boyne.

During operation, there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. This includes the River Boyne which supports areas of WN5 Riparian Woodland downstream of the Proposed Scheme. As such, the operation of the Proposed Scheme could potentially negatively affect the water quality (potentially over the long term) in this watercourse. This could consequently impact upon the quality of the WN5 Riparian Woodland habitat associated with the River Boyne.

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As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible. The extent of the effect is the River Boyne water body. The magnitude of the effect is considered to be the degradation of this feature. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

IEF 20 – Annex I Habitat (Undesignated)

II. Habitat Degradation: Surface Water Pollution

During the operational phase there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. Hydrophilous tall herb fringe communities, as mapped by the NPWS (2020), occurs c. 4 km and 9 km downstream of the Proposed Scheme, where a direct pathway has been identified with the Proposed Scheme via the River Boyne.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the River Boyne water body and the Boyne navigation canal.. The magnitude of the effect is considered to be the degradation of these watercourses and the undesignated Annex I habitat. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered to be **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

15.4.2.4 Fauna

IEF 21 – Otter

I. Impact on Breeding Sites

See assessment of operational impacts on IEF1 River Boyne and River Blackwater SAC above.

II. Impact on Resting Sites

See assessment of operational impacts on IEF1 River Boyne and River Blackwater SAC above.

III. Impact on Commuting and Foraging

See assessment of operational impacts on IEF1 River Boyne and River Blackwater SAC above.

IEF 22 – Bats

I. Impact on Bat Roosting – Trees

As there is no pathway of effect, no significant impact on bat roosting (trees) is predicted during the operational phase.

II. Impact on Bat Roosting – Buildings

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As there is no pathway of effect, no significant impact on bat roosting (buildings) is predicted during the operational phase.

III. Impact on Bat Foraging and Commuting

a. Habitat Fragmentation

The proposed bridge crossing is 22.55 m wide and is located approximately 12 m above median river levels of the River Boyne. When combined with the clear span design of the proposed bridge crossing, this is considered to provide sufficient height above water and sufficient cross-sectional area to avoid any significant obstacle to bats commuting and foraging in the River Boyne corridor.

However, there will be lengths of the proposed road development that may act as a barrier to foraging and commuting bats within the terrestrial biodiversity study area. This has the potential to have a long-term impact on local bat population dynamics, affecting both local foraging behaviour and competition for resources and larger scale movements associated with dispersal and/or with breeding behaviour and genetic exchange between populations. It is predicated that to the north and south of the Boyne bridge, east-west foraging and commuting will be impacted however north/south commuting and foraging may well be enhanced compared to baseline.

The extent of the effect is the entire extent of the Proposed Scheme. The magnitude of effect on commuting and foraging bats is likely to be the loss of habitat connectivity for Leisler's bat, Nathusius' pipistrelle, common pipistrelle and soprano pipistrelle. The duration of the effect is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and irreversible effect on this IEF, which in the absence of mitigation measures, would be considered to be **significant adverse at a Local (Higher) geographic scale**.

b. Collision Risk

The operation of the Proposed Scheme will result in fragmentation of the localised landscape and the subsequent restriction in foraging activities for bat species. Through reducing the current foraging range, the Proposed Scheme may result in bats entering the mainline and environs of the Proposed Scheme, thus increasing the potential for collision and mortality. However, bats are nocturnal and their peak activity (i.e. dusk to dawn) will coincide with lower traffic levels associated with this time period. Although it is not possible to quantify the magnitude of the effect, collision risk is not considered to result in long-term effects on the local bat assemblage.

The extent of the effect is the entire extent of the Proposed Scheme; however primarily focussed on the habitats to the north and south of the proposed Boyne River crossing given that the crossing is permeable with respect to bats by virtue of its proposed design. The magnitude of effect is commuting and foraging bats, namely, Leisler's bat, Nathusius' pipistrelle, common pipistrelle and soprano pipistrelle. The duration of the effect is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered **not significant**.

c. Disturbance – Lighting

There is potential for artificial lighting associated with the operation of the Proposed Scheme to spill onto adjacent habitats. Lighting is proposed at the N2 south and north roundabouts, the N51 roundabout and Slane village (see chapter 4: Scheme Description). Considering the levels of bat activity recorded within the Zol of the Proposed Scheme, light spill onto adjacent suitable habitats could potentially cause disturbance and act as a barrier to connectivity to foraging and commuting bat species.

The extent of the effect is the entire extent of the Proposed Scheme. The magnitude of the effect is commuting and foraging bats, namely, Leisler's bat, Nathusius' pipistrelle, common pipistrelle and soprano pipistrelle. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered to be **significant adverse at a Local (Higher) geographic scale**.

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IEF 23 – Birds (Wintering & Breeding)

I. Habitat Fragmentation

As outlined above, the proposed bridge crossing is approximately 12 m above median river levels. When combined with the clear span design of the proposed bridge crossing, this is predicted to provide sufficient height above water and sufficient cross-sectional area to avoid any significant obstacle to wintering and breeding bird populations in the River Boyne corridor.

Furthermore, given the presence of the existing Slane bridge and the location of the proposed bridge crossing approx. 600 m east of this, it is not anticipated that the proposed bridge will contribute to any new significant impact on wintering or breeding bird populations. It is considered that the local wintering or breeding bird populations are already habituated to the presence of man-made structures at this location and throughout the River Boyne (e.g. Newgrange Monument bridge crossing, Mary McAleese Boyne Valley Bridge, Drogheda Bridge crossings and Boyne Viaduct etc).

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the fragmentation of habitat used by wintering and breeding birds of a range of species. The duration of the effect is considered to be long-term. The timing of the operational activities will influence the magnitude (i.e. vegetation maintenance between October and March, inclusive, are more likely to disturb wintering birds and vegetation maintenance between March and August, inclusive, are more likely to disturb breeding birds). This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

II. Habitat Degradation: Surface Water Pollution

During the operational phase of the Proposed Scheme there will be drainage outfalls to all river/stream catchments crossed by the Proposed Scheme. As such, the potential exists for discharge from the Proposed Scheme to affect water quality (potentially over the long term) in receiving watercourses and consequently impact upon aquatic/wetland habitats within the River Boyne. This could result in effects upon the prey availability and ultimately the extent and distribution of wintering and breeding bird species which it supports.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

The extent of the effect is the River Boyne water body, the Mattock (Mooretown) Stream and the Boyne Navigation Canal. The magnitude of the effect is considered to be the degradation of these watercourses and their habitats. The duration of the effect is considered to be long-term. The timing of the operational activities will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered to be **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

III. Disturbance – Noise & Vibration

Disturbance can temporarily impact local population abundances and trends by causing changes in the behaviour/movements of breeding or wintering birds within the River Boyne corridor. Given the presence and location of the current bridge at Slane, high traffic volumes and walking trails along the River Boyne which have a high public presence, it is not anticipated that increased noise and vibration during the operational phase will have a negative effect on these SCI species.

Furthermore, given this current use of the environment surrounding the River Boyne, wintering and breeding bird populations in the area are considered to already be habituated to the presence of noise and vibration within the environment (i.e. anthropogenic factors).

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of wintering and breeding birds of a range of species. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational activities will influence the magnitude (i.e. operational activities between October and March, inclusive, are more likely to disturb wintering birds and between March and August, inclusive, are more likely to disturb breeding birds). This effect is considered to be reversible over the long term. Due to the

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magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IV. Disturbance – Lighting

In relation to artificial lighting associated with the bridge, light spill has the potential to deter or alter the behaviour/movements of wintering and breeding birds within the immediate River Boyne corridor. BTO (2014) have suggested that artificial lighting can be associated with several aspects of changes to bird behaviour and could disrupt the long-term circadian rhythm that dictates the onset of the breeding season.

However, light spill along the River Boyne corridor and any subsequent effects on bird species shall not occur, owing to the fact that the proposed bridge crossing is to remain unlit during the operational phase. The impact and effect is **not significant**.

V. Disturbance – Human Presence

Disturbance can temporarily impact local population abundances and trends by causing changes in the behaviour/movements of breeding or wintering birds within the immediate River Boyne corridor. Given the presence and location of the current bridge at Slane, high traffic volumes and walking trails along the River Boyne which have a high public presence, it is not anticipated that increased human presence during the operational phase will have a negative effect on these bird species.

Furthermore, given this current use of the environment surrounding the River Boyne, wintering and breeding bird populations in the area are considered to already be habituated to the presence of noise and vibration within the environment (i.e. anthropogenic factors).

The extent of the effect is the entire works area within the Proposed Scheme. The magnitude of the effect is considered to be the disturbance of wintering and breeding birds of a range of species. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational activities will influence the magnitude (i.e. operational activities between October and March, inclusive, are more likely to disturb wintering birds and between March and August, inclusive, are more likely to disturb breeding birds). This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible adverse effect on this IEF, which is considered **not significant**.

IEF 24 – Badger

I. Habitat Fragmentation

During operation, the presence of the Proposed Scheme (where it severs existing Badger territories) has the potential to act as a permanent barrier to badger movements by either acting as a physical barrier or through the presence of traffic deterring badgers from crossing.

As mentioned above, the proposed River Boyne crossing will be elevated above ground level, providing an accessible link beneath the proposed bridge which will serve to maintain habitat connectivity within each affected Badger territory.

There will be lengths of the proposed road development that may act as a barrier to badger movements within the study area. This has the potential to have a long-term impact on local badger population dynamics, affecting both local foraging behaviour and competition for resources and larger scale movements associated with dispersal and/or with breeding behaviour and genetic exchange between populations.

The extent of the effect is the entire extent of the Proposed Scheme. The magnitude of the effect is considered to be the fragmentation of habitat used by local badger populations. The duration of the effect is considered to be long-term. The timing of the operational activities will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered to be **significant adverse at a County geographic scale**.

II. Collision Risk

The introduction of the Proposed Scheme into the local landscape will permanently increase the risk of road traffic collisions with badger within the Terrestrial Biodiversity Study Area. This risk will be higher in areas where the Proposed Scheme is in close proximity to Badger setts, severing badger territories or passing through areas where high levels of badger activity were recorded.

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Although it is not possible to quantify the magnitude of this effect, the increased collision risk would likely result in a long-term suppression of the local badger population. This could negatively affect the conservation status of the local badger population over time.

The extent of the effect is the entire extent of the Proposed Scheme. The magnitude of effect is local badger populations. The duration of the effect is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered to be **significant adverse at a Local (Higher) geographic scale**.

III. Disturbance – Lighting

There is potential for artificial lighting to spill into established badger breeding and foraging areas adjacent to the Proposed Scheme.

Along the Proposed Scheme, lighting is only proposed along all approaches to the N2 South Roundabout, N51 Roundabout and N2 North Roundabout. The majority of the Proposed Scheme will remain unlit, minimising the potential for light spill to affect Badger, such as the proposed bridge crossing. However, light spill adjacent to the Proposed Scheme during hours of darkness could potentially lead to disturbance of this nocturnal species through illuminating previously undisturbed areas of breeding and foraging habitat.

The extent of the effect are the locations proposed for lighting. The magnitude of the effect is the operational lifetime of the Proposed Scheme. The duration of the effect extends to the entire operational timeframe and is considered to be long-term. The timing of the operational works will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the operational phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which in the absence of mitigation measures, would be considered to be **significant adverse at a Local (Higher) geographic scale**.

IEF 25 – Amphibians

During the operational phase of the Proposed Scheme a drainage outfall is proposed within the Boyne Navigation Canal. As such, the potential exists for discharge from the Proposed Scheme to affect water quality (potentially over the long term) and consequently impact upon aquatic habitats utilised by amphibians within it.

As detailed under **Section 15.4.2.1**, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible. It is also noted that attenuation ponds are known to provide valuable habitat to a wide variety of amphibian species, and will result in a positive effect by providing a network of ponds throughout the scheme (i.e. six attenuation ponds are proposed).

The extent of the effect is the Boyne Navigation Canal. The magnitude of the effect is considered to be the degradation of these watercourses and their habitats. The duration of the effect is considered to be long-term. The timing of the operational activities will not influence the magnitude. This effect is considered to be reversible over the long term. Due to the magnitude, this effect during the construction phase of the Proposed Scheme is predicted to have a long-term and reversible effect on this IEF, which would be considered to be **not significant**. Measures have been incorporated into **Section 15.5** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

15.4.3 Cumulative Impact

A cumulative impact assessment (CIA) has been undertaken to consider potential for cumulative impact of the Proposed Scheme with other approved development. The detailed methodology for the CIA is described in **Chapter 25 – Cumulative Effects**. With respect to the IEFs relating to the European sites (SACs and SPAs), the cumulative assessment of these IEFs has been completed as part of the in-combination assessment of the Proposed Scheme as set out in the NIS which is documented under separate cover.

The projects listed in **Appendix 25.2** have been assessed. Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved, to identify projects with potential for cumulative effects on

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terrestrial ecological receptors during the construction and operational/maintenance phases of the Proposed Scheme.

Projects were screened-in to the terrestrial biodiversity CIA where: they involve discharges to the River Boyne or the Mattock (Mooretown) Stream; where habitat lost is the same habitat type lost as part of the Proposed Scheme and which were identified as Important Ecological Features (IEFs); and where projects could result in negative effects on fauna such as bats, badger, otter and birds. In relation to discharges and water quality issues specifically for aquatic ecological receptors, the potential for cumulative effects are described for **Biodiversity: Aquatic Ecology** in **Chapter 16, Section 16.4.3 (Cumulative Impact)**. A total of four projects were therefore screened-in to the Biodiversity: Terrestrial Ecology CIA, as set out in **Table 15-24**.

Table 15-24: Projects Screened-in for Potential Cumulative Effects on Biodiversity: Terrestrial Ecology

Project Code	Project Location	Project Type	Potential for Cumulative Effect
PR 2	Millhouse, Slane, Co. Meath	Restaurant	Possible – IEFs considered include Treelines; Bats; (commuting and foraging)
PR 3	Ledwidge Hall, Drogheda Road, Slane, Co. Meath (<i>now constructed</i>)	Residential Development	Possible – IEFs considered include: Habitats; Bats (commuting and foraging); Badger (breeding, commuting and foraging); Birds (breeding and wintering)
PR 27	Veldonstown Road, Kentstown, Co. Meath	Residential Development	Possible – IEFs considered include: Treelines and hedgerows; Bats (commuting and foraging)
PR 50	Bryanstown, Drogheda, Co. Meath	Residential Development	Possible – IEFs considered include: Treelines and hedgerows; Bats (commuting and foraging); Birds (breeding)

Of the four projects screened-in, all present the potential for cumulative effects to occur. However, upon examination of the planning data, it is considered that cumulative effects are not likely or significant.

PR 2 seeks permission for a single storey extension to the rear and side of the Pavilion restaurant, a protected structure surrounded by high quality mature woodland habitat. As detailed in the bat survey report submitted, high levels of bat activity were recorded within the woodland surrounding the mill race, which is considered locally significant for foraging and commuting bats. Should any trees require removal as part of the extension, the bat survey report details several measures to ensure there is no reduction in available bat foraging habitat (e.g. tree retention where possible), in addition to other measures in order to reduce disturbance impacts (e.g. specific lighting requirements). It is therefore considered highly unlikely in conjunction with the small scale of this development, that cumulative effects associated with commuting and foraging bats will occur. The potential for cumulative effects on terrestrial receptors as a result of in-combination effects associated with the extension of the Pavilion restaurant and the Proposed Scheme construction phase is therefore, not significant.

PR 3 seeks permission for the demolition of a derelict dwelling and surrounding derelict outbuildings and the development of 36 residential houses. A full suite of site surveys are to be carried out as part of the environmental reporting required (not yet available) prior to the commencement of works, as well as the submission of a CEMP. Planning conditions also require a licensed bat specialist to survey any trees/building earmarked for removal. As planning conditions are listed and an ecological report will be prepared, the potential for cumulative effects on terrestrial receptors as a result of in-combination effects associated with the residential development and the Proposed Scheme construction phase is therefore, not significant.

PR 27 seeks permission for the construction of 53 two storey residential houses, together with all associated and ancillary works on an overall site area of 1.7 ha. Treelines and hedgerows lost as a result of the development, includes an estimated combined length of up to 530 m, which may also negatively affect commuting and foraging bats. Mitigation measures have been outlined so as to avoid and/or minimise these negative effects, these include: the preservation and retention of trees and hedgerows, lighting controls and the planting of native trees and shrubs. It is therefore considered highly unlikely where these measures are adopted, that cumulative effects associated with hedgerows and treelines and their commuting and foraging potential for bats will occur. The potential for cumulative effects on terrestrial receptors as a result of in-combination effects associated with the residential development and the Proposed Scheme construction phase is therefore, not significant.

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PR 50 seeks permission for the construction of 250 dwellings and associated facilities on an overall site area of 5.8 ha. The proposed development will result in the removal of 948 m of the existing 1387 m of hedgerows/treelines (439 m of which will be managed and retained). This will result in localised negative effects on commuting and foraging habitat available to bats and nesting habitat available to birds. Mitigation measures have been outlined so as to avoid and/or minimise these negative effects, these include: timing of works to avoid the bird nesting season, replanting of trees (300 m) and hedgerows (690 m), and the lighting controls for bats. It is therefore considered highly unlikely where these measures are adopted, that cumulative effects associated with hedgerows and treelines, their commuting and foraging potential for bats and their breeding and foraging potential for birds will occur. The potential for cumulative effects on terrestrial receptors as a result of in-combination effects associated with the residential development and the Proposed Scheme construction phase is therefore, not significant.

15.5 Mitigation Measures

15.5.1 Measures Incorporated into the Design

The following measures have been incorporated and integrated into the Proposed Scheme design as described in **Chapter 4** and **Chapter 5**. The key measures are:

- A clear-span weathering steel plate girder bridge will be used in order to eliminate the requirement for any instream works and to eliminate direct ecological impact on the freshwater environment of the River Boyne and River Blackwater SAC.
- Working platforms will consist of reno-mattresses containing washed clean rockfill in order to prevent the introduction of any additional run-off in the form of sediment, particularly working platforms 3 and 4 located within the floodplain of the River Boyne and River Blackwater SAC (for details, refer to **Chapter 5 – Description of the Construction Strategy**, and **Appendix 5.1 – Working Platform Design**).
- To facilitate the construction of bridge piers within the floodplain of the River Boyne and River Blackwater SAC, cofferdams will be constructed which will comprise of interlocking sheet piles. Cofferdams will provide an almost watertight environment, preventing any uncontrolled run-off during construction from reaching the River Boyne. Rainwater will enter the cofferdam at times and some groundwater may also ingress from the base of the cofferdam, both of which will be pumped out using a bowser and taken off-site to a suitably licensed facility for treatment/disposal.
- Seeding and planting, and geotextiles and mats will be employed during the construction phase on all exposed earthworks slopes to limit the amount of sediment being initially suspended in rainfall or groundwater run-off.
- Settlement ponds, check-dams, silt barriers and specific stockpile locations will be implemented during the construction phase to reduce sediment that has become suspended despite the erosion controls.
- To minimise sediment run-off from stockpiles their locations have been carefully considered. Stockpiles will be:
 - Located away from drains, water bodies and flood zones;
 - Seeded or provided with other surface protection appropriate to the length of time the stockpile is in place;
 - Provided with earth bunds or ditches on adjacent higher ground or slopes to prevent surface run-off reaching the stockpile;
 - Provided with silt fences around the toe of a stockpile to trap any sediment in run-off from the stockpile; and
 - Topsoil stockpiles will be tamped down and grass-seeded and protected by a surrounding silt fence.
- Where groundwater is encountered, slope drains and external de-watering will be utilised.
- The drainage design for the Proposed Scheme includes for both measures to mitigate any interference with the existing hydrology and to convey run-off from the proposed road scheme to proposed treatment and attenuation facilities prior to outfall to existing watercourse.

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- To assist with the proposed treatment of surface water run-off and to provide measures to reduce peak water flows to outfalls, six attenuation ponds together with vortex grit separators and petrol interceptors will be provided.
- Control measures will be implemented to reduce the generation of airborne material (i.e. dust), including:
 - Use of water spraying of exposed earthworks and site haul roads during dry weather;
 - Sediment tracked on plant will be controlled at exit from the site (i.e. wheel washes);
 - Spraying of earthworks during dry weather conditions will include for the provision of silt traps;
 - Self-contained wheel washes will be provided at site compounds as well as at site exit points;
 - Erosion control measures will be implemented as early as possible to protect exposed side slopes (i.e. erosion control mats and hydroseeding);
 - Site vehicle speeds will be limited to minimise the dust re-suspension;
 - Hard surface roads will be regularly swept; and
 - Dust generation will be monitored as part of the management of construction activities. Dust monitoring locations will be established on site. A baseline dust measurement will be made in advance of works and an ongoing system of monitoring and remedial action will be implemented during the construction.
- Measures will be implemented to maintain a clean and uncluttered site, including:
 - Daily inspections of the site will be carried out and a program of site tidying will be prepared;
 - Debris netting will be attached to scaffolding to prevent debris materials and equipment from falling from a height as both a debris matter and for health and safety reasons;
 - Food waste will be strictly controlled to prevent litter and/or attraction of vermin;
 - Wheel wash facilities will be provided for vehicles exiting the construction site. Wheel wash run off will be stored in an onsite storage tank and will be disposed of by permitted waste haulage company at a permitted or licensed facility;
 - There will be regular inspection and sweeping of public roads; and
 - Covering will be applied to loaded lorries and skips, if necessary.
- A Resource and Waste Management Plan (RWMP) will be prepared by the contractor in advance of construction to ensure that the materials and waste arising during the construction and demolition phase of the Proposed Scheme will be managed and disposed of in a way that ensures compliance with the provisions of the Waste Management Act, 1996, as amended and associated Regulations as amended. The preparation of the RWMP will follow the EPA guidance (Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects, EPA 2021).
- Earthworks will be phased into Phase 1 (Drainage) and Phase 2 (Earthworks):
 - Phase 1 will include the construction and seeding of all permanent pre-earthworks ditches (PEDs) and attenuation ponds and the construction of all culverts as this will allow sufficient time for vegetation establishment on the base and sides of the ponds prior to the commencement of the main earthworks will allow the permanent attenuation ponds to be utilised as temporary settlement ponds for the treatment of construction run-off; and
 - Phase 2 will include earthworks of the proposed mainline and side roads which have been divided into zones based on existing and proposed topography, and existing and proposed road layouts. The construction of the zones will be carried out in the sequence set out below to reduce the risk of sediment-laden run-off entering the River Boyne and River Blackwater SAC/SPA directly or indirectly.
- Machines will be checked regularly for evidence of hydrocarbon leaks. While machines are parked-up on the working platform, a contaminant containment tray will be placed beneath them. These trays will be removed from the working platform at the end of each day and any contaminants they have collected disposed of accordingly.

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- An early warning system will be implemented to monitor rainfall and upstream river levels in real-time. Once set thresholds are exceeded all materials, plant and equipment will be removed from the platform.

15.5.2 Pre-construction Works

15.5.2.1 Appointment of Environmental Team

Prior to commencement of any works related to the Proposed Scheme, the following key environmental personnel shall be appointed (see **Chapter 5 – Description of the Construction Phase**):

- **Contractor’s Environmental Clerk of Works (ECoW):** to ensure that the mitigation measures outlined in this document and the outline Environmental Operating Plan (EOP) (including any updates to these documents following consent) are implemented in full and to supervise works with respect to sensitive habitats and/or species (including the control/eradication of invasive species).
- **Contractor’s Project Ecologist(s):** to supervise all pre-construction ecological surveying, implementation and overseeing of ecological mitigation measures and ensuring that activities on site are conducted in accordance with the planning permission as they pertain to ecological matters and specifically any works that could have an effect on the River Boyne and River Blackwater SAC and/or SPA, their qualifying interests (QI) and special conservation interests (SCI) respectively.
- **Client Environmental Representative (CER):** MCC shall appoint the CER before the commencement of works. The CER shall act as the ‘MCC representative’ and liaise directly with the contractor’s environmental staff, review reporting deliverables, and supervise site activities as required.
- **Client Project Ecologist:** MCC shall appoint the Client Project Ecologist before the commencement of works. to supervise all pre-construction ecological surveying, implementation and overseeing of ecological mitigation measures and ensuring that activities on site are conducted in accordance with the planning permission as they pertain to ecological matters and specifically any works that could have an effect on the River Boyne and River Blackwater SAC and/or SPA, their qualifying interests (QI) and special conservation interests (SCI) respectively.

Note: When mitigation measures extend beyond the construction phase (undertaken by Contractor), and thereafter require ‘monitoring’ during the operational phase, Meath County Council will be responsible for the commission of a suitably qualified person(s) to monitor their effectiveness.

15.5.2.2 Environmental Operating Plan

An EOP for the Proposed Scheme has been prepared and is available in **EIAR Volume 4, Appendix 5.6**. The EOP contains all the mitigation measures as detailed in the EIAR and this NIS. Following grant of planning consent, the appointed Contractor will be responsible and take ownership of the EOP.

Prior to the commencement of construction phase, the Contractor will update the EOP to take account of any conditions attached to planning consent and to include the level of mitigation detail required by that consent prior to commencement of construction for the identified mitigation measures. The updated EOP will be subject to the Client’s approval prior to the commencement of construction.

During the construction phase, the Contractor and Client will undertake a monthly review of the implementation of the mitigation measures identified within the approved EOP, taking inputs and feedback from the appointed Environmental Team. Following the completion of the monthly reviews, the Contractor will be responsible for any further updates of the EOP necessary to address any issues identified during the review process. Such updates will be approved by the Client.

The Contractor will be responsible for the implementation in full of the approved EOP throughout the construction phase in accordance with NRA/TII guidelines (refer to **Chapter 5**). The EOP will set out the Contractor’s approach to managing environmental issues associated with construction of the Proposed Scheme and provide a documented account to the implementation of the environmental commitments set out in the EIAR and NIS and measures stipulated in the planning conditions.

15.5.2.3 Pre-construction Surveys

Prior to the commencement of construction works, the scope, programme and phasing of pre-construction habitat and species surveys will be defined by the ECoW in consultation with MCC and the appointed

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Contractor. Given the duration of the construction works, the pre-construction habitat and species surveys will be appropriately phased to take account of the planned work and seasonal constraints. This is to ensure that an up-to-date baseline is maintained to inform construction stage activities. Some of these surveys will be completed as part of Enabling Works set out in **Chapter 4**. Others will be completed as the phases of construction are progressed along the route.

Based on the existing evidence base, pre-construction surveys will be required with respect to the following IEFs:

- **Bats:** The status with respect to bat roosting of any buildings to be demolished and trees to be felled to enable construction will be confirmed through the completion of update surveys at the appropriate time of year (typically, May to August) by the ECoW (and appropriately qualified personnel, if required). The surveys will be completed with reference to the following guidance (or relevant guidance at time of survey):
 - NPWS (2022) Bat Mitigation Guidelines for Ireland (v.2); and
 - Bat Conservation Trust (BCT) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Ed).

The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS; based on current baseline no such derogation licensing is necessary.

- **Badgers:** Update badger surveys will be completed for all setts (active or inactive) within the CPO boundary and within 200 m of the CPO boundary. The level of survey will be sufficient to confirm and classify whether setts are active (or not) and to confirm if they are main, annexe, subsidiary or minor setts, depending on their use and importance to the badger group at that time. The survey will be completed with reference to Guidelines for the Treatment of Badgers prior to the construction of National Road Schemes (NRA, 2006a). The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS; based on current baseline a derogation licence will be required;
- **Otters:** Evidence of otter was recorded along the River Boyne, the Boyne Canal and the Mattock (Mooretown) stream. No breeding or resting sites were recorded within the Zol of the Proposed Scheme. However, prior to any works being carried out, a pre-construction otter survey will be carried out to ensure that otter has not taken up residence or established any new territories within or in close vicinity to the footprint of the Proposed Scheme. The survey will be completed within the footprint of the proposed scheme and 200 m up and downstream of this footprint. The survey will confirm the presence/absence of otter holts, resting sites (couches) and any other signs of otter activity within the survey area. The survey will be completed with reference to Guidelines for the Treatment of Otter Prior to the Construction of National Road Schemes (NRA, 2006b) or whatever guidelines are pertinent at that stage in the event that those guidelines are updated and superseded. The survey will be completed during optimal seasonal/weather conditions and will be completed by competent, experienced otter surveyor(s). The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS; based on current baseline no such derogation licensing is necessary;
- **Invasive Species:** The presence of Japanese Knotweed *Reynoutria japonica* and Himalayan Balsam *Impatiens glandulifera* have been identified in the vicinity of the Proposed Scheme. The survey will be undertaken within the lands made available and all stands of Schedule 3 species will be taped off to prevent accidental spread. An Invasive Alien Species Avoidance and Management Plan will also be prepared by an ecologist/invasive species specialist and shall build on the baseline data presented in this statement, including the findings of the pre-construction survey. The Plan will include any measures to manage, control or eradicate any identified Schedule 3 species prior to and during the construction phase of the Proposed Scheme. The plan will also identify any licensing or approvals necessary from NPWS, EPA or other to enable the implementation of the plan.
- **Kingfisher Survey:** Evidence of kingfisher was recorded along the River Boyne. One nesting site was recorded upstream of the Proposed Scheme, however no adverse effects were predicted. Although no suitable nesting habitat was noted within the footprint of the Proposed Scheme, the precautionary principle has been applied and prior to any works being carried out, a pre-construction kingfisher survey will be carried out to ensure that kingfisher has not established any new territories within or in close vicinity to the footprint of the Proposed Scheme. The survey will be completed within the footprint of the

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proposed scheme and 200 m up and downstream of this footprint. The survey will confirm the presence/absence of kingfisher nesting sites and any other signs of kingfisher activity within the survey area. The survey will be completed during optimal seasonal/weather conditions and will be completed by competent, experienced ornithologist(s). The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS; based on current baseline no such derogation licensing is necessary

Based on the findings of the pre-construction surveys, mitigation for each of these species set out in the EIAR will be reviewed and, if necessary, augmented accordingly by the ECoW; particularly with respect to whether any derogation licensing or other approvals are triggered by the findings of the pre-construction surveys. Any adjustment to the mitigation measures will be agreed with the Client in advance of them being implemented.

The pre-construction surveys will be supplemented by further inspection of any identified otter holt/resting site, kingfisher nest or IAPs stand by the ECoW (as deemed necessary by them) immediately prior to site clearance.

15.5.2.4 Pre-Construction Ground Investigation and Archaeological Testing

The following mitigation measures will be implemented prior to and during the completion of the pre-construction ground investigations and archaeological testing.

15.5.2.4.1 Within the Proposed LMA

The following mitigation will be implemented prior to the construction phase during ground investigation works. Ground investigation works will consist of a mix of percussion drilling and rotary coring.

- An ECoW and a suitably qualified and experienced Project Ecologist will be appointed by MCC to supervise the proposed GI works and to ensure compliance with relevant legislation, planning conditions and to ensure the implementation (in whole or part) of the mitigation measures in the planning approval as may be granted as relevant to the pre-construction GI works;
- No ground investigation testing will be permitted outside the lands made available for the Proposed Scheme;
- Works at sensitive locations will be carried out under the strict supervision of and to the approval of an ECoW appointed to supervise the works;
- Ground investigation will not be undertaken within 10 m of the River Boyne;
- Soil/subsoil removed for GI works will be piled near to the trench and a minimum 10 m setback from watercourses. Each excavation will be backfilled as soon as possible to avoid prolonged exposure and to ensure sediment does not erode or wash away;
- Each location for excavation will be assessed for potential pathways for run-off to the River Boyne and measures to prevent uncontrolled run-off will be implemented (see below):
 - Silt barrier fencing will be used around excavations to prevent uncontrolled run-off.
 - Each excavation will be backfilled as soon as possible to avoid prolonged exposure and to ensure sediment does not erode or wash away.
 - Works will be carried out under the strict supervision of and to the approval of an ECoW appointed to supervise the works.
 - When working within the flood plain of the river Boyne, weather conditions will be closely monitored and works will not be undertaken when periods of heavy rainfall are predicted, which could result in flooding of the area.
 - Plant will not be left within the flood plain overnight and will be mobilised daily as required from locations outside the flood plain.
 - Considering the nature of the existing soft ground within the flood plain area, access into the site will be a carefully controlled process. Access will be from the existing Boyne Canal towpath and bog mats will be placed over the existing ground in advance of machinery, such as borehole rigs

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and excavators entering into the area. At each location of an excavation, a silt barrier fence will be erected around the site to prevent any run-off reaching the river as the excavation takes place and excavated materials temporarily stored within the area protected by the silt fence. Each excavation will be backfilled as soon as practicable and vegetated topsoil reinstated on completion.

- All hydrocarbons will be stored and all refuelling will take place outside the floodplain of the SAC.
- Existing field access points/routes will be used to avoid disturbance/removal of hedgerows, trees and scrub. In the event that such field access points/routes are not available, the removal of hedgerows, trees and scrub will be minimised to only the extent required for access. Any vegetation removal will be completed outside the breeding bird season (March to August, inclusive) unless the Project Ecologist has confirmed that no breeding birds, their active nest or dependent young are present immediately prior to the works commencing. Any trees needing to be removed will be assessed for bat roosting by the Project Ecologist prior to them being removed and any derogation requirements identified and implemented according to any derogation licence obtained.

With respect to the pre-construction archaeology investigations, the TII Project Archaeologist will liaise with the Project Ecologist for the Proposed Scheme, in advance of any disturbance, with regard to the mitigation strategy for terrestrial ecology. The archaeology testing strategy will have regard for the Guidelines for the testing and mitigation of the wetland archaeological heritage for national road schemes (NRA, 2005).

15.5.2.4.2 Within the River Boyne Floodplain

In addition to the measures detailed above (**Section 15.5.2.4.1**), the following measures will also be implemented when undertaking ground investigation works within the River Boyne floodplain:

- Works within the River Boyne floodplain will be carried out under the strict supervision of and to the approval of an ECoW appointed to supervise the works;
- Access to the River Boyne floodplain will be from the existing Boyne Canal towpath and ground protective bog mats will be put in place prior to the commencement of any works within the River Boyne floodplain;
- When working within the flood plain of the River Boyne, weather conditions will be closely monitored and works will not be undertaken when periods of heavy rainfall are predicted, which could result in flooding of the area;
- Plant will not be left within the flood plain overnight and will be mobilised daily as required from locations outside the flood plain;
- Core samples in the River Boyne floodplain shall only be taken during the bridge foundation construction period and at the same locations as the bridge piers to avoid further ground disturbance; and
- Disturbed areas of soil will be returned to its former use.

With respect to the archaeological testing, in addition the following mitigation measures will be implemented:

- Archaeological testing of areas of archaeological potential located within the floodplain of the River Boyne (ACH05 & ACH08) will minimise ground disturbance. To achieve this, testing within the floodplain will be carried out (ground conditions allowing) after the advanced testing programme, within the footprint of the coffer dams and attenuation ponds, if necessary during the site preparation works phase and before construction takes place;
- Core sampling within the River Boyne floodplain will take place during the bridge foundation construction period and at the same locations as the bridge piers to avoid further ground disturbance;
- No test-trenches will be placed within 10 m of the River Boyne or any other waterways crossed by the Proposed Scheme;
- Where trenches are in proximity to watercourses, the material taken out of test trenches shall be placed, as far as possible, on the landward side of the trench.

The TII Project Archaeologist for the proposed scheme will liaise with the Project Ecologist appointed by MCC to supervise the GI and archaeological works with regard to these measures.

15.5.3 Construction Phase

15.5.3.1 Mitigation by Avoidance

The Proposed Scheme has been designed to avoid ecologically sensitive areas and had been constraint led from the initial feasibility stage and route selection process. The Proposed Scheme design has followed the principles outlined below to eliminate the potential for ecological impacts where possible, and to minimise such effects where total elimination is not possible.

The Proposed Scheme has been designed to:

- Avoid any direct, indirect or residual adverse effects on the integrity of European sites or other designated sites for nature conservation;
- To avoid/minimise effects on habitats that correspond to those that are listed on Annex I of the EU Habitats Directive outside of European and nationally designated sites; and
- Minimise direct or indirect effects on any habitats or species that were classified as being of National, County or Local Importance (Higher Value) in the design of the Proposed Scheme.

Through careful planning and design, direct or indirect effects on receptors of international, national and county importance have been avoided at the designs stage. In addition, the Proposed Scheme layout minimises the potential for effects on receptors. A detailed construction methodology has been developed in consultation with the relevant experts to avoid, minimise and mitigate impacts and effects, particularly with respect to the River Boyne and surface water quality impacts; refer to **Chapter 5**. The construction of the Proposed Scheme will be undertaken in accordance with this construction methodology.

15.5.3.2 Overarching Measures

Prior to the commencement of construction or enabling works, the Environment Team (as set out above) will be appointed and the post-consent updated EOP (as set out above) will be prepared by the Contractor and approved by the Client. The approved EOP will then be updated and reviewed as detailed above.

In advance of works commencing on site, the Contractor will be responsible for providing all personnel involved with construction on site (either at the outset or brought onboard during the construction phase) with an on-site induction by the Contractor's ECoW and Contractor's Project Ecologist. The scope and content of the on-site induction will be agreed with the Environment Team prior to the commencement of construction. The content will include a briefing on ecological constraints/sensitivities and all the applicable ecological mitigation measures relevant to the construction phase. For the avoidance of doubt, it will be the responsibility of the Contractor to ensure that any new personnel who are employed during the construction work also receive the on-site induction prior to commencing work. Prior to the commencement of construction works, the scope, programme and phasing of pre-construction surveys will be defined by the Contractor's ECoW and Project Ecologist and agreed by the Environment Team.

Given the duration of the construction works, the habitat and species surveys to be completed prior to construction works will be appropriately phased mindful of the planned work and seasonal constraints. This is to ensure that an up-to-date baseline is maintained to inform decision making including with respect to the need for derogation licensing in the event of baseline changes between this assessment and commencement of construction. Some of these surveys will be completed as part of enabling works set out in **Chapter 5**; others will be completed as the phases of construction are progressed along the route.

The scope of updated surveys will take full account of the mitigation (precautionary or otherwise) set out in this chapter. Given the mobile nature of the species concerned (e.g. kingfishers, bats, otters and badgers), the need for derogation licensing for any particular phase of works will be informed by the findings of the update surveys. The level of surveying will be sufficient to inform any derogation licensing which may be required. The need for derogation licensing will be determined by the Contractor's ECoW in consultation with the Contractor's Project Ecologist and agreed with the Environment Team. The acquisition of derogation licences will be the responsibility of the Contractor (unless otherwise agreed with the Environment Team) and may be completed, in part, during the enabling works set out in **Chapter 5**. The need for derogation licences will be kept under review by the Contractor's ECoW as the works progress based on the findings of the update surveys completed. The Contractor's ECoW will oversee the implementation of mitigation for management/control of IAPS, however, the 'sign off' of the works required to remove/eradicate IAS will be completed by a specialist contractor specialising in such eradication.

15.5.3.3 Measures to Protect European Sites (River Boyne and River Blackwater SAC/SPA)

The mitigation measures that are specifically required to ensure that the Proposed Scheme will not result in a likely significant effect on the European Sites within its Zol (River Boyne and River Blackwater SAC, River Boyne and River Blackwater SPA, Boyne Estuary SPA, North-west Irish Sea SPA) are presented in **Section 7 of the NIS**. Following consideration and assessment of the Proposed Scheme on the identified relevant European sites, mitigation measures were developed and will be implemented to address the following potential impacts that were identified:

- **Habitat Loss:** Mitigation measures to avoid loss of QI habitats within the River Boyne and River Blackwater SAC (see **Section 15.5.3.3.1**) during the construction of the Proposed Scheme;
- **Habitat degradation – hydrogeology:** Mitigation measures to avoid habitat degradation in the River Boyne and River Blackwater SAC as a result of potential hydrogeological impacts during the construction of the Proposed Scheme;
- **Habitat degradation – hydrology:** Mitigation measures to protect water quality in receiving watercourses during construction;
- **Habitat degradation – air quality:** Mitigation measures to control dust emissions during construction to prevent impacts on vegetation in the River Boyne and River Blackwater SAC;
- **Habitat degradation – non-native invasive plant species:** Mitigation measures to avoid the introduction or spread of non-native plant invasive species to European sites during construction or operation;
- **Disturbance/Displacement:** Mitigation measures to avoid/reduce the disturbance/displacement effects of construction works on SCI Kingfisher and wintering birds of the Boyne Estuary SPA using ex-situ sites within the Zol of the Proposed Scheme;
- **Barrier effect:** Mitigation measures to avoid the Proposed Scheme restricting otter movement within the River Boyne and Mattock (Mooretown) Stream; and
- **Mortality risk:** Mitigation measures to avoid mortality of the QI species of the River Boyne and River Blackwater SAC. These include measures to ensure that construction materials are not introduced into the River Boyne and to remove the risk of otter being killed/injured due to collisions with road traffic.

15.5.3.3.1 Habitat loss

Habitat loss (topsoil stripping, excavation and filling) within the floodplain of the River Boyne and River Blackwater SAC will occur in order to accommodate Working Platforms 1, 2, 3 and 4 (reno mattresses), which will further accommodate the construction of cofferdams.

In order to minimise impacts of temporary habitat loss within the River Boyne and River Blackwater SAC (i.e. GS4 Wet grassland and FS1 Reed and large sedge swamp), the following measures shall be completed:

- Vegetation clearance will be programmed to avoid the bird nesting season (1 March to the 31 August, inclusive);
- Vegetation/surface stripping will be removed concurrent with the working platform construction in order to minimise erosion, run-off or dust from exposed unvegetated surfaces; and
- Surface vegetation will be carefully removed in turves (i.e. intact block of vegetation and soil) for later re-instatement or re-location elsewhere within the SAC.

In order to remediate temporary habitat loss within the River Boyne and River Blackwater SAC, the following measures shall be completed:

- Monitoring of weather forecasting reports will be undertaken in the lead up to removal of the temporary reno-mattress work platforms such that the works including the subsequent reinstatement will be carried out during an extended settled weather period in which time platforms can be installed when there is low risk of over-bank river flows on the Boyne. This will occur in the spring/summer months when grasses can re-establish within that growing season for protection over the ensuing winter;

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- Any ground damage and habitat loss within the SAC will be remediated to ensure that any bare soil is stabilised, and habitats returned to their former function. This habitat will be reinstated through reseeded with appropriate wet/damp native meadow grasses following the completion of the construction work;
- Remediation will start as soon as construction works have ceased;
- Remediation will involve the development of a Habitat Restoration and Monitoring plan prepared by a qualified person(s) appointed by MCC in consultation with the NPWS. The plan shall be implemented. The plan shall detail the following:
 - the re-instatement of stripped surface curves, where possible
 - the use of stabilising materials to allow for natural regeneration through reseeded. Ground remediations will not include the use of artificial fertilisers
 - a monitoring schedule to assess site stabilisation and revegetation progress such as seed germination, recruitment of native species and determining/correcting any problems (i.e. erosion)
 - habitat monitoring will be completed on a monthly basis and once vegetation is established and site stabilisation is achieved, monitoring will continue on a quarterly basis for three years thereafter
 - progress reports shall be completed on a monthly basis and once vegetation is established and site stabilisation is achieved, progress reports shall be completed on a quarterly basis for three years;
 - after the three-year period (of vegetation establishment) a final report shall be prepared which will summarise the following:
 - the name, title, and company of all persons involved in restoration monitoring and report preparation;
 - maps or aerials showing restoration areas and photo documentation
 - an explanation of the methods and restoration techniques used to perform the work
 - a description of the vegetation communities, the size of the restoration area restored, and any maintenance activities completed.
 - the wet meadow habitat will be retained under the control of MCC and it will be managed for the sole benefit of biodiversity in order to complement the existing biodiversity features of the SAC (and SPA).

15.5.3.4 Pollution Control Measures

The construction methodology (**Chapter 5**) set out a significant suite of measures to control pollution from sediments, hydrocarbons, cement and other chemicals used during the construction phase.

Erosion Control Measures

Erosion controls will be carried out on all exposed earthworks slopes to limit the amount of sediment being initially suspended in rainfall or groundwater run-off. The following erosion controls will be used on the Proposed Scheme:

- Geotextiles and mats: all earthworks side slopes will be provided with a geotextile fabric, mesh or mat to protect against immediate erosion.
- Seeding and planting: after geotextiles/mats are laid, hydraulic seeding (where a binder is mixed with the seed) will be widely used on slopes to ensure establishment of a vegetative cover.

Additional measures to control sediment are discussed in greater detail in **Chapter 5, Section 5.3**.

Sediment Control Measures

Sediment controls will be implemented to reduce whatever sediment has become suspended despite the erosion controls. The following sediment controls will be used on the Proposed Scheme:

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- **Sediment ponds:** A combination of temporary settlement areas and use of the permanent attenuation pond for the control and treatment of run-off during construction is proposed to be implemented for the construction of the Proposed Scheme (see **Chapter 5, Section 5.13**);
- **Check-dams:** Check-dams will only be used where water volumes and sediment load are low, for example, in pre-earthworks ditches that only cater for overland flow or groundwater (see **Chapter 5, Section 5.13**);
- **Silt barriers:** Silt barriers will be typically used around temporary stockpile areas, site perimeters and across ditches with low flows. The silt barriers used during construction of the Proposed Scheme will comprise a geotextile filter fabric installed in the path of sheet flow run-off to filter out heavy sediments. Posts support the filter fabric and the fabric itself will be buried in the ground to ensure sediment is trapped behind it and doesn't breach the fence; and
- **Stockpile locations:** Stockpiles will be located remote from existing watercourses, drains and flood zones and provided with measures to control sediment run-off. Topsoil stockpiles will be tamped down and grass-seeded and protected by a surrounding silt fence. Stockpiles consisting of rock (to be processed and reused during the construction) will be protected from uncontrolled run-off by a perimeter protection consisting of either bunding and/or silt fences. Additional measures to control sediment are discussed in greater detail in **Chapter 5, Section 5.3**.

Groundwater Protection Measures

The mitigation measures to protect groundwater quality during construction of the Proposed Scheme are detailed in **Chapter 18 – Land, Soils, Geology and Hydrogeology, Section 18.5**.

Dust Control Measures

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive receptors and whether the wind can carry the dust to these locations. The implementation of a Dust Minimisation Plan during construction of the Proposed Scheme shall include the following standard measures:

- Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only;
- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential);
- All vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads;
- Wheel washes, will be self-contained systems that do not require discharge of the wastewater to water bodies;
- Public roads outside the site shall be regularly inspected for cleanliness and cleaned as necessary;
- The focus of the control procedures relating to emissions to air during earth moving and construction will be to reduce the generation of airborne material;
- Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind; and
- Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

Additional measures to mitigate dust emissions are discussed in greater detail in **Chapter 10, Section 10.5**.

15.5.3.5 Environmental Emergency Response/Contingency Plan

Prior to commencing works, the contractor shall prepare an Environmental Emergency Response Plan/Contingency Plan, as per the mitigation outlined in **Chapter 17 (Section 17.5.1)**, **Chapter 18 (Section 18.5.1)** and **Chapter 5 (Section 5.11)**. The plan will detail the procedures to be undertaken in the event of

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the release of any sediment into a watercourse, a serious spillage of chemical, fuel or hazardous wastes (e.g. concrete), or other such risks that could lead to a pollution incident, including flood risks. The plan will be updated regularly and shall include a Spill Response with the following as a minimum:

- Instruction to stop work;
- Instruction to contain the spill;
- Details of spill clean-up material location;
- Name and contact details of responsible staff; and
- Measures particular to the location and the activity.

This Response Plan shall be displayed at several locations along the proposed road and at all sensitive locations.

15.5.3.6 Derogation Licensing

Based on the current baseline, no derogation licensing is required for any species, however a license will be required for badgers due to sett closures. Given the mobile nature of the species concerned (e.g. bats and otters), the need for derogation licencing for any particular phase of works will need to be informed by the findings of the up-to-date pre-construction surveys. The level of surveying will need to be sufficient to inform any derogation licensing which may be required. The need for derogation licensing will be determined by the ECoW in conjunction with the Project Ecologist. The acquisition of derogation licences may be completed, in part, during the enabling works set out in **Chapter 5**. The need for derogation licences will be kept under review by the ECoW as the works progress based on the findings of the pre-construction surveys completed.

15.5.3.7 Measures to Protect Otter

Pre-construction surveys for otter are dealt with above. Otters are evidenced as using watercourses throughout the study area, particularly along the River Boyne and its proximal complex of wetland habitats which support suitable feeding and commuting habitat. Otters do not limit their movements to watercourse and can enter hinterlands to search for prey species, such as frogs and newts where available. An exclusion zone and set-back of 10 m from the riverbank is included in the design proposals to accommodate free movement of otter along these riparian habitats. No work will be permitted within this exclusion zone. Temporary otter fencing will be used to enclose all construction working areas 200 m to the south of the Canal, between the Canal and the River Boyne, 200 m to the north of the River Boyne and 200 m upstream and downstream of the Mattock (Mooretown) Stream. The fencing will be maintained throughout the construction period to provide a robust barrier to avoid movement of otters into and through the construction working areas.

The following are precautionary measures in the event that an otter holt is identified during pre-construction surveys:

No construction personnel or machinery will be used within 150 m of otter holts unless subject to the provisions of a derogation licence. The location of otter holts will be confirmed during the pre-construction survey. During the pre-construction survey, otter holts located within the CPO boundary or within 150 m of this boundary will be clearly identified to all personnel working in the vicinity of the holt. Temporary boundary tape fencing (or similar) will be used at the discretion of the ECoW to identify such holts subject to such measures themselves not impacting on the use of the holt. Neither blasting nor pile-driving will be undertaken within 150 m of active holts during the breeding season, unless subject to provisions of a derogation licence.

In the event that holts are to be closed (wholly or partially), this will be completed in accordance with the necessary derogation licence which will be obtained from the NPWS and with reference to the Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA, 2006b). The need for licence to be determined by the ECoW. The need for additional mitigation for derogation licensing purposes will be reviewed and determined by the ECoW and relayed, as necessary to the appointed Environmental Team. It is assumed that all active holts at the time of construction and within the CPO boundary will need to be closed in accordance with a derogation licence. Currently, no active holts are located within the CPO boundary and no derogation licence is required.

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Where required, evacuation and destruction of holts setts will be carried out under the supervision of an appropriately qualified ecologist under licence from the NPWS. In the event that derogation licence(s) are required, these could require the loss of holt(s) to be compensated through the construction of artificial holt(s). The locations of such holts will be determined by the ECoW in liaison with the Contractor and the requirement of any derogation licence. The above provisions regarding otter fencing will apply to such artificial setts. Currently, no active holts are located within the CPO boundary and no derogation licence is required.

Otters may potentially be affected during the construction phase of the development during foraging activities (based on existing survey evidence). The potential for fatalities from road traffic accidents on site or becoming trapped within open works could pose a direct impact. Mitigation measures to protect from the accidental killing/injury of otter during the construction phase are detailed as follows and will be implemented:

- Maintain the 10 m set back zone from both banks of the River Boyne to ensure the free movement and safe passage of otter along the watercourse during construction phase (i.e. habitat will not be bisected);
- Pre-construction surveys will be undertaken to ensure that otter has not taken up residence or established any new territories (i.e. since baseline surveys were undertaken, see **Section 15.3**) within or in close vicinity to the footprint of the Proposed Scheme;
- Mammal resistant fencing will be incorporated at the earliest possible stage during road construction, preferably during erection of the permanent fence line with gaps left at locations specified for culverts. These gaps shall be subsequently closed after culverts have been constructed;
- With reference to the NRA Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA, 2006b), mammal-resistant fencing will be incorporated along the boundary of construction compounds, working areas and reno-mattresses to ensure no otters can access or become trapped within open works. Mammal-resistant fencing will adhere to the relevant specifications as set out by the NRA (2006b); see **Figure 15.11**:
 - Fences will be constructed and erected in accordance with Irish Standard (I.S.) 435:2005 (updated version available: I.S. 435-1:2017);
 - Where appropriate, fences will stretch at least 25 m and preferably to 50 m or more either side of watercourse crossings;
 - Any length of fencing (including branches and spurs) will start with a post and end with a post. An additional post will be provided at fence junctions and at fence corners;
 - Posts (2100 x 150 x 75) will be erected 2100 mm above ground level, 700 mm below ground and 2100 mm apart;
 - Rails (4200 x 100 x 44) will be spaced out between 200 and 250 mm from ground level (i.e. the two rails closest to ground level will be spaced 200 mm apart, with the remaining two furthest from ground level spaced 250 mm apart);
 - Chain-link mesh will be 1800 mm wide, consisting of 60 mm mesh made up of a diameter of 2.25/3.15 mm. Mesh will be plastic coated galvanised mild steel wire and erected with a 200 mm section below ground level and recovered with excavated material; and
 - Post holes falling in rock shall be excavated to a depth of 700 mm or with an Engineer's approval to a depth of 500 mm. Where a reduced depth of hole is accepted by the Engineer, the top of the post will be suitably cut and treated with preservative.
- Once installed, the mammal-resistant fencing will be inspected by the Contractor's Project Ecologist to ensure that fencing is fit for purpose (i.e. adequate for the exclusion of otter).

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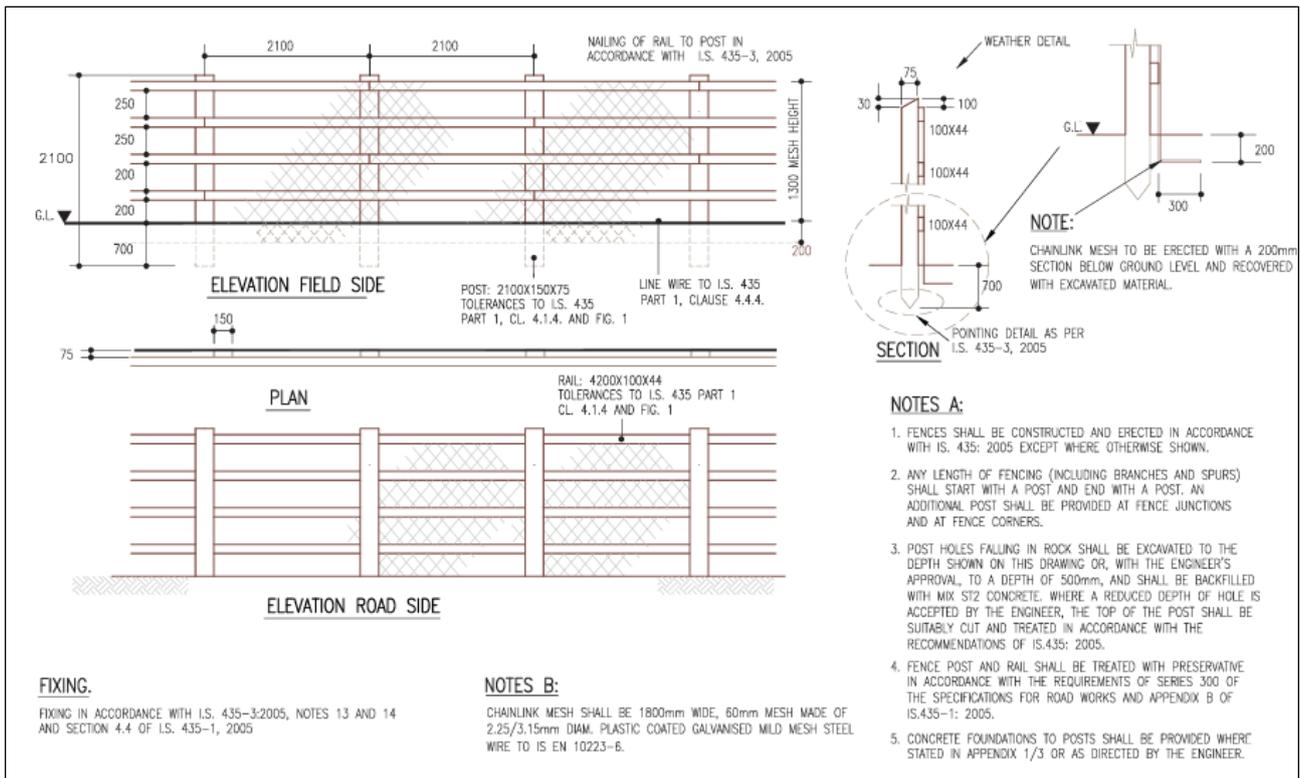


Figure 15.11: Specification for Mammal-Resistant Fencing (NRA, 2006b)

15.5.3.8 Measures to Protect Badger

The following measures will be implemented during the construction phase to protect badger:

- Pre-construction surveys for badgers are dealt with above (**Section 15.5.2.3**). Pre-construction surveys will be undertaken to identify any newly established badger setts (mindful of the mobile nature of the species concerned) and on the following badger setts identified within the baseline environment to determine whether setts are active or not prior to the commencement of construction activities:
 - The Mill House Badger Group (BS07, BS08, BS09, BS28, BS49, BS50)
 - The Cullen/Fennor Badger Group (BS14 and BS48)
 - The Cashel Badger Group (BS04, BS13, BS18, BS21 and BS22)
 - Not considered to be part of any badger group (BS16)
- Where setts are identified to be active and are to be closed (wholly or partially), a derogation license will be obtained from the NPWS by the Contractor's Project Ecologist and setts located within the footprint of the Proposed Scheme (i.e. loss of breeding/resting site) will be evacuated in line with Guidelines for the Treatment of Badgers prior to the construction of National Road Schemes (NRA, 2006a). The need for a licence shall be determined by the Project Ecologist.
- Setts within the footprint of the Proposed Scheme will be clearly marked with temporary fencing and signage with construction activities prohibited until such a time that setts have been evacuated.
- Evacuation and destruction of setts will be undertaken under the supervision of a qualified and licensed ecologist, and will be undertaken during the period 1 July to 30 November. The derogation licence(s) will be complied with in the carrying out of the works in question.
- An artificial sett will be constructed west of attenuation pond 3 and the proposed bridge crossing [Ch. 1350-1550] and alongside the boundary of woodland habitat located just outside the LMA, in order to provide a suitable alternative sett to replace the setts that require evacuation as part of the Mill House Badger Group. The artificial sett will be constructed in line with NRA guidance (NRA, 2006a).

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- The need for additional mitigation for derogation licensing purposes to be reviewed and determined by the ECoW and relayed, as necessary to the appointed Environmental Team.

Where badger setts will not be lost but could be subject to disturbance (BS01, BS02, BS03, BS06, BS10, BS11, BS12, BS15, BS17, BS24, BS25, BS27, BS29, BS30, BS42- BS47), the following measures will be implemented:

- No construction personnel or machinery will be used within 30 m of badger setts (extended to 50 m for active setts during the breeding season, December – June inclusive) unless those works are subject to a derogation licence.
- During the pre-construction survey, setts located within 50 m of the Proposed Scheme will be clearly marked with temporary fencing and the extent of bounds prohibited for vehicles clearly marked by fencing and signage. Such marker fencing will be sufficiently durable and robust to cover the period of construction.
- Neither blasting nor pile-driving will be undertaken within 150 m of active setts during the breeding season.
- Temporary badger fencing (doubling up with otter fencing as necessary) in line with the NRA (2006a) will be used to enclose all construction working areas. The fencing must be maintained throughout the construction period to provide a robust barrier to avoid movement of badger into and through the construction working areas. Badger fencing will be checked by the ECoW to ensure compliance with specifications.

15.5.3.9 Measures to Protect Bats

Pre-construction surveys for bats are dealt with above.

No demolition of buildings or the removal of any trees with bat roost potential (potential to be determined by the ECoW based on findings of pre-construction surveys) will be undertaken unless the ECoW has confirmed that the buildings or trees do not support roosting bats (confirmed via survey) or unless the demolition/removal is completed under the provisions of a derogation licence. Following the pre-construction survey, bat roosts located within the CPO boundary will be clearly identified to all personnel working in the vicinity of the roost. Temporary boundary tape fencing (or similar) will be used at the discretion of the ECoW to identify such roosts subject to such measures themselves not impacting on the use of the roost.

In the event that roosts are removed or significantly disturbed (wholly or partially), this will be completed in accordance with the necessary derogation licence to be obtained from NPWS and with reference to the Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes and the Guidelines for the Treatment of Bats during the Construction of National Road Schemes (NRA, 2006c) and Bat Mitigation Guidelines for Ireland (NPWS, 2022). The need for licence will be determined by the Contractor's Project Ecologist. The need for additional mitigation for derogation licensing purposes to be reviewed and determined by the ECoW and relayed, as necessary to the appointed Environmental Team. It is assumed that all roosts at the time of construction and within the CPO boundary will need to be closed in accordance with a derogation licence. Currently, no roosts are located within the CPO boundary and no derogation licence necessary.

By way of biodiversity enhancement, ten no. bat boxes per 1 km of new carriageway will be erected in pairs at suitable locations along the route of the Proposed Scheme. Suitable locations will be determined by the ECoW based on suitable locations available to erect them, proximity to artificial lighting and connectivity to foraging and commuting habitats. In the absence of suitable structures (e.g. retained trees, bridge structures, buildings) to erect the boxes, they will be pole-mounted in suitable locations or mounted in suitable locations on built structures. The bat boxes will be Schwegler-type (woodcrete) type boxes (or similar) and a range of different type boxes (e.g. 2f, 1FF, 3FF, 1FW, 1FE and 1FTH) will be used. These will be provided in addition to any mitigation required with respect to any derogation requirements which may be identified as a result of pre-commencement surveys.

See also **Section 15.5.3.13** and **Chapter 12** for planting mitigation.

15.5.3.10 Measures to Protect Birds

All vegetation removal, demolition of buildings or works on other pre-existing structures e.g. bridges will be completed outside the breeding bird season (March to August, inclusive) unless no breeding birds are

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confirmed present by the ECoW immediately prior to the vegetation being removed or unless required for the implementation of derogated measures with respect to otters or badgers. Breeding birds will be present in most habitats at the appropriate time of year including habitats which are of negligible ecological value in their own right (e.g. modern agricultural buildings).

By way of enhancement, six no. bird boxes per 1 km of new carriageway will be erected at suitable locations along the route of the Proposed Scheme. Suitable locations will be determined by the ECoW based on locations available to erect, proximity to operational sources of disturbance and connectivity to foraging and commuting habitats. In the absence of suitable structures (e.g. retained trees, bridge structures, buildings) to erect the boxes, they will be pole-mounted in suitable locations. The bird boxes will be Schwegler-type (wood Crete) type boxes (or similar) and a range of different type boxes (e.g. 1B, 2H, 17C) will be used.

15.5.3.11 Measures to Protect Amphibians

The removal of any aquatic vegetation suitable to support breeding smooth newt or common frog will avoid the breeding period (typically, 1 March to 31 July) unless otherwise agreed by the Environment Team as advised by the Contractor's ECoW and Project Ecologist. By way of enhancement, artificial hibernacula/refugia will be constructed (ideally using materials such as logs generated during the vegetation clearance) in the vicinity of the attenuation basins to be created as part of the Proposed Scheme. At least one hibernacula/refugia per attenuation basin will be provided. The design of the hibernacula/refugia will follow standard guidance such as the Amphibian Habitat Management Handbook (Baker, J. et al., 2011).

15.5.3.12 Artificial Lighting

Where artificial lighting is required during hours of darkness (i.e. critical bridge lifts) the following measures are proposed to control the effects of artificial lighting:

- During daytime working, all lights shall be turned off prior to darkness periods. This will eliminate any risk to sensitive receptors as a result of lighting used during daytime hours;
- During periods of night working, directional lighting (i.e. lighting which only shines on roads and not adjacent habitats) shall be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only; and
- Where lighting may spill (although highly unlikely with application of the above measures) onto nearby habitats, light spill shall not exceed 1 lux. To put this in perspective, 0.2 lux level is equivalent to moonlight (BCI, 2010).

15.5.3.13 Landscape Planting

Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). Severed linear features such as hedgerows and treelines shall be reconnected to the specific landscape measures and ecological landscape measures using semi-mature trees underplanted with hedgerow species to compensate for the loss of treelines and hedgerows.

Furthermore, the woodland copse (WD1) located at Ch. 1450 which is considered 'recent woodland' (i.e. it is neither ancient nor possible ancient woodland based on a review of historic mapping), will be replanted to the west of the Proposed Scheme, between Ch. 1400 and Ch. 1500. Soil excavated as part of the removal of the woodland copse will be stored for later replanting and re-seeding of certified native (broadleaf tree species) seed mix as part of detailed landscape design. This shall be overseen by the Project Ecologist and the appointed landscape designer.

The indicative locations of such planting are outlined in the Landscape and Visual chapter (refer to **Chapter 12, Section 12.5**). Native species shall be used as they support more insect life than non-native varieties.

Planting of trees and shrubs will preferably be completed prior to completion of the Proposed Scheme. This would ensure that bats commuting in the area would have prior knowledge of newly planted landscape features as well as ensuring the newly planted hedgerows/treelines are well established prior to completion of the Proposed Scheme. Habitat replacement and landscaping will mitigate for scheme effects and also provide an opportunity to support biodiversity in the area. Woodland mixes, individual tree planting and grass and wildflower mixes will also be planted.

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Attenuation pond planting is proposed to include mixed species broadleaved woodland, mix species hedgerows, aquatic planting, and wet meadow seeding along pond edges, all of which will aid in the integration of these features into the wider natural landscape to bring ecological benefit to the area.

The Contractor's Project Ecologist shall liaise with the landscaping specialist regarding the landscaping mitigation measures. Refer also to the Specific Landscape Mitigation measures as set out in **Chapter 12, Section 12.5**.

15.5.3.14 Non-IEF Mitigation

15.5.3.14.1 Non-native Invasive Species

Relevant Guidance

Three non-native species, Japanese knotweed, Himalayan Balsam and Giant Hogweed were recorded in close proximity to the Proposed Scheme (i.e. outside the footprint but within the immediate surrounds). Where the above species are encountered and for the prevention of spread of these species, the following guidelines will be followed:

- The Management of Invasive Alien Plant Species on National Roads – Standard, (TII 2020);
- The Management of Invasive Alien Plant Species on National Roads – Technical, Guidance, (TII 2020);
- Guidelines for the Management of Waste from National Road Construction Project (NRA, 2014),
- The Knotweed Code of Practice. Managing Japanese Knotweed on Development sites. UK Environment Agency Environment Agency (2013),
- Inland Fisheries Ireland (IFI) guidance regarding aquatic invasive species control (<http://www.fisheriesireland.ie/Research/invasive-species>),
- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (NRA, 2010), and
- Invasive Species Ireland guidance (<http://invasivespeciesireland.com>).

Invasive Species Management Plan

Prior to commencing construction, a further invasive species survey will be undertaken within the lands made available and the Contractor will be required to prepare an Invasive Species Management Plan, outlining measures to control invasive species. This will be prepared by a licensed professional and will be implemented during all phases of the Proposed Scheme. This plan will be prepared in accordance with TII's Management of Invasive Alien Plant Species on National Roads (TII, 2020) and shall include the following as a minimum:

- General measures to avoid spreading invasive species during construction or soil movement;
- Treatment plan to include in-situ chemical treatment and/or excavation and disposal at a suitably licensed facility;
- Biosecurity measures to ensure invasive species are not spread between sites or along the Route Corridor, including measures to limit any potential introduction or spread of Crayfish plague (which has been noted in the Boyne previously); and
- Good machinery hygiene including steam cleaning machinery and disinfection of water pumps etc.

15.5.4 Operational Phase

15.5.4.1 Surface Water Drainage

Surface Water Drainage Design

During the operational phase and as part of the Proposed Scheme, it is proposed to control and attenuate water draining the Proposed Scheme. The drainage design will facilitate attenuation/retention and pollution

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control of drainage water before it is released to receiving aquatic receptors such as streams and watercourses, coastal/intertidal areas and groundwater within the Zol.

Measures to attenuate and treat carriageway run-off have been incorporated into the drainage design of the Proposed Scheme in accordance with TII standards. The Proposed Scheme involves the construction of a new surface water drainage system including new attenuation outfalls to existing watercourses or existing surface water drainage networks.

The proposed alignment crosses a number of existing watercourses, agricultural drains and the River Boyne. Where the Proposed Scheme crosses these they are proposed to be accommodated in culverts. The culverts, surface water drainage network, and run-off interceptors have been designed so as to minimise the potential impact on the receiving watercourses.

Attenuation measures in the form of attenuation/retention ponds and grassed surfaced water channels which are considered to be a Sustainable Drainage System (SuDS) will be used to reduce the rate of run-off discharged to the receiving watercourses. While the purpose of the attenuation/retention ponds and grassed surfaced water channels is to reduce the risk of flooding in the receiving watercourse/networks, they will also improve water quality by facilitating settlement and deposition of sediment and contaminants carried through the pipe network from the carriageway.

The proposed surface water drainage system also includes measures to reduce the concentrations of pollutants that are routinely found in road run-off, and which pose a risk of short-term acute impacts (from dissolved/soluble pollutants) and/or long-term chronic impacts (from sediment bound pollutants on receiving waters). As part of the proposed surface water drainage design, a Class I by-pass petrol interceptor will be installed upstream of where the drainage collection system discharges into the retention/attenuation ponds.

The hydrocarbon interceptors incorporated within the design of the proposed surface water drainage network are primarily aimed at removing hydrocarbons from run-off. However, to ensure that the concentrations of other types of pollutants, (e.g. heavy metals and sediment) are controlled, filter drains, and vortex grit removal chambers will also contribute to the treatment of surface water run-off from the Proposed Scheme.

Surface water drainage measures for the scheme and their maintenance are described in the relevant chapters of this EIAR namely, **Chapter 4 – Description of the Proposed Scheme**, **Chapter 5 – Description of the Construction Phase** and **Chapter 17 – Water**.

Culvert Design

In addition to the culvert drainage design proposed as part of the Proposed Scheme, the following enhancement measures will be implemented to improve the three culverts located along the Mattock (Mooretown) Stream for the free passage of otter, which may be used by commuting otter:

- Culvert construction will take cognisance of the ‘Guidelines for the Treatment of Otters during the Construction of National Road Schemes. National Roads Authority’ (NRA, 2006b);
- As otters will be disinclined to use water-filled culverts without dry pathways, culverts will provide ledges;
- There will be adequate access to any ledges provided from the riverbank next to the ledge;
- The ledges and mammal access paths should be linked (i.e. fencing) and landscaped appropriately so that otters will use them. Ramps will be provided to ensure accessibility to ledges;
- Ledges shall be at least 500 mm wide, constructed at least 150 mm above the 1 in 5 year flood event, and allow at least 600 mm headroom;
- Care will be taken to ensure planting/landscaping does not obscure entrances to wildlife ledges; and
- During operation, quarterly monitoring will be carried out over a period of at least one year to determine the success of the measures employed in an effort to ensure protection of otter.

Surface Water Drainage Inspection and Maintenance

During the operational phase of the Proposed Scheme, regular inspection will be required in addition to the establishment of a maintenance regime to ensure that the surface drainage network is functioning effectively. These include:

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- All maintenance site personnel will be made aware of the importance of the surrounding environment of the Proposed Scheme (i.e. European sites and connectivity with the freshwater environment) and the requirement to avoid pollution of all types;
- Grassed surface water channels will be inspected monthly for the duration of the establishment period (i.e. will vary but generally 3 months) and will be inspected after heavy rainfall events;
- Filter drains will be inspected monthly;
- Attenuation/retention ponds will require an inspection every six months;
- Vortex grit removal chambers and petrol/oil interceptors will require monthly inspections for the duration of the first 3 months and then every 3-6 months thereafter;
- Maintenance tasks in relation to the aforementioned surface water drainage to be completed during inspections include (where relevant), but are not limited to:
 - Weed control;
 - Sediment removal/monitoring (i.e. depth) and the unclogging or replacement of filter materials;
 - Removal of litter and other debris;
 - Repair of any damage associated with drainage infrastructures;
 - Vegetation inspection and care (i.e. retention ponds and grassed surface water channels);
 - Cleaning and integrity check.

15.5.4.2 Pollution Control Measures

Due to the incorporation of the inherent design measures that have been proposed for this scheme (see **Chapter 4 – Description of the Proposed Scheme**), it is unlikely that the operation of the Proposed Scheme will have any significant adverse impacts on the surrounding hydrological environment. There will be no direct discharges to surface waters during this phase (refer to **Appendix 5.6 – Environmental Operating Plan**). In addition to the surface water design measures, the following control measures are also proposed and have due regard to pollution prevention control during the operational phase. These include:

Sediment and Contaminant Control

- The level of suspended solids in any discharges to watercourses as a consequence of the operational phase shall not exceed 25 mg/l⁸ nor result in the deposition of silts on gravels or any element of aquatic flora and fauna (as per IFI (2016) guidelines);
- Existing and proposed surface water drainage and discharge points shall be mapped on a site plan including the location of existing and proposed measures such as of petrol/oil interceptors, vortex grit separators, sediment traps, attenuation ponds with treatment forebays, grassed channels and filter drains where appropriate;
- Attenuation ponds will be lined and the surface water drainage system sealed to prevent any infiltration of contaminated groundwater into surface water network; and
- To minimise sediment build up, a regular inspection and maintenance regime will be put in place to remove any litter, debris and sediment from drainage features which will be removed to a suitable licensed facility.

Environmental Incidents and Accidents

In the case of environmental incidents or accidents occurring during the operational phase of the Proposed Scheme, the following measures will help to prevent/contain the contamination of the potential source-vector pathways for negative impacts to proximal European sites:

⁸ The standard is expressed as an average concentration over a period of 12 months and does not apply to suspended solids with harmful chemical properties. <http://www.irishstatutebook.ie/eli/1988/si/293/made/en/print>

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- All surface water run-off from rainwater that has passed over impermeable surfaces will be collected within the surface water drainage network, which will pass through petrol/hydrocarbon interceptors prior to the discharge into attenuation/retention ponds before it is released into the River Boyne;
- In the case of a catastrophic accidental spill or similar incident, each attenuation/retention pond will be fitted with an emergency shut-down facility so that the spillage will be contained and prevent contaminants entering the downstream watercourse;
- As detailed in **Section 15.7.2**, the drainage system will be maintained by Meath County Council.

Oil and Chemical Spillages

Should an oil or chemical spill occur during the operational phase of the Proposed Scheme, the following measures will help to prevent/contain the potential source of the spill to prevent pathways for negative impacts to the relevant IEFs:

- The type, size and location of the spill will be identified;
- If possible, stop the source of the spill and control the area of the spill;
- If the oil spill is small in nature it will be treated with an appropriate spill kit to reduce the effect of the spillage (i.e. a suitable absorbent material will be used to absorb/remove the spill);
- In the event of a significant oil spill occurring, an appropriate licenced contractor will be employed to determine the extent of the area affected and to implement an appropriate clean-up operation in line with suitable standards;
- Material will be removed and disposed of in accordance with the Resource and Waste Management Plan;
- In the event of a chemical spill, stop the source of the spill and control the area;
- If the spill is hazardous or toxic in nature, warn all in the vicinity and use an appropriate clean up kit, or if a large spill occurs employ a licenced contractor to carry out remediation works; and
- A programme of mitigation will be put into place to address the spill and any relevant bodies will be notified.

Aquatic Ecology

A suite of measures for the protection of watercourses including the design of culverts for the Mattock (Mooretown) Stream, channel realignment measures and measures for the operation of attenuation ponds and wetlands, are provided in **Chapter 16**.

15.5.4.3 Measures to Protect Mammals

Mammal-resistant or mammal proof fencing will be required to guide badgers and otter under the proposed bridge crossing and to prevent animals crossing the new roadway. The specification for mammal-resistant fencing (badger and otter respectively) is given in the NRA guidelines (NRA 2006a and 2006b).

Otter fencing will be recessed and tied into the following chainage (Ch.) points of the Proposed Scheme:

- To guide otter under the proposed bridge crossing, otter fencing will be installed at appropriate locations south of the River Boyne between Ch. 1250 and Ch. 1300, in addition to 150 m either side of this chainage point in parallel with the Boyne towpath, north of the Boyne Navigation Canal;
- To guide otter under the proposed bridge crossing, otter fencing will be installed at appropriate locations north of the River Boyne between Ch. 1450 and 1600;
- Where steel single field gates are proposed north and south of the River Boyne (i.e. maintenance track south of the River Boyne, access track 4 north of the River Boyne and the farm accommodation overbridge 3), gates will be fitted with chain link mesh (see NRA 2006b) to prevent otter using these points to gain access to the mainline. The location of gates on farm access roads requiring this modification will be determined at the detailed design stage;

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- Attenuation Ponds 2 and 3 will remain unfenced to allow the free movement of otter within this habitat;
- To guide otters to culverts along the Mattock (Mooretown) Stream, otter fencing will be installed at Ch. 3440, Ch. 3450 and Ch. 3460 and for a distance of 150 m either side of each culvert;
- Where there is an overlap of stock-proof fencing and mammal-resistant fencing at culvert locations, stock-proof fencing will be adjusted to allow for unimpeded access to the culvert. The fence will be adjusted so that the bottom rail and wire mesh are removed and chain-link is not fixed to the ground at the location of the underpass. This allows for the animals to see a break in the fence line and thus clear access to the underpass nearby. Detail of this will be seen in the NRA (2006a) Guidelines; and
- These crossings will be more readily used if the approach is softened through the use of appropriate planting.

Badger fencing will be recessed and tied into the following chainage points of the Proposed Scheme:

- To prevent badger from entering the proposed carriageway, badger fencing will be installed as a precautionary measure between Ch. 0 and Ch. 700;
- To guide badger under the proposed bridge crossing, badger fencing will be installed at appropriate locations north of the River Boyne between Ch. 1450 and Ch. 1600;
- These crossings will be more readily used if the approach is softened through the use of appropriate planting;
- Where steel single field gates are proposed north River Boyne (i.e. Access Track 4 north of the River Boyne and the farm Overbridge 3), gates will be fitted with chain link mesh (see NRA 2006b) to prevent badger using these points to gain access to the mainline. The location of gates on farm access roads requiring this modification will be determined at the detailed design stage;
- In general, gates entering into farm access roads will require concrete sills and mammal-resistant mesh attached to the gate to exclude badgers from accessing the proposed N2 mainline.

Mammal-resistant fencing will be incorporated at the earliest possible stage during operation.

15.5.4.4 Artificial Lighting

Lighting proposed for the Proposed Scheme has been identified in accordance with TII Publication DN-LHT-03038 Design of Road Lighting the National Road Network and is described in detail in **Chapter 4 – Description of the Proposed Scheme**.

During the operational phase, the risk of impacts (i.e. disturbance) associated with artificial lighting will be minimised through the adoption of the following requirements:

- Floodlight style lighting is prohibited;
- A suitably qualified ecologist will be present to oversee artificial lighting requirements and ensure the spread of lighting is minimised to at or near horizontal to ensure that only the task area is lit. This will avoid the use of high-level lighting columns such as over-hanging lanterns etc.;
- The proposed River Boyne bridge crossing will remain unlit during the operational phase; and
- The use of any ground lighting will be avoided (i.e. upward lighting) so as to avoid any up-lighting trees, buildings and vegetation.

15.5.4.5 Measures to Protect European Sites (River Boyne and River Blackwater SAC/SPA)

The mitigation measures that are specifically required to ensure that the Proposed Scheme will not result in a likely significant effect on the European Sites within its Zol (River Boyne and River Blackwater SAC, River Boyne and River Blackwater SPA, Boyne Estuary SPA, Boyne Coast and Estuary SAC and the North-west Irish Sea SPA) are presented in **Section 7 of the NIS**. Following consideration and assessment of the Proposed Scheme on the identified relevant European sites, mitigation measures were developed to address the following potential impacts that were identified:

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- **Habitat Loss:** Mitigation measures to remediate the temporary loss of QI habitats within the River Boyne and River Blackwater SAC during operation of the Proposed Scheme (see **Section 15.5.3.3.1**);
- **Habitat degradation – hydrogeology:** Mitigation measures to avoid habitat degradation in the River Boyne and River Blackwater SAC as a result of potential hydrogeological impacts during the operation of the Proposed Scheme;
- **Habitat degradation – hydrology:** Mitigation measures to protect water quality in receiving watercourses during operation; and
- **Habitat degradation – non-native invasive plant species:** Mitigation measures to avoid the introduction or spread of non-native plant invasive species to European sites during operation.

15.5.4.6 Non-IEF Mitigation – Invasive Alien Plant Species Management

Mitigation to follow measures already outlined for construction phase; see **Section 15.5.3**. In addition, measures to mitigate deer-vehicle collision risk are as follows:

- Deer signage will be erected between Ch. 1200 and Ch. 3450 as these sections of the Proposed Scheme are most likely to coincide with deer encounters (i.e. east/west movement along the Boyne Valley, and Littlewoods Forest north of the scheme);
- Sign W 153 for Deer or Wild Animals will be used in line with the Traffic Signs Manual (DTTS, 2019);
- Deer signs will be erected at distances in line with the Traffic Signs Manual (DTTS, 2019).

15.6 Residual Impacts

15.6.1 Construction Phase

The Proposed Scheme will potentially impact on 13 IEFs (note: several of these have been grouped) which are considered of conservation importance (seven at an international level, four at national level, and two at local level (higher value)). The impact is considered significant to these receptors mainly due to surface water pollution, habitat loss, species disturbance and habitat fragmentation. A list of likely residual impacts for the Proposed Scheme are listed as follows:

- Loss of approx. 99 m of FW1 Eroding upland river along the Mattock (Mooretown) Stream;
- Loss of approx. 2332 m of WL1 Hedgerow within the footprint of the proposed N2 route corridor;
- Loss of approx. 2192 m of WL2 Treeline within the footprint of the proposed N2 route corridor;
- Loss of approx. 0.12 ha of WD1 (Mixed) broadleaved woodland within the footprint of the proposed N2 route corridor;
- Loss of approx. 0.25 ha of WD2 Mixed broadleaved/conifer woodland within the footprint of the proposed N2 route corridor;
- Loss of approx. 0.15 ha of WS1 scrub within the footprint of the proposed N2 route corridor;
- Severance of foraging/commuting territory used by several bat species and badger groups;
- Loss of fifteen badger setts within the footprint of the Proposed Scheme;
 - Seven setts (BS07, BS08, BS09, BS13, BS49, BS50 BS51) of the Mill House badger group;
 - Two setts (BS14 and BS48) of the Cullen/Fennor Badger Group;
 - A single sett (BS18) of the Cashel Badger group; and
 - A single sett (BS16) which is not considered to be part of any badger group.
- Loss of five trees with 'Moderate' bat roosting potential.

Construction of the Proposed Scheme will result in the loss of semi-natural grassland and woodland habitats along the Proposed Scheme. This loss and residual impact will be significant at a local (higher) geographic scale. The implementation of landscape planting will compensate in part for the loss of these semi-natural habitats, over the medium to long term, as these landscaping features continue to establish and mature. The

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introduction of new habitat such as the attenuation ponds will also contribute to landscape connectivity and ecological value (see **Chapter 12 – Landscape and Visual**).

The implementation of mitigation measures will prevent any long-term significant impacts on the remaining species of conservation interest present in the study area, such as badgers, bats, otters and avifauna. All species of flora and fauna described in this report are expected to maintain a presence in the immediate area of the Proposed Scheme. The residual impact is considered to be not significant.

15.6.2 Operational Phase

Residual Impacts associated with the operation of the Proposed Scheme will be mitigated through the implementation of mitigation and design measures during the Proposed Scheme's construction phase. This will include the retention and attenuation of road drainage and the continued functioning of mammal mitigation measures (including mammal proof fencing). The robust and functioning surface water drainage system, that includes the regulation and retention of suspended solids and hydrocarbons draining hard surfaces will ensure no residual impacts will occur from the Proposed Scheme.

Additionally, during the operational phase, temporary habitat loss associated with the River Boyne and River Blackwater SAC will be remediated through the development of a Habitat Restoration and Monitoring plan prepared by a qualified person(s) in consultation with the NPWS. It will be managed for the sole benefit of biodiversity in order to complement the existing biodiversity features of the SAC and SPA and will ensure no residual impacts will occur from the Proposed Scheme.

15.7 Monitoring

Monitoring measures, and targets as appropriate have been recommended in relation to the Proposed Scheme for the construction and operational phases set out in the following sections.

15.7.1 Construction Phase

The construction works will be monitored at several levels to ensure that the environmental best practice prescribed in this document is fully adhered to and is effective. The following system will be put in place to ensure compliance:

- The contractor will assign an Environmental Clerk of Works with the responsibility for ensuring the mitigations prescribed in this document are adhered to. The Main Contractor's Environmental Clerk of Works will liaise directly with the Environmental Clerk of Works/Project Ecologist appointed by the Local Authority to oversee the ecological aspects of the work (see also **Appendix 5.6 Environmental Operating Plan** for details on roles and responsibilities). A checklist will be filled in on a weekly basis to show how the measures above have been complied with. Any environmental incidents or non-compliance issues will immediately be reported to the project team;
- The project manager will be continuously monitoring the works and will be fully briefed and aware of the environmental constraints and protection measures to be employed;
- The works will be periodically monitored during the construction phase by a suitably qualified ecologist. Following completion of the works, the ecologist will complete a final audit report to show how the works complied with the environmental provisions described in this chapter;
- Surface water monitoring procedures will be undertaken to ensure environmental protection and management requirements are being implemented. These measures are described in **Chapter 16**.

Monitoring of mammal-resistant fencing

In order to ensure the effectiveness of the exclusion of otter from open works during the construction phase, mammal-resistant fencing requires monitoring and maintenance at regular intervals. Naturally, a sturdy fence requires less maintenance, however digging by animals and damage from machinery may contribute to reduced fence robustness. If damage occurs, the main purpose of the fence is jeopardized. The following monitoring measures will include:

- Monthly inspection will be undertaken by the Contractor's Project Ecologist in order to identify and fix potential fencing problems (e.g. 'weak spots');

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- If potential problems are identified by personnel between monthly inspections, the Contractor's Project Ecologist will be notified;
- Any problems identified, such as damage or weak spots, will be rectified immediately.

15.7.2 Operational Phase

Meath County Council will be responsible, during operation, for the commission of a suitably experienced ecologist to monitor the effectiveness of:

- Surface water drainage and water quality mitigation;
- Mammal-resistant fencing; and
- Habitat remediation.

Surface water drainage and water quality

As part of this EIAR, as transposed to the Environmental Operating Plan (EOP) for the Proposed Scheme, surface water quality monitoring procedures are proposed during the construction works. These measures are described in **Chapter 16 – Biodiversity: Aquatic Ecology**.

In relation to surface water drainage features, during the operational phase of the Proposed Scheme, regular inspection will be required in addition to the establishment of a maintenance/monitoring regime to ensure that the surface drainage network is functioning effectively. These include:

- All maintenance site personnel will be made aware of the importance of the surrounding environment of the Proposed Scheme (i.e. European sites and connectivity with the freshwater environment) and the requirement to avoid pollution of all types;
- Grassed surface water channels will be inspected monthly for the duration of the establishment period (i.e. will vary but generally three months) and will be inspected after heavy rainfall events;
- Filter drains will be inspected monthly;
- Attenuation/retention ponds will require an inspection every six months;
- Vortex grit removal chambers and petrol/oil interceptors will require monthly inspections for the duration of the first three months and then every three to six months thereafter; and
- Maintenance tasks in relation to the aforementioned surface water drainage to be completed during inspections include (where relevant), but are not limited to:
 - Weed control;
 - Sediment removal/monitoring (i.e. depth) and the unclogging or replacement of filter materials;
 - Removal of litter and other debris;
 - Repair of any damage associated with drainage infrastructures;
 - Vegetation inspection and care (i.e. retention ponds and grassed surface water channels);
 - Cleaning and integrity check.

Mammal-resistant fencing

Meath County Council will be responsible, during operation, for the commission of a suitably experienced ecologist to monitor the effectiveness of surface water drainage mitigation.

The success of mitigation measures for mammals will be monitored for a period of 3 years after construction, and measures taken to enhance the use of underpasses where required. Quarterly monitoring will be carried out to determine the success of the measures employed. Thereafter, mammal fencing will be monitored once every three years for maintenance purposes. Should a pattern of roadkill be identified at any location, a suitably qualified ecologist will reassess territories, fence lines and crossing points and advise on replacement/further works to reduce the risk as far as practicable.

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Habitat remediation

The success of habitat remediation within the River Boyne and River Blackwater SAC will also be monitored, such as a monitoring schedule to assess site stabilisation and revegetation progress (refer also to the NIS, available under separate cover). Habitat monitoring will be completed on a monthly basis and once vegetation is established and site stabilisation is achieved, monitoring will continue on a quarterly basis for 3 years thereafter.

Regrowth of IAPS will be monitored annually for 7 years post opening of the scheme. Should regrowth occur, further control measures will be implemented suitable to the species and size of the stand.

15.8 Chapter References

- Baker, J., Beebee T., Buckley, J., Gent, A. and Orchard, D. (2011) *Amphibian Habitat Management Handbook*. Amphibian and Reptile Conservation, Bournemouth.
- British Trust for Ornithology (2014) Early Bird Survey 2014.
- Bibby, C.J., Burgess, N.D., Hillis, D.M., Hill, D.A. and Mustoe, S. (2000) Bird census techniques. Elsevier.
- Catto, C., Russ. J. and Langton, S. (2004) Development of a Car Survey Monitoring Protocol for the Republic of Ireland. A report prepared for the Heritage Council by the Bat Conservation Trust.
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Version 1.2 updated April 2022. Winchester.
- Clarke, M., Farrell, E.D., Roche, W., Murray, T.E., Foster, S. and Marnell, F. (2016) Ireland Red List No. 11: Cartilaginous fish [sharks, skates, rays and chimaeras]. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Dublin, Ireland.
- Cocchiglia, L., Purcell, P.J. and Kelly-Quinn, M. (2012) A critical review of the effects of motorway river-crossing construction on the aquatic environment. *Freshwater Reviews*, 5(2), pp.141-168.
- Collins, J. (Ed.) (2016) Bat surveys for professional ecologists: good practice guidelines. Bat Conservation Trust.
- Cross (1986) The Distribution and Status of *Pyrola rotundifolia* L. in Ireland. *The Irish naturalists Journal*, Vol. 22, No.1, pp. 16-20.
- Cummins, S., Fisher, J., McKeever, R. G., McNaghten, L., and Crowe, O. (2010) Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland. Birdwatch Ireland.
- Curtis, T.G.F. and Mc Gough H.N. (1988) *The Irish Red Data Book 1 : Vascular Plants*. Government Publications, Stationery Office. Dublin.
- DCHG (2017) National Biodiversity Action Plan 2017-2021. Department of Culture, Heritage and the Gaeltacht.
- DTTS (2019) Traffic Signs Manual – Warning Signs, Chapter 6. Department of Transport, Tourism and Sport.
- EC (2013) Interpretation Manual of European Union Habitats. EUR 28 April 2013. European Commission DG Environment. Nature ENV B.3.
- EC (2000) Communication from the Commission on the Precautionary Principle. Office for Official Publications of the European Communities, Luxembourg.
- EPA (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports. Environmental Protection Agency.
- Fitzpatrick, U.N.A., Murray, T.E., Paxton, R.J. and Brown, M.J., (2007) Building on IUCN regional red lists to produce lists of species of conservation priority: a model with Irish bees. *Conservation Biology*, 21(5), pp.1324-1332.
- Fossit, J.A. (2000) *A Guide To Habitats In Ireland*. The Heritage Council.
- Gilbert, G., Gibbons, D.W. and Evans, J. (1998) *Bird Monitoring Methods: A Manual of Techniques for UK Key Species*. The Royal Society for the protection of Birds, Sandy, Bedfordshire, England.
- Gilbert, G., Stanbury, A. and Lewis, L. (2021) Birds of conservation concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22.
- Harris, S., Creswell, P. and Jeffries, D.J. (1989) *Surveying Badgers*. Mammal Society, London.
- Hayden, T. and Harrington, R. (2001) *Exploring Irish mammals*. Town House & Country House Ltd., Dublin. Ireland.
- Kelleher, C. and Marnell, F. (2006) *Bat Mitigation Guidelines for Ireland*. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

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- King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O’Grady, M.F., Poole, R., Roche, W.K. and Cassidy, D. (2011) Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Kingston, N. (2012) Checklist of protected & rare species in Ireland. Unpublished Report. National Parks & Wildlife Service, Dublin, Ireland.
- Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019) Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
- Lockhart, N., Hodgetts, N. and Holyoak, D. (2012) Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- Lundy, M.G., Aughney, T., Montgomery, W.I. and Roche, N. (2011) Landscape conservation for Irish bats & species-specific roosting characteristics. Bat Conservation Ireland.
- Marnell, F., Looney, D. and Lawton, C. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.
- Marnell, F., Kingston, N., and Looney, D. (2009) Ireland Red List No. 3: Terrestrial Mammals, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.
- MCC (2021) Meath County Development Plan 2021-2027. Meath County Council.
- MCC (2015) Meath Biodiversity Action Plan 2015-2020. Meath County Council.
- MCC (2010) Meath Biodiversity Action Plan 2008-2012. Adopted April 2010. Meath County Council.
- NRA (2010) Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads, Revision 1. National Roads Authority.
- NRA (2009a) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. National Roads Authority.
- NRA (2009b) Guidelines for Assessment of Ecological Impacts of National Roads Schemes. National Roads Authority.
- NRA (2006a) Guidelines for the Treatment of Badgers prior to the construction of National Road Schemes.
- NRA (2006b) Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.
- NRA (2006c) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes.
- NRA (2005) Guidelines for the Conservation of Bats in the Planning of National Road Schemes. National Road Authority.
- NPWS (2022) Conservation objectives for River Boyne and River Blackwater SPA [004232]. Generic Version 9.0. Department of Housing, Local Government and Heritage.
- NPWS (2021) Conservation Objectives: River Boyne and River Blackwater SAC 002299. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
- NPWS (2014) Site Synopsis: River Boyne and River Blackwater SAC 002299. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.
- NPWS (2012) Boyne Estuary Special Protection Area (Site Code 4080). Conservation Objectives Supporting Document Version 1. National Parks & Wildlife Service.
- Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D., Nixon, D., and Wilson, C.J. (2010) Ireland Red List No. 4 – Butterflies. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Ireland.
- Roche, N., Langton, S. and Aughney T. (2012) Car-based bat monitoring in Ireland 2003-2011. Irish Wildlife Manuals, No. 60. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.
- Rose, P.M. and Scott, D.A. (1994) Waterfowl Population Estimates, IWRB Publication 29. International Waterfowl and Wetlands Research Bureau, Slimbridge, England.

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Russ (2021) British Bat Calls – A Guide to Species Identification. Pelagic Publishing.

Scottish Badgers (2018) Surveying for Badgers: Good Practice Guidelines. Version 1.

Scottish Natural Heritage (2017) Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH Guidance. Scottish Natural Heritage, Battleby.

Smith, G., O'Donoghue, P., O'Hora, K., and Delaney, E. (2011) Best Practice Guidance for Habitat Survey and Mapping. Kilkenny, The Heritage Council, Ireland.

Stace, C. (2010) New Flora of the British Isles. Cambridge University Press.

TII (2020) The Management of Invasive Alien Plant Species on National Roads – Standard GE-ENV-01104, December 2020. Transport Infrastructure Ireland.

VWT (2022) Vincent Wildlife Trust – Species Profile, Otter. Available online at:

<https://www.vincentwildlife.ie/species/otter#:~:text=The%20territories%20of%20otters%20can,be%20as%20small%20as%202km.>

Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. and Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.