
Chapter 8

Biodiversity

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8. Biodiversity

8.1. Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes and presents an assessment of the likely significant effects of the proposed DART+ South West Project (hereafter as ‘the proposed Project’) on Biodiversity. The assessment will examine the potential impacts during the construction and operational phases.

8.2. Legislation, Policy and Guidance Context

The assessment of the likely significant effects of the proposed project on ecological features has taken account of the following legislation, policy, and guidance documents, set out in Chapter 1 (Sections 1.5, 1.6 and 1.7). Specific to Biodiversity, the following legislation, guidance and planning framework has informed the assessment as outlined below.

8.2.1. Legislation

The Transport (Railway Infrastructure) Act 2001 (as amended) provides for the making of a Railway Order application by Córas Iompair Éireann (CIÉ) to An Bord Pleanála. The European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743 of 2021) gives further effect to the transposition of the EIA Directive (EU Directive 2011/92/EU as amended by Directive 2014/52/EU) on the assessment of the effects of certain public/ private projects on the environment by amending the Transport (Railway Infrastructure) Act 2001 (‘the 2001 Act’).

An examination, analysis and evaluation is carried out by An Bord Pleanála in order to identify, describe and assess, in the light of each individual case, the direct and indirect significant effects of the proposed railway works, including significant effects derived from the vulnerability of the activity to risks of major accidents and disasters relevant to it, on: population and human health; biodiversity, with particular attention to species and habitats protected under the Habitats and Birds Directives; land, soil, water, air and climate; material assets, cultural heritage and the landscape, and the interaction between the above factors.

This chapter addresses biodiversity.

In carrying out an EIA in respect of an application made under section 37 of the 2001 Act, An Bord Pleanála is required, where appropriate, to co-ordinate the assessment with any assessment under the Habitats Directive or the Birds Directive.

Ireland has given effect to the Habitats and Birds Directives through Part XAB of the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) as amended (‘the Habitats Regulations’ or ‘the Habitats Regulations 2011 to 2021’).

The Habitats Regulations were amended *inter alia* by the European Union (Birds and Natural Habitats) (Sea-fisheries) Regulations 2013 (S.I. No. 290 of 2013); the European Communities (Birds

and Natural Habitats) (Amendment) Regulations 2013 (S.I. No. 499 of 2013); the European Communities (Birds and Natural Habitats) (Amendment) Regulations 2015 (S.I. No. 355 of 2015); Chapter 4 of the Planning, Heritage and Broadcasting (Amendment) Act 2021 (No.11 of 2021) and the European Union (Birds and Natural Habitats) (Amendment) Regulations 2021 (S.I. No. 293 of 2021).

The Habitats Regulations list priority habitats and species of international (European Union) conservation importance, which require protection. This protection is afforded in part through the designation of European sites – areas that represent significant occurrences of listed habitat types and populations of listed species within a European context. Areas designated for bird species are classed as Special Protection Areas (SPAs), while those designated for other protected species and/or habitats are classed as Special Areas of Conservation (SACs). Wild bird species in SPAs, and habitats and species listed on Annexes I and II (respectively) to the Habitats Directive that are contained in SACs, are legally protected.

Additionally, species listed on Annex IV to the Habitats Directive are strictly protected wherever they occur – whether inside or outside the Natura 2000 network. This protection is afforded to animal and plant species by Sections 51 and 52, respectively, of the Habitats Regulations. Annex I habitats outside of SACs are still considered to be of national and international importance and, under Section 27(4)(b) of the Habitats Regulations, public authorities have a duty to strive to avoid the pollution or deterioration of Annex I habitats and all habitats integral to the functioning of SPAs.¹The Wildlife Acts (which include *inter alia* the Wildlife Act 1976, the Wildlife (Amendment) Act 2000, the Wildlife (Amendment) Act 2010, the Wildlife (Amendment) Act 2012, the Heritage Act 2018, including Part 3 thereof, the Planning, Heritage and Broadcasting (Amendment) Act 2021, including Chapter 3 thereof) are the principle legislative mechanism for the protection of wildlife in Ireland. A network of nationally protected Nature Reserves, which public bodies have a duty to protect, is established under the Wildlife Acts. Sites of national importance for nature conservation are afforded protection under planning policy and the Wildlife Acts. Natural Heritage Areas (NHAs) are sites that are designated under the Wildlife Acts for the protection of flora, fauna, habitats, and geological features of interest. Proposed Natural Heritage Areas (pNHAs) are published sites identified as of similar conservation interest, but which have not been statutorily proposed or designated – but are nonetheless afforded some protection under planning policies and objectives.

The Wildlife Acts also protect species of conservation value from injury, disturbance, and damage to individual entities or to their breeding and resting places. All species listed on the relevant Schedules to the Wildlife Acts must, therefore, constitute a material consideration in the planning process.

An additional, important piece of national legislation for the protection of wild flora, i.e. vascular plants, mosses, liverworts, lichens and stonewort's, is the Flora (Protection) Order, 2022, which makes it illegal to cut, uproot or damage listed species in any way or to alter, damage or interfere in any way with their habitats.

¹ In 2022, the EU proposed a new Nature Restoration Law which would include legally binding targets for nature restoration, to be implemented by all Member States. At time of print the proposal is undergoing debate and refinement at EU level.

8.2.2. Policy

The relevant policies and how these have been considered in the EIAR are summarised in the following sections on national policies and regional/local policies.

8.2.2.1. National Policies

- All Ireland Pollinator Plan 2021-2025 (NBDC, 2021) is a five-year plan which sets out to help restore declining Irish pollinator populations, the plan will work to provide a landscape where pollinators can flourish. The plan has six main objectives to help conserve and improve pollinator populations in Ireland. Objective 2 of the plan addresses making public land pollinator friendly. Iarnród Éireann is a partner identified to deliver the core actions.
- The National Biodiversity Action Plan 2017-2021 (DCHG, 2017) is a framework for the conservation and protection of biodiversity in Ireland. The main objective of the plan is to conserve and restore biodiversity and ecosystem services. The move towards ‘no net loss’ for biodiversity has been identified as an action under Objective 1 (mainstream biodiversity into decision-making across all sectors) of the NBAP. The objective recognises the shared responsibility for the conservation of biodiversity and the sustainable use of its components, by all sectors.
- Ireland’s 4th National Biodiversity Action Plan (DHLGH, 2022), which is currently in draft, will set the national biodiversity agenda for the period 2023-2027 which has been in development since October 2021. The Plan will aim to improve the governance of biodiversity in Ireland so that we can better respond to the biodiversity crisis. The Plan will also address the connections between biodiversity and climate change, and the need to enhance the evidence base for biodiversity conservation policy and practice. The overview of the plan currently details six general objectives, which aim to recognise, enhance and strengthen Ireland’s response and actions toward biodiversity.

8.2.2.2. Regional/Local Policies

- The Dublin City Development Plan 2022 - 2028 (DCC, 2022) is a long-term plan that sets out a guide on how and where development will take place in the city over the lifetime of the plan. The plan contains a range of draft policies and objectives relevant to establishing support and protection of environmental sensitivities for Dublin City and its environs.
- The Dublin City Biodiversity Action Plan 2015 – 2020 (DCC, 2015) sets out twenty-nine actions under four key themes. As a key green infrastructure tool for Dublin City Council, it sets a targeted and coordinated approach to biodiversity conservation in the area.
- The Dublin City Biodiversity Action Plan 2021-2025 (DCC, 2021), which was adopted in December 2021, builds on 2015-2020 plan including what has changed since the earlier plan. Sets out six themes that focus the outcomes for biodiversity conservation required across the city including 18 objectives for biodiversity management and conservation along with a series of targeted actions with measurable outcomes to achieve these objectives.

- The South Dublin County Development Plan 2022 – 2028 (SDCC, 2021), was adopted on the 22nd of June 2022 and came into effect on the 3rd of August 2022. This plan sets out a land use framework for South Dublin. There are a number of policies and objectives set out to help achieve sustainable urban development. There are seven objectives specific to public transport - rail services, in policy SM3. This will lead to a more sustainable public transport infrastructure.
- The Kildare County Council Development Plan 2017 – 2023 (KCC, 2017) sets out to achieve sustainable development in County Kildare. There are a number of policies set up in this plan to help protect and conserve biodiversity and the surrounding environment.
- The Draft Kildare County Development Plan 2023 – 2029 (KCC, 2022) is currently in development. There are a number of draft policies and objectives set out under Chapter 12- Biodiversity and Green Infrastructure and Chapter 5- Sustainable Mobility and Transport which aim to protect biodiversity and ensure a more sustainable public transport infrastructure.
- Biodiversity Guidelines for Infrastructure Staff: promoting biodiversity and sustainability practices (Irish Rail, 2022) sets out actions in relation to protected species, habitats, and designated sites. These actions include a native species tree planting initiative and the installation of bat and bird nesting boxes across suitable locations across platforms and outbuildings at stations.

8.2.3. Guidance

Specific to the biodiversity, the following guidance documents have also been incorporated into the assessment:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, Version 1.1 (CIEEM, 2018);
- Guidelines for Assessment of Ecological Impacts of National Roads Schemes, Revision 2 (NRA, 2009).

8.3. Methodology

This section outlines the approach and methodologies that were followed in collecting data, in describing the baseline ecological conditions and in assessing the likely significant effects of the proposed Project.

8.3.1. Study Area

8.3.1.1. Zone of Influence

The Zone of Influence (Zoi) for a project (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 as a result of the proposed project and associated activities.

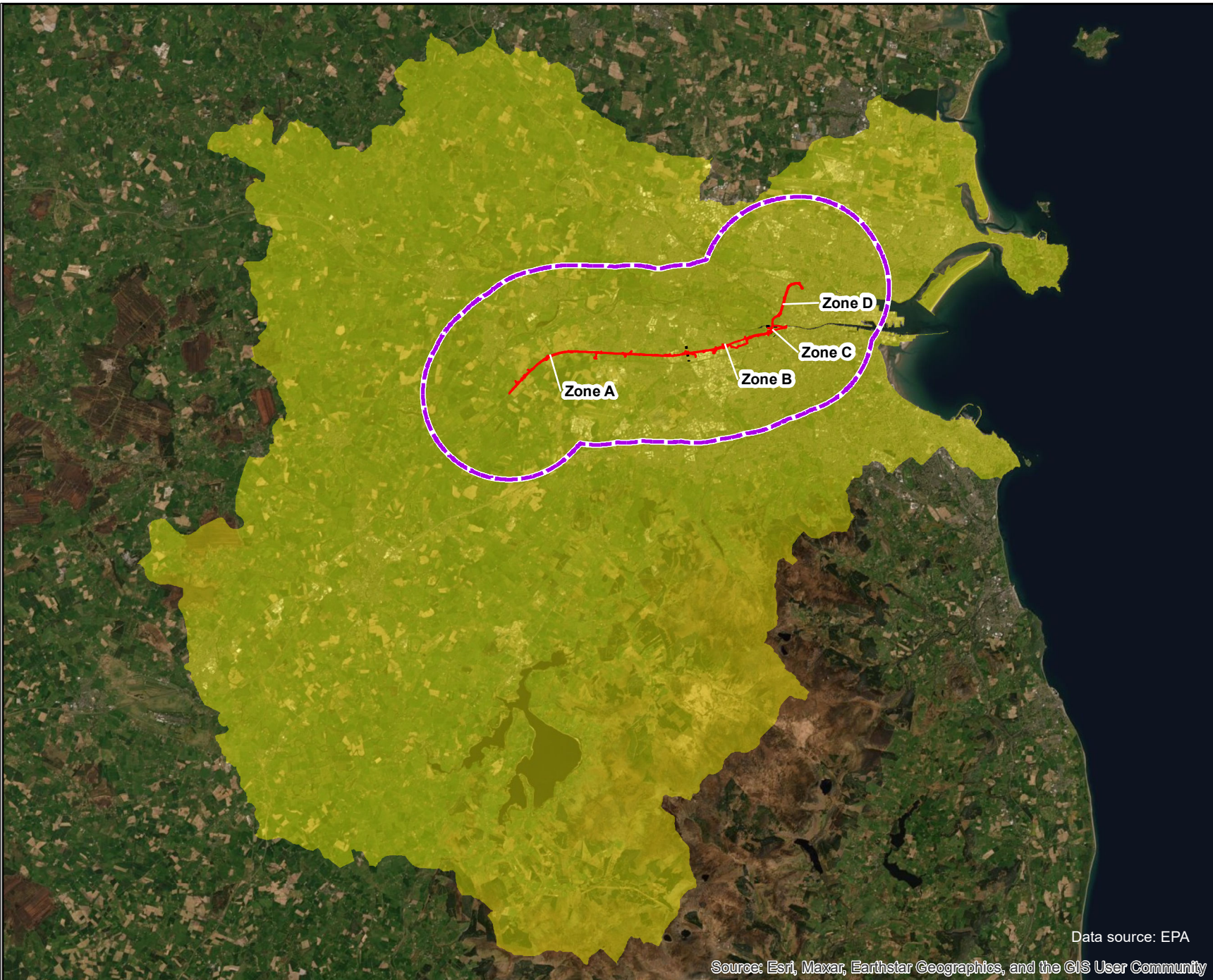
The Zol is likely to extend beyond the boundary of a project, for example where there are hydrological links extending beyond the site boundaries. It will also vary for different ecological features depending on their sensitivity to an environmental change. It is therefore appropriate to identify different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

It is also important to acknowledge, as per EPA guidance (EPA, 2022) *'that the absence of a designation or documented feature does not mean that no such feature exists within the site'*. As such, Zol have been identified for all features potentially occurring within the project site, in addition to any known to occur. Also as recommended by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018), professionally accredited or published studies have also been used to determine Zol for this proposed Project.

Through the incorporation of relevant Zols for the proposed Project, the biodiversity study area extends outside of the footprint of the proposed Project, see Table 8.1 and Figure 8-1.

Table 8.1: 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	Catchment Management Unit	All sites with connectivity to the proposed Project
Otter	5km	Up to 150m along suitable watercourses
Badger	5km	Up to 150m from the redline boundary of the proposed Project
Bats	5km	Redline boundary of the proposed Project and adjoining habitats
Habitats, rare, threatened, and protected flora, and invasive alien plant species.	5km	Redline boundary of the proposed Project and adjoining habitats
Breeding Birds	5km	Redline boundary of the proposed Project and adjoining habitats



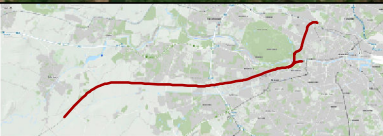
Legend

- Redline Development Boundary
- Zone Boundaries
- Biodiversity Study Area (5km Buffer)
- WFD Catchment: Liffey and Dublin Bay



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Rev	Date	Dwn	Chk'd	App'd	Description
v03	20/10/2022	NR	HF	MN	Biodiversity Study Area
v02	08/09/2022	NR	HF	MN	Biodiversity Study Area
v01	01/06/2022	NR	HF	MN	Biodiversity Study Area

Client Irish Rail		Engineering Designer ATKINS Supported by: rps							
Date	01/11/2022	Scale	1:310,000 @ A4	Drawn	NR	Checked	HF	Approved	MN
Project Code	6195886	Issuer	TTA	QMS Code					

Project Title	DART + SOUTH WEST				
Drawing Title	Figure 8.1: Biodiversity Study Area				
Drawing File Name	DP-04-23-DWG-EV-TTA-23761	Version	v03	Status	S3

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8.3.2. Survey Methodology

8.3.2.1. Desk Study

Relevant information within the biodiversity study area was collected through a detailed desktop review of existing studies and datasets. Sources of information that were used to inform the desk study assessment included:

- EPA online interactive mapping tool²;
- Information on ranges of species populations and habitats in Volume 1, 2 and 3 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2019 a, b, c);
- Information on ranges of bird populations from Bird Atlas 2007–11 (Balmer *et al.*, 2013), excluding birds of prey whose ranges were determined with reference to Hardey *et al.* (2013);
- Mapping of designated site for nature conservation for relevant sites in County Dublin, County Kildare, and beyond, as relevant, available online from the NPWS;
- Distribution records for protected species and habitats (including suitability index for bats) held online by the National Biodiversity Data Centre (NBDC)³, NPWS⁴, Heritage Council⁵ and Doogue *et al.* (1998);
- Checklists of protected and threatened species in Ireland (Nelson *et al.*, 2019);
- Red lists for rare and threatened Irish species (Curtis and Gough, 1998; Fitzpatrick *et al.*, 2006; 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);
- Surface and ground water quality status data, and river catchment boundaries available from the online database of the Environmental Protection Agency (EPA);
- National and regional surveys of semi-natural habitats, including grasslands (O'Neill *et al.*, 2013), saltmarsh (McCorry and Ryle, 2009; Devaney and Perrin, 2015), and woodland (Perrin *et al.*, 2008);
- Boundaries for catchments with confirmed or potential freshwater pearl mussel (FWPM) *Margaritifera* populations in GIS format available online from the NPWS;
- Biodiversity data contained within the Kildare Route Project Phase 2 EIS (Iarnród Éireann & PM Group, 2010); and
- Incident record of animal collisions and incursions on the line 2016-2021 (Iarnród Éireann, unpublished data).

² Available online at: <https://gis.epa.ie/EPAMaps/default>. Accessed January 2022.

³ Assessing records up to 10 years old (from date of search), for an area of 5 km from the proposed Project site. Available online at: <https://maps.biodiversityireland.ie/Map>, Accessed January 2021.

⁴ Available online at:

<https://dahq.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e>. Accessed January 2022

⁵ Available online at: <https://www.heritagemaps.ie/WebApps/HeritageMaps/index.html>. Accessed January 2022

8.3.2.2. Field Surveys

To inform the assessment, detailed field surveys were undertaken by qualified professional ecologists as outlined in Table 8.2. Detailed surveys were identified following the completion of preliminary ecological site assessment surveys. All field surveys were undertaken using professional interpretation and application of the guidance, systems, and methods. Complete detailed methods for each field survey are available in Volume 4, Appendix 8.1 of this EIAR.

Table 8.2: Summary of Field Surveys Completed

Field survey focus	Extent of survey	Overview of survey	Surveyor	Date(s)
Habitats	Extent of proposed Project and environs	Habitat classification to Fossitt (2000)	RPS Ecology	August and November 2020; May, June, August, and September 2021; May 2022.
Protected Flora	Extent of proposed Project and environs	Assessment of potential for species listed in Flora (Protection) Order 2022, and Red Lists (Wyse Jackson <i>et al.</i> , 2016; Lockhart <i>et al.</i> , 2012)	RPS Ecology	August and November 2020; May, June, August, and September 2021; May 2022
Invasive alien plants and animals	Extent of proposed Project and environs	Identification of Third Scheduled species of European Communities (Birds and Natural Habitats) Regulations 2011 (as amended)	RPS Ecology	August and November 2020; May, June, August, and September 2021; May 2022
Bats – suitability for roosting	Extent of proposed Project and environs	Suitability assessments completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016)	RPS Ecology	August and November 2020; and April and May 2022.
Bats – commuting and foraging habitats				August and November 2020; May, June, August, and September 2021; May 2022.
Bats – Roosting behaviour	Site specific locations (Phoenix Park Tunnel; Old Signal Tower & Turret, Inchicore works; Royal Canal bridge OBO8, and an abandoned residential building near Hazelhatch Station) 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	Phoenix Park Tunnel: June, July, September, and October 2021. Old Signal Tower and Turret – Inchicore works: June, July, and September 2021. Royal Canal: June, July, and September 2021. Abandoned residential building: May and June 2022
Bats - activity	Site specific locations (near Tubber Lane, Hillcrest, Co. Kildare; near Clondalkin train station; near South Circular	Activity assessments completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines	RPS Ecology	May 2021 to September 2021

Field survey focus	Extent of survey	Overview of survey	Surveyor	Date(s)
	Road/Chapelizod Bypass interchange; and, near Cabra Road rail bridge (OBO6)) as identified during suitability for commuting and foraging assessment	(Collins, 2016) and the Bat Mitigation Guidelines for Ireland (Marnell <i>et al.</i> , 2022)		
Bats - hibernation	Phoenix Park Tunnel	Activity assessments completed with cognisance of the Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins, 2016) and the Bat Mitigation Guidelines for Ireland (Marnell <i>et al.</i> , 2022)	RPS Ecology	February to April 2022
Badger	Site specific locations as identified during preliminary walkover	Assessment for evidence of sett entrances and field signs (e.g. scat, hair, trails, prints and snuffle holes).	RPS Ecology	August and November 2020; April, May, June, August, and September 2021; and April and May 2022
Otter	Site specific locations as identified during preliminary walkover	Assessment for evidence of holts and field signs (e.g. spraint, slides, trails, prints, and couch).	RPS Ecology	August 2021 and April 2022.
Aquatic (Freshwater ecology survey)	All watercourses crossed by the proposed project.	Macroinvertebrate Survey (3 min Kick sample and 2 min Stone wash). Q value assessment.	RPS Ecology	August 2021
Breeding Birds	Site specific locations (Le Fanu Road rail bridge (OBC7); Memorial Road rail bridge (OBC3); Aughrim St (R806) rail bridge (OBO4); Glasnevin cemetery carpark rail bridge (OBO10); Fassaugh Ave rail bridge (OBO7); and Inchicore Works footbridge (OBC5)) as identified during preliminary walkover	Identification of calls, sightings, and breeding behaviours during timed vantage points	Veale Ecology Ltd.	March to May 2021
Amphibian	Site specific location (pond located in south of Griffeen Valley park, Adamstown) as	Habitat Suitability Survey and presence/absence.	RPS Ecology	August 2021

Field survey focus	Extent of survey	Overview of survey	Surveyor	Date(s)
	identified during preliminary walkover			
Other protected mammals	Extent of proposed Project and environs	Incidental evidence of field signs (e.g. prints, scat, hairs) observed during other field surveys.	RPS Ecology	All dates listed above

On the basis of the results of the surveys carried out to inform the baseline environment (desk study and field surveys), and through the assessment of the likely significant effects on ecological receptors, the following surveys were not deemed necessary to inform the baseline:

- **Amphibians and reptiles** – no significant habitat present within the Zol of the proposed Project for significant populations of protected amphibian and reptile species to occur;
- **Terrestrial invertebrates** – no significant habitat present within the Zol of the proposed project for significant populations of protected terrestrial invertebrate species to occur;
- **Mammals** (red squirrel *Sciurus vulgaris*, Irish stoat *Mustela erminea hibernica*, pine marten *Martes martes*, and deer species) - no significant habitat present within the Zol of the proposed Project for significant populations of these mammal species to occur;
- **Mammals** (pygmy shrew *Sorex minutus*, Irish hare *Lepus timidus hibernicus*, hedgehog *Erinaceus europaeus*) – habitat is present within the Zol of the proposed Project to support populations of these mammal species. Although it is assumed that these species are likely to occur within the footprint and environs of the proposed project, they are deemed to occur in low numbers and are unlikely to be significantly negatively impacted by the likely effects.

8.3.3. Assessment Methodology

For the purposes of this impact assessment process on terrestrial biodiversity and ornithology, the CIEEM (2018) guidelines have been used for the basis of the assessment. The process takes cognisance of the EPA (2022) guidelines and incorporates NRA (2009) guidelines for the ecological valuation and geographic context.

8.3.3.1. Important Ecological Features (IEFs)

Having defined the relevant baseline conditions within the Zol of the proposed Project, ecological features therein are valued, in advance of commencing the assessment of potential impacts.

The methodology used to value ecological features takes cognisance of the relevant principles underpinning impact assessment under the EPA (2022) guidelines; however, it also has regard for the geographic frames of reference outlined by the NRA (2009). The geographic frames of reference outlined by the NRA (2009) are employed in this chapter.

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 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.

‘Important Ecological Features’, as termed in CIEEM (2018), are defined here as those ecological features which are valued at Local Importance (Higher Value) or above (NRA, 2009; see Volume 4, Appendix 8.1 of this EIAR. Ecological features below this value are not carried forward to impact assessment.

8.3.3.2. Ecological Impact Assessment Process

The impact assessment process, as described by CIEEM (2018), involved:

- Identifying and characterising impacts and their effects;
- Incorporating measures to avoid and mitigate negative impacts and effects;
- Assessing the significance of any residual effects after mitigation;
- Identifying appropriate compensation measures to offset significant residual effects; and
- Identifying opportunities for ecological enhancement.

The assessment comprises the review of the baseline data gathered and the identification of IEFs with features valued on the basis of available information/guidance and using professional ecological judgement.

8.3.3.3. Assessment Criteria and Significance

Impact on IEFs are characterised with the following qualitative terms, as relevant (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 project. 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.

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 project. 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.

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.’

8.3.3.4. Key Parameters for Assessment

A description of the proposed Project is provided in Chapter 4: Project Description and Chapter 5 Construction Strategy. The activities that have potential to result in likely significant effects on ecological receptors are outlined below:

Construction phase

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

- Site clearance and enabling works including the removal of vegetation and trees;
- Demolition of the existing buildings;
- Earthworks and construction activities including the construction of the proposed lines, substations and associated grid connections, relocated buildings, compounds, new platforms and station, signalling and electrification infrastructure, realignment of services, and associated infrastructure;

- 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; and
- Earthworks with potential for changes to groundwater quality, yield and/or flow paths.

Operational and maintenance phase

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

- Operational activities including the maintenance of line proposed lines, substations, relocated buildings, new platforms and station, signalling and electrification infrastructure, and associated infrastructure;

Impact categories

The impact categories assessed within the assessment are set out as follows:

- Biodiversity loss, fragmentation, and alteration;
- Disturbance from noise, vibration, lighting, and human presence;
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species

The impact of electromagnetic radiation (EMR) on biodiversity has been scoped out of this assessment due to the low levels of EMR predicted for the proposed Project. Further analysis of the impact source is provided in Volume 4, Appendix 8.1 of this EIAR.

8.3.4. Consultation

The overall project stakeholder and public consultation undertaken in respect of the Project is set out in the Public Consultation No. 1 Findings Report (for PC1) and Public Consultation No. 2 Findings Report (for PC2) which are included in Volume 4, Appendix 1.3 and 1.4. All feedback was collated, including feedback specific to the EIAR topic 'Biodiversity'. This feedback has informed this chapter including the baseline and impact assessment presented.

Specific consultation was also undertaken with key stakeholders in relation to EIA Scoping. A summary of the issues raised in relation to the scope of the EIA is included in Volume 4, Appendix 1.2. Feedback on the scope and level of detail of the assessment, data sources and methodologies as they pertain to the EIAR topic 'Biodiversity' have been reviewed and have influenced this chapter of the EIAR.

Specific consultation was also undertaken with representatives of various Departments in Kildare, South Dublin and Dublin City Councils. This included a combination of presentations, workshops, and meetings to discuss the project, technical design issues and environment and planning matters.

Nine pre-application meetings were held with ABP to explain the project and present technical and environmental information. A summary of the information presented and the environmental issues discussed at the nine meetings is provided in Volume 4, Appendix 1.6. Feedback relevant to the topic 'Biodiversity' has been reviewed and has influenced this chapter of the EIAR.

8.3.5. Difficulties Encountered/Limitations

8.3.5.1. 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 limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

8.3.5.2. Field Surveys

The receiving environment (i.e. baseline condition) may naturally vary through seasons and between years (NRA, 2008). All reasonable effort has been made to address this (e.g. combined use of desk and field survey data), and the limitation is acknowledged. Once incorporated into the assessment the limitation is deemed to not affect the certainty or predictability of the assessment.

8.3.5.2.1. Bats

Bat activity

For bat activity assessment it was not possible to complete activity transects on the railway line due to health and safety concerns associated with walking on the live railway line. To prevent a potential gap in the baseline, static bat detectors were used at key location, in combination with incidental bat records collection during emergence/re-entry bat surveys. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

Throughout the static bat detector survey period (May to September 2021) occasional equipment errors occurred. These were a result of battery, memory card, and Global Positioning System (GPS) issues. 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.

Bat roosts

Assessment of structures and trees within privately owned lands, including back gardens (i.e. along Clover Hill Rd, Cherry Orchard; Kylemore Dr, Kylemore; and Landen Rd, Decies / Kilmainham) was not completed as access was not possible at the time of survey. To reduce any potential gaps in the baseline, assessments were carried out using binoculars from accessible lands combined with assessment of potentially suitable habitats using satellite imagery. As a result, a precautionary approach has been applied to the impact assessment when considering bats in these areas. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

Assessment of a small number of structures was not possible. To reduce any potential gaps in the baseline, assessments were carried out using data gathered from the surrounding area, i.e. nearby assessed structures and static bat detectors. As a result, a precautionary approach has been applied to the impact assessment when considering bat roosts within these structures. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

Emergence and re-entry bat roost surveys

It was not possible to complete full dawn bat roost re-entry surveys due to safety restrictions for access to the live rail. Dawn surveys were completed as far as possible (up to one hour before dawn). Additional dusk bat emergence surveys were completed to compensate for the reduced dawn survey data. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment. Badger

Privately owned back gardens (i.e. along Clover Hill Rd, Cherry Orchard; Kylemore Dr, Kylemore; and Landen Rd, Decies/Kilmainham) were not accessible for assessment. To reduce any potential gaps in the baseline, assessments were carried out using binoculars from accessible lands combined with assessment of potentially suitable habitats using satellite imagery. As a result, a precautionary approach has been applied to the impact assessment when considering badger in these areas. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

8.3.5.2.2. Un-surveyed areas

Where field survey was not possible, desk study resources were assessed (satellite imagery, LIDAR imagery, and Google Maps Street view), professional judgement and supplemented where possible using binoculars from accessible lands. As a result, a precautionary approach has been applied to the assessment when considering impacts in these areas. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

8.4. Receiving Environment

8.4.1. Current Baseline Environment

The proposed Project has been divided into four distinct geographic zones along the length of the corridor (Zones A to D) as outlined in Chapter 4 Project Description and summarised below. The proposed Project is described from west to east along the railway corridor.

- **Zone A:** Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station (refer to Section 4.6);
- **Zone B:** Park West & Cherry Orchard Station to Heuston Station (incorporating Inchicore Works) (refer to Section 4.7);
- **Zone C:** Heuston Yard & Station (incorporating New Heuston West Station) (refer to Section 4.8);

- **Zone D** - Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line) (refer to Section 4.9).

This section outlines the biodiversity baseline characterisation as informed by the desktop studies and site surveys (see section 8.3.2).

8.4.1.1. Designated Sites for Nature Conservation

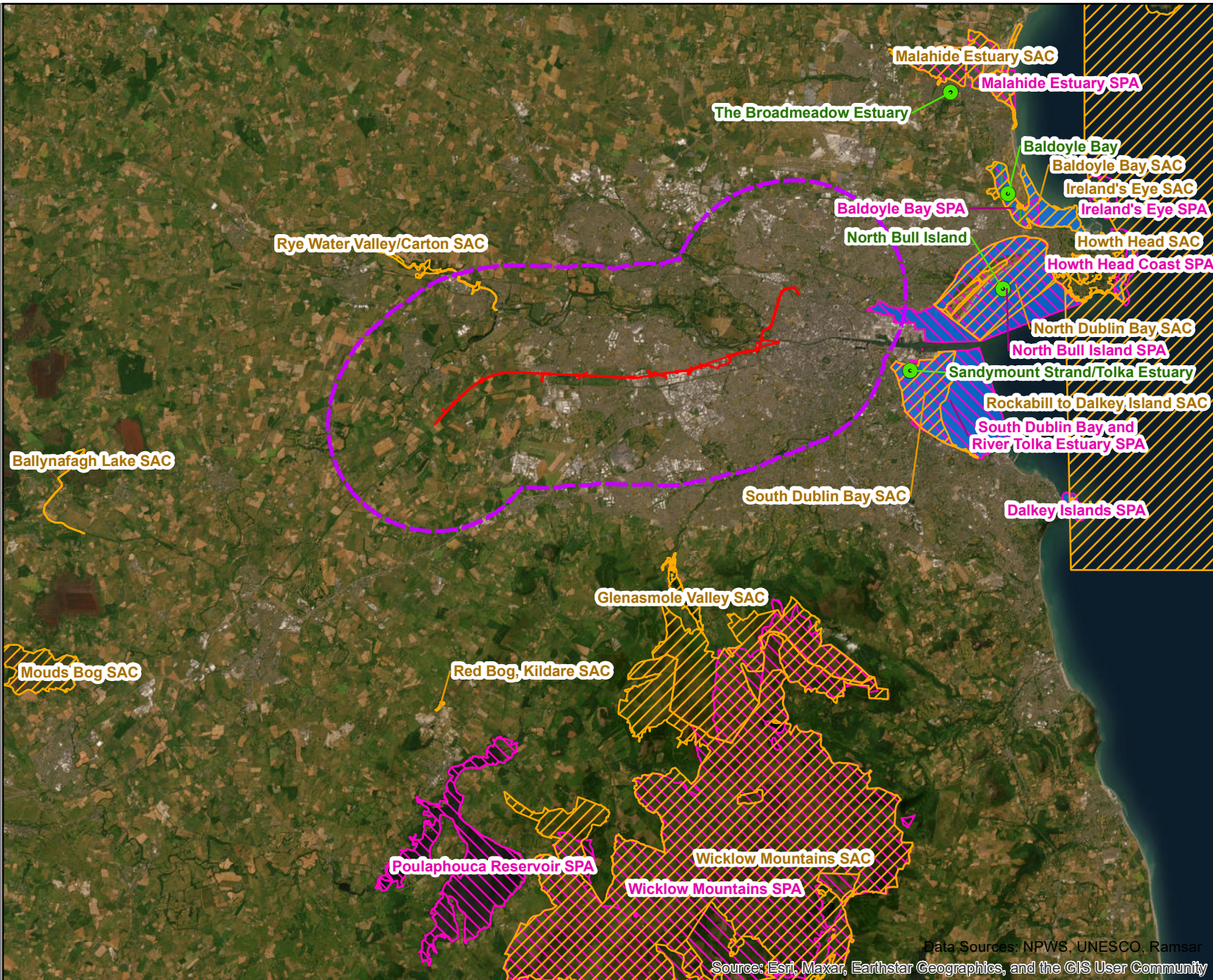
The proposed Project is not located within or adjoining any internationally designated sites for nature conservation; however, a nationally designated site does intersect the proposed Project. Designated sites for nature conservation within the wider biodiversity study area are detailed in Volume 4, Appendix 8.1 of this EIAR and illustrated in Figure 8-1.

The closest European site to the proposed Project is the Rye Water Valley/Carton SAC (site code 001398), located c. 2.9 km north of proposed Project. South Dublin Bay SAC (site code 000210), South Dublin Bay and River Tolka Estuary SPA (site code 004024), and North Dublin Bay SAC (site code 000206) are located c. 5.6 km, c. 5.6 km and c. 6.3 km east of the proposed Project, respectively.








A report to inform screening for Appropriate Assessment has been prepared to assess the potential for likely significant effects arising from the proposed Project and it has been concluded that there is potential for likely significant effects exist. As such a Natura Impact Statement (NIS) has been prepared to support the Railway Order for the proposed Project. The NIS is provided under separate cover (RPS, 2022).

The Dublin Bay Biosphere Reserve and the Sandymount Strand/Tolka Estuary Ramsar sites (site 832) are located c. 3.2 km and c. 6.5 km east of the proposed Project, respectively. The following proposed Natural Heritage areas (pNHAs) were identified within the study area:

- Royal Canal pNHA (site 002103), intersects the proposed Project at a railway underbridge;
- Grand Canal pNHA (site 002104), c.0.5 km south of the proposed Project;
- Liffey Valley pNHA (site 000128), c. 2 km north of the proposed Project;
- Rye Water Valley/Carton pNHA (site 001398), c. 2.9 km north west of the proposed Project;
- North Dublin Bay pNHA (site 000206), c. 3.6 km east of the proposed Project;
- Santry Demesne pNHA (site 000178), c. 4 km north east of the proposed Project;
- Dodder Valley pNHA (site 000991), c. 5.4 km south of the proposed Project; and
- South Dublin Bay pNHA (site 000210), c. 5.6 km east of the proposed Project.



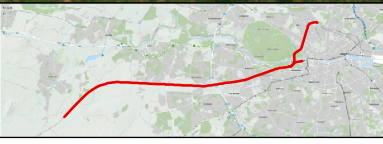
Legend

-  Reline Development Boundary
-  Biodiversity Study Area (5km Buffer)
-  Special Area of Conservation (SAC)
-  Special Protection Area (SPA)
-  Ramsar Site Boundaries
-  Ramsar Locations
- Dublin Bay Biosphere Reserve**
-  Marine Core Area

Data Sources: NPWS, UNESCO, Ramsar
 Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Rev	Date	Dm	Chk'd	App'd	Description
v03	11/11/2022	NR	HF	MN	Designated Sites within Study Area
v02	08/09/2022	NR	HF	MN	Designated Sites within Study Area
v01	25/03/2022	NR	HF	MN	Designated Sites within Study Area

Client: **Iarnród Éireann Irish Rail**

Engineering Designer: **ATKINS** (TYPSA), **rps**

Date: 18/01/2023 Scale: 1:250,000 @ A4

Project Code: 5195886 Issuer: TTA QMS Code

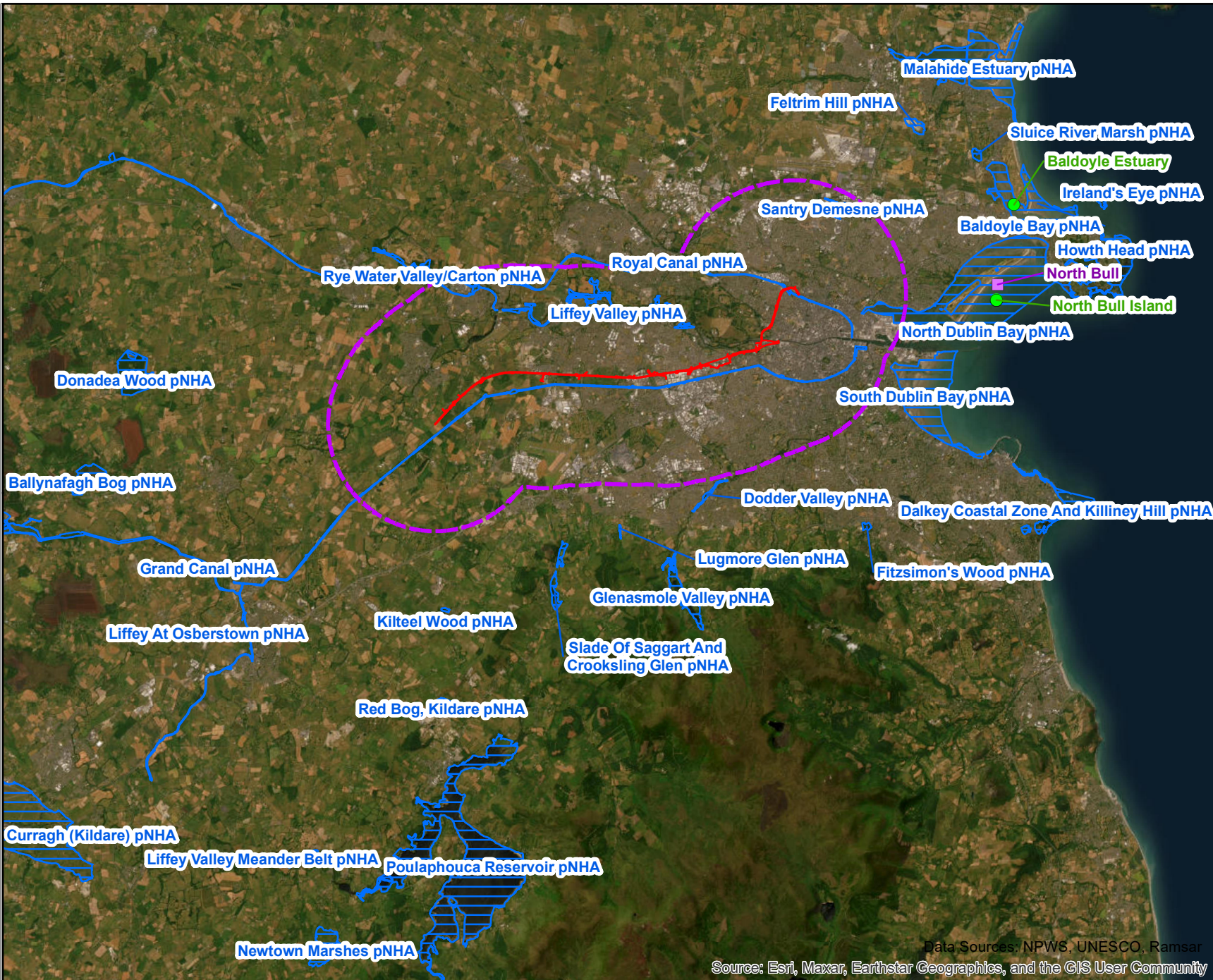
Drawn: NR Checked: HF Approved: MN

Project Title: **DART + SOUTH WEST**






Drawing Title: **Figure 8.2: Designated sites for nature conservation within the study area**
Map 1 of 2: International

Drawing File Name: **DP-04-23-DWG-EV-TTA-23762** Version: v03 Status: S3

DO NOT SCALE USE FIGURED DIMENSIONS ONLY



Legend

-  Reline Development Boundary
-  Biodiversity Study Area (5km Buffer)
-  Nature Reserves
-  Wildfowl Sanctuaries
-  Proposed Natural Heritage Area (pNHA)

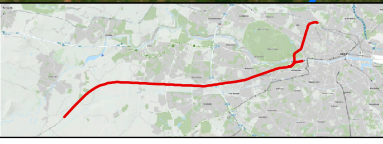


Data Sources: NPWS, UNESCO, Ramsar

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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Rev	Date	Drn	Chk'd	App'd	Description
v03	11/11/2022	NR	HF	MN	Designated Sites within Study Area
v02	08/09/2022	NR	HF	MN	Designated Sites within Study Area
v01	25/03/2022	NR	HF	MN	Designated Sites within Study Area

Client: **Iarnród Éireann Irish Rail**

Date: 18/01/2023 Scale: 1:250,000 @ A4

Project Code: 5195886 Issuer: TTA OMS Code:

Engineering Designer: **ATKINS** (TYPESA Member of the SNC-Lavalin Group) Supported by: **RPS**

Drawn: NR Checked: HF Approved: MN

Project Title	DART + SOUTH WEST		
Drawing Title	Figure 8.2: Designated sites for nature conservation within the study area		
Drawing File Name	DP-04-23-DWG-EV-TTA-23762	Version	v03
Status	S3		

DO NOT SCALE USE FIGURED DIMENSIONS ONLY

8.4.1.2. Habitats

Habitats detailed during the field study within the ZOI of the proposed Project are presented in Volume 3A of this EIAR, Drawing No. DP-04-23-DWG-EV-TTA-23750 which includes the relevant habitat codes from Fossitt (2000). Habitat descriptions are detailed in Volume 4, Appendix 8.1 of this EIAR. Habitats which fall outside of the proposed works area (i.e. the area in which temporary and/or permanent works are proposed), together with artificial ground (e.g. rail line ballast, roads, buildings, concrete surfaces, etc.) have not been mapped. The proposed Project and adjoining area predominantly consist of habitats associated with artificial surfaces, previous industrial use, residential development, unmanaged grasslands, disturbed ground, built land, and trees and scrub.

Ecologically, the proposed Project can be categorised into the following sections:

- **Zone A** - Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station. Rural to sub-urban transitioning landscape of open ground marked variously by industrial estates/large open ground (not obviously agricultural managed in traditional sense) used by horses and scrambler bikes, golf course, and residential development.
- **Zone B and C** - Park West & Cherry Orchard Station to Heuston Station (incorporating Inchicore Works) and Heuston Station & Yard (incorporating New Heuston West Station). Urban area where the rail line is adjoined by scrub, trees, residential and industrial areas.
- **Zone D** - Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line). Urban area with the rail line occurring in a cut with scrub, grassland and trees occupying the slopes. The top of the cutting is adjoined by residential lands.

8.4.1.2.1. Zone A: Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station

The dominant habitat within the proposed works area is gravel ballast (ED1 exposed gravel) used to stabilise the rail lines. Outside of the ballast area, grassy verges (GS2) and recolonising bare ground (ED3) adjoin various rail corridor boundary habitats, the most frequent of which was hedgerow (WL1), followed by treeline (WL2), and palisade security fencing and concrete walls (BL3 artificial surfaces). Areas proposed for the substations (Hazelhatch, Adamstown, Kishoge and Park West), compounds, and access tracks contained dry meadows (GS2), scrub (WS1), hedgerow (WL1), treeline (WL2), and recolonising bare ground (ED3).

One eroding watercourse (FW1) and five depositing watercourses (FW2) are crossed within this section: Castletown_09 (IE_EA_09C500830); tributary of the Castletown_09 (IE_EA_09C500830); Coneyburrow_09 (IE_EA_09L011900); Lucan stream (IE_EA_09L012100); Griffeen river (IE_EA_09L012100); and a tributary of the Griffeen river (IE_EA_09L012100). At the surveyed location (see Volume 3A of this EIAR, Drawing No. DP-04-23-DWG-EV-TTA-23765), these watercourses ranged from c.1.5-3 m in width and c.10-40 cm in depth. The Water Framework Directive River Waterbody status (2013-2018) ranges from Good to Moderate for these six watercourses.

Outside of the works area, adjoining habitats were dominated by arable crops (BC1), improved agricultural grasslands (GA1), and hedgerows (WL1), with interspersed areas of road and residential

dwelling (BL3 build and artificial surfaces). Between the Ninth Lock Road Bridge (OBC13) and the M50 Motorway Bridge (OBC10A) the habitats outside the works areas become increasingly urbanised and industrialised. The dominant habitat in this area is build and artificial surfaces (BL3), consisting of industrial buildings, hardstanding and road network.

The key habitats of ecological interest in this Zone are:

- Hedgerows (WL1)
- Dry meadow and grassy verges (GS2)
- Eroding rivers (FW1)
- Depositing rivers (FW2)

8.4.1.2.2. Zone B and C: Park West & Cherry Orchard Station to Heuston Station (incorporating Inchicore Works and Heuston Station & Yard (incorporating New Heuston West Station))

The dominant habitat within the proposed works area is gravel ballast (ED1 exposed gravel) used to stabilise the rail lines. Outside of the ballast area, various quantities of grassy verge (GS2), recolonising bare ground (ED3), bare ground (ED2), and a matrix of scrub (WS1) and grassy verge (GS2) were present. These areas showed signs of disturbance from vegetation control (e.g. seasonal cutting). The most frequently occurring rail corridor boundary habitat was hedgerow (WL1), followed by scrub (WS1), stone walls (BL1), treelines (WL2), and security fencing and concrete walls (BL3 artificial surfaces). Areas proposed for a station platform (Heuston West), substations (Heuston station and Kylemore (within the Iarnród Éireann's Inchicore rail depot)), compounds, and access tracks contained dry meadows (GS2), neutral grassland (GS1), scrub (WS1), hedgerow (WL1), treeline (WL2), recolonising bar ground (ED3), amenity grassland (GA2), and bare ground (ED2).

Outside of the works area, adjoining habitats were dominated by commercial and residential development, hardstanding, and road network (BL3 build and artificial surfaces), with limited dry meadows (GS2).

The key habitats of ecological interest in this Zone are:

- Neutral grassland (GS1);
- Dry meadow and grassy verges (GS2)
- Matrix of scrub (WS1) and grassy verge (GS2);
- Scrub (WS1);
- Hedgerow (WL1), and
- Treeline (WL2).

8.4.1.2.3. Zone D: Liffey Bridge to Glasnevin Junction (Phoenix Park Tunnel Branch Line)

The dominant habitat within the proposed works area is gravel ballast (ED1 exposed gravel) used to stabilise the rail lines. Apart from the c. 700 m section of the Phoenix Park Tunnel (EU2), the ballast area is mostly located within a cutting with steep slopes. The slopes are dominated with a matrix of scrub (WS1) and grassy verge (GS2) scrub (WS1) which transitions into scrub (WS1) and hedgerow (WL1) towards the top of the slope. Evidence of annual vegetation management (cutting/mowing) was observed on the lower section of the slope.

The rail line returns to near level grade at the proposed Cabra construction compound where recolonising bare ground (ED3), scrub (WS1), neutral grassland (GS1), and dry meadows (GS2) are present.

The proposed works pass over the River Liffey Estuary (CW2), via the Liffey Bridge (UBO1) and under the Royal Canal (FW3) and LUAS green line via the Royal Canal and Luas Twin Arch (OBO8). The Water Framework Directive Transitional Waterbody status (2013-2018) for the River Liffey estuary is Good.

Outside of the works area, adjoining habitats were dominated by commercial and residential development, hardstanding, and road network (BL3 build and artificial surfaces).

The key habitats of ecological interest in this Zone are:

- Neutral grassland (GS1);
- Matrix of scrub (WS1) and grassy verge (GS2);
- Hedgerow (WL1);
- Canal (FW3); and
- Estuary (CW2).

8.4.1.3. Flora

No protected flora (i.e. Flora (Protection) Order 2022 and Annex II species protected under the Habitats Directive) or flora species of conservation concern (i.e. red lists for vascular plants and bryophytes), were noted from the field study. Seven rare and threatened flora species were noted in the desk study as occurring outside the ZoI of the proposed Project. The species were mostly associated with the Liffey valley, sandy banks and dunes, and calcareous grasslands, which do not occur within the ZoI of the proposed Project.

8.4.1.4. Invasive Alien Plant Species

Eleven 'Third Schedule' Invasive Alien Plant Species (IAPS) were returned from the NBDC data search. Of these, four species were noted during the field study: Japanese knotweed (*Reynoutria japonica*), Himalayan balsam (*Impatiens glandulifera*), Spanish bluebell (*Hyacinthoides hispanica*), and three-cornered leek (*Allium triquetrum*). The majority of the Japanese knotweed was located around the western side of Platform 10 at Heuston Station, whilst a smaller cluster was noted on the

southern side of the rail line towards Hazelhatch. Himalayan balsam was noted as a cluster alongside the eastern boundary of Cabra Road Bridge (OBO6), as well as in ballast at the southern entrance to the Royal Canal and Luas Twin Arch (OBO8). Spanish bluebell and three-cornered leek were recorded in several locations between the South Circular Road Bridge (OBC1) and Inchicore Works. These locations are illustrated in Volume 3A of this EIAR, Drawing No. DP-04-23-DWG-EV-TTA-23750. Descriptions of IAPS locations are detailed in Volume 4, Appendix 8.1 of this EIAR.

8.4.1.5. Breeding Birds

During the desk study, 43 bird species were noted in the data search (NBDC), of which:

- Six were Annex I (Birds Directive);
- Twenty were Special Conservation Interest (SCI);
- Twelve were red listed; and
- Twenty-seven were amber listed birds of conservation concern.

A total of 32 bird species were recorded during the field survey, of which:

- Twenty-four species were considered to be probable or confirmed breeders with the study area, eight of which are of 'Amber' conservation concern.
- Three species were considered to be possible breeders, one of which was of 'Amber' conservation concern (sparrowhawk).
- Four species were considered to be non-breeders, two of which were of 'Amber' conservation concern (black-headed gull and swallow) and one of which was of 'Red' conservation concern (swift).

Tabulated breeding bird data are detailed in Volume 4, Appendix 8.1 of this EIAR.

8.4.1.6. Bats

Commuting and Foraging Habitats

Hazelhatch & Celbridge Station to Park West & Cherry Orchard Station has been categorised as moderate suitability for commuting and foraging bat habitats due to the presence of continuous habitat (hedgerows, scrub and trees) which connect to the wider landscape. Park West & Cherry Orchard Station to Heuston Station contains both moderate and low categories of suitability for commuting and foraging bat habitats due to the increased urbanisation of the adjoining lands and isolation and gaps between suitable vegetation. Heuston Station to Glasnevin has been categorised as moderate suitability for commuting and foraging bat habitats due to the connectivity with wider landscape features (Royal Canal and other linear rail corridors) and presence of good quality vegetation cover within the cut (scrub, grassland, and trees).

Suitability of Roosting Features

The preliminary ground level roost assessments identified seven structures with features suitable for roosting bats which were potentially impacted by the proposed Project. These include the following (see section 8.3.5.2.1 regarding un-surveyed areas):

- BS1: Royal Canal and Luas Twin Arch (OBO8) - Moderate suitability
- BS2: Phoenix Park Tunnel - High suitability
- BS3: Inchicore Works Turret - Moderate suitability
- BS4: Inchicore Works Old Signal Tower - Moderate suitability
- BS5: Abandoned residential building near Hazelhatch and Celbridge Station - High suitability
- BS10: Abandoned residential building near Hazelhatch and Celbridge Station - Moderate suitability
- BS11: Abandoned residential building near Hazelhatch and Celbridge Station - High suitability

Descriptions of these features are detailed in Volume 4, Appendix 8.1 of this EIAR.

Bat Emergence and Re-entry Survey

Five structures were surveyed (BS1-BS5) and no bats were recorded emerging or re-entering from these structures (see also section 8.3.5.2.1 regarding un-surveyed areas).

Bat Activity

A total of six species of bat (Leisler's bat (*Nyctalus leisleri*), Nathusius' pipistrelle (*Pipistrellus nathusii*), common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), brown long-eared (*Plecotus auratus*), and Daubenton's (*Myotis daubentonii*)) were identified foraging and/or commuting in the vicinity of the static detector deployment locations. In addition, unidentified *Myotis* species and unidentified *Pipistrellus* species were also recorded.

Tubber Lane had the highest total passes across the survey timeframe, which were dominated by Leisler's bat (62.1%) and common pipistrelle (30.6%). This was the only location to have confirmed identification of brown long-eared bat. The Clondalkin survey location was dominated by Leisler's bat passes (84.8%), with a small proportion of Nathusius' pipistrelle (8.4%) and common pipistrelle (5.3%). This was the only location to have confirmed identification of Daubenton's bat. The South Circular Road location was dominated by Leisler's bat (82.7%), with smaller proportions of soprano pipistrelle (9.5%) and common pipistrelle (6.3%). The Cabra location was also dominated by Leisler's bat (92.4%) with smaller proportions of and soprano pipistrelle (6.5%) and common pipistrelle (1.1%).

Overall peak Bat Passes Per Night (BPPN) was observed in Tubber Lane in June 2021 (62.2 BPPN). The peak month for BPPN was observed in June 2021 (121.2 BPPN). June was the peak BPPN month for all survey locations, bar Couth Circular Road, which had a peak BPPN in September 2021. The most frequently recorded species was Leisler's bat, followed by common pipistrelle.

During the emergence and re-entry surveys, incidental bat activity was noted. Few (10) incidental bat records were noted at the Turret (BS3) and Old Signal Tower (BS4) within Inchicore works. Similarly, few records were noted from the Royal Canal Rail Bridge (BS1) (ten) and the abandoned Residential Building (BS5), 10 and 14, respectively. Leisler's bat and common pipistrelle were the most frequently recorded at these locations and one brown long-eared bat was also noted. Higher incidental activity (97 passes) was noted from the north entrance/exit of the Phoenix Park Tunnel (BS2), which consisted mostly of *Pipistrelle* spp. and occasional *Myotis* spp.

Tabulated bat activity data are detailed in Volume 4, Appendix 8.1 of this EIAR.

Hibernation Assessment

A brown long-eared bat *Plecotus auritus* was recorded within the Phoenix Park Tunnel in late February 2022. This species of bat was recorded on the detector in the middle of the tunnel and was then recorded approximately 102 seconds later at the detector placed near the northern end of the tunnel. Although it cannot be confirmed whether this was one individual or multiple bats, or whether the bat was hibernating within the tunnel, it is assumed to be for the purpose of the baseline that the species was hibernating within the tunnel.

8.4.1.7. Badger

The NBDC data search returned 95 records of badger *Meles meles* within the 5 km biodiversity study area. One of these records is within the Zol of the proposed Project, a sighting of a live badger in 2015, located south of the Hazelhatch and Celbridge train station.

During the field study, evidence of badger activity was noted from a number of areas; however, no badger setts were recorded. Although much of the rail line boundary is effectively mammal proof, there is potential for badger setts adjacent to the railway, particularly in open ground towards Hazelhatch. The bulk of the badger activity was noted between the northern entrance to the Phoenix Park Tunnel and the Cabra road rail bridge. This included a considerable number of fresh deposits including two well defined latrines and a trail crossing the cutting (illustrated in Volume 3A of this EIAR, Drawing No. DP-04-23-DWG-EV-TTA-23763). Tabulated badger activity data are detailed in Volume 4, Appendix 8.1 of this EIAR.

8.4.1.8. Otter

The NBDC data search returned 31 records of otter *Lutra lutra* within the 5 km biodiversity study area. Two of these records are within the Zol of the proposed Project. A sighting of a live otter in 2018 was recorded in the Royal Canal and a roadkill otter was recorded in 2011 east of the Hazelhatch and Celbridge train station.

The field surveys did not record any sightings of otter or identify any signs of resting or breeding sites within the Zol of the proposed Project. This widespread species is nevertheless presumed to forage and/or commute within the Zol of the proposed Project.

8.4.1.9. Other Fauna Species

The presence of pygmy shrew *Sorex minutus*, Irish hare *Lepus timidus* subsp. *hibernicus*, hedgehog *Erinaceus europaeus*, red squirrel *Sciurus vulgaris*, Irish stoat *Mustela erminea* subsp. *hibernica*, and

pine marten *Martes martes* were noted in the data search (NBDC) within the biodiversity study area; however, no signs of these protected mammals were noted from the field surveys.

Pygmy shrews nest in long grasses in dense vegetation (including damp conditions) or under rocks or logs, occurring wherever adequate insect food supplies exist. It is considered likely for pygmy shrew to occur within the Zol of the proposed Project. There are no known national or county population estimates for the species in Ireland as it is common and widespread and assigned a conservation status of Least Concern (Marnell *et al.*, 2019).

Suitable habitat for Irish hare was noted in adjoining habitats during the field study. It is likely that this species forages and/or commuted within the Zol of the proposed Project. The species is considered common and widespread in Ireland and is currently assigned a conservation status of Least Concern (Marnell *et al.*, 2019).

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 proposed Project. The species is considered common and widespread in Ireland and is currently assigned a conservation status of Least Concern (Marnell *et al.*, 2019).

No suitable habitat for pine marten, Irish stoat, and deer species (e.g. red deer) were noted within the Zol of the proposed Project site.

Other non-protected species for which there was evidence on site included rabbit *Oryctolagus cuniculus* and fox *Vulpes vulpes*. These species are not afforded wildlife protection and are not assessed further.

8.4.1.10. Amphibians and Reptiles

Common frog *Rana temporaria* and smooth newt *Lissotriton vulgaris* were the only amphibians or reptiles noted in the desk study. Although no common frog (spawn/tadpole/froglet/adult) or smooth newts (spawn/ larvae/ juvenile/ adult) were encountered during the field study, only limited suitable habitats for common frog (damp vegetation and hedgerows) and smooth newt (wet grassland) were recorded. Frogs are considered likely to be present within the site of the proposed Project; however, smooth newt are considered unlikely to occur within the Zol.

No common lizard individuals were encountered during the field study, and their suitable habitats (woods/scrub with basking sites on south facing slopes) were not recorded. This species is considered unlikely to occur within the site of the proposed Project.

8.4.1.11. Terrestrial Invertebrates

Twelve terrestrial invertebrate species were returned from the NBDC data search: marsh fritillary *Euphydryas aurinia*; small heath *Coenonympha pamphilus*; wood white *Leptidea* sp.; scarce blue-tailed damselfly *Ischnura pumilio*; a mining bee *Andrena nigroaenea*; field cuckoo bee *Bombus campestris*; Gooden's nomad bee *Nomada goodeniana*; large red tailed bumble bee *Bombus lapidarius*; Willughby's leaf-cutter bee *Megachile willughbiella*; patchwork leafcutter bee *Megachile centuncularis*; moss carder-bee *Bombus muscorum*; and English chrysalis snail *Leiostryla anglica*.

Incidental records of several species were noted during the habitat surveys, including: peacock butterfly (*Aglais io*), holly blue (*Celastrina argiolus*), common carder bumblebee (*Bombus pascuorum*), hoverfly sp. (*Syrphidae*) and small tortoiseshell butterfly (*Aglais urticae*) within grassy verges and scrub habitats.

In terms of relevant EU protected species, marsh fritillary (*Euphydryas aurinia*) colonies can occur in a wide variety of habitats, however the proposed Project site does not provide suitable habitat. The presence of its food plant devil's-bit scabious (*Succisa pratensis*), an essential habitat component to its lifecycle, was additionally not recorded from within proposed Project site.

It is assumed that the proposed Project site is suitable for foraging and nesting behaviour for a wide range of common terrestrial invertebrates.

8.4.1.12. Aquatic Invertebrates and Fish

Two aquatic invertebrates were returned from the NBDC data search: lake orb mussel (*Musculium lacustre*) and freshwater white-clawed crayfish (*Austropotamobius pallipes*). These records are outside the Zol of the proposed Project. Evidence of aquatic invertebrates and fish recorded during the field surveys is summaries in Table 8.3. Tabulated aquatic invertebrate and fish data are detailed in Volume 4, Appendix 8.1 of this EIAR.

Table 8.3: Evidence of Aquatic Invertebrates and Fish Recorded During the Feld Surveys

Waterbody	Results Description
Griffeen River (IE_EA_09L012100)	<p>The macroinvertebrate sample recorded 14 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Two Class B taxa were recorded all in low numbers (<i>Hydroptilidae</i> and <i>Limnephilidae</i>). No single taxon was dominant, and no Class A taxa were recorded. A Q3 was assigned (moderate) and this corresponds with EPA quality in 2018.</p> <p>Salmonid and Lamprey spawning habitat was rated as Fair due to the presence of gravels and coarse substrates albeit some light siltation.</p> <p>For juvenile salmonids, some overhanging and in-stream vegetation was present along with some coarse substrates (although no sand). Siltation was low and dissolved oxygen levels were high, above the limit for salmonids at 10.2 mg/l. These conditions are somewhat representative of juvenile salmonid habitat and was assigned a rating of Fair.</p> <p>A similar case is true for juvenile lamprey. Slow flow and muddy/silty bed material were available along the river margins in addition to good water depth (30cm).</p> <p>No crayfish were present within the kick sample. With instream boulders and cobbles, aquatic vegetation, and detritus there is suitable crayfish habitat available. A habitat rating of Fair was assigned.</p>
Tributary of the Griffeen River (IE_EA_09L012100)	<p>The macroinvertebrate sample recorded 18 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Three Class B taxa were recorded all in low numbers (<i>Alainites muticus</i>, <i>Glossosomatidae</i> and <i>Limnephilidae</i>). One Class E was recorded (<i>Tubificidae</i>). No single taxon was dominant, and no Class A taxa were recorded. A Q2-3 was assigned (moderate).</p> <p>Good spawning substrates were not present. Salmonid and lamprey spawning habitat was rated as none due to the presence of siltation, limited riffle/glide habitat and no pool habitat sequence present and only 25% gravels.</p> <p>For juvenile salmonids, some coarse substrate is available in addition to suitable cover such as overhanging trees and cobbles/boulders. Dissolved oxygen (DO) levels were below the recommended limit for salmonids at 8.23mg/l.</p> <p>Lamprey nursery habitat was rated as Poor. There were no areas silted or slow backwater present along the margins of the reach surveyed. Some suitable hiding</p>

Waterbody	Results Description
	<p>places were present however water depth was low (10cm).</p> <p>Crayfish were not noted within the kick sample. No soft banks for were present for burrowing however suitable rock/boulder habitat was noted in areas however these were silted cobbles at shallow depths. A food source for crayfish was also noted in the form of aquatic vegetation and detritus. A habitat rating of None was assigned.</p>
<p>Lucan Stream (IE_EA_09L012100)</p>	<p>A macroinvertebrate sample was not possible due to the absence of the watercourse. Only a dry drainage ditch remains which was noted as likely a result of land drainage.</p> <p>There is no potential for salmonids, lamprey or crayfish at any life stage at the site surveyed and habitat rating of None was assigned.</p>
<p>Coneyburrow_09 (IE_EA_09L011900)</p>	<p>The macroinvertebrate sample recorded 17 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Three Class B taxa were recorded, two in low numbers (<i>Sericostimatidae</i> and <i>Alainites muticus</i>) and one common throughout the sample (<i>Glossosomatidae</i>). <i>Baetis Rhodani</i> (Class C) were dominant, and no Class A taxa were recorded. Class D/E were also present but were not dominant. A Q3 was assigned (moderate) which is a dis-improvement from EPA quality in 2018, which assigned the Coneyburrow 'Good' status.</p> <p>Salmonid and lamprey spawning habitat was rated as none due to high siltation in this watercourse, lack of riffle and pool habitat, lack of suitable substrates and barriers to migration. Silt is the dominant substrate and a gradient of 1% was noted which is less than ideal.</p> <p>For juvenile salmonids, substrates are not suitable. Although water is shallow, it is not fast flowing, and some overhanging vegetation is present to provide suitable cover to juveniles. DO is high at 9.7mg/l.</p> <p>A similar case is true for juvenile lamprey. Silt is the dominant substrate with no sand available for eggs to adhere to. Some areas of slow flow/backwater are present with some small areas of mud/silty bed material in margins for burrowing but not common. Low flows are almost stagnant and not suitable for lamprey.</p> <p>No crayfish were present within the kick sample. Soft banks for burrowing were noted with some coverage and food source available (i.e. aquatic vegetation, submerged trees and detritus). High levels of siltation provide poor conditions. A habitat rating of None was assigned.</p>
<p>Castletown_09 (IE_EA_09C500830)</p>	<p>The macroinvertebrate sample recorded 12 taxa altogether with Class C taxa (moderately pollution tolerant) forming most of the sample. Two Class B taxa were recorded, both in low numbers (<i>Limnephilidae</i> and <i>Baetis muticus</i>). No one taxa was dominant and no Class A taxa were recorded. One Class E was also present but was not dominant (<i>Tubificidae</i>). A Q3 was assigned (moderate). In 2018, the EPA categorised this watercourse as 'unassigned'. Expert Judgement, applied by the EPA, has assigned a classification of 'Good' status to this waterbody.</p> <p>Salmonid and Lamprey spawning habitat was rated as none due to high siltation in this watercourse, lack of riffle and pool habitat, lack of suitable substrates/cover and barriers to migration. Silt is the dominant substrate and any spawning gravels present were not suitable.</p> <p>For juvenile salmonids, substrates are not suitable. Although water is shallow and fast flowing there is a lack of suitable cover. Habitat not ideal for juveniles. DO is less than ideal at 8.66mg/l. Owing to the conditions and indications of water quality issues it is unlikely that salmonids may be present. A habitat rating of Poor was assigned.</p> <p>For juvenile lamprey, nursery habitat was identified along the margins such as silty deposits and detritus. However, spawning gravels were highly silted. Areas of slow flow are present and the reach surveyed lacks suitable hiding places for adults. A habitat rating of Poor was assigned.</p> <p>No crayfish were present within the kick sample. Soft banks for burrowing were noted with some coverage and food source available (i.e. overhanging banks, and detritus). High levels of siltation provide poor conditions and low turbidity increases when</p>

Waterbody	Results Description
	kicked. A habitat rating of None was assigned.
Tributary of the Castletown_09 (IE_EA_09C500830)	<p>The macroinvertebrate sample recorded 12 taxa altogether, similar to those recorded at site 4a and an overall low species richness. Class C taxa (moderately pollution tolerant) formed most of the sample. Two Class B taxa were recorded, both in low numbers (<i>Limnephilidae</i> and <i>Alainites muticus</i>). No one taxa was dominant and no Class A taxa were recorded. One Class E was also present but was not dominant (<i>Tubificidae</i>). A Q3 was assigned (moderate). This is an unmapped tributary. Expert Judgement, applied by the EPA, has assigned a classification of 'Good' status to the downstream waterbody.</p> <p>Salmonid and Lamprey spawning habitat was rated as none due to high siltation in this watercourse, lack of riffle and pool habitat and lack of suitable substrates/cover. Silt is the dominant substrate and any spawning gravels present were not suitable.</p> <p>For juvenile salmonids, substrates are not suitable. Although water is shallow and fast flowing there is a lack of suitable cover. Habitat not ideal for juveniles. DO levels were high, above the limit for salmonids at 10.6 mg/l.</p> <p>For juvenile lamprey, nursery habitat was identified along the margins due to the high level of silty deposits and detritus. Some sand is available (10%) for eggs to adhere to but is limited. No clean spawning gravels are available and there is limited suitable hiding places. A habitat rating of Poor was assigned.</p> <p>A small juvenile crayfish was found during the kick sample (1.5 cm in length). Soft banks for burrowing are present, as is suitable cobble substrate albeit heavily silted. Water has no turbidity and is very clear but increases when kicked. Tree roots and aquatic vegetation are also present providing possible cover and food availability. A habitat rating of Fair was assigned.</p>

8.4.1.13. Invasive Alien Animal Species

Six 'Third Schedule' Invasive Alien Animal Species (IAAS) were returned from the NBDC data search. Of these, evidence of one was noted during the field study. American mink *Neovison vison* scat was noted at a field gate on the southern side of the railway track near Hazelhatch and Celbridge train station (ITM 700348, 732708).

8.4.2. Important Ecological Features (IEF)

All ecological features identified within the ZoI (described in Section 8.4.1) for the proposed Project have been identified and assessed as to whether they are considered IEFs to be scoped into the impact assessment. IEFs are defined as 'habitats, species and ecosystems, including ecosystem function and processes that may be affected, with reference to a geographical context in which they are considered important' (CIEEM, 2018).

The evaluation of the ecological features is detailed in Volume 4, Appendix 8.1 of this EIAR. The following IEFs have been identified:

- Designated Sites for Nature Conservation:
 - South Dublin Bay SAC (site code 000210), South Dublin Bay and River Tolka Estuary SPA (site code 004024), North Dublin Bay SAC (site code 000206);
 - Sandymount Strand/Tolka Estuary Ramsar (site 832), Dublin Bay Biosphere Reserve;
 - Royal Canal pNHA (site 002103); and

- North Dublin Bay pNHA (site 000206), South Dublin Bay pNHA (site 000210).
- Habitats and Flora:
 - Zone B and C (Park West & Cherry Orchard Station to Heuston Station): neutral grassland (GS1); dry meadow and grassy verges (GS2); matrix of scrub (WS1) and grassy verge (GS2); scrub (WS1); hedgerow (WL1), and treeline (WL2); and
 - Zone D (River Liffey Bridge to Glasnevin Junction): neutral grassland (GS1); matrix of scrub (WS1) and grassy verge (GS2); hedgerow (WL1); canal (FW3); estuary (CW2).
- Fauna:
 - Bats (roosting, commuting and foraging, and hibernating);
 - Badger (breeding, commuting, and foraging); and
 - Birds (breeding, commuting, and foraging).

8.4.3. Evolution of the Environment in the absence of the Project (Do Nothing)

Annex IV of the EIA Directive sets out the information required to be included in an EIAR. This includes

“a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the Proposed Project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge”.

In the event that the proposed Project is not constructed, an assessment of the environmental conditions or ‘Do Nothing’ has been carried out and is described within this section. Table 8.4 outlines the likely evolution of the baseline (i.e. the important ecological features) in the absence of the proposed Project.

Table 8.4: Likely Evolution of the Environment in the Absence of the Project

Important Ecological Features		Likely evolution of the environment in the absence of the proposed Project
Designated sites for Nature Conservation	South Dublin Bay SAC (site code 000210), South Dublin Bay and River Tolka Estuary SPA (site code 004024), North Dublin Bay SAC (site code 000206)	Designated sites within the Zol of the proposed Project would likely remain as described in the baseline section of this report into the medium-term future. The current pressures and threats affecting these sites would remain in the absence of the Project.
	Sandymount Strand/Tolka Estuary Ramsar (site 832), Dublin Bay Biosphere Reserve	

Important Ecological Features		Likely evolution of the environment in the absence of the proposed Project
	Royal Canal pNHA (site 002103); and North Dublin Bay pNHA (site 000206), South Dublin Bay pNHA (site 000210).	
Habitats and Flora	Zone B and C (Park West & Cherry Orchard Station to Heuston Station): neutral grassland (GS1); dry meadow and grassy verges (GS2); matrix of scrub (WS1) and grassy verge (GS2); scrub (WS1); hedgerow (WL1), and treeline (WL2);	Habitats within the Zol of the proposed Project would likely remain as described in the baseline section of this report into the medium-term future. The current pressures and threats affecting these habitats would remain in the absence of the Project.
	Zone D (River Liffey Bridge to Glasnevin Junction): neutral grassland (GS1); matrix of scrub (WS1) and grassy verge (GS2); hedgerow (WL1); canal (FW3); estuary (CW2)	
Fauna	Bats (roosting, commuting and foraging, and hibernating)	Fauna within the Zol of the proposed Project would likely remain as described in the baseline section of this report into the medium-term future. The current pressures and threats affecting these species would remain in the absence of the Project.
	Badger (breeding, commuting and foraging)	
	Birds (breeding, commuting and foraging)	

8.5. Description of Potential Impacts

8.5.1. Potential Construction Impacts

A summary of the IEFs, ecological valuation, relevant impact categories assessed, characterisation of unmitigated impacts, and effects, during the construction of the proposed Project, are detailed in Table 8.6.

8.5.1.1. Designated Sites for Nature Conservation

Scoping of Impacts

For the IEF coastal designated sites for nature conservation (South Dublin Bay SAC (site code 000210); South Dublin Bay and River Tolka Estuary SPA (site code 004024); North Dublin Bay SAC (site code 000206); Sandymount Strand/Tolka Estuary Ramsar (site 832); Dublin Bay Biosphere Reserve; North Dublin Bay pNHA (site 000206); South Dublin Bay pNHA (site 000210)), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the site:

- Biodiversity loss, fragmentation, and alteration;
- Disturbance from noise, vibration, lighting, and human presence; and
- Spread of invasive alien species.

For the Royal Canal pNHA (site 002103), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the site:

- Biodiversity loss, fragmentation, and alteration;
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF coastal designated sites for nature conservation grouped above, the impact of water pollution during the construction phase of the proposed Project have been assessed. Water pollution during construction may result from surface water run-off carrying suspended silt or contaminants into local watercourses (tributaries of the River Liffey), which are connected via hydrological pathway (Liffey estuary) to the IEFs. The extent of the effect is the Liffey estuary transitional waterbodies and the Dublin Bay Coastal waterbody. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will be linked with the construction timeframe associated with works within the Zol of the tributaries of the River Liffey and Liffey estuary and is considered to be short-term. The timing of the construction works may influence the magnitude (i.e. works during high rainfall events). This effect is considered to be reversible after construction works are completed. Due to the unmeasurable magnitude of the effect, the effect of water pollution during the construction phase of the proposed Project is predicted to result in a significant adverse, short-term, and reversable effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

For the Royal Canal pNHA (site 002103), the impact of disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project is being assessed. Disturbance during construction may result from works taking place within the vicinity of the Royal Canal Bridge (OBO8), which is connected via structural and airborne pathways to the IEF. The extent of the effect is the considered to be a maximum of 150 m along the Royal Canal (in both directions) from the Royal Canal & Luas Twin Arch (OBO8). The magnitude of the effect is considered to be low, due to the nature of the works proposed in this area. The duration of the effect will be linked with the construction timeframe associated with works within the Zol, which is considered to be short-term. The timing of the construction works is not considered as having an influence on the magnitude. This effect is considered to be reversible after construction works are completed. Due to the low magnitude and short-term nature of the works, the effect of disturbance during the construction phase of the proposed Project is predicted to be not significant.

8.5.1.2. Habitats

Scoping of Impacts

For the IEF habitats in Zone B and C (Park West & Cherry Orchard Station to Heuston Station) and Zone D (River Liffey Bridge to Glasnevin Junction), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Disturbance from noise, vibration, lighting, and human presence.

To avoid duplication of assessment, water pollution to the estuary is addressed in the assessment of designated sites for nature conservation and is not assessed again here.

Assessment of Impacts

For the IEF habitats in Zone B and C (Park West & Cherry Orchard Station to Heuston Station) and Zone D (River Liffey Bridge to Glasnevin Junction), the impact of: biodiversity loss, fragmentation, and alteration; pollution to air; and, spread of invasive alien species, during the construction phase of the proposed Project has been assessed.

Biodiversity loss, fragmentation, and alteration during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs. 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 loss of this linear feature, the effect of biodiversity loss, fragmentation, and alteration during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

Pollution to air during construction may result from activities creating dust or particulate matter. Connectivity via airborne pathways to the IEFs may then result in physical smothering of vegetation, affecting their function and survival. The extent of the effect is considered to be up to 100 m from the source of impact (NRA, 2011). The magnitude of the effect is unmeasurable but is considered to be a 50% reduction in habitat quality within 100 m of piling and excavation activities; therefore, the precautionary principle has been applied. The duration of the effect will be linked with the construction timeframe associated with works within the ZoI 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 unmeasurable magnitude, the effect of air pollution during the construction phase of the proposed Project is predicted to result in a significant adverse, short-term, and temporary effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

Spread of invasive alien species may result from dispersal of Scheduled invasive alien species via machinery, materials, clothing or personnel, which are connected via physical interaction pathways to the IEFs. The extent of the effect is potentially the entire extent of construction works within the proposed Project and other offsite locations, including haulage routes. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will be linked with the construction timeframe associated with works and is considered to be medium-term. The timing of the construction works may influence the magnitude (i.e. evidence of invasive alien species may not be present during works carried out in winter months). This effect is considered to be reversible after construction works are completed; however, the timeframe for this may be medium-term. Due to the unmeasurable magnitude of the effect, the effect of the spread of invasive alien species during the construction phase of the proposed Project is predicted to result in a significant adverse, medium-term, and reversible effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

8.5.1.3. Bats

8.5.1.3.1. Roosting

Scoping of Impacts

For the IEF of bats (roosting), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF bat (roosting), the impact of biodiversity loss, fragmentation, and alteration and the impact of disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project have been assessed.

Biodiversity loss, in the form of loss of roosting sites, during construction may result from potential loss of unrecorded roosting bats within the un-surveyed area of the proposed Project, which are connected via physical pathway to the IEFs. The extent of the effect is the structures and trees within private residential ownership (i.e. areas adjoining the rail line along Clover Hill Rd, Cherry Orchard; Kylemore Dr, Kylemore; and Landen Rd, Decies/Kilmainham) and five structures (2 no. existing vacant dwellings near Hazelhatch station; a lookout tower and office toilet block facility and lunch block (prefab unit) within Inchicore works; a maintenance building adjacent to platform 10 and NTCC and existing structures adjacent to Guinness sidings), which were not accessible for assessment during the establishment of the baseline in this chapter. The magnitude of the effect is considered to be the potential loss of roosting sites of the species recorded in the bat activity surveys. The precautionary principle has been applied to this magnitude. The duration of the effect will potentially extend further than the construction timeframe associated with works and is considered to be long-term. The timing of the construction works may influence the magnitude (i.e. works completed during the summer months are more likely to encounter roosting bats). This effect is considered to be potentially irreversible after construction works are completed. Due to the unmeasurable magnitude, the effect of biodiversity loss, in the form of loss of roosting sites, during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and potentially irreversible effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

Disturbance from noise, vibration, lighting, and human presence, in the form of loss of roosting sites, during construction may result from potential disturbance of unrecorded roosting bats within the un-surveyed area of the proposed Project, which are connected via physical and airborne pathway to the IEFs. The extent of the effect is the structures and trees within private residential ownership as noted above. 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 medium-term. The timing of the construction works may influence the magnitude (i.e. works completed during the summer month are more likely to encounter roosting bats). This effect is considered to be potentially irreversible after construction works are completed. Due to the magnitude, the effect of biodiversity loss, in the form of loss of

roosting sites, during the construction phase of the proposed Project is predicted to result in a significant adverse, medium-term, and potentially irreversible effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

8.5.1.3.2. Commuting and Foraging

Scoping of Impacts

For the IEF of bats (roosting, commuting and foraging, and hibernating), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF bat (roosting), the impact of biodiversity loss, fragmentation, and alteration and the impact of disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project have been assessed.

Biodiversity loss, fragmentation, and alteration, in the form of loss of suitable bat commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs. The magnitude of effect on commuting and foraging bats is likely to be the loss of suitable commuting and foraging habitat for Leisler's bat, *Nathusius'* pipistrelle, common pipistrelle, soprano pipistrelle, brown long-eared, and *Daubenton's* bats. 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 loss of this linear feature, the effect of biodiversity loss, fragmentation, and alteration during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

Disturbance from noise, vibration, lighting, and human presence, in the form of loss of suitable bat commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire works area within the proposed Project. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will not extend further than the construction timeframe associated with works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the summer month are more likely to affect commuting and foraging bats). This effect is considered to be reversible after construction works are completed. Due to the unmeasurable magnitude, the effect of disturbance from noise, vibration, lighting, and human presence, in the form of loss of suitable bat commuting and foraging habitat, during the construction phase of the proposed Project is predicted to result in a significant adverse, short-term, and

reversible effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

8.5.1.3.3. Hibernating

Scoping of Impacts

For the IEF of bats (hibernating), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Spread of invasive alien species.

Assessment of Impacts

For the IEF bat (hibernating), the impacts of biodiversity loss, fragmentation, and alteration; disturbance from noise, vibration, lighting, and human presence; and air pollution during the construction phase of the proposed Project have been assessed.

Biodiversity loss, in the form of loss of a bat hibernation site, during construction may result from construction works associated with electrical infrastructure addition within the Phoenix Park Tunnel, which are connected via physical and airborne pathway to the IEFs. The extent of the effect is the Phoenix Park Tunnel. The magnitude of the effect is the loss of a small number of bat hibernation sites, likely to be one brown long-eared bat (based on the baseline). The duration of the effect will potentially extend further than the construction timeframe associated with works and is considered to be long-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months are more likely to encounter hibernating bats). This effect is considered to be potentially irreversible after construction works are completed. Due to the magnitude, the effect of biodiversity loss, in the form of loss of one brown long-eared bat hibernation sites, during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and reversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

Disturbance from noise, vibration, lighting, and human presence during construction may result from construction works associated with electrical infrastructure addition and track alteration within the Phoenix Park Tunnel, which are connected via physical and airborne pathway to the IEF. The extent of the effect is the Phoenix Park Tunnel. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will be linked with the construction timeframe associated with works within the ZoI, which is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months are more likely to encounter hibernating bats). This effect is considered to be reversible after construction works are completed. Due to the unmeasurable magnitude, the effect of disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project is predicted to result in a significant adverse, short-term, and reversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

Air pollution during construction may result from potential disturbance of bat hibernation sites within the Phoenix Park Tunnel, which are connected via physical and airborne pathway to the IEFs. The extent of the effect is the Phoenix Park Tunnel. The magnitude of the effect is the potential loss or

displacement of a small number of bat hibernation sites, likely to be one brown long-eared bat (based on the baseline). The duration of the effect will be linked with the construction timeframe associated with works within the Zol, which is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works completed during the winter months are more likely to encounter hibernating bats). This effect is considered to be reversible after construction works are completed. Due to the magnitude, the effect of air pollution, during the construction phase of the proposed Project is predicted to result in a significant adverse, short-term, and reversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

8.5.1.4. Badger

8.5.1.4.1. Setts and Breeding

Scoping of Impacts

For the IEF of badger (setts and breeding), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of badger (setts and breeding), the impacts of biodiversity loss, fragmentation, and alteration, and disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project have been assessed.

Biodiversity loss, in the form of loss of setts and breeding badgers, during construction may result from potential loss of unrecorded features within the un-surveyed area of the proposed Project, which are connected via physical pathway to the IEFs. The extent of the effect is the suitable vegetation within private residential ownership (i.e. areas adjoining the rail line along Clover Hill Rd, Cherry Orchard; Kylemore Dr, Kylemore and Landen Rd, Decies/Kilmainham), which were not accessible for assessment during the establishment of the baseline in this chapter. 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. The timing of the construction works will not influence the magnitude. This effect is considered to be potentially irreversible after construction works are completed. Due to the unmeasurable magnitude, the effect of biodiversity loss, in the form of loss of setts and breeding badgers, during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and potentially irreversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

Disturbance from noise, vibration, lighting, and human presence in the form of disturbance of setts and breeding badgers, during construction may result from potential loss of unrecorded features within the un-surveyed area of the proposed Project, which are connected via physical pathway to the IEFs. The extent of the effect is the suitable vegetation within private residential ownership (i.e. areas adjoining the rail line along Clover Hill Rd, Cherry Orchard; Kylemore Dr, Kylemore and

Landen Rd, Decies / Kilmainham), which were not accessible for assessment during the establishment of the baseline in this report. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will be linked with the construction timeframe associated with works within the ZoI, which is considered to be short-term. The timing of the construction works may influence the magnitude (i.e. works completed during the night hours are more likely to disturb badger setts). This effect is considered to be reversible after construction works are completed. Due to the unmeasurable magnitude, the effect of biodiversity loss, in the form of loss of roosting sites, during the construction phase of the proposed Project is predicted to result in a significant adverse, short-term, and reversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

8.5.1.4.2. Commuting and Foraging

Scoping of Impacts

For the IEF of badger (commuting and foraging), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of badger (commuting and foraging), the impacts of biodiversity loss, fragmentation, and alteration, and disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project have been assessed.

Biodiversity loss, fragmentation, and alteration, in the form of loss of suitable badger commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. 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 unmeasurable magnitude and the permanent loss of this linear commuting and foraging feature, the effect of biodiversity loss, fragmentation, and alteration during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

Disturbance from noise, vibration, lighting, and human presence, in the form of loss of suitable badger commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire works area within the proposed Project. The magnitude of the effect is considered to be multiple individuals, based on the baseline. The duration of the effect will not extend further than the construction timeframe associated with 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 low magnitude and short-term nature of the works, the effect of disturbance during the construction phase of the proposed Project is predicted to be not significant.

8.5.1.5. Birds

8.5.1.5.1. Breeding

Scoping of impacts

For the IEF of birds (breeding), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of birds (breeding), the impacts of biodiversity loss, fragmentation, and alteration, and disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project have been assessed.

Biodiversity loss, fragmentation, and alteration, in the form of loss of suitable breeding bird habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs.. The magnitude of the effect is considered to be the loss of breeding birds (estimated as 30 pairs per 100m, based on the breeding bird baseline) of a range of species (c. 50% of which are Amber conservation concern). The precautionary principle has been applied. 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 and the permanent loss of this suitable habitat, the effect of biodiversity loss, fragmentation, and alteration during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

Disturbance from noise, vibration, lighting, and human presence, in the form of reduced breeding success, during construction will result from four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire works area within the proposed Project. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will not extend further than the construction timeframe associated with works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works 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 unmeasurable magnitude and the permanent loss of this vegetation suitable for bird breeding, the effect of biodiversity loss, fragmentation, and alteration during the construction phase of the proposed Project is predicted to result in a significant

adverse, short-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

8.5.1.5.2. Commuting and Foraging

Scoping of Impacts

For the IEF of birds (commuting and foraging), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the IEF:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of birds (commuting and foraging), the impacts of biodiversity loss, fragmentation, and alteration, and disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project have been assessed.

Biodiversity loss, fragmentation, and alteration, in the form of loss of suitable bird commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEF. The magnitude of the effect is likely to be loss of commuting and foraging habitat for c. 30 bird species. The precautionary principle has been applied. 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 in the spring, summer and autumn months are more likely to affect commuting and foraging birds). This effect is considered to be irreversible after construction works are completed. Due to the magnitude and the permanent loss of this suitable habitat, the effect of biodiversity loss, fragmentation, and alteration during the construction phase of the proposed Project is predicted to result in a significant adverse, long-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

Disturbance from noise, vibration, lighting, and human presence, in the form of reduced commuting and foraging, during construction will result from four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEF. The extent of the effect is the entire works area within the proposed Project. The magnitude of the effect is unmeasurable; therefore, the precautionary principle has been applied. The duration of the effect will not extend further than the construction timeframe associated with works and is considered to be short-term. The timing of the construction works will influence the magnitude (i.e. works carried out in the spring, summer and autumn months are more likely to affect commuting and foraging birds). This effect is considered to be reversible after construction works are completed. Due to the unmeasurable magnitude and the permanent loss of this vegetation suitable for bird breeding, the effect of disturbance from noise, vibration, lighting, and human presence during the construction phase of the proposed Project is predicted to result in a significant adverse, short-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2.1, will be required to mitigate this effect.

8.5.2. Potential Operational Impacts

A summary of the IEFs, ecological valuation, relevant impact categories assessed, characterisation of unmitigated impacts, and effects, during the operation of the proposed Project, are detailed in Table 8.7.

8.5.2.1. Designated Sites for Nature Conservation

Scoping of Impacts

For the IEF coastal designated sites for nature conservation (South Dublin Bay SAC (site code 000210); South Dublin Bay and River Tolka Estuary SPA (site code 004024); North Dublin Bay SAC (site code 000206); Sandymount Strand / Tolka Estuary Ramsar (site 832); Dublin Bay Biosphere Reserve; North Dublin Bay pNHA (site 000206); South Dublin Bay pNHA (site 000210)), the following impacts have been scoped out during operation as no pathway exists between the proposed Project and the site:

- Biodiversity loss, fragmentation, and alteration;
- Disturbance from noise, vibration, lighting, and human presence;
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

For the Royal Canal pNHA (site 002103), the following impacts have been scoped out during operation as no pathway exists between the proposed Project and the site:

- Biodiversity loss, fragmentation, and alteration;
- Disturbance from noise, vibration, lighting, and human presence;
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

No impact pathways identified.

8.5.2.2. Habitats

Scoping of Impacts

For the IEF habitats in Zone B (Park West & Cherry Orchard Station to Heuston Station) and Zone C Heuston Yard and Station and Zone D (Liffey Bridge to Glasnevin Junction), the following impacts

have been scoped out during operation as no pathway exists between the proposed Project and the site:

- Disturbance from noise, vibration, lighting, and human presence; and
- Pollution to water, air, and/or soil.

Assessment of Impacts

For the IEF of Habitats, the impacts of biodiversity loss, fragmentation, and alteration, and spread of invasive alien species during the operational phase of the proposed Project have been assessed.

Biodiversity loss, fragmentation, and alteration during operation will result from vegetation management (cutting and trimming), which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire operational area within the proposed Project. The duration of the effect is considered to be long-term. The timing of the operational works will influence the magnitude (i.e. vegetation maintenance in summer months may increase the material cut and trimmed). This effect is considered to be reversible. Due to the magnitude the effect of biodiversity loss, fragmentation, and alteration during the operational phase of the proposed Project is predicted to be not significant.

Spread of invasive alien species may result from dispersal of Scheduled invasive alien species via machinery, materials, clothing or personnel during vegetation maintenance and other activities, which are connected via physical interaction pathways to the IEFs. The extent of the effect is considered to be seven metres away from all occurrences of Scheduled invasive alien plant species. The magnitude of the effect has potential to be the vegetate areas along the entire extent of the operational maintenance area of the proposed Project. The duration of the effect is considered to be long-term. The timing of the operational works will influence the magnitude (i.e. vegetation maintenance in summer months may increase likelihood of spread of invasive alien plant species). This effect is considered to be reversible. Due to the magnitude the effect of spread of invasive alien species during the operational phase of the proposed Project is predicted to be not significant.

8.5.2.3. Bats

8.5.2.3.1. Roosting

For the IEF of bats (roosting), impacts have been scoped out during operation as no pathway exists between the proposed Project and the IEF.

8.5.2.3.2. Commuting and Foraging

Scoping of Impacts

For the IEF of bats (commuting and foraging), the following impacts have been scoped out during operation as no pathway exists between the proposed Project and the IEF:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of bats (commuting and foraging), the impacts of biodiversity loss, fragmentation, and alteration, and disturbance from noise, vibration, lighting, and human presence during the operational phase of the proposed Project have been assessed.

Biodiversity loss, fragmentation, and alteration, in the form of reduction of suitable bat commuting and foraging habitat, during operation may result from the presence of electrified overhead lines and increased train movements, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire operational area within the proposed Project. The magnitude of the effect is in an increase in train traffic from 12 trains per hour per direction to 23 trains per hour per direction and the operation of approximately 20 km of overhead lines on two tracks. The duration of the effect extends to the entire operational timeframe associated with proposed Project and is considered to be long-term. The timing of the operation activities (i.e. train movements) will influence the magnitude (i.e. operational activities during night time hours in the summer months are more likely to affect commuting and foraging bats). This effect is considered to be reversible as bats become habituated to the new infrastructure. Due to the magnitude, the effect of biodiversity loss, fragmentation, and alteration during the operational phase of the proposed Project is predicted to be not significant.

Disturbance from noise, vibration, lighting, and human presence, in the form of reduction of suitable bat commuting and foraging habitat, during operation may result from increased train movements, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire operational area within the proposed Project. The magnitude of the effect is in an increase in train traffic from 12 trains per hour per direction to 23 trains per hour per direction. The duration of the effect extends to the entire operational timeframe associated with proposed Project and is considered to be long-term. The timing of the operation activities (i.e. train movements) will influence the magnitude (i.e. operational activities during time hours in the summer months are more likely to affect commuting and foraging bats). This effect is considered to be reversible over the long-term. Due to the magnitude, the effect of disturbance from noise, vibration, lighting, and human presence, in the form of reduction of suitable bat commuting and foraging habitat, during the operational phase of the proposed Project is predicted to be not significant.

8.5.2.3.3. Hibernating

Scoping of Impacts

For the IEF of bats (hibernating), the following impacts have been scoped out during operation as no pathway exists between the proposed Project and the site:

- Biodiversity loss, fragmentation, and alteration;
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of bats (hibernating), the impacts of disturbance from noise, vibration, lighting, and human presence during the operational phase of the proposed Project have been assessed.

Disturbance from noise, vibration, lighting, and human presence during operation may result from electrified overhead lines and increased train movements, which are connected via direct physical pathway to the IEFs. The extent of the effect is the Phoenix Park Tunnel. The magnitude of the effect is the potential loss of a suitable hibernation location for one brown long-eared bat resulting from an increase in train traffic from 2 trains per hour per direction to 7 trains per hour per direction within the Phoenix Park Tunnel. The duration of the effect extends to the entire operational timeframe associated with proposed Project and is considered to be long-term. The timing of the operation activities (i.e. train movements) will influence the magnitude (i.e. operational activities during hours in the winter months are more likely to affect hibernating bats). This effect is considered to be irreversible. Due to the magnitude, the effect of disturbance from noise, vibration, lighting, and human presence during the operational phase of the proposed Project is predicted to result in a significant adverse, long-term, and irreversible effect on this IEF. Measures, as set out in Section 8.6.2, will be required to mitigate this effect.

8.5.2.4. Badger

8.5.2.4.1. Setts and Breeding

For the IEF of badger (setts and breeding), impacts have been scoped out during operation as no pathway exists between the proposed Project and the IEF.

8.5.2.4.2. Commuting and Foraging

Scoping of Impacts

For the IEF of badger (commuting and foraging), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the site:

- Biodiversity loss, fragmentation, and alteration
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of badger (commuting and foraging), the impacts of disturbance from noise, vibration, lighting, and human presence during the operational phase of the proposed Project have been assessed.

Disturbance from noise, vibration, lighting, and human presence, in the form of loss of suitable badger commuting and foraging habitat, during construction may result from increased train movements, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire operational area within the proposed Project. The magnitude of the effect is considered to be multiple individuals, based on the baseline. The duration of the effect extends to the entire operational timeframe associated with the proposed Project and is considered to be long-term. The timing of the operation activities (i.e. train movements) will influence the magnitude (i.e. operational activities during night-time hours are more likely to affect commuting and foraging badgers). This

effect is considered to be irreversible. Due to the magnitude, effect of disturbance during the operational phase of the proposed Project is predicted to be not significant.

8.5.2.5. Birds

8.5.2.5.1. Breeding

Scoping of Impacts

For the IEF of birds (breeding), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the site:

- Biodiversity loss, fragmentation, and alteration;
- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of birds (breeding), the impacts of disturbance from noise, vibration, lighting, and human presence during the operational phase of the proposed Project have been assessed.

Disturbance from noise, vibration, lighting, and human presence, in the form of reduced breeding success, during operation may result from increased train movements, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire operational area within the proposed Project. The magnitude of the effect is an increase in train traffic from 12 trains per hour per direction to 23 trains per hour per direction. Breeding bird activity is predicted to be lower after construction phase is complete, due to vegetation loss; therefore, the magnitude of disturbance during the operational phase is reduced.

The duration of the effect extends to the entire operational timeframe associated with proposed Project and is considered to be long-term. The timing of the operation activities (i.e. train movements) will influence the magnitude (i.e. operational activities in March and August, inclusive, are more likely to affect breeding birds). This effect is considered to be irreversible. Due to the magnitude, the effect of biodiversity loss, fragmentation, and alteration during the operational phase of the proposed Project is predicted to be not significant.

8.5.2.5.2. Commuting and Foraging

Scoping of Impacts

For the IEF of birds (commuting and foraging), the following impacts have been scoped out during construction as no pathway exists between the proposed Project and the site:

- Pollution to water, air, and/or soil; and
- Spread of invasive alien species.

Assessment of Impacts

For the IEF of birds (commuting and foraging), the impacts of biodiversity loss, fragmentation, and alteration, and disturbance from noise, vibration, lighting, and human presence during the operational phase of the proposed Project have been assessed.

Biodiversity loss, fragmentation, and alteration, in the form of collision with Overhead Line Equipment (OHLE) and trains on Liffey Bridge, during operation may result from proposed OHLE infrastructure and trains, which are connected via direct physical pathway to the IEF. The magnitude of the effect is likely to be injury or loss of commuting and foraging bird species through contact with the OHLE and trains. As number of effected birds cannot be quantified, the precautionary principle has been applied. The duration of the effect is considered to be long-term. This effect is considered to be reversible. Due to the magnitude, the effect of biodiversity loss, fragmentation, and alteration, in the form of bird collision with OHLE and trains on Liffey Bridge, during the operational phase of the proposed Project is predicted to be not significant.

Disturbance from noise, vibration, lighting, and human presence, in the form of reduced commuting and foraging, during operation may result from increased train movements, which are connected via direct physical pathway to the IEFs. The extent of the effect is the entire operational area within the proposed Project. The magnitude of the effect is an increase in train traffic from 12 trains per hour per direction to 23 trains per hour per direction. Bird commuting and foraging activity is predicted to be lower after construction phase is complete, due to vegetation loss; therefore, the magnitude of disturbance during the operational phase is reduced.

The duration of the effect extends to the entire operational timeframe associated with proposed Project and is considered to be long-term. The timing of the operation activities (i.e. train movements) will influence the magnitude (i.e. operational activities during day-time hours in March and August, inclusive, are more likely to affect breeding birds). This effect is considered to be irreversible. Due to the magnitude, the effect of biodiversity loss, fragmentation, and alteration during the operational phase of the proposed Project is predicted to be not significant.

8.6. Mitigation Measures

8.6.1. Framework Measures

8.6.1.1. Roles and responsibilities

A Project Ecologist shall be appointed by Iarnród Éireann before the commencement of works. A suitably qualified and experienced ecologist (hereafter referred to as 'the Project Ecologist') shall be utilised in the implementation of the mitigation measures and survey requirements outlined here.

The ecologist shall be a full member of a relevant institution, such as the Chartered Institute of Ecology and Environmental Management (CIEEM) or similar, have relevant experience in the management of mitigation measures and ecological constraints on construction sites/restoration projects, and hold or have previously held a protected species derogation licence in the Republic of Ireland. It shall be their responsibility to supervise and provide recommendations on the execution of any works which have the potential to give rise to negative or positive effects on biodiversity. The Project Ecologist shall be suitably qualified and experience and have a minimum of five years' experience completing similar tasks on linear infrastructure projects.

The Contractor shall also appoint an Environmental Manager / Clerk of Works before the commencement of works. This person shall be responsible for carrying out environmental monitoring of the works and ensuring that the mitigation measures, proposed in this EIA and identified by the Project Ecologist, are adhered to. The Environmental Manager / Clerk of Works shall be suitable qualified and experienced and have a minimum of five years' experience completing similar tasks on linear infrastructure projects.

8.6.2. IEF Mitigation

8.6.2.1. Construction

8.6.2.1.1. Designated sites for Nature Conservation

The following measures are required to lessen or avoid the identified or potential significant effects on designated sites for nature conservation from water pollution:

General Pollution Prevention Control Measures

The following mitigation is for the general protection of watercourses:

- All works in, near (within 15 m of a watercourse feature) or liable to impact on a waterway must have prior agreement with IFI and NPWS.
- Stockpiling of construction materials shall be strictly prohibited within 15 m of any ditch or watercourse;
- Hazardous materials including diesel, fuel oils, solvents, paints and/or lubricants stored on temporary or permanent lands made available shall be stored on hardstand and within suitably designed bunded areas with a bund volume of 110% of the capacity of the largest tank / container;
- Re-fuelling of plant shall only take place on hardstand and not within 15 m of any watercourse or surface water feature (see Volume 3A of this EIA, Drawing DP-04-23-DWG-EV-TTA-23750). Spill containment (i.e. drip trays) shall be used, and spill kits shall be kept available and used if necessary;
- Oils, fuel, chemicals, hydraulic fluids etc. will not be stored outside construction compounds. They will be stored in designated bunded areas at construction compounds in accordance with established guidelines. Refuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/equipment will take place in these designated bunded areas only;
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or recycling at licensed facilities;
- Waste materials shall be stored in designated areas that are isolated from surface water drains and watercourses. Waste materials will be carefully managed including covering

stockpiles during rainfall. Skips shall be closed or covered to prevent materials being blown or washed away.

- All machinery will be routinely checked to ensure no leakage of oils or lubricants occurs during the construction phase. Any spillages will be immediately contained, and the contaminated soil removed from the site and disposed of properly;
- Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks will be trapped on-site to allow sediment to settle out before clarified water is released to a drain system; and
- No waste will be buried, burnt, or dumped on-site or in land adjacent to the site.
- Only emergency breakdown maintenance shall be carried out on site. Emergency procedures and spill kits will be readily available at strategic and/or sensitive site locations and all relevant personnel will be familiar with emergency procedures;
- An appropriate emergency response will be in place for any spillage of fuels, lubricants of hydraulic oils to ensure they are immediately contained; and
- Any contaminated soil shall be removed from the site and disposed of in a licensed facility.

For the protection of watercourses associated with surface water run-off, the following measures shall be employed:

- No in-stream works will be permitted;
- Where works are required within 15 m of a watercourse feature, ecologist shall assess and verify that appropriate demarcation and signage is in place before works commence. Demarcation shall be physically marked out using post and rail/post and rope/bunting, or equivalent, and be signposted to identify an ecological sensitivity.;
- Silt fencing shall be installed for all work within 15 m of the River Liffey. Silt fencing shall consist of a maintainable geotextile membrane (equivalent to Terrastop™ Premium; 250 micron; 45 l/m²/sec). Installation, maintenance, and removal shall follow the manufacturers' specifications. The geotextile membrane will be inspected at least once a week and following any period of heavy rainfall (i.e. Met Éireann Orange and Red rain warning).
- The Contractor will monitor weather forecasts for heavy rain and where required, certain works and in particular excavations/earthworks will cease in order to minimise exposed soil entering surface water run-off; and
- Soil excavation will not be completed during periods of prolonged or heavy rain (i.e. Met Éireann Orange and Red rain warning)

Controls over Use of Concrete

For the protection of watercourses associated with the use of concrete, the following measures shall be employed:

- All ready-mixed concrete shall be brought to site by truck. A suitable risk assessment for wet concreting shall be completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters to the underlying subsoil. Wash down and washout of concrete transporting vehicles shall take place at an appropriate facility offsite;
- Concrete shall be contained and managed appropriately to prevent pollution of watercourses. Concrete pouring will be prevented during periods of heavy rainfall, and quick setting mixes shall be used; and
- Waste materials shall be stored in designated areas that are isolated from surface water drains. Skips shall be closed or covered to prevent materials being blown or washed away.

Control and Response to Environmental Incidents and Accidents

In the case of environmental incidents or accidents occurring during the construction phase of the Project, the following measures will be applied:

- The Contractor will be required to have available on-site spill kits and hydrocarbon absorbent materials to deal with any accidental spillages;
- An Environmental Incident and Emergency Response Plan will be established by the Contractor to deal with incidents or accidents during construction that may give rise to pollution in watercourses proximal to the works. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (e.g. oil booms, soakage pads);
- Throughout all stages of the construction phase the Contractor will ensure that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types;
- All hazardous materials on site will be stored within secondary containment designed to retain at least 110% of the total storage contents;
- Temporary bunds for oil/diesel storage tanks will be used off- site during the construction phase of the proposed Project as appropriate;
- Safe handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the Project; and

- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site and properly disposed of at a suitable licensed facility.

8.6.2.1.2. Habitats

The following measures are required to lessen or avoid the identified or potential significant effects on IEF habitats from spread of invasive species, air pollution, and loss of habitats.

Invasive Alien Species Management

The following measures shall be employed in relation to non-native invasive plant species:

- Before construction begins, an Invasive Alien Species Avoidance and Management Plan shall be prepared by an ecologist/invasive species specialist pre-construction. This plan shall build on the baseline data presented in this chapter and include the following information and management protocols for dealing with occurrences of scheduled invasive species:
 - Confirmation of locations of invasive alien plant species (IAPS) identified in the baseline section of this chapter and identification of new or expanded locations of invasive alien plant species;
 - A buffer zone of 10 m shall be put in place around all know location of IAPS. The buffer zone shall be physically demarked using post and rail/post and rope/bunting, or equivalent, and be signposted to identify an ecological sensitivity. The Ecologist shall assess and verify the demarcation and signage before works commence.
- Prior to works commencing within the vicinity of any IAPS, all site personnel shall be given a Toolbox talk where operatives will be briefed on the presence of the IAPS and the legal provisions relating to introduction and spread under the Wildlife Acts as amended and the Habitats Regulations;
- All excavated material within 7 m of the known IAPS locations shall be considered to be contaminated with IAPS (roots, stem fragments, or seeds) suitable to cause the spread of IAPS and shall be disposed of at an appropriately licensed waste facility;
- No works shall proceed in the 10 m buffer zone without prior approval from the Project Ecologist;
- Materials introduced to the site during construction, such as soils, sands, and gravels, shall be free from scheduled IAPS, with certification of such by the Environmental Manager / Clerk of Works.

Air Pollution

Refer to Chapter 12 Air Quality for construction phase dust mitigation measures. In addition to the mitigation measures set out in Chapter 12, the following measure shall be employed to avoid and minimise exposure to windy periods:

- The contractor shall monitor weather forecasts for strong wind (i.e. Met Éireann Orange and Red wind warning) and works including excavations and earthworks shall cease until the weather warning expires in order to minimise dust emissions.

Loss of habitats during construction

The following measures are proposed to protect retained and adjoining habitats, to reinstate vegetation where removal or clearance is required, and to provide enhancement to mitigate the loss of habitats during construction. Before construction begins, a Biodiversity Management Plan (or Landscape and Biodiversity Management Plan) shall be prepared by an ecologist and landscape specialist incorporating the measure outlined here.

Retained areas

Retained vegetation shall be improved through hedgerow planting, wildflower seeding, and tree planting which incorporates the safety requirements in relation to OHLE clearance specified in Iarnród Éireann CEE-TMS-381 Control and Management of Vegetation Standard. Measures shall include:

- Where hedgerows contain gaps and connectivity can be improved, native trees and shrubs shall be planted under the direction of the Project Ecologist in consultation with the appointed landscape specialist. Species planted shall increase the variety of hedgerow types in terms of height, width, shape and species mix (diversity). Planted tree and scrubs shall be of Irish provenance (i.e. stock grown within the island of Ireland) and include mixes of at least five of the following species: blackthorn (*Prunus spinose*), hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*), crab apple (*Malus sylvestris*), pedunculate oak (*Quercus robur*), birch (*Betula pendula* and/or *B. pubescens*), rowan (*Sorbus aucuparia*), cherry (*Prunus avium* and/or *P. padus*), whitebeam (*Sorbus aria* and/or *S. hibernica*), wych elm (*Ulmus glabra*), guelder rose (*Viburnum opulus*), and spindle (*Euonymus europaeus*).
 - Hedgerows identified for improvement include the following locations: Zone B (areas between Park West/Cherry Orchard Station and Cherry Orchard Footbridge, chainage 14+600 to 13+350); and Zone D (North entrance to Phoenix park Tunnel to the Glasnevin cemetery road bridge, chainage 8+150 to 5+650). Also see landscape mitigation, see Volume 4, Appendix 15.1 of this EIAR.

Reinstated areas

Reinstated vegetation shall be improved through hedgerow planting, wildflower seeding, and tree planting which incorporates the safety requirements in relation to OHLE clearance specified in Iarnród Éireann CEE-TMS-381 Control and Management of Vegetation Standard. Measures shall include:

- Hedgerow planting shall use a suitable native species mix (see above).
 - New hedgerows identified for improvement include the following locations: Zone B (adjacent to Park West substation, chainage 14+500; along Le Fanu Rd, chainage 12+600; adjacent to proposed Inchicore substation, chainage 11+750). See landscape mitigation, see Volume 4, Appendix 15.1 of this EIAR.
 - Management of new hedgerows shall include:
 - New planting at each location will be dominated by native species identified for those locations. Where ash was the dominant hedgerow species removed, hawthorn or blackthorn shall be planted as dominant;
 - The dominant tree species in the planting shall be feathered whips, while sub-dominant species shall be greater than 40 cm in height;
 - All new hedgerow planting shall contain, at a minimum, five native tree/shrub species (see species list above);
 - Planting shall follow a double-row format of zig-zag pattern, with row spacing at 50 cm and tree spacing at 40-45 cm;
 - All new hedgerows shall be maintained for eight years, with seasonal checks by a suitably qualified arboriculturist/ecologist for the first two years and yearly checks for the subsequent six years. A rate of 90% living individuals after 4 years and 80% living individuals after 6 years shall be retained, with replacement planting completed when required. Any gaps greater than 1 m shall be replanted with native tree/shrub species of similar size to those adjacent.
- Replanting of reinstated soil cover areas shall use a wildflower seeding mix. Seeding mix shall include Irish native species with a 80:20 ratio of forbs to grasses in order to prevent grass dominance and reduce maintenance requirements. The native species seed mix shall be of Irish provenance (i.e. stock grown within the island of Ireland) and shall be species rich mixes which are appropriate for the soil type and locations. The Project Ecologist shall determine the suitable species mixes at the following locations:
 - All reinstated soil areas in Zone B, Zone C, and Zone D (including areas cleared for soil nailing).

- Proposed attenuation tank at proposed Heuston West Station, chainage 9+000
- Proposed compound, west of station road, chainage 15+500
- Proposed substation at Hazelhatch, chainage 24+200. In addition to wildflower seeding, planting of species rich native trees and shrubs along boundary of land parcel, planting of pockets of mixed broadleaf woodland habitat, creation of pond habitat (preferably clustered design), installation of 6no. 1B Schwegler Nest Box (or equivalent) with varying entrance hole sizes (All boxes shall be made from long-lasting materials (e.g. woodcrete / woodstone)) shall be completed.
- Green walls shall be developed on retaining walls/boundary treatments. Options of green walls include vertical planting 'living wall' and/or wall planter boxes. The living wall shall be achieved through the use of rows of planter boxes attached to the inside face of the retaining wall. The planter boxes shall be located, and firmly attached, on the top and/or inside base of the retaining walls. The green wall shall be installed on the retaining wall running parallel to Con Colbert Road to South circular road bridge, Chainage 10+370 to 9+675.
 - The green wall species mix shall be of Irish provenance (i.e. stock grown within the island of Ireland) and shall be appropriate for the soil type and locations. The species mix shall include plug plants of native heather (*Calluna vulgaris*), heath (*Erica cinerea* and *E. tetralix*), ivy (*Hedera helix*), and honeysuckle (*Lonicera periclymenum*). Climbers will trail down the rail side (i.e. on the southern aspect) of the wall. A minimum of 50% of coverage will be native Irish species. The Project Ecologist will determine the suitable species mixes, which will meet the health and safety requirements relating to the Project.

Creation of Biodiversity 'Stepping Stones'

The following measures are to mitigate the loss of linear habitat removal through the enhancement of existing lands adjoining the proposed Project. The locations and enhancement measures are provided in Table 8.5 and enhancement areas are indicated by the orange line. Through consultation with the detailed design team, the Project Ecologist will determine the final specifications and locations of these enhancement measure.

Table 8.5: Location and Enhancement of Existing Adjoining Lands

Location	Measures to be incorporated
Attenuation/soakaway at the Royal Canal	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> ● Creation of 6no. habitat piles through the use of deadwood. These are to be located throughout the site utilising woody vegetation proposed for clearance from the rail line; and ● Creation of pond habitat (preferably clustered design) consisting of at least 3 ponds. New ponds shall include features such as extensive shallows on at least one side,

Location	Measures to be incorporated
	<p>islands, and be a maximum depth of 50cm. See pond creation toolkit information available from the Freshwater Habitat Trust⁶ in the UK.</p> <ul style="list-style-type: none"> ○ One pond may be used as a working pond to receive pumped water from the rill line, before reaches the existing soakaway. ○ Through consultation with the detailed design team, the Project Ecologist will determine the final specifications of the ponds.
<p>Proposed construction compound at Cabra</p>	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Embankment creation with slope no greater than 80 degrees; • Planting of species rich native trees and shrubs along boundary of properties; and • Sowing Irish native wildflower seed mix (80/20 forbs to grass) in order to establish grassland and meadow habitat.
<p>McKee Barracks Bridge (OBO3), chainage 7+700</p>	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Retention of existing vegetation on the McKee barracks bridge.

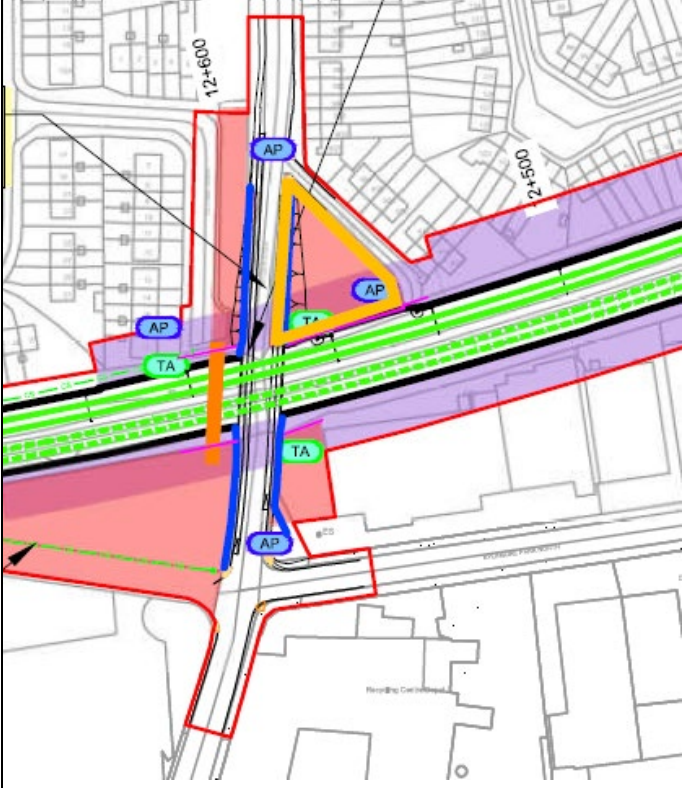
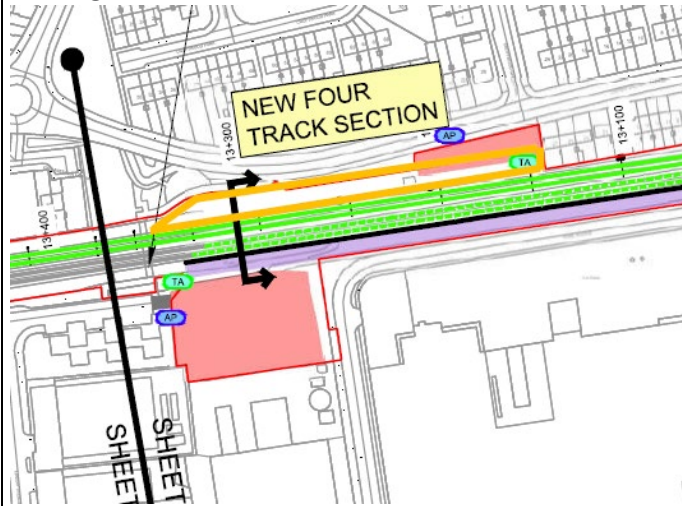
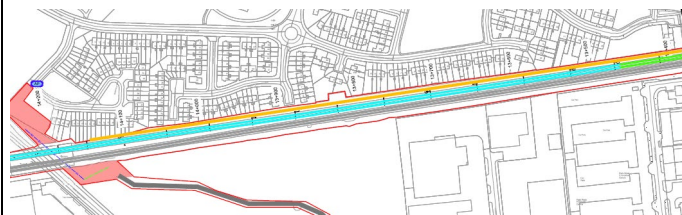
⁶ Available online at: <https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/>. Accessed 29/12/2022.

Location	Measures to be incorporated
<p>South of proposed Heuston West Station at Platform 10, chainage 9+100 to 9+350</p>	<p>On adjacent land to Heuston Station the following measures shall be instated:</p> <ul style="list-style-type: none"> • Removal of invasive alien plant species, including Japanese knotweed. • Planting of species rich native trees and shrubs along boundary of the fence line; • Installation of bat boxes: 2no. Schwegler 1FF bat box (or equivalent) and 2no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete / woodstone).
<p>West of South Circular Bridge (OBC1A) on 'Cut and cover tunnel', Chainage 9+500</p>	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Green roof on top of the cut and cover tunnel to consist of vegetated fabric mats with broad mix of sedum and native wildflower species

Location	Measures to be incorporated
<p>Proposed construction compounds north and south of Sarsfield Road Under-Bridge (UBC4), chainage 10+500.</p>	<p>For both areas, the following measures shall be instated:</p> <ul style="list-style-type: none"> • Over-sowing of existing grassland with Irish native wildflower seed mix (80/20 forbs to grass); • Planting of Irish native trees and shrubs along boundaries; • Installation of bat boxes: 2no. Schwegler 1FF bat box (or equivalent) and 2no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete / woodstone). • Installation of bird boxes: 4no. 1B Schwegler Nest Box (or equivalent) with varying entrance hole sizes. All boxes shall be made from long-lasting materials (e.g. woodcrete/woodstone).
<p>Proposed attenuation tank and amenity grassland in Inchicore Works, chainage 10+700</p>	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Sowing Irish native wildflower seed mix (80/20 forbs to grass) to grassland and meadow habitat. Habitats to be managed with spring and autumn cut and removal; • Within existing grassland habitat to the west of the proposed attenuation tanks, planting of Irish native trees and shrubs along boundary of the fence line to increase connectivity where gaps are present.

Location	Measures to be incorporated
<p>Proposed construction compound and existing amenity grassland and water feature in Inchicore Works, chainage 10+900.</p>	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Enhance existing amenity grassland through over-sowing of existing grassland with Irish native wildflower seed mix (100% forbs, no grass); • Enhance existing tree and shrub through planting of Irish native species; • Installation of bat boxes: 2no. Schwegler 1FF bat box (or equivalent) and 2no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete/woodstone). • Installation of bird boxes: 4no. 1B Schwegler Nest Box (or equivalent) with varying entrance hole sizes. All boxes shall be made from long-lasting materials (e.g. woodcrete/woodstone). • Enhancement of existing pond features such as extensive shallows on at least one side, islands, and be a maximum depth of 50cm. See pond creation toolkit information available from the Freshwater Habitat Trust⁷ in the UK.

⁷ Available online at: <https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/>. Accessed 29/12/2022.

Location	Measures to be incorporated
<p>Existing park/proposed construction compound on Le Fanu Road, chainage 12+590.</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Restore existing amenity grassland through over-sowing of existing grassland with Irish native wildflower seed mix (100% forbs, no grass); • Enhance existing tree and shrubs through planting of Irish native species; • Installation of bat boxes: 2no. Schwegler 1FF bat box (or equivalent) and 2no. 2F Schwegler Bat Box (or equivalent). All boxes shall be made from long-lasting materials (e.g. woodcrete / woodstone). • Installation of bird boxes: 4no. 1B Schwegler Nest Box (or equivalent) with varying entrance hole sizes. All boxes shall be made from long-lasting materials (e.g. woodcrete / woodstone).
<p>Area east of Cherry Orchard Footbridge (OBC8B), chainage 13+350 to 13+150</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Enhance existing treeline by inter-planting Irish native tree species and shrubs.
<p>Area adjoining track on Cherry Orchard Ave, chainage 14+150 to 13+400</p> 	<p>The following measures shall be instated:</p> <ul style="list-style-type: none"> • Enhance existing hedgerow by selective replacement planting using Irish native tree species and shrubs.

8.6.2.1.3. Bats

Roosting

The following measures are required to lessen or avoid the identified or potential significant effects on roosting bats from habitat loss and disturbance:

- Pre-construction bat roosting assessments will be completed, this assessment will visually assess all structures and tree proposed for removal/demolition. The visual assessment and any follow-on roost assessment methods shall follow the baseline methods outlined in this assessment.
- An alternative bat roosting structure, for use by multiple bat species, shall be installed adjoining the proposed Inchicore substation.. The roost structure shall be suitable for maternity roosting or large colony roosting for Leisler's bat, *Nathusius'* pipistrelle, common pipistrelle, soprano pipistrelle and brown long-eared bat.
 - Option 1: Consideration shall be given to repurposing the lookout tower (chainage 11+800), which is proposed for demolition. Repurposing shall include the 'blocking up' of the windows to exclude light, installation of bat suitable internal insulation (e.g. 50mm polyisocyanurate (PIR) board completely covered with Oriented Strand Board (OSB)), installation of wooded rafters at multiple heights for bats to roost on, and creation of one small opening on each aspect suitable for bats to enter/exit. A maintenance entrance shall also be installed for any future requirements. Final specification to be agreed with the Project Ecologist.
 - Option 2: Alternatively, pole mounted maternity/large colony bat boxes shall be provided. Four poles with two boxes per pole shall be installed (see example in Figure 8-4), i.e. a total of eight boxes. The boxes shall be constructed of long-lasting material and shall be 4-6m above ground level with boxes orientated to different aspects.
- An alternative bat roosting structure, for use by multiple bat species, shall be installed adjoining the proposed Hazelhatch substation. The roost structure shall be suitable for maternity roosting or large colony roosting for Leisler's bat, *Nathusius'* pipistrelle, common pipistrelle, soprano pipistrelle and brown long-eared bat.
 - Pole mounted maternity/large colony bat boxes shall be provided. Four poles with two boxes per pole shall be installed (see example in Figure 8-4), i.e. a total of eight boxes. The boxes shall be constructed of long-lasting material and shall be 4-6m above ground level with boxes orientated to different aspects.



Figure 8-3: Example of Pole Mounted Bat Roosting Box

Commuting and Foraging

The following measures are required to lessen or avoid the identified or potential significant effects on commuting and foraging bats from habitat loss and disturbance:

- The loss, fragmentation and alteration of suitable bat commuting, and foraging habitat shall be mitigated through the measures detailed under section 8.6.2.1.2. Through these measures, habitat will be both enhanced where retained, reinstated and replanted where lost, and ecological stepping stones shall be created within adjoining habitat to provide connectivity within the wider landscape.

Hibernation

The following measures are required to lessen or avoid the identified or potential significant effects on hibernating bats from habitat loss, disturbance, and air pollution:

- Pre-construction bat roosting/hibernation assessments shall be completed. These shall include visual assessment of the Phoenix Park Tunnel and deployment of static bat detector

in the appropriate season (late autumn and or early spring) before construction begins. Methods shall follow the baseline methods outlined in this assessment.

- Pre-construction briefings and toolbox talks for all involved in the Project;
- Bat hibernation boxes appropriate for brown long-eared bat to be placed in close proximity to northern Phoenix Park Tunnel entrance, e.g. on the top of the cutting, chainage 8+500. This location shall be agreed with the Project Ecologist. The bat hibernation box shall be of long-lasting material and be suitable for brown long eared bat shall be (e.g. the Vivara Pro Large Multi Chamber Wood Stone Bat Box for trees or the Schwegler 2FE wall-mounted bat shelter for structures only);
- The timing of the construction works within the Phoenix Park Tunnel will avoid the winter hibernation periods (November-March, inclusive) (CIEEM, 2021);
- In the event that construction works in Phoenix Park Tunnel cannot be completed outside the winter hibernation periods;
 - Construction works within Phoenix Park tunnel will only proceed under the supervision of the Project Ecologist. A derogation licence may be required to complete this work;
 - Should any potential hibernation sites be identified during the construction phase by the Project Ecologist, works will immediately cease until the appropriate course of action is identified by the suitably qualified and licensed bat ecologist, which may include the requirement to seek a licence from the Wildlife Licensing Unit for the completion of the construction works.
- Air pollution prevention measures for habitats, as set out in Section 8.6.2.1.2 shall be employed.

8.6.2.1.4. Badger

Setts and Breeding

The following measures are required to lessen or avoid the identified or potential significant effects on badger setts and breeding from biodiversity loss and disturbance:

- At least one month in advance, but no greater than six months in advance, of commencing any enabling or advance works, a pre-construction survey for badger shall be undertaken by the Project Ecologist. The Project Ecologist shall report, in writing, any additional mitigation measures resultant from these surveys. Any additional mitigation measures shall be cognisant of the *Guidelines for the treatment of badgers prior to the construction of National Road Schemes* (NRA, 2005). The Project ecologist shall also advise on any additional relevant protective measures and/or licensing requirements resulting from the survey findings;

Commuting and Foraging

The following measures are required to lessen or avoid the identified or potential significant effects on badger commuting and foraging from biodiversity loss:

- Habitat loss measures, as set out in Section 8.6.2.1.2 shall be employed.

8.6.2.1.5. Birds

Breeding

The following measures are required to lessen or avoid the identified or potential significant effects on breeding birds from biodiversity loss and disturbance from noise:

- The removal of existing hedgerow and vegetation shall avoid the bird nesting season (March to August, inclusive).
- Construction lighting will avoid night-time illumination of retained and adjoining vegetation during the bird nesting season (March to August, inclusive). All night-time construction operatives will be informed of this requirement by the Project Ecologist or EcOW.
- Bird nesting boxes shall be installed at various locations. The specification for these boxes have been outlined in Section 8.6.2.1.2.

Commuting and Foraging

The following measures are required to lessen or avoid the identified or potential significant effects on commuting and foraging birds from biodiversity loss and disturbance from noise:

- The removal of existing hedgerows and vegetation shall avoid the bird nesting season (March to August, inclusive); and
- Measures to retain, reinstate, and create ecological stepping-stone vegetation shall be put in place. These measures are set out in Section 8.6.2.1.2.

8.6.2.2. Operation

8.6.2.2.1. Bats

Hibernating

The potential loss of the Phoenix Park Tunnel as a bat hibernation site during the operation of the proposed Project shall be mitigated through the installation of alternative bat hibernation boxes, detailed under section 8.6.2.1.3.

8.6.3. Non-IEF Mitigation

8.6.3.1. Construction

8.6.3.1.1. Tree protection

Prior to construction commencement, Root Protection Areas (RPAs) for retained trees shall be put in place. The purpose of protective barriers is to avoid any harmful construction activity that may damage the retained trees. Tree protection barriers shall be fit for the purposes of excluding construction activities and be durable to withstand an impact. The extent of the RPA shall be an area equivalent to a circle with a radius 12 times the stem diameter (stem diameter measured at 1.5m above ground level) (NRA, 2006).

8.6.3.1.2. Pre-construction ecology surveys

At least one month in advance, but no greater than six months in advance, of commencing any enabling or advance works, a pre-construction survey for protected and invasive alien species shall be undertaken (within a suitable season) within the proposed Project area, including areas which could not be accessed during the establishment of the baseline. The surveys shall be undertaken by a suitable qualified and experienced ecologist. The ecologist shall also advise, in writing, on any additional relevant protective measures and/or licensing requirements resulting from the pre-construction survey findings.

The timing of vegetation removal for construction shall avoid the breeding bird season (e.g. no removal between 1st March and the 31st August, inclusive).

8.6.3.1.3. Bats (roosting and individuals)

In the unlikely event that unknown roosting or stranded bats are encountered on the Project, works shall immediately cease in that area and the local NPWS Conservation Ranger shall be contacted. If present, bats shall only be removed under licence from the NPWS.

8.6.3.1.4. Badger (commuting and foraging)

There is potential for badgers to be killed or injured during construction through accessing areas of construction, including excavations. The following measure shall be completed: protective fencing, covering excavations overnight and/or allowing temporary access ramps from excavations if too large or not possible to cover overnight.

8.6.3.2. Operation

8.6.3.2.1. Habitats

- Timing of vegetation maintenance works to avoid the breeding bird season (e.g. no removal between 1st March and the 31st August, inclusive).
- Operation activities to follow set guidelines for non-native invasive plant species and in accordance with the Invasive Species Management Plan for the proposed Project.

8.6.3.2.2. Bats

- Measures to avoid artificial light spillage from operation with respect to structures and trees. Any proposed external lighting shall be directional and cowled to avoid the light spill (greater than 1 LUX above background levels) to all relevant ecological features.

8.6.3.2.3. Birds

The feeder wire along both sides of Single-Track Cantilever OHLE masts on the Liffey Bridge crossing (Zone D) will be fitted with a device to make lines more visible to commuting and foraging birds. Devices will not be required in any other location along the proposed Project.

Although the information surrounding the efficacy of bird diverters with a species-specific focus is limited, a wide range of wire marking devices can be used, generally falling into three basic designs: aerial marker spheres, spirals, and suspended devices (swinging, flapping, and fixed) (APLIC, 2012).

The hanging device is proposed here (Figure 8-4) as it is universal, cost-effective, allows easy installation, remains in position in severe weather conditions and fits a range of conductors/wires. Like other diverters (because there are few comparative studies), there is extensive field studies (Prinsen *et al.*, 2011) showing that when installed properly they can significantly decrease bird strike. Hanging devices (e.g. Raptor Clamp Diverter, Fire Fly) are suspended from the wire with fixed or swinging plates or flappers and are designed to increase the visibility of overhead lines and reduce the incidence of bird collisions with overhead cables.



Figure 8-4: Examples of Hanging Tags (from APLIC, 2012)

Specification requirements include (derived from SNH (2016) guidance):

- Devices should vary in colour (e.g. black and white), be as reflective as possible with glowing surfaces and be capable of a swinging or flapping motion making them more visible and effective (ESKOM Transmission, 2009) (see Figure 8-4). Devices shall not be restricted in their movement;

- Devices should be placed 5m apart and staggered on parallel lines. Based on various studies as reported by APLIC (2012) in the United States, data recommends spacing between 4.6 m and 30 m. As this is largely dependent on the extent of the overhead lines which requires mitigation through diversion devices, 5m is considered appropriate for the Liffey Bridge crossing which only extends for c. 50m over the water;
- Devices should be as large as possible for maximum visibility (i.e. diameter of at least 20cm and length of at least 10 to 20cm) . A study completed by Jenkins et al., (2010) concluded that by line marking with devices that increase the visibility of the line are likely to lower general collision rates by 50% to 80%. Other studies have also shown a reduction of collision rates by 50% to 94% (Prinsen et al., 2011);
- Line markers shall require annual maintenance and replacement, ensuring that markers remain in position and functional throughout the lifetime of the proposed Project.

8.7. Monitoring

Monitoring of successful growth and integration is required of for the following biodiversity elements:

- Improving retained vegetation (Section 8.6.2.1.2);
- Replanting of reinstated areas (Section 8.6.2.1.2);
- Creation of 'steppingstones' for biodiversity (Section 8.6.2.1.2), and
- condition of bird diverters (Section 8.6.3.2.3)

8.8. Residual Effects

An assessment of residual effects, after the mitigation measures have been implemented, has been completed. Residual effects arising from the proposed Project are presented in Table 8.6 and Table 8.7.

Table 8.7 summarise the IEFs, ecological valuation, relevant impact categories assessed, characterisation of unmitigated impacts, effects, summary mitigation, and effects of residual impacts after mitigation.

8.9. Cumulative Effects

The cumulative assessment of relevant plans and projects is undertaken separately in Chapter 26 of this EIA.

Table 8.6: Residual Effects During the Construction Phase of the Proposed Project

Category	Important Ecological Features	Ecological valuation	Relevant Impact Category	Characterisation of Unmitigated Impact on IEF	Effect without Mitigation	Residual Effects
Designated Sites for nature conservation	South Dublin Bay SAC (site code 000210), South Dublin Bay and River Tolka Estuary SPA (site code 004024), North Dublin Bay SAC (site code 000206), Sandymount Strand/Tolka Estuary Ramsar (site 832), Dublin Bay Biosphere Reserve.	International	Pollution to water, air, and/or soil	Water pollution during construction may result from surface water run-off carrying suspended silt or contaminants into local watercourses (tributaries of the River Liffey) which are connected via hydrological pathway (Liffey estuary) to the IEF.	Significant adverse	Not Significant
	North Dublin Bay pNHA (site 000206), South Dublin Bay pNHA (site 000210)	National	Pollution to water, air, and/or soil	As pre above	As per above	Not Significant
	Royal Canal pNHA (site 002103)	National	Disturbance from noise, vibration, lighting, and human presence	Disturbance during construction may result from works taking place within the vicinity of the Royal Canal Bridge (OBO8) which is connected via structural and airborne pathways to the IEF.	Not significant	n/a
Habitats and Flora	Zone B and C (Park West & Cherry Orchard Station to Heuston Station) <ul style="list-style-type: none"> • Neutral grassland (GS1); • Dry meadow and grassy verges (GS2) • Matrix of scrub 	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, fragmentation, and alteration during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs.	Significant adverse	Not Significant
			Pollution to water, air, and/or soil; and	Pollution to air during construction may result from activities creating dust or particles resulting in physically smothering of vegetation, affecting their function and survival, which are connected via airborne pathway to the IEFs.	Significant adverse	Not Significant

Category	Important Ecological Features	Ecological valuation	Relevant Impact Category	Characterisation of Unmitigated Impact on IEF	Effect without Mitigation	Residual Effects
	(WS1) and grassy verge (GS2);			To avoid duplication of assessment, water pollution to the estuary is addressed in the assessment of designated sites for nature conservation and is not assessed again here.		
	<ul style="list-style-type: none"> Scrub (WS1); Hedgerow (WL1), and Treeline (WL2) <p>And,</p> <p>Zone D (River Liffey Bridge to Glasnevin Junction):</p> <ul style="list-style-type: none"> Neutral grassland (GS1); Matrix of scrub (WS1) and grassy verge (GS2); Hedgerow (WL1) Canal (FW3) Estuary (CW2) 		Spread of invasive alien species	Spread of invasive alien species may result from dispersal of Scheduled invasive alien species via machinery, materials, clothing or personnel, which are connected with the via physical interaction pathway to the IEFs.	Significant adverse	Not Significant
Fauna	Bats (roosting)	Local (higher)/unknown	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, in the form of loss of roosting sites, during construction may result from potential loss of unrecorded roosting bats within the un-surveyed area of the proposed Project, which are connected via physical pathway to the IEFs.	Potential significant adverse	Likely not Significant
			Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of loss of roosting sites, during construction may result from potential disturbance of unrecorded roosting bats within the un-surveyed area of the proposed Project, which are connected via physical and airborne pathway to the IEFs.	Potential significant adverse	As above
	Bats (commuting and	Local (higher)	Biodiversity	Biodiversity loss, fragmentation, and alteration, in the	Significant	Not

Category	Important Ecological Features	Ecological valuation	Relevant Impact Category	Characterisation of Unmitigated Impact on IEF	Effect without Mitigation	Residual Effects
	foraging)		loss, fragmentation, and alteration	form of loss of suitable bat commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs	adverse	significant
			Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of loss of suitable bat commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs	Significant adverse	Not significant
	Bats (hibernating)	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, in the form of loss of a bat hibernation site, during construction may result from construction works associated with electrical infrastructure addition within the Phoenix Park Tunnel, which are connected via physical and airborne pathway to the IEFs.	Significant adverse,	Not significant
			Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence during construction may result from construction works associated with electrical infrastructure addition and track alteration within the Phoenix Park Tunnel, which are connected via physical and airborne pathway to the IEF	Significant adverse	Not significant
			Pollution to water, air, and/or soil; and	Air pollution during construction may result from potential disturbance of bat hibernation sites within the Phoenix Park Tunnel, which are connected via physical and airborne pathway to the IEFs. The extent of the effect is the Phoenix Park Tunnel.	Significant adverse,	Not significant
	Badger (setts and breeding)	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, in the form of loss of setts and breeding badgers, during construction may result from potential loss of unrecorded features within the un-surveyed area of the proposed Project, which are connected via physical pathway to the IEFs	Significant adverse	Likely not significant

Category	Important Ecological Features	Ecological valuation	Relevant Impact Category	Characterisation of Unmitigated Impact on IEF	Effect without Mitigation	Residual Effects
			Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence in the form of disturbance of setts and breeding badgers, during construction may result from potential loss of unrecorded features within the un-surveyed area of the proposed Project, which are connected via physical pathway to the IEFs.	Potentially significant adverse	Likely not significant
	Badger (Commuting and foraging)	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, fragmentation, and alteration, in the form of loss of suitable badger commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs.	Significant adverse	Not significant
			Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of loss of suitable badger commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs.	Not significant	n/a
	Birds (breeding)	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, fragmentation, and alteration, in the form of loss of suitable breeding bird habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs	Significant adverse	Not significant
			Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of reduced breeding success, during construction will result from four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs	Significant adverse	Not significant
	Birds (commuting and	Local (higher)	Biodiversity	Biodiversity loss, fragmentation, and alteration, in the	Significant	Not

Category	Important Ecological Features	Ecological valuation	Relevant Impact Category	Characterisation of Unmitigated Impact on IEF	Effect without Mitigation	Residual Effects
	foraging)		loss, fragmentation, and alteration	form of loss of suitable bird commuting and foraging habitat, during construction will result from vegetation removal for four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEFs	adverse	significant
			Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of reduced commuting and foraging, during construction will result from four-tracking, track realignment, and associated infrastructure, which are connected via direct physical pathway to the IEF	Significant adverse	Not significant

Table 8.7: Residual Effects During the Operational Phase of the Proposed Project

Category	Important Ecological Features	Ecological valuation	Relevant Impact Category	Characterisation of Unmitigated Impact on IEF	Effect without Mitigation	Effects of Residual Impacts after Mitigation
Habitats and Flora	Zone B and C (Park West & Cherry Orchard Station to Heuston Station) <ul style="list-style-type: none"> Neutral grassland (GS1); Dry meadow and grassy verges (GS2) Matrix of scrub (WS1) and grassy verge (GS2); Scrub (WS1); Hedgerow (WL1), and Treeline (WL2) 	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, fragmentation, and alteration during operation will result from vegetation management (cutting and trimming), which are connected via direct physical pathway to the IEFs.	Not Significant	n/a
	And, Zone D (River Liffey Bridge to Glasnevin Junction): <ul style="list-style-type: none"> Neutral grassland (GS1); Matrix of scrub (WS1) and grassy verge (GS2); Hedgerow (WL1) Canal (FW3) Estuary (CW2) 		Spread of invasive alien species	Spread of invasive alien species may result from dispersal of Scheduled invasive alien species via machinery, materials, clothing or personnel during vegetation maintenance and other activities, which are connected via physical interaction pathways to the IEF species via machinery, clothing or personnel.		
Fauna	Bats (commuting and foraging)	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, fragmentation, and alteration, in the form of reduction of suitable bat commuting and foraging habitat, during operation may result from the presence of electrified overhead lines and increased train movements, which are connected via direct physical pathway to the IEFs.	Not Significant	n/a

Category	Important Ecological Features	Ecological valuation	Relevant Impact Category	Characterisation of Unmitigated Impact on IEF	Effect without Mitigation	Effects of Residual Impacts after Mitigation
		Local (higher)	Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of reduction of suitable bat commuting and foraging habitat, during operation may result from electrified overhead lines and increased train movements, which are connected via direct physical pathway to the IEFs	Not significant	n/a
	Bats (hibernating)	Local (higher)	Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence during operation may result from electrified overhead lines and increased train movements, which are connected via direct physical pathway to the IEFs.	Significant adverse	Not significant
	Badger (Commuting and foraging)	Local (higher)	Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of loss of suitable badger commuting and foraging habitat, during construction may result from increased train movements, which are connected via direct physical pathway to the IEFs.	Not significant	n/a
	Birds (breeding)	Local (higher)	Biodiversity loss, fragmentation, and alteration	Biodiversity loss, fragmentation, and alteration, in the form of collision with Overhead Line Equipment (OHLE) and trains on Liffey Bridge, during operation may result from proposed OHLE infrastructure and trains, which are connected via direct physical pathway to the IEF	Not significant	n/a
	Birds (breeding)	Local (higher)	Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of reduced breeding success, during operation may result from increased train movements, which are connected via direct physical pathway to the IEFs	Not significant	n/a
	Birds (commuting and foraging)	Local (higher)	Disturbance from noise, vibration, lighting, and human presence	Disturbance from noise, vibration, lighting, and human presence, in the form of reduced commuting and foraging, during operation may result from increased train movements, which are connected via direct physical pathway to the IEFs.	Not significant	n/a

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