
Chapter 8

Biodiversity

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8. BIODIVERSITY

8.1 Introduction

This chapter assesses the impact of the proposed DART+ West project (hereafter referred to as ‘the proposed development’) on biodiversity during the construction and operation phase. This chapter describes and assesses the likely direct and indirect significant impacts of the proposed development on biodiversity. The methods employed to establish the ecological baseline within and around the proposed development are described, together with the process followed to determine the nature conservation importance of the ecological features present. The ways in which habitats, species and ecosystems are likely to be affected by the proposed development are described and the magnitude of the likely effects predicted, taking into account the conservation condition of the habitats and species under consideration¹. Mitigation measures are proposed, and any residual effects are assessed.

8.2 Legislation, policy and guidance

8.2.1 Legislation

Ireland has given effect to the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992) and the Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009) 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.

In accordance with the Transport (Railway Infrastructure) Act 2001 “the 2001 Act”, as recently further amended by the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 in S.I. No. 743/2021 (“the 2021 Regulations”), CIÉ, as the Applicant for this Railway Order, has adopted a coordinated assessment in its approach to the preparation of the EIAR together with the preparation of the Natura Impact Assessment under the Habitats Directive and the Birds Directive.

The main legislation which provides for biodiversity and nature conservation in Ireland are the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), SI No.477 of 2011 as amended, (“the Habitats Regulations” or “the Habitats Regulations 2011 to 2021” and the Wildlife Acts 1976 (as amended) (which includes *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.

The Habitats Regulations were *inter alia* amended by S.I. No. 290 of 2013; S.I. No. 499 of 2013; S.I. No. 355 of 2015; Planning, Heritage and Broadcasting (Amendment) Act 2021 (no.11 of 2021), Chapter 4; S.I. No. 293 of 2021. The National Parks & Wildlife Service (“the NPWS”) has issued the following circulars as guidance on the implementation of the Habitats Regulations: Circular Letter NPWS 1/10; Circular Letter L8/08; Circular Letter NPWS 2/08; Circular Letter SEA 1/08 & NPWS 1/08; Circular Letter PD 2/07 & NPWS 1/07; Circular Letter NPWS 2-07 - Guidance on Compliance with Regulation 23.

The European Communities (Birds and Natural Habitats) Regulations, 2011, as amended (‘the Habitats Regulations’), transpose into Irish law Directive 2009/147/EC (the ‘Birds Directive’) and Council Directive 92/43/EEC (the ‘Habitats Directive’), which 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

¹ Based upon the definitions of favourable conservation status in Article 1 of Council Directive 92/43/EEC (the Habitats Directive).

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.

The Wildlife Act, 1976 (as amended) ('the Wildlife Acts'), is 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 stoneworts, is the Flora (Protection) Order, 2015, 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.

8.2.2 Policy

This section summaries National policy relevant to this Chapter, including national policy documents and policies and objectives in the relevant county development plans.

Ireland's National Biodiversity Action Plan (2017 – 2021) (Department of Culture, Heritage and the Gaeltacht, 2017), in accordance with the Convention on Biological Diversity, is a framework for the conservation and protection of Ireland's biodiversity, with an overall objective to secure the conservation, including, where possible, the enhancement and sustainable use, of biological diversity in Ireland and to contribute to collective efforts for conservation of biodiversity globally. Action 1.1.3 of the *National Biodiversity Action Plan* states that “*all Public Authorities and private sector bodies move towards no net loss of biodiversity through strategies, planning, mitigation measures, appropriate offsetting and/or investment in Blue-Green infrastructure*” (p. 28). This is particularly relevant to developments. The plan is implemented through legislation and statutory instruments concerned with nature conservation.

All-Ireland Pollinator Plan 2021 – 2025 (NBDC, 2021) seeks to halt the decline in pollinators through a range of objectives. This plan is supplemented by the guidance document, *Pollinator Friendly Management of Transport Corridors* (NBDC, 2019) and *Councils: Actions to Help Pollinators* (NBDC, 2016).

Dublin City Development Plan 2016 – 2022 (Dublin City Council, 2016) sets out policies and objectives to guide how and where development will take place in the city over the lifetime of the Plan. It provides an integrated, coherent spatial framework to ensure the city is developed in an inclusive way, which improves the quality of life for its citizens, whilst also being a more attractive place to visit and work. The following policies are relevant in relation to this biodiversity assessment:

- GI23:** To protect flora, fauna and habitats, which have been identified by Articles 10 and 12 of Habitats Directive, Birds Directive, Wildlife Acts 1976–2012, the Flora (Protection) Order 2015 S.I No. 356 of 2015, European Communities (Birds and Natural Habitats) Regulations 2011 to 2015.
- GI24:** To conserve and manage all Heritage Areas, [SACs] and [SPAs] designated, or proposed to be designated, by the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

- GI26:** To have regard to the conservation and enhancement of significant non-designated areas of ecological importance in accordance with development standards set out in this plan.
- GI27:** To minimise the environmental impact of external lighting at sensitive locations to achieve a sustainable balance between the needs of an area, the safety of walking and cycling routes and the protection of light sensitive species such as bats.

Draft Dublin City Development Plan 2022 – 2028 (Dublin City Council, 2022) sets out the Council's proposed policies and objectives for the development of the County over the Plan period. The following draft policies are most relevant to this chapter:

- CA8f:** Development proposals should demonstrate sustainable design principles for new buildings/services/site. The Council will promote and support development which is resilient to climate change. This would include promoting and protecting biodiversity and green infrastructure.
- GI9:** To conserve, manage, protect and restore the favourable conservation condition of all qualifying interest/special conservation interests of all European sites designated, or proposed to be designated, under the EU Birds and Habitats Directives, as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) (European / Natura 2000 sites).
- GI11:** To protect and enhance the ecological functions and connectivity of habitats and species of proposed Natural Heritage Areas (pNHAs) to be designated by the National Parks and Wildlife Service (NPWS).
- GI14:** To maintain and strengthen the integrity of the city's ecological corridors and stepping stones which enable species to move through the city, by increasing their connectivity [to be shown in the proposed Green Infrastructure Strategy] under Article 10 of the EU Habitats Directive. Development proposals should not compromise their ecological functions and should realise opportunities to contribute to enhancing the nature conservation value of them by landscaping that provides complementary habitats. An Ecological Impact Assessment will be required for any proposed development likely to have a significant impact on habitats and species of interest on or adjacent an ecological corridor.
- GI16:** That new development should provide opportunities to incorporate biodiversity improvements through urban greening and the use of nature based infrastructural solutions that are of particular relevance and benefit in an urban context. Opportunities should be taken as part of new development to provide a net gain in biodiversity.
- GI34:** To ensure that new development, in terms of siting and design, responds to the character, importance and setting of the city's rivers where the context allows, and to require public open space which is to be provided as part of new development, to supplement riparian buffer zones so as to support the attainment of 'good ecological status' or higher for water bodies, flood management, the conservation of biodiversity and ecosystem functions

The Biodiversity Plan for the Dublin County Council is currently under review. The *Draft Dublin City Biodiversity Action Plan 2021-2025* was published in May 2021. The draft Plan is based on the six themes that focus the outcomes for biodiversity conservation required across the city. Within these themes, there are 18 objectives for biodiversity management and conservation along with a series of targeted actions with measurable outcomes to achieve these objectives. Each theme links to the Strategic Objectives of the National Biodiversity Action Plan (2017-2021) while considering the urban context of biodiversity within Dublin. There is a new focus on restoration of biodiversity to respond to the public survey and reflect EU policy.

Fingal Development Plan 2017 – 2023 (Fingal County Council, 2017) sets out the Council's proposed policies and objectives for the development of the County over the Plan period. The Development Plan seeks to develop and improve, in a sustainable manner, the social, economic, environmental, and cultural assets of the County. The following policies are relevant to this chapter:

- NH07:** Actively support the aims and objectives of the All-Ireland Pollinator Plan 2015-2020 by encouraging bee keeping and other measures to protect and increase the population of bees and other pollinating insects in Fingal.
- NH08:** Ensure that the management of the Council's open spaces and parks is pollinator-friendly, provides more opportunities for biodiversity, and does not introduce or lead to the spread of invasive species.
- NH09:** Support the National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, in the maintenance and, as appropriate, the achievement of favourable conservation status for the habitats and species in Fingal to which the Habitats Directive applies.
- NH10:** Ensure that the Council takes full account of the requirements of the Habitats and Birds Directives, as they apply both within and without European Sites in the performance of its functions.
- NH11:** Ensure that the Council, in the performance of its functions, takes full account of the objectives and management practices proposed in any management or related plans for European Sites in and adjacent to Fingal published by the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.
- NH12:** Undertake field studies and map invasive species throughout the County and initiate control programs with all relevant stakeholders and landowners to control the key invasive species.
- NH13:** Ensure that proposals for development do not lead to the spread or introduction of invasive species. If developments are proposed on sites where invasive species are or were previously present, the applicants will be required to submit a control and management program for the particular invasive species as part of the planning process and to comply with the provisions of the European Communities Birds and Habitats Regulations 2011 (S.I. 477/2011).
- NH14:** Protect inland fisheries within and adjacent to Fingal and take full account of Inland Fisheries Ireland Guidelines in this regard when undertaking, approving or authorising development or works which may impact on rivers, streams and watercourses and their associated habitats and species.
- NH15:** Strictly protect areas designated or proposed to be designated as Natura 2000 sites (i.e. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs); also known as European sites) including any areas that may be proposed for designation or designated during the period of this Plan.

The Draft Fingal Development Plan 2023 – 2029 (Fingal County Council, 2022) sets out the Council's proposed policies and objectives for the development of the County over the Plan period. The following draft policies are relevant to this chapter:

- GINHO2:** Reduce fragmentation and enhance the resilience of Fingal's GI network by strengthening ecological links between urban areas, Natura 2000 sites, proposed Natural Heritage Areas, parks and open spaces and the wider regional network by connecting all new developments into the wider Green Infrastructure network.
- GINHO3:** Make provision for biodiversity within public open space and include water sensitive design and management measures (including SuDS) as part of a sustainable approach to open space design and management.
- GINHO5:** Continue to support the provisions of the National Pollinator Plan 2021-2025 through the management and monitoring of the County's pollinator protection sites and through the promotion of additional pollinator sites during the lifetime of this Development Plan.

Meath County Development Plan 2021 – 2027 (Meath County Council, 2021) drives the present-day evolution of the county and to establish a framework for the coordinated and sustainable economic, social,

cultural and environmental development of County Meath. The Plan includes the following policies and objectives in relation to biodiversity:

- HER POL 25:** To protect and enhance the built and natural heritage of the Royal Canal and Boyne Navigation and associated structures and to ensure, in as far as practically possible, that development which may impact on these structures and their setting be sensitively designed with regard to their character and setting. Development of the project will be subject to the outcome of the Appropriate Assessment process.
- HER POL 27:** To protect, conserve and enhance the County's biodiversity where appropriate.
- HER OBJ 33:** To ensure an Appropriate Assessment in accordance with Article 6(3) and Article 6(4) of the Habitats Directives (92/43/EEC) and in accordance with the Department of Environment, Heritage and Local Government Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, 2009 and relevant EPA and European Commission guidance documents, is carried out in respect of any plan or project not directly connected with or necessary for the management of the site but likely to have a significant effect on a Natura 2000 site(s), either individually or in-combination with other plans or projects, in view of the site's conservation objectives.
- HER OBJ 34:** To protect and conserve the conservation value of candidate Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas and proposed Natural Heritage Areas as identified by the Minister for the Department of Culture, Heritage and the Gaeltacht and any other sites that may be proposed for designation during the lifetime of this Plan in accordance with the provisions of the Habitats and Birds Directives and to permit development in or affecting same only in accordance with the provisions of those Directives as transposed into Irish Law.
- HER OBJ 35:** To ensure that development does not have a significant adverse impact, incapable of satisfactory avoidance or mitigation, on plant, animal or bird species protected by law.
- HER POL 35:** To ensure, where appropriate, the protection and conservation of areas, sites, species and ecological/networks of biodiversity value outside designated sites and to require an appropriate level of ecological assessment by suitably qualified professional(s) to accompany development proposals likely to impact on such areas or species.
- HER POL 36:** To consult with the National Parks and Wildlife Service and take account of their views and any licensing requirements, when undertaking, approving or authorising development which is likely to affect plant, animal or bird species protected by law.
- HER POL 37:** To encourage the retention of hedgerows and other distinctive boundary treatments in rural areas and prevent loss and fragmentation, where practically possible. Where removal of a hedgerow, stone wall or other distinctive boundary treatment is unavoidable, mitigation by provision of the same type of boundary will be required.
- HER POL 38:** To promote and encourage planting of native hedgerow species in new developments and as part of the Council's own landscaping works.

Kildare County Development Plan (2017 – 2023) (Kildare County Council 2017) sets out an overall strategy for the proper planning and sustainable development of the functional area of County Kildare, over the period of the plan and beyond. The following policies are set out in the plan in relation to biodiversity:

- CS12:** Protect and conserve the natural environment.
- CS13:** Protect and conserve nationally important and EU designated sites.

CS14: Promote and enhance biodiversity throughout the county.

On 11th January 2021, Kildare County Council gave notice of its intention to review the existing Kildare County Development Plan 2017-2023 and to prepare a new County Development Plan for the period 2023-2029. At the time of writing, no draft policies or objectives were available.

8.2.3 Guidance

The process of identifying, quantifying and evaluating potential impacts of the proposed development on habitats, species and ecosystems was undertaken in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland* (CIEEM, 2019). In addition, reference to the following recognised guidance defined the scope and evaluation process:

- Collins (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)*.
- EPA (2002) *Guidelines on the Information to be Contained in Environmental Impact Statements*.
- EPA (2003) *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*.
- EPA (2015) *Draft Advice Notes for preparing Environmental Impact Statements*.
- EPA (2022) *Guidelines on the information to be contained in Environmental Impact Assessment Reports*.
- ESB (2017) *EMF & You. Information about Electric and Magnetic Fields and the Electricity Network in Ireland*. Information booklet. April, 2017.
- Institution of Lighting Professionals (2020) *Guidance notes for the reduction of obtrusive light*. Guidance Note 01/20. Institution of lighting professionals, Regent House, Regent Place, Rugby, Warwickshire, UK.
- Marnell, F. Kelleher, C & Mullen, E. (2022). *Bat Mitigation Guidelines for Ireland v2. Irish Wildlife Manuals, No. 134*. National Parks & Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- NBDC (2019) *Pollinator-friendly management of: Transport Corridors*. All-Ireland Pollinator Plan, Guidelines 9. National Biodiversity Data Centre Series No. 20, Waterford. Sept, 2019.
- NBDC (2021) *All Ireland Pollinator Plan 2021-2025*.
- TII (2006a) *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*.
- TII (2006b) *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*.
- TII (2006c) *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes*.
- TII (2006d) *Guidelines for the protection and preservation of trees, hedgerows and scrub prior to, during and post Construction of National Road Schemes*.
- TII (2008a) *Environmental Impact Assessment of National Road Schemes – A Practical Guide (Revision 1)*.
- TII (2008b) *Ecological Survey Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*.
- TII (2008c) *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes*.
- TII (2008d) *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*.
- TII (2009) *Guidelines for Assessment of Ecological Impacts of National Road Schemes*.
- TII (2020a) *The Management of Invasive Alien Plant Species on National Roads – Standard*.
- TII (2020b) *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance*.

8.3 Methodology

This section describes the approach, objectives, terminology and methodologies that were followed in collecting information, in describing the baseline ecological conditions and in assessing the likely effects of the proposed development.

8.3.1 Establishing the Zone of Influence

The Zone of Influence (Zol), or distance over which a likely significant effect may occur will differ across the key ecological receptors, depending on the predicted impacts and the potential impact pathway(s).

The key variables determining whether Key Ecological Receptors (KERs) will be subject to impacts through development are:

- the physical distance of the proposed development to the ecological receptors.
- the sensitivities of the ecological receptors within the receiving natural environment.
- the potential for cumulative effects.

The Zone of Influence was defined as:

- The entire area within 550m of the proposed development boundary.
- All watercourses within 550m of the proposed development boundary downstream as far as, and including, the Liffey Estuary Lower Transitional Waterbody and the Tolka Estuary Transitional Waterbody.

The buffer was defined as 550 m around the proposed development, which is the precautionary flushing distance for waterbirds, informed by the sensitivity of different species, the potential for visual and noise disturbance, and the ambient disturbance levels (Cutts et al., 2009; Cutts et al., 2013). The use of amenity grassland by Light-bellied Brent Geese has been considered, and the 550 m buffer includes all areas of amenity grassland in the vicinity of the proposed development. Any potential Light-Bellied Brent Goose feeding areas outside this buffer are screened by buildings, walls and natural boundaries which will act as effective barriers to noise and visual disturbance.

The watercourses within 550 m of the proposed development boundary, and downstream as far as their transitional waterbodies, is the extent to which hydrological impacts could potentially occur downstream of the proposed development in the River Liffey, River Tolka and Dublin Bay².

In relation to impacts on groundwater and groundwater dependent species and habitats, *Guidelines on Procedures for Assessment and Treatment of Geology and Hydrogeology for National Road Schemes* (TII, 2008) recommends that for National roads, the study area should be 250 m either side of the centreline and notes that professional judgement must be applied in assessing whether the study area needs to be extended. The Hydrogeological Assessment undertaken to inform the AA Screening Report concluded that the proposed development would result in imperceptible to slight impacts on the groundwater system immediately surrounding the depot. These effects will be attenuated with distance from the depot. In effect, any effects on groundwater flows further away will be less than slight to imperceptible. All areas where track lowering is proposed, for the purposes of assessing effects on the Rye Water Valley/ Carton SAC, concluded that the impact of the track lowering at the location of the works is imperceptible. Therefore, the buffer of 550 m exceeds the limit for potential effects on ground water flows.

The Zone of Influence is presented in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80020-D.

² As defined in Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy (the Water Framework Directive), transitional waters are as bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows.

8.3.2 Study Area

The proposed development comprises the electrification of the Dublin to Maynooth & M3 Parkway lines, with a total length of approximately 40 kilometres. The development runs along the existing operational railway corridor from Dublin City centre (Connolly/Docklands) to the proposed new depot located west of Maynooth in Co. Kildare and to the M3 Parkway in Co. Meath.

The study area was defined by the findings of the desk study (presence/absence of protected habitats, flora or fauna within the Zone of Influence) and best practice methodology referenced above for assessing effects on those ecological features. In general, the study area includes the site of the proposed development and a 50 m buffer. Consideration is also given to species and habitats outside this area on a case-by-case basis. The study area/survey area for each Key Ecological Receptor (KER) is described under the subheadings in Section 8.3.8.

8.3.3 Approach and objectives to Ecological Impact Assessment

A 'habitat' is the environment in which an animal or plant lives and is generally defined in terms of vegetation and physical structures. Habitats and species of ecological significance occurring, or likely to occur within the defined Zone of Influence and Study Area of the proposed development are classified as Key Ecological Receptors (KERs).

In accordance with Transport Infrastructure Ireland (TII) *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (2009), an impact assessment is undertaken of Key Ecological Receptors within the Zone of Influence of the proposed development. According to these guidelines, the Zone of Influence is the 'effect area' over which change resulting from the proposed development is likely to occur. The Key Ecological Receptors are defined as features of sufficient value as to be material in the decision-making process for which potential impacts are likely.

In the context of the proposed development, a Key Ecological Receptor is defined as any feature valued as follows:

- International Importance.
- National Importance.
- County Importance.
- Local Importance (Higher Value).

Features of local importance (Lower Value) and features of no ecological value are not considered to be Key Ecological Receptors. The assessment presented in this Chapter does not consider any other type of environmental effects other than those on biological diversity (of flora and fauna). This Chapter quantifies the potential effects on identified Key Ecological Receptors and prescribes mitigation measures required to avoid and reduce any negative effects identified.

Determining the ecological issues to be addressed for the assessment was informed by early engagement with relevant stakeholders. During this scoping process, selected consultees were provided the opportunity to input into the proposed development through preliminary discussions on Key Ecological Receptors that could potentially be affected; strategies to avoid negative impacts; and possible compensation or enhancement measures. Further details of the consultation process, including a list of the statutory and non-statutory consultees, can be found in Section 8.3.6.

On completion of scoping, a desk study was undertaken to review all available published data describing ecological conditions within the Zone of Influence. The desk study cross-referenced this published data with publicly available maps and aerial orthophotography from Ordnance Survey Ireland (OSi), National Parks & Wildlife Service (NPWS) and Environmental Protection Agency (EPA) to identify Key Ecological Receptors. During preparation of this assessment, the statutory conservation agency, the NPWS, provided data on nature conservation designations, habitats and species of conservation interest. The baseline information obtained from the desk study was the first stage in defining the Zone of Influence of the proposed development.

In addition to this desk study, field surveys were carried out in 2020, 2021 and 2022 to obtain primary data regarding the baseline environment with respect to biodiversity and to identify potential effects thereon. Section 8.3.8 presents details of these surveys.

Where potential significant negative effects were identified, detailed and specific mitigation measures have been proposed in accordance with the hierarchy of options suggested in the European Commission 2021 report 'Assessment of plans and projects in relation to Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC'. Accordingly, the avoidance of effects at their source is the prioritised approach. Where this is not possible, the following approaches are adopted, in order of decreasing preference: (i) reduction of effects at source; (ii) on-site abatement, and finally; (iii) abatement at receptor. These mitigation measures (as set out in Section 8.7 of this Chapter) have been incorporated into the design of the proposed development.

The information provided in this chapter accurately and comprehensively describes the baseline ecological environment, provides an accurate prediction of the likely significant ecological effects of the proposed development, prescribes specific mitigation, as necessary, and describes the residual ecological effects.

8.3.3.1 Terminology

The evaluation of Key Ecological Receptors and the criteria used to determine ecological value is in accordance with aforementioned guidelines (TII, 2009). The description of effects is in accordance with the EPA Guidelines *Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022).

8.3.4 Desk study

The desk study was carried out to collate information on the ecology of the Zone of Influence that will potentially be impacted by the proposed development. Information on species listed on Annexes II and IV to the Habitats Directive, the Wildlife Acts, the Flora (Protection) Order, 2015, Annex I to the Birds Directive, Red- and Amber-listed Birds (Gilbert et al., 2021), and the Third Schedule to the Habitats Regulations were sourced from the statutory consultee, the NPWS, and the National Biodiversity Data Centre (NBDC). The NPWS online interactive map viewer provided information relating to designated sites of nature conservation importance within the Zone of Influence. The NBDC provided rare and protected species data from within 2 km of the proposed development. The NPWS provided rare and protected species records from the 10 km grid squares that intersect the proposed development. A data request was submitted to Bat Conservation Ireland, and records of bats and roosts were received. Records of bats and roosts was narrowed down to within 5 km of the proposed development. The desk study undertaken for this chapter included a review of available ecological data from the following sources:

- Altemar Marine & Environmental Consultancy (2020) *Ecological Impact Assessment for a proposed development at the Old School House Site, Porterstown Road, Clonsilla, Dublin 15*. Report prepared for OSH Ventures Limited.
- Bat Eco Services (2019) *Bat Assessment*. Report prepared for DBFL Consulting Engineers, Dublin, Ireland.
- Bat Eco Services (2018) *Bridge Surveys, Royal Canal, County Dublin*. Report prepared for Natura Environmental Consultants.
- BEC Consultants (2013) *Ecological Study of the Royal Canal between Talbot Bridge and Maynooth Train Station*. Report prepared for Waterways Ireland.
- Biosphere Environmental Services (2007) *Dunboyne M3 Commuter Rail Environmental Impact Assessment: Terrestrial Ecology*. Report prepared for PM Group.
- Bat Conservation Ireland (2021) *All Ireland Daubenton's Survey* data. Received via email.
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As with all desk studies, the data considered was only as good as the data supplied by the recorders and recording schemes. The recording schemes provide disclaimers in relation to the quality and quantity of the data they provide, and these were considered when examining outputs of the desk study.

8.3.5 Overview of ecological surveys

Field surveys were undertaken in 2020 and 2021 (see Table 8-1 for details). The surveys aimed to detect the presence, or likely presence, of rare/threatened, protected and invasive species, and to record the habitats present in the study area. The surveys provided baseline information regarding the existing ecology of the study area. Incidental records of plants, bird species and protected species were collected throughout the surveys in 2020, 2021 and 2022.

Specific ecological surveys were carried out with respect to the following:

- Habitats.
- Bats.
- Otter.
- Badger.
- Amphibians.
- Invasive Species.
- Water Chemistry and Freshwater Invertebrate Sampling.

Section 8.3.8 outlines the methodologies applied during these surveys. Results of these surveys are presented in Section 8.5. Table 8-1 below lists the surveys, dates and personnel involved. Where the surveys were carried out over several days, the exact dates are listed in the individual sections.

Table 8-1 Ecological Survey Details

Survey	Date	Surveyor
Habitats	July - September 2020, April - August 2021, April 2022.	Patrick O'Shea and Kate Moore
Bats	August- September 2020, May - August 2021	Patrick O'Shea, Kate Moore and ROD Environment Team
Badger	February, March, April and November 2021, Feb, May, June 2022	Patrick O'Shea and Kate Moore
Otter	February, March, April and November 2021, March 2022	Patrick O'Shea, Kate Moore and ROD Environment Team
Amphibians	June and July 2021	Patrick O'Shea and Kate Moore
Invasive Species	July - September 2020, April - August 2020	Patrick O'Shea and Kate Moore
Water Chemistry and Freshwater Invertebrate Sampling	October 2021	JBA Consulting

8.3.6 Survey methodology

Sections 8.3.7.1 – 8.3.7.8 outline the methodologies applied during the surveys.

8.3.6.1 Habitats

Habitats within the proposed development footprint were surveyed in 2020, 2021 and 2022 during the optimum habitat survey season i.e. April to September (Smith et al., 2011). Selected areas outside the footprint of the proposed development were also surveyed, where potential features of interest were identified in the desk study. Habitats were classified according to *A Guide to Habitats in Ireland* (Fossitt, 2000) and any habitats corresponding to types listed on Annex I to the Habitats Directive were identified using the *Interpretation Manual of European Union Habitats* (EC, 2013).

8.3.6.2 Bats

Bat suitability assessment

The bat suitability assessment focussed on identifying built or natural features within the footprint of the proposed development and a 30 m buffer, where accessible. The bat suitability assessment was conducted adhering to best practice guidelines (TII, 2006a,b; Collins (ed.), 2016) and involved a visual assessment and categorisation of suitable features on trees and structures capable of supporting roosting bats. Trees and structures were assessed using the recognised criteria outlined in Collins (ed.) (2016). The locations of features on trees and structures with features that could provide moderate to high potential were recorded with a hand-held GPS unit and photographed.

Emergence/Re-entry Surveys

Following the bat roost suitability assessment, trees and structures which were considered suitable for bats to roost in were surveyed. The emergence surveys were undertaken between 15 minutes before sunset and 105 minutes after sunset. The re-entry surveys were undertaken from 90 minutes before sunrise to sunrise. The emergence and re-entry surveys adhered to best practice guidelines (Collins (ed.), 2016).

Surveyors undertook their work in pairs or groups. The surveyors used either Anabat Walkabout or Song Meter EM3+ bat detectors. Both detectors allow visual validation of echolocation recordings (species identification) in real time and all audio files are linked to a GPS and digitally geospatially referenced.

Following each survey, recordings (detections) were processed using Kaleidoscope Pro Analysis or BTO Acoustic Pipeline software to extract information including sound recordings, sonograms, GPS coordinates, time, date and species identification confidence values. Recordings with low confidence values or of rare species were validated manually.

Bat Activity Transects

Bat Activity Transects were carried out along the Royal Canal from Cross Gun's Bridge, Co. Dublin to Kilcock, Co. Kildare in June 2021. The towpath was divided into six sections, and each section was walked twice on each survey, at a slow pace, to observe and record bat activity. The bat activity transects were undertaken between 15 minutes before sunset and lasted for approximately three hours, or from three hours before sunrise to sunrise.

Following each survey, recordings (detections) were processed using Kaleidoscope Pro Analysis or BTO Acoustic Pipeline software to extract information including sound recordings, sonograms, GPS coordinates, time, date and species identification confidence values. Recordings with low confidence values or of rare species were validated manually.

8.3.6.3 Badger

A badger survey was conducted within the footprint of the proposed development and a 50m buffer, where accessible. Adhering to best practice guidelines (TII, 2006c, 2009) and involved a systematic search of the development footprint including the railway verges, woodland, scrub and grassland habitats, for physical evidence of badgers, e.g. setts, latrines, badger paths.

A bait marking study was carried out on two setts in the depot area. The construction of the depot and the flood compensatory storage area will lead to the loss of over 50 hectares of habitat within the territory of one or more badger social groups. The bait marking survey involved seeding two setts with a mixture of peanuts, golden syrup and food grade plastic pellets. Different coloured plastic pellets were used at each sett. Each sett was seeded three times. The area was then searched for latrines containing the pellets, with a focus on known latrine sites, field boundaries, pockets of woodland and around setts. The survey aimed establish if the two setts belonged to the same social group.

8.3.6.4 Otter

An Otter survey was conducted adhering to best practice guidelines (TII, 2008b,c), and involved a systematic search of the footprint of the proposed development and a 50 m buffer, where accessible. It also included the Royal Canal from the Docklands Station to Kilcock and all watercourses crossed by the proposed development were also surveyed to 150 m upstream and downstream of the crossing point. The survey involved a search for signs of otter activity (prints, spraints, trails, holts, couches, slides, feeding remains etc.). The survey included the railway line, compounds, ancillary infrastructure locations and all watercourses crossed by the proposed development.

8.3.6.5 Amphibians

All waterbodies within the footprint of the proposed development and a 50 m buffer were assessed for potential to support frogs and newts during the habitat survey. Where presence could not be confirmed during the day, night-time surveys were carried out adhering to TII guidelines (2008b). The night-time surveys involved a thorough search of the waterbody for frogs and newts using a high-powered torch.

8.3.6.6 Birds

Birds were recorded incidentally during the extensive field surveys both on and off the railway line. All bird species were recorded using standard species codes from the British Trust for Ornithology (BTO). Breeding evidence for each species was also collected, noting 'possible', 'probable' and 'confirmed' breeding sites outlined in *Bird Atlas 2007-11* (BTO, 2011).

8.3.6.7 Fisheries and aquatic fauna

The watercourses crossed by the proposed development were assessed in terms of their potential to support fish, including but not limited to salmonids, lampreys, and eel. Fish stock surveys were not conducted given that significant impacts on fisheries are not anticipated. This follows best practice guidelines (TII, 2009) which states that "*It will only be appropriate to undertake detailed surveys where significant impacts are anticipated on potentially valuable assemblages of fish, or important populations of a particular species*" (p. 59).

Other than in the upper reaches of the River Liffey, there are no records of Freshwater Pearl Mussel (*Margaritifera margaritifera*) in the watercourses crossed by the proposed development. Most of the watercourses in the study area have been deepened, straightened and channelised and are in poor ecological condition and, consequently, are unsuitable for this species. This species is, therefore, not considered further.

White-clawed Crayfish (*Austropotamobius pallipes*) is widespread in central Ireland in both rivers and lakes with sufficient lime in the water. The species tolerates a range of habitat conditions and is relatively tolerant of pollution. This species has been recorded in the River Liffey, the Rye Water and the Royal Canal and is considered to be present in suitable habitat.

8.3.6.8 Water Chemistry and Freshwater Invertebrate Sampling

The water quality assessment included semi-quantitative sampling of benthic macroinvertebrates and chemical analysis at two locations on the Lyreen Stream, upstream and downstream of the proposed railway realignment at Jackson's Bridge, and two locations on the Ballycaghan Stream, one upstream and one downstream of the depot (but upstream of the proposed works at Jackson's Bridge). The locations were selected to provide baseline data upstream and downstream of the proposed in-stream works. The

methodology used in the water quality assessment report is provided in Appendix A8.1 Water Quality Report in Volume 4 of this EIAR.

8.3.6.9 Other mammals & lizard

During the ecological surveys, the potential for the study area to support other species protected under the Wildlife Acts, such as Irish Hare, Pygmy Shrew, deer species, Irish Stoat, Hedgehog and Common Lizard was assessed. Any natural and built features that could potentially support these species were searched thoroughly and any physical evidence, such as live sightings, feeding signs and droppings/scats. Any incidental evidence of these species observed during the other surveys was also recorded.

8.3.6.10 Invasive species

Invasive plants, including species listed on the Third Schedule to the Habitats Regulations, but also other species which can negatively impact biodiversity were recorded and their distributions sketched on field maps. Target notes were taken which detailed height, density, and any signs of previous management.

8.3.7 Assessment methodology

The ecological evaluation and impact assessment methodology within this chapter follows the methodology that is set out in Chapter 3 of *Guidelines for Assessment of Ecological Impacts of National Roads Schemes* (TII, 2009).

8.3.7.1 Evaluation of ecological resources

The criteria used for the ecological evaluation follow those set out in Section 3.3 of TII (2009). These guidelines set out the context for the determination of value on a geographic basis, with a hierarchy assigned in relation to the importance of any receptor based on the following scale:

- International Importance.
- National Importance.
- County Importance.
- Local Importance (Higher Value).
- Local Importance (Lower Value).

The Guidelines clearly set out the criteria by which each geographic level of importance can be assigned. For example, Locally Important (Lower Value) receptors contain habitats and species that are widespread and of low ecological significance and only of importance in the local area. Conversely, Internationally Important sites are either designated for conservation as part of the Natura 2000 network (SACs or SPAs) or provide the best examples of habitats or internationally important populations of protected species.

All habitats and species within the Zone of Influence and study area were assigned a level of significance on the above basis, and Key Ecological Receptors were established and classified on this basis.

8.3.7.2 Characterisation of ecological impacts

The impact assessment herein uses the EPA (2022) guidelines and is based on the criteria listed in Annex III of the amended EIA Directive, but also has regard to the EPA (2015) Guidelines in relation to characterising the impact of the proposed development on the receiving environment. The parameters used to characterise ecological impacts are:

- The magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected).
- The nature of the impact.
- The transboundary nature of the impact;
- The intensity and complexity of the impact;
- The probability of the impact.

- The expected onset, duration, frequency and reversibility of the impact;
- The cumulation of the impact with the impact of other existing and/or approved project
- The possibility of effectively reducing the impact.'

Definitions of terms used when quantifying duration and frequency of effects are defined below, as per EPA (2022):

- Momentary – seconds to minutes.
- Brief – less than a day.
- Temporary – up to 1 year.
- Short-term – 1 to 7 years.
- Medium-term – 7 to 15 years.
- Long-term – 15 to 60 years.
- Permanent – over 60 years.

It is necessary to ensure that any assessment of impacts takes account of the construction and operational phases; direct, indirect and cumulative impacts; and impacts that are temporary, reversible and irreversible.

8.3.7.3 Assessing the Significance of Effects

The significance of effects was determined following guidelines set out in Section 6.2.20 of TII (2009), whereby effects are assigned significance based on the characterisation of impacts, irrespective of the value of the receptor. Significance is determined by effects on conservation status or integrity, regardless of geographical level at which these would be relevant.

Quality and Significance are the most relevant criteria for the assessment of effects on biodiversity. These criteria are defined in EPA (2022) and reproduced in Table 8-2 and Table 8-3 respectively.

Table 8-2 Criteria for assessing quality (EPA, 2022)

Quality	Criteria
Positive	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
Neutral	No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
Negative/ Adverse	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 8-3 Criteria for describing the significance of effects (EPA, 2022)

Significance	Criteria
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

8.3.7.4 Mitigation, compensation and enhancement

The proposed development has been designed to specifically avoid, reduce and/or minimise impacts on all Key Ecological Receptors. The potential impacts of the proposed development have been considered and assessed to ensure that all impacts on Key Ecological Receptors are adequately addressed. Where potential significant impacts on Key Ecological Receptors are predicted, mitigation has been prescribed to ameliorate such impacts. Proposed best practice and mitigation measures are specifically set out in this chapter and are realistic in terms of cost and practicality. Mitigation measures follow best practice and have a high probability of success in terms of addressing the impacts on the identified Key Ecological Receptors.

The need for compensation and/or enhancement measures has also been considered. Compensatory measures are those which ‘offset’ significant residual (post-mitigation) impacts. Enhancement measures are those which “seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation or compensation” (CIEEM, 2019 p. 12).

The locations of mitigation, compensation, and enhancement measures are illustrated in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D to MAY-MDC-ENV-ROUT-DR-V-81011-D.

8.3.8 Consultation

Statutory and non-statutory consultation has informed all stages of the design and EIAR. Consultees were invited to submit observations in relation to ecology and nature conservation. Observations received relevant to this chapter are summarised in Table 8-4 below. Concerns raised by the consultees have been addressed as far as possible. The purpose of the consultation was to:

- Identify any relevant information that consultees held, including the presence of data on protected species or species of conservation concern.
- Identify any concerns that consultees may have about the proposed development.
- Identify any issues that the consultees would like to see addressed during the ecological impact assessment process.

Table 8-4 Consultation summary

Consultee	Date	Summary of Response or Meeting
Prescribed Bodies		
Department of Housing, Local Government and Heritage (National Parks & Wildlife Service)	12 th Jan 2021	<p>A virtual meeting was held with Divisional Ecologists, Eastern Division, of the NPWS. The NPWS staff made the following points:</p> <ul style="list-style-type: none"> • Details of vegetation loss and compensatory planting should be provided, and any compensation should be like-for-like. • The vegetation along the scheme might be an important ecological corridor. • The presence of Daubenton’s Bat and rare gastropods on the Royal Canal was noted. • Otter are present on the Royal Canal and a survey should be carried out along the entire length of the canal. • NPWS noted the presence of rare plants between Glasnevin and Broombridge and at Barnhill Bridge. • The canal overflows lead to the Rye Water Valley/Carton SAC and these connections need to be assessed. • Cumulative impacts on the Royal Canal pNHA need to be assessed. <p>Pollinator friendly planting and mowing regimes should be implemented along the scheme.</p>
	6 th October 2021	<p>A response to public consultation no. 2 was received from the development applications unit (DAU). A summary of the observations is presented below.</p> <ul style="list-style-type: none"> • The project must ensure that the designated sites and their constituent habitats and species are protected.

Consultee	Date	Summary of Response or Meeting
		<ul style="list-style-type: none"> • Construction compounds must not be located in Natural Heritage Areas. The DAU recommends that the compound at Barberstown and any other compounds in Natural Heritage Areas be relocated. • The DAU is concerned that the ramps for the cycle and pedestrian bridges will encroach into the pNHA. • Vegetation cover should be maintained along the route to protect and enhance the ecological corridor. Vegetation loss must be replaced like for like. • Biodiversity enhancements such as bat boxes and swift boxes should be incorporated into the project. • The flood compensatory storage areas should be managed to maximised their biodiversity value. • The riparian corridor of the Lyreen River should be maintained, and bridges including mammal ledges should be favoured instead of culverts • Hedgerows should be appraised in accordance with the Heritage Council Hedgerow Appraisal guidance. Root protection areas should be calculated in accordance with NRA guidelines. • Habitats must be appraised in accordance with the Heritage Council guidance. The development must avoid important habitat areas. • The NPWS, BSBI and NBDC should be consulted for records of rare and protected plants. • A moss, lichen and vascular plant survey should be carried out by a suitably qualified ecologist. The submission lists a number of rare and protected plants recorded along the railway line. • Habitat suitability assessments for whorl snails and <i>Myxas glutinosa</i> should be carried out by a suitably qualified ecologist. • The department recommends that an otter specialist survey the entire Royal Canal between Spencer Dock and the depot. The department is concerned that fencing could cause a barrier to connectivity. • A bat survey in accordance with best practice guidelines should be carried out. • Works to bridges and old walls should use similar stone and lime mortar. • Green areas should be managed for pollinators. • Lighting should be wildlife friendly. • Site clearance should be carried out outside the nesting bird season. • Invasive species should be dealt with in accordance with TII guidance. • The submission lists the information that should be supplied to the competent authority for them to carry out their Appropriate Assessment of the project.
	12 th April 2022	<p>A virtual meeting was held with Divisional Ecologists, Eastern Division, of the NPWS. In the meeting, ROD provided an update on the proposed development and provided responses to the DAU submission on PC2. The NPWS staff made the following points:</p> <ul style="list-style-type: none"> • A boat based Otter Survey should be undertaken from the Dublin/ Kildare boundary to Kilcock. • Prior to the demolition of stone walls, a botanical survey should be undertaken. • Reseeding should be avoided, and mowing regimes should instead be implemented • Different types of mowing regimes should be implemented at the flood compensatory storage area wetlands. • The measures relating to the management of badger setts needs to be provided in the planning documents. • The locations of protected species should be provided in a confidential appendix to the EIAR. • Wildlife collisions should be monitored after the development is completed and compared to the data pre-development.
Inland Fisheries Ireland (IFI)	21 st April 2021	<p>A response to the scoping report was received from IFI. IFI made the following observations:</p> <ul style="list-style-type: none"> • The proposed development will cross a number of important river systems • The Royal Canal supports significant numbers of course fish, freshwater aquatic species, flora and fauna.

Consultee	Date	Summary of Response or Meeting
		<ul style="list-style-type: none"> Waterways Ireland should be consulted on works that could potentially impact the canal. <i>Guidelines on protection of fisheries during construction works in and adjacent to waters</i> (2016) should be consulted when planning to undertake works in or near any streams and the maintenance of habitat integrity is essential. Specific details of works directly affecting watercourses or riparian habitats, including surface water discharges, must be submitted to IFI for assessment. IFI should be consulted on any proposal to manipulate surface water channels. Any new structures must be fish passable and should be clear-span. Pre-construction baseline biotic and abiotic data should be collected, to allow for comparison should the development go ahead.
	6 th April 2022	<p>A virtual meeting was held with Roisin O'Callaghan, Fisheries Environmental Officer, Inland Fisheries Ireland. In the meeting, ROD provided an update on the proposed development. IFI made the following points:</p> <p>IFI should be consulted on the CEMP.</p>
Dublin City Council	19 th Mar 2021	A virtual meeting was held with Dublin City Council (DCC) representatives and the Project Team. DCC made no observations in relation to biodiversity.
Fingal County Council	29 th Jan 2021	<p>A virtual meeting was held with Fingal County Council (FCC) representatives and the Project Team. FCC made the following observations:</p> <p>Presence of calcareous grassland was noted west of Porterstown level crossing replacement works but not at the location of the works themselves.</p>
	22 nd Apr 2021	No scoping response related to biodiversity.
Kildare County Council	16 th Mar 2021	<p>A virtual meeting was held with Kildare County Council (KCC) representatives and the Project Team. KCC made the following observations:</p> <ul style="list-style-type: none"> The biodiversity assessment should take into consideration vegetation loss and replacement and should seek to retain bat arrangements. To consider potential impacts of fencing around the proposed attenuation ponds. <p>The ecology team should feed into the lighting design at Jackson Bridge.</p>
Meath County Council	19 th Apr 2021	<p>A virtual meeting was held with Meath County Council (MCC) representatives and the Project Team. MCC made the following observations:</p> <ul style="list-style-type: none"> The EIAR to include results of the ecological surveys, detailing the methodology and timing. The final design should seek integration and enhancement of existing biodiversity/ecological and landscape features where possible by minimising adverse impacts on existing habitats and by including mitigation/compensation measures as appropriate. The impact of the proposed project on birds is required to be appropriately assessed and that a proposed 50 m buffer zone may be insufficient to adequately assess impact on birds and should be expanded to ensure any bird risk is appropriately assessed. <p>The submission also requests that Meath Biodiversity Plan 2015-2020 to be referred to when carrying out the EIAR.</p>
Pre-application Consultation		
An Bord Pleanála	24 th February 2021	<p>Pre-application consultation (PAC) meeting No. 7 was held virtually with staff of An Bord Pleanála (ABP). The purpose of PAC No. 7 with regards to biodiversity was to outline the approach and rationale that was being taken to undertake the Appropriate Assessment. The ABP representatives made the following observations:</p> <ul style="list-style-type: none"> Careful consideration should be given to ensure that the language used in the EIA and AA Screening Report or NIS was in line with the EIA Directive/Habitats Directive, as appropriate. Issues around AA Screening are currently evolving with a number of live cases before the courts. The proposed development crosses the Rye Water Valley/ Carton SAC, and surveys should be undertaken to identify the locations of Qualifying Interests relative to the proposed development. The rationale for the likely zone of impact should be scientifically justified.

Consultee	Date	Summary of Response or Meeting
		<ul style="list-style-type: none"> Surveys should not be limited to the railway line and stations, as it is necessary to understand the potential effects of the proposed development within an appropriate zone of influence. All pathways to European sites should be considered and a tailored rationale for each European site should be used. The potential for electromagnetic effects should be addressed.
	31 st March 2021	<p>Pre-application consultation (PAC) meeting No. 8 was held virtually with staff of An Bord Pleanála. The purpose of PAC No. 8 with regards to biodiversity was to discuss the outcomes of discussion which had taken place in PAC No. 7. The ABP representatives made the following observations:</p> <ul style="list-style-type: none"> The effects of noise and vibration on biodiversity should be dealt with in the EIAR Chapter. The 550 m element of the Zone of Influence accounted for waterbirds, however the Board queried how this was relevant to habitats, and in particular Qualifying Interests of European sites.

8.3.9 Difficulties encountered/ limitations

Standard survey methods were followed, and no difficulties were encountered during the completion of the surveys described above. However, any biases or limitations associated with these methods could potentially affect the results collected. While every effort was made to provide a full assessment and comprehensive description of the study area, ecological trends (e.g., population trends) may not be fully reflected due to the instantaneous/short-term nature of the field surveys. However, the data obtained from field surveys coupled with the desk study provides a robust representation of the baseline for the habitats and species within the Zone of Influence.

Bat activity transects were not carried out east of Cross Guns Bridge, due to safety concerns in this area. The railway line is removed from the Royal Canal in this area by high walls. Therefore, there will be no impact on bats feeding or commuting on this section of the Royal Canal, as a result of the proposed development.

Land access was not granted to carry out certain ecological surveys on a small number of land holdings, most notably at the Ashtown and Barberstown. One compound (CC-SW-S2A-20750-B) was not surveyed. A review of aerial photographs indicates that this area is an existing compound used to store railway ballast, and therefore the absence of a field survey is not significant.

Land access was temporarily restricted in the depot area, which led to the badger bait-marking survey being undertaken in May and June 2022, outside the optimum period for this type of survey. The results of the badger surveys are discussed in this Chapter and any deviations from the survey guidelines are addresses and are not significant.

8.4 Receiving environment – desk study results

8.4.1 General description and context

The receiving environment is dominated by the existing railway corridor which passes through both urban and rural areas. The railway is generally lined with managed and unmanaged verges, scrub, and hedgerows or treelines outside the urban areas, runs parallel to the Royal Canal between Spencer Dock and the depot. The railway corridor has areas of seminatural habitat in an otherwise relatively managed landscape in Dublin City. Further west, outside Dublin City, the landscape becomes more open, and the main land use is agricultural. The proposed development passes a number of stately homes and golf courses in this area.

The proposed development will cross the Royal Canal, the Rye Water, the River Tolka and a tributary of the River Liffey in Westmanstown, as well as a number of small streams, ditches and drains. The proposed development is located within the bounds of the Royal Canal pNHA and is parallel to the canal between Dublin

and the depot. The canal is connected to surrounding watercourses via overflows. The habitats within the immediate vicinity of the proposed development include canal (FW3), buildings and artificial surfaces (BL3), amenity grassland (GA2), flowerbeds and borders (BC4), stonewalls and other stonework (BL1), hedgerow (WL1), treelines (WL2), improved agricultural grassland (GA1) and arable crops (BC1). The Royal Canal flows in an easterly direction where it eventually discharges into the River Liffey at North Wall quay, which in turn flows into Dublin Bay. Dublin Bay is a UNESCO Biosphere Reserve and contains several other sites designated for nature conservation. Habitat mapping is presented in Volume 3A of this EIAR, Drawing no. MAY-MDC-ENV-ROUT-DR-V-80000-D to 80011-D.

8.4.2 Designated sites

The NPWS online map viewer was consulted in order to identify the boundaries of designated sites within the Zone of Influence.

It was determined that six European sites, namely the South Dublin Bay & River Tolka Estuary SPA, the North Bull Island SPA, the North Dublin Bay SAC, the Rye Water Valley/Carton SAC, the Malahide Estuary SAC and the Malahide Estuary SPA, occur within the Zone of Influence, and that the South Dublin Bay SAC occurs adjacent to the Zone of Influence. The South Dublin Bay SAC is not considered to be in any way connected to the proposed development as the Great South Wall forms a barrier against any impacts from the proposed development to the Qualifying Interests of this site.

Other internationally designated sites including the Dublin Bay UNESCO Biosphere Reserve, the Dublin Bay Important Bird Area (IBA), the Sandymount Strand/Tolka Estuary Wetland of International Importance (WII), the North Bull Island WII and the Broadmeadow Estuary WII have connectivity to the proposed development. Some of these designated sites refer to the same areas.

Six nationally designated sites: the Royal Canal pNHA, the Rye Water pNHA, the Liffey Valley pNHA, the Dolphins, Dublin Docks pNHA, the North Dublin Bay pNHA and the Malahide Estuary pNHA lie within the Zone of Influence. The South Dublin Bay pNHA is adjacent to the Zone of Influence, however, it is not considered to be in any way connected to the proposed development as the Great South Wall forms an effective barrier against any impacts from the proposed development on this site.

The designated sites within the Zone of Influence are presented in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80020-D, and Table 8-5 and described in the following sections.

Table 8-5 Designated sites within the Zone of Influence

Designated Site	Distance from the Proposed Development
<i>European Designated Sites</i>	
Rye Water Valley/Carton SAC [001398]	The proposed development is within this European Site for a distance of 400 m, at the Rye Water crossing (Louisa Bridge), east of Leixlip. The railway line is immediately adjacent to this European site for a further 230 m west of Louisa Bridge train station. The proposed development also passes close to this European site at the Carton Estate over a length of 200 m. The depot and railway realignment works are upstream of this site. However, at this location, it is separated by the Royal Canal, vegetation and the R148.
South Dublin Bay and River Tolka Estuary SPA [004024]	The shortest absolute distances from the proposed development to this site are 750 m east to the Tolka Estuary and 2.2 km south-east to Sandymount Strand. The shortest distance from the proposed development to the site via a hydrological connection is 3.7 km east (through the Royal Canal and the River Liffey) to Dublin Port which is within the Zone of Influence. There is a potential pathway through the existing surface water drainage network between the proposed development and this site through the River Tolka, which has a hydrological distance of 1.1 km. Therefore, the effective distance to the site is 1.1 km.

Designated Site	Distance from the Proposed Development
North Bull Island SPA [004006]	The shortest absolute distance from the proposed development to this site is 3.5 km north-east. The shortest distance from the proposed development to the site via a hydrological connection is 6.2 km east (through the Royal Canal and the River Liffey and across the River Tolka Estuary) to the Bull Wall, which is within the Zone of Influence. There is a potential pathway through the existing surface water drainage network between the proposed development and this site through the River Tolka and River Tolka Estuary, which has a hydrological distance of 4 km. Therefore, the effective distance to the site is 4.3 km.
North Dublin Bay SAC [000206]	The shortest absolute distance from the proposed development to this site is 3.5 km north-east. This distance is over land. The shortest distance from the proposed development to the site via a hydrological connection is 6.2 km north-east (down the Royal Canal and the River Liffey and across the River Tolka Estuary), which is within the Zone of Influence. There is a potential pathway through the existing surface water drainage network between the proposed development and this site through the River Tolka and River Tolka Estuary, which has a hydrological distance of 4.3k m. Therefore, the effective distance to the site is 4.3 km.
Malahide Estuary SAC [000205]	The shortest absolute distance from the proposed development to this site is 7 km east. This distance is over land. The shortest distance from the proposed development to the site via a hydrological connection is approximately 10.5 km east (down the Rowelstown Stream and Broadmeadow River), which is within the likely zone of impact. Therefore, the effective distance to the site is 10.5 km.
Malahide Estuary SPA [004025]	The shortest absolute distance from the proposed development to this site is 7 km east. This distance is over land. The shortest distance from the proposed development to the site via a hydrological connection is approximately 10.5 km east (down the Rowelstown Stream and Broadmeadow River), which is within the likely zone of impact. Therefore, the effective distance to the site is 10.5 km.
Nationally Designated Sites	
Royal Canal pNHA [002103]	This pNHA is located within and adjacent to the proposed development from the Docklands Station to the proposed depot. In places, particularly west of Maynooth, there is no separation whatsoever between the railway line and the canal. The pNHA include lands adject to the canal itself at Glasnevin, Ashtown, Castleknock to Coolmine, 'the Deep Sinking', Barberstown and Leixlip. The proposed development will result in habitat loss within this site.
Rye Water Valley / Carton pNHA [001398]	At its closest point, the existing railway line is within this pNHA for a distance of 40 0m, at the Rye Water crossing (Louisa Bridge), east of Leixlip. The railway line is immediately adjacent to this European site for a further 230 m west of Louisa Bridge train station. The railway line also passes close to this pNHA at the Carton Estate over a length of 200 m. However, at this location, it is separated by the Royal Canal, vegetation and the R148.
Liffey Valley pNHA [000128]	The proposed development crosses two tributaries of the River Liffey, namely the Rusk Stream and the Oranstown Stream, 1.5 km and 1.2 km upstream of the pNHA boundary. The proposed development also crosses the Rye Water at Leixlip, which flows into the pNHA 1.1 km downstream of the crossing point.
Dolphins, Dublin Docks pNHA [000201]	The shortest distance from the proposed development to the site via a hydrological connection is 3.2 km east, down the Royal Canal and the River Liffey, to the ESB Dolphin.
North Dublin Bay pNHA [000206]	The shortest absolute distance from the proposed development to this site is 3.5 km north-east. This distance is over land. The shortest distance from the proposed development to the site via a hydrological connection is 6.2 km north-east (down the Royal Canal and River Liffey, and across the River Tolka Estuary), which is within the Zone of Influence. There is a potential pathway through the existing surface water drainage network between the proposed development and this site through the River Tolka, which has a hydrological distance of 550 m. Therefore, the effective distance to the site is 550 m.
Malahide Estuary pNHA [000205]	The shortest absolute distance from the proposed development to this site is 7 km east. This distance is over land. The shortest distance from the proposed development to the site via a hydrological connection is approximately 10.5 km east (down the Rowelstown Stream and Broadmeadow River), which is within the likely zone of impact. Therefore, the effective distance to the site is 10.5 km.
Internationally Designated Sites	
Dublin Bay UNESCO Biosphere Reserve	The proposed development lies within the 'Terrestrial Transition Zone' of the Dublin Bay Biosphere. The transition zone is the outermost part of the Biosphere Reserve. This is an area of active cooperation between reserve management and the local people, wherein activities including settlements, cropping, forestry, recreation, and other economic uses continue in harmony with people and conservation goals.

Designated Site	Distance from the Proposed Development
Dublin Bay IBA (BirdLife International)	The closest proximity to the bay is 2.4 km south-east of the proposed development at Sandymount Strand.
Sandymount Strand / Tolka Estuary WII (Ramsar Convention)	This Ramsar site is located 2.4 km south-east of the proposed development at Sandymount Strand.
North Bull Island WII (Ramsar Convention)	This Ramsar site is located 3.5 km north-east of the proposed development at Bull Island.
Broadmeadow Estuary WII (Ramsar Convention)	This Ramsar site is located 7 km east of the proposed development in Malahide Estuary.

The descriptions of the European designated sites in Section 8.4.3 below are based on the Site Synopses, Conservation Objectives and Natura 2000 Standard Data Forms, as well as the Conservation Objectives supporting documents, where applicable. The descriptions of the pNHAs in Section 8.4.4 are based on the respective Site Synopses, where available. The description of the internationally designated sites in Section 8.4.5 are based on information available on their respective websites.

8.4.3 European designated sites

8.4.3.1 Rye Water Valley/Carton SAC [001398]

The description of the Rye Water Valley/Carton SAC is based on the Site Synopsis (NPWS, 2013a), Conservation Objectives (NPWS, 2021a) and Natura 2000 Standard Data Form (NPWS, 2019a) for the site. Pathways for negative effects exist between the proposed development and this European site. This European site has been considered under the Key Ecological Receptor heading 'Watercourses'.

Site overview

Rye Water Valley/Carton SAC is located between Leixlip and Maynooth, in Counties Meath and Kildare, and extends along the Rye Water, a tributary of the River Liffey. The Rye Water in Carton Estate is dammed at intervals, creating a series of lakes. The woods on Carton Estate are mostly old demesne woods with both deciduous and coniferous species. Hairy St. John's-wort (*Hypericum hirsutum*), a species legally protected under the Flora (Protection) Order, 2015, occurs in Carton Estate and there is an old record from the estate for the similarly protected Hairy Violet (*Viola hirta*). However, this latter species has not been recorded from the site in recent years. Another species listed in the Red Data Book, Green Figwort (*Scrophularia umbrosa*), occurs on the site in several locations by the Rye Water. The woods at Carton Demesne are the site of a rare myxomycete fungus, *Diderma deplanatum*.

The marsh, mineral spring and seepage area found at Louisa Bridge supports a good diversity of plant species. Mineral spring found at the site is of a type considered to be rare in Europe and is a habitat listed on Annex I to the Habitats Directive. The Red Data Book species Blue Fleabane (*Erigeron acer*) is found growing on a wall at Louisa Bridge. Within the woods, Blackcap, Woodcock and Long-eared Owl have been recorded. Little Grebe, Coot, Moorhen, Tufted Duck, Teal and Kingfisher, the latter a species listed on Annex I to the Birds Directive, occur on and about the lake. The Rye Water is also a spawning ground for Trout and Salmon, and the rare, White-clawed Crayfish (*Austropotamobius pallipes*) has been recorded at Leixlip. The latter two species are listed on Annex II to the Habitats Directive.

The rare Narrow-mouthed Whorl Snail and Desmoulin's Whorl Snail are found in marsh vegetation near Louisa Bridge. Both are rare in Ireland and in Europe and are listed on Annex II to the Habitats Directive. The scarce dragonfly *Orthetrum coerulescens* has also been recorded at Louisa Bridge. The conservation importance of the site lies in the presence of several rare and threatened plant and animal species, and the presence of petrifying springs, a habitat type listed on Annex I to the Habitats Directive. The woods found on Carton Estate and their birdlife are of additional interest.

Sensitivities of the Site and its Qualifying Interests

The greatest pressures/threats to the integrity of the Rye Water Valley/Cartron SAC come from continuous urbanisation, modification of structures of inland watercourses and forestry.

Conservation Objectives

No Conservation Objectives have been published for the Rye Water Valley/Cartron SAC. Therefore, generic Conservation Objectives (requiring the restoration or maintenance of favourable condition) apply.

8.4.3.2 South Dublin Bay and River Tolka Estuary SPA [004024]

The description of the South Dublin Bay and River Tolka Estuary SPA provided here is based on the Site Synopsis (NPWS, 2015a), Conservation Objectives (NPWS, 2015b) and Natura 2000 Standard Data Form (NPWS, 2021b) for the site, as well as the Conservation Objectives Supporting Document (NPWS, 2014b). Pathways for negative effects exist between the proposed development and this European site. This European site has been considered under the Key Ecological Receptor headings 'Watercourses' and 'Birds'.

Site Overview

This site comprises a substantial part of Dublin Bay. It includes the intertidal area between the River Liffey and Dún Laoghaire and the estuary of the River Tolka to the north of the River Liffey, as well as Booterstown Marsh. A portion of the shallow marine waters of the bay is also included.

The site is of ornithological importance as it supports an internationally important population of Light-bellied Brent Goose and nationally important populations of a further nine wintering species. Furthermore, the site supports a nationally important colony of breeding Common Tern and is an internationally important passage/staging site for three tern species. Notably, four of the species that regularly occur at this site are listed on Annex I of the Birds Directive, namely Bar-tailed Godwit, Common Tern, Arctic Tern and Roseate Tern. Parts of the site are also designated as the Ramsar Convention site, 'Sandymount Strand/Tolka Estuary'.

Being an integral part of the internationally important Dublin Bay complex, the site is important for wintering waterfowl – all counts for wintering waterbirds are five-year mean peaks for the period 1995/96 to 1999/2000. Although birds regularly commute between the south bay and the north bay, recent studies have shown that certain populations which occur in the south bay spend most of their time there.

An internationally important population of Light-bellied Brent Goose (368) occurs regularly, and newly arrived birds in the autumn feed on the Eelgrass bed at the Merrion Gates. At the time of designation, the site supported nationally important numbers of a further nine species: Oystercatcher (1,145), Ringed Plover (161), Grey Plover (45), Knot (548), Sanderling (321), Dunlin (1,923), Bar-tailed Godwit (766), Redshank (260) and Black-headed Gull (3,040). Other species occurring in smaller numbers include Great Crested Grebe (21), Curlew (127) and Turnstone (52). Little Egret, a species which has recently colonised Ireland, also occurs at this site.

South Dublin Bay is a significant site for wintering gulls, with a nationally important population of Black-headed Gull, but also Common Gull (330) and Herring Gull (348). Mediterranean Gull is also recorded here, occurring through much of the year, but especially in late winter/spring and again in late summer into winter.

Both Common Tern and Arctic Tern breed in Dublin Docks, on a man-made mooring structure known as the ESB Dolphin – this is included within the site. Small numbers of Common Tern and Arctic Tern were recorded nesting on this dolphin in the 1980s. A survey in 1995 recorded nationally important numbers of Common Tern nesting here (52 pairs). The breeding population of Common Tern at this site has increased, with 216 pairs recorded in 2000. This increase was largely due to the ongoing management of the site for breeding terns. More recent data highlights this site as one of the most important Common Tern sites in the country, with over 400 pairs recorded here in 2007.

South Dublin Bay is an important staging/passage site for a number of tern species from late July to September. The origin of many of the birds is likely to be the Dublin breeding sites (Rockabill and the Dublin Docks) though numbers suggest that the site is also used by birds from other sites, perhaps outside the state. This site is selected for designation for its autumn tern populations: Roseate Tern (2,000 in 1999), Common Tern (5,000 in 1999) and Arctic Tern (20,000 in 1996).

Sensitivities of the Site and its Qualifying Interests

As this site is mostly comprised of coastal wetlands and is located directly adjacent to a major city and port, expansion of the city and port poses the greatest threat to its integrity. Reclamation of land from the sea, estuary or marsh represents a direct loss of key Qualifying Interests of the Site. Roads, urbanisation, human habitation, industrial and commercial activities and discharges present pressures on the site in terms of disturbance and pollution. Watersports, walkers, horse riding and non-motorised vehicles also cause persistent disturbance to the birds within the site. Angling, particularly bait collection, causes both disturbance to birds, and reduces food availability. The site is also subject to some natural eutrophication pressures.

Conservation Objectives for the Qualifying Interests

All of the Qualifying Interests of the site are currently considered to be in a favourable conservation condition. Therefore, all Qualifying Interests, with the exception of Grey Plover, which is proposed for removal as a Qualifying Interest, have been assigned Conservation Objectives requiring the maintenance of this condition. These Conservation Objectives predominantly focus on the Attributes of “*Population trend*” and “*Distribution*”, but those for the three tern species cover a broader range of Attributes, e.g. “*Breeding population abundance: apparently occupied nests (AONs)*” and “*Productivity rate: fledged young per breeding pair*”, and that for Wetlands focuses exclusively on the Attribute of “*Habitat area*”.

Grey Plover is proposed for removal from the list of Qualifying Interests³ of the site. Therefore, there is currently no site-specific Conservation Objective for Grey Plover in the South Dublin Bay and River Tolka Estuary SPA.

8.4.3.3 North Bull Island SPA [004006]

The description of the North Bull Island SPA provided here is based on the Site Synopsis (NPWS, 2014a), Conservation Objectives (NPWS, 2015c) and Natura 2000 Standard Data Form (NPWS, 2020a) for the site, as well as the Conservation Objectives Supporting Document (NPWS, 2014c). Pathways for negative effects exist between the proposed development and this European site. This European site has been considered under the Key Ecological Receptor headings ‘Watercourses’ and ‘Birds’.

Site Overview

This site covers all of the inner part of north Dublin Bay, with the seaward boundary extending from the Bull Wall lighthouse across to Drumleck Point at Howth Head. The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th Centuries. It is c. 5 km long and 1 km wide and runs parallel to the coast between Clontarf and Sutton. Part of the interior of the island has been converted to golf courses.

The North Bull Island SPA is an excellent example of an estuarine complex and is one of the top sites in Ireland for wintering waterfowl. It is of international importance on account of both the total number of waterfowl and the individual populations of Light-bellied Brent Goose, Black-tailed Godwit and Bar-tailed Godwit that use it. Also of significance is the regular presence of several species that are listed on Annex I to the Birds Directive, notably Golden Plover and Bar-tailed Godwit, but also Ruff and Short-eared Owl. North Bull Island is a Ramsar Convention site, and part of the North Bull Island SPA is a statutory Nature Reserve and a Wildfowl Sanctuary.

³ In NPWS (2015a), Grey Plover is referred to as a “Special Conservation Interest” of the site. This term is sometimes used in place of “Qualifying Interest” but has the same meaning.

Saltmarsh extends along the length of the landward side of the island and provides the main roost site for wintering birds in Dublin Bay. The island shelters two intertidal lagoons which are divided by a solid causeway. These lagoons provide the main feeding grounds for the wintering waterfowl. The sediments of the lagoons are mainly sands with a small and varying mixture of silt and clay. Green algal mats (*Ulva* spp.) are a feature of the flats during summer. These sediments have a rich macro-invertebrate fauna, with high densities of Lugworm (*Arenicola marina*) and Ragworm (*Hediste diversicolor*).

This site is of international importance for waterfowl on the basis that it regularly supports in excess of 20,000 waterfowl. The site supports internationally important populations of three species, Light-bellied Brent Goose (1,548), Black-tailed Godwit (367) and Bar-tailed Godwit (1,529) – all figures are mean peaks for the five winters between 1995/96 and 1999/2000. The site is one of the most important in the country for Light-bellied Brent Goose. A further 14 species have populations of national importance: Shelduck (1,259), Teal (953), Pintail (233), Shoveler (141), Oystercatcher (1,784), Grey Plover (517), Golden Plover (2,033), Knot (2,837), Sanderling (141), Dunlin (4,146), Curlew (937), Redshank (1,431), Turnstone (157) and Black-headed Gull (2,196). The populations of Pintail and Knot are of particular note as they comprise 14% and 10%, respectively, of the all-Ireland population totals. Other species that occur regularly in winter include Grey Heron, Little Egret, Cormorant, Wigeon, Goldeneye, Red-breasted Merganser, Ringed Plover and Greenshank. Gulls are a feature of the site during winter and, along with the nationally important population of Black-headed Gull (2,196), other species that occur include Common Gull (332) and Herring Gull (331). While some of the birds also frequent South Dublin Bay and the River Tolka Estuary for feeding and/or roosting purposes, the majority remain within the site for much of the winter. The wintering bird populations have been monitored more or less continuously since the late 1960s and the site is now surveyed each winter as part of the larger Dublin Bay complex.

The North Bull Island SPA is a regular site for passage waders, especially Ruff, Curlew Sandpiper and Spotted Redshank. These are mostly observed in single figures in autumn but occasionally in spring or winter. The site formerly had an important colony of Little Tern but breeding has not occurred in recent years. Several pairs of Ringed Plover breed, along with Shelduck in some years. Breeding passerines include Skylark, Meadow Pipit, Stonechat and Reed Bunting. The island is a regular wintering site for Short-eared Owl, with up to five present in some winters.

Sensitivities of the site and its Qualifying Interests

The greatest pressures/threats to the integrity of the North Bull SPA come from the bridge/viaduct located within the site (and the potential for other structures to be built within the site) and from walking, horse riding and non-motorised vehicles within the site. Bait digging/collection, nautical sports and the gold course (all inside the site) and roads, motorways, shipping lanes, continuous urbanisation and industrial or commercial areas (all outside the site) also represent significant pressures/threats to the integrity of this site. Other patterns of habitation within the site represent a lower-level pressure/threat.

Conservation objectives for the Qualifying Interests

All of the Qualifying Interests of the site are currently considered to be in a favourable conservation condition. Therefore, all Qualifying Interests have been assigned Conservation Objectives requiring maintenance of this condition. These Conservation Objectives focus on the Attributes of “Population trend” and “Distribution”, but that for Wetlands focuses exclusively on the Attribute of “Habitat area”.

8.4.3.4 North Dublin Bay SAC [000206]

The description of the North Dublin Bay SAC provided here is based on the Site Synopsis (NPWS, 2013b), Conservation Objectives (NPWS, 2013c) and Natura 2000 Standard Data Form (NPWS, 2020b) for the site, as well as the Conservation Objectives Supporting Documents (NPWS, 2013g). Pathways for negative effects exist between the proposed development and this European site. This European site has been considered under the Key Ecological Receptor heading ‘Watercourses’.

Site Overview

This site covers the inner part of north Dublin Bay, the seaward boundary extending from the Bull Wall lighthouse across to the Martello Tower at Howth Head. The North Bull Island is the focal point of this site.

North Bull Island is a sandy spit which formed after the building of the South Wall and Bull Wall in the 18th and 19th centuries. It now extends for about 5 km in length and is up to 1 km wide in places. A well-developed and dynamic dune system stretches along the seaward side of the island. Various types of dunes occur, from fixed dune grassland to pioneer communities on foredunes. About 1 km from the tip of the island, a large dune slack with a rich flora occurs, usually referred to as the 'Alder Marsh' because of the presence of Alder trees (*Alnus glutinosa*). The water table is very near the surface and is only slightly brackish. Saltmarsh extends along the length of the landward side of the island. The edge of the marsh is marked by an eroding edge which varies from 20 cm to 60 cm high. The marsh can be zoned into different levels according to the vegetation types present. Towards the tip of the island, the saltmarsh grades naturally into fixed dune vegetation. The habitat 'annual vegetation of drift lines' is found in places, along the length of Dollymount Strand, with species such as Sea Rocket (*Cakile maritima*), Oraches (*Atriplex* spp.) and Prickly Saltwort (*Salsola kali*).

The island shelters two intertidal lagoons which are divided by a solid causeway. The sediments of the lagoons are mainly sands with a small and varying mixture of silt and clay. The north lagoon has an area known as the "Salicornia flat", which is dominated by *Salicornia dolichostachya*, a pioneer glasswort species, and covers about 25 ha. The sediments on the seaward side of North Bull Island are mostly sands. The site extends below the low spring tide mark to include an area of the sublittoral zone. Three rare plant species which are legally protected under the Flora (Protection) Order, 2015 have been recorded on the North Bull Island. These are Lesser Centaury (*Centaureum pulchellum*), Red Hemp-nettle (*Galeopsis angustifolia*) and Meadow Saxifrage (*Saxifraga granulata*). Two further species listed as threatened in the Red Data Book, Wild Clary/Sage (*Salvia verbenaca*) and Spring Vetch (*Vicia lathyroides*), have also been recorded. A rare liverwort, *Petalophyllum ralfsii*, was first recorded from the North Bull Island in 1874 and has recently been confirmed as still present. This species is of high conservation value as it is listed on Annex II to the Habitats Directive. The North Bull is the only known extant site for the species in Ireland away from the western seaboard.

North Dublin Bay is of international importance for waterfowl. Some of these species frequent South Dublin Bay and the River Tolka Estuary for feeding and/or roosting purposes (mostly Brent Goose, Oystercatcher, Ringed Plover, Sanderling and Dunlin). The tip of the North Bull Island is a traditional nesting site for Little Tern. A peak total of 88 pairs nested in 1987. However, nesting attempts have not been successful since the early 1990s. A well-known population of Irish Hare is resident on the island. The invertebrates of the North Bull Island have been studied and the island has been shown to contain at least seven species of regional or national importance in Ireland. The principal land uses in this site are amenity activities and nature conservation. The North Bull Island is the main recreational beach in Co. Dublin and is used throughout the year. Much of the land surface of the island is taken up by two golf courses. Two separate statutory Nature Reserves cover much of the island east of the Bull Wall and the surrounding intertidal flats. The site is used regularly for educational purposes. North Bull Island has been designated as an SPA under the Birds Directive and it is also a statutory Wildfowl Sanctuary, a Wetland of International Importance (WII) under the Ramsar Convention, a Biogenetic Reserve, a UNESCO Biosphere Reserve and a Special Amenity Area.

This site is an excellent example of a coastal site with all the main habitats represented. The site holds good examples of nine habitats that are listed on Annex I to the Habitats Directive; one of these is listed with priority status. Several of the wintering bird species have populations of international importance, while some of the invertebrates are of national importance. The site contains a number of rare and scarce plants including some which are legally protected. Its proximity to the capital city makes North Dublin Bay an excellent site for educational studies and research.

Sensitivities of the site and its Qualifying Interests

As this site is located directly adjacent to a major city and port, expansion of the city and port poses the greatest threat to its integrity. Reclamation of land from the sea, estuary or marsh represents a direct loss of key Qualifying Interests of the site. Roads, urbanisation, human habitation, industrial and commercial activities and accumulation of organic material present pressures on the site in terms of disturbance and pollution. Walkers, horse riding and non-motorised vehicles also cause persistent disturbance to the birds within the site.

Conservation objectives for the Qualifying Interests

The Conservation Objective is to maintain the favourable conservation status for the following qualifying interests: Mudflats and Sandflats not covered by the sea water at low tide; Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Mediterranean salt meadows (*Juncetalia maritimi*); and, Petalwort (*Petalophyllum ralfsii*). The Conservation Objective is to restore the favourable conservation status for the following qualifying interests: Annual vegetation of drift lines; *Salicornia* and other annuals colonising mud and sand; Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes); Fixed coastal dunes with herbaceous vegetation (grey dunes); Humid dune slacks.

8.4.3.5 Malahide Estuary SAC [000205]

The description of the Malahide Estuary SAC provided here is based on the Site Synopsis (NPWS, 2017a), Conservation Objectives (NPWS, 2013d) and Natura 2000 Standard Data Form (NPWS, 2020c) for the site, as well as the Conservation Objectives Supporting Documents (NPWS, 2013h).

Site Overview

Malahide Estuary is situated immediately north of Malahide and east of Swords in Co. Dublin. It is the estuary of the River Broadmeadow. The site is divided by a railway viaduct which was built in the 1800s.

The outer part of the estuary is mostly cut off from the sea by a large sand spit, known as 'the island'. The outer estuary drains almost completely at low tide, exposing sand and mud flats. There is a large bed of Eelgrass (Dwarf Eelgrass, *Zostera noltii*, and Narrow-leaved Eelgrass, *Z. angustifolia*) in the north section of the outer estuary, along with Beaked Tasselweed (*Ruppia maritima*) and extensive mats of green algae (*Enteromorpha* spp., *Ulva lactuca*). Common Cord-grass (*Spartina anglica*) is also widespread in this sheltered part of the estuary.

The dune spit has a well-developed outer dune ridge dominated by Marram Grass (*Ammophila arenaria*). The dry areas of the stabilised dunes have a dense covering of Burnet Rose (*Rosa pimpinellifolia*), Red Fescue (*Festuca rubra*) and species such as Yellow-wort (*Blackstonia Perfoliata*), Autumn Gentian (*Gentianella amarella*), Hound's tongue (*Cynoglossum officinale*), Carlina Thistle (*Carlina vulgaris*) and Pyramidal Orchid (*Anacamptis pyramidalis*). Much of the interior of the spit is taken up by a golf course. The inner stony shore has frequent Sea-holly (*Eryngium maritimum*). Well-developed saltmarshes occur at the tip of the spit. Atlantic salt meadow is the principal type and is characterised by species such as Sea-purslane (*Halimolobos portulacoides*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Arrowgrass (*Triglochin maritima*) and Common Saltmarsh-grass (*Puccinellia maritima*). Elsewhere in the outer estuary, a small area of Mediterranean salt meadow occurs which is characterised by the presence of Sea Rush (*Juncus maritimus*). Below the salt marshes there are good examples of pioneering glasswort (*Salicornia* spp.) swards and other annual species, typified by *S. dolichostachya* and Annual Sea-blite (*Suaeda maritima*).

The inner estuary does not drain at low tide apart from the extreme inner part. Here, patches of saltmarsh and salt meadows occur, with Sea Aster, Sea Plantain (*Plantago maritima*) and Sea Club-rush (*Scirpus maritimus*). Beaked Tasselweed occurs in one of the channels. The inner part of the estuary is heavily used for water sports. A section of the outer estuary has recently been infilled for a marina and housing development.

Sensitivities of the Site and its Qualifying Interests

The greatest pressures/threats to the integrity of the Malahide Estuary SAC are from the bridge/ viaduct, reclamation of land from sea/ estuary/ marsh, nautical sports, walking, horse-riding, non-motorised vehicles and motorised vehicles.

Conservation objectives for the Qualifying Interests

The Conservation Objective is to maintain the favourable conservation status for the following qualifying interests: Mudflats and Sandflats not covered by the sea water at low tide; Salicornia and other annuals colonising mud and sand and Mediterranean salt meadows (*Juncetalia maritimi*). The Conservation Objective is to restore the favourable conservation status for the following qualifying interests: Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes'); Fixed coastal dunes with herbaceous vegetation (grey dunes).

8.4.3.6 Malahide Estuary SPA [004025]

The description of the Malahide Estuary SPA is based on the Site Synopsis (NPWS, 2013e), Conservation Objectives (NPWS, 2013f) and Natura 2000 Standard Data Form (NPWS, 2021c) for the site, as well as the Conservation Objectives Supporting Document (NPWS, 2013h).

Site Overview

Malahide Estuary is situated in north Co. Dublin, between the towns of Malahide and Swords. The site encompasses the estuary, saltmarsh habitats and shallow subtidal areas at the mouth of the estuary. A railway viaduct, built in the 1800s, crosses the site and has led to the inner estuary becoming lagoonal in character and only partly tidal. Much of the outer part of the estuary is well-sheltered from the sea by a large sand spit, known as "The Island". This spit is now mostly converted to golf-course. The outer part empties almost completely at low tide and there are extensive intertidal flats exposed. Substantial stands of eelgrass (both *Zostera noltii* and *Z. angustifolia*) occur in the sheltered part of the outer estuary, along with Tasselweed (*Ruppia maritima*). Green algae, mostly *Ulva* spp., are frequent on the sheltered flats.

This site is of high importance for wintering waterfowl and supports a particularly good diversity of species. It has internationally important populations of Light-bellied Brent Goose (1,104 individuals or 5% of the all-Ireland total) and Black-tailed Godwit (409 individuals or 2.9% of the all-Ireland total) – figures given here and below are mean peaks for the five winters 1995/96-1999/2000. Furthermore, the site supports nationally important populations of an additional 12 species: Great Crested Grebe (63), Shelduck (439), Pintail (58), Goldeneye (215), Red-breasted Merganser (99), Oystercatcher (1,360), Golden Plover (1,843), Grey Plover (201), Knot (915), Dunlin (1,594), Bar-tailed Godwit (156) and Redshank (581). The high numbers of diving ducks reflect the lagoon-type nature of the inner estuary, and this is one of the few sites in eastern Ireland where substantial numbers of Goldeneye can be found.

A range of other species occurs, including Mute Swan (37), Pochard (36), Ringed Plover (86), Lapwing (1,542), Curlew (548), Greenshank (38) and Turnstone (112). The estuary also attracts other migrant wader species such as Ruff, Curlew Sandpiper, Spotted Redshank and Little Stint. These occur mainly in autumn, though occasionally in spring and winter. Breeding birds of the site include Ringed Plover, Shelduck and Mallard. Up to the 1950s there was a major tern colony at the southern end of Malahide Island. Grey Herons breed nearby and feed regularly within the site.

Malahide Estuary SPA is a fine example of an estuarine system, providing both feeding and roosting areas for a range of wintering waterfowl. The lagoonal nature of the inner estuary is of particular value as it increases the diversity of birds which occur. The site is of high conservation importance, with internationally important populations of Light-bellied Brent Goose and Black-tailed Godwit, and nationally important populations of a further 12 species. Two of the species which occur regularly (Golden Plover and Bar-tailed Godwit) are listed on Annex I of the E.U. Birds Directive.

Sensitivities of the Site and its Qualifying Interests

The greatest pressures/threats to the integrity of the Malahide Estuary SPA are from urbanised areas and human habitation, reclamation of land from sea/ estuary/ marsh, paths/ tracks/ cycle tracks and nautical sports.

Conservation objectives for the Qualifying Interests

All of the Qualifying Interests of the site are currently considered to be in a favourable conservation condition. Therefore, all Qualifying Interests have been assigned Conservation Objectives requiring maintenance of this condition. These Conservation Objectives focus on the Attributes of “Population trend” and “Distribution”, but that for Wetlands focuses exclusively on the Attribute of “Habitat area”.

8.4.4 Nationally designated sites

Only three of the six pNHAs found in the Zone of Influence has a site synopsis. The descriptions of the other three pNHAs, the Rye Water Valley/ Carton pNHA, the North Dublin Bay pNHA and the Malahide Estuary pNHA, are considered to be similar to those described in the sections above relating to the Rye Water Valley/ Carton SAC, the South Dublin Bay and River Tolka Estuary SPA/ North Dublin Bay SAC and the Malahide Estuary SAC & SPA.

8.4.4.1 Royal Canal pNHA [002103]

The description of the Royal Canal pNHA provided here is based on the Site Synopsis (NPWS, 2009c).

The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Tarmonbarry, Co. Roscommon. There is a branch line from Kilashee to Longford Town. The pNHA comprises the central channel and the banks on either side of it. The main water supply is from Lough Owel via a feeder channel into the canal at Mullingar.

The Royal Canal was closed to navigation in 1961. The section of canal west of Mullingar was allowed to dry out, and the eastern section silted up and became overgrown. Restoration began in 1988, and is still in progress. The proposed development runs parallel to the Royal Canal pNHA between Dublin City and the depot. At a number of locations, it is within the boundary of the pNHA.

The site also encompasses the habitats adjacent to the canal itself including a number of discreet pockets of woodland and wetlands. These include six areas which are listed in Table 8-6 below.

Table 8-6 Areas of Biodiversity Value Adjacent to the Proposed Development

Chainage	Location	Habitat
43+400 - 50+800	Glasnevin	Semi-natural grassland, scrub
54+000 - 54+700	Navan Road Parkway	Scrub
56+400 - 60+100	The Deep Sinking, between Castleknock and Clonsilla	Mixed woodland
70+500 - 70+700	Barberstown	Woodland, grassland
73+200 - 73+900	East of Leixlip	Wet woodland
75+600 - 75+950	North of the Rye Water crossing	Wet woodland

A number of different habitats are found within the canal boundaries – hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The hedgerow, although diverse, is dominated by Hawthorn (*Crataegus monogyna*). On the limestone soils of the midlands, Spindle (*Euonymus europaeus*) and Guelderrose (*Viburnum opulus*) are present. The vegetation of the towpath is usually dominated by grass species. Crested Dogs-tail (*Cynosurus cristatus*), Quaking-grass (*Briza media*) and Sweet Vernal-grass (*Anthoxanthum odoratum*) are typical species of the calcareous grasslands of the midlands. Where the canal

was built through a bog, soil (usually calcareous) was brought in to make the banks. The contrast between the calcicolous species of the towpath and the calcifuge species of the bog is very striking.

Otter spraints are found along the towpath, particularly where the canal passes over a river or stream. The rare and legally protected Opposite-leaved Pondweed (*Groenlandia densa*), which is listed on the Flora (Protection) Order, 2015, is present at one site in Dublin, between Locks 4 and 5. *Tolypella intricata* (a stonewort listed in the Red Data Book as being vulnerable) is also in the Royal Canal in Dublin, the only site in Ireland where it is now found.

The ecological value of the canal lies more in the diversity of species it supports along its linear habitat than in the presence of rare species. It crosses through agricultural land and therefore provides a refuge for species threatened by modern farming methods. The Royal Canal pNHA could be negatively impacted through the accidental introduction of chemicals or cementitious material and through the introduction of artificial lighting during the construction and operation of the proposed development.

Accordingly, the 'Royal Canal pNHA' has been included as a Key Ecological Receptor.

8.4.4.2 Dolphins, Dublin Docks pNHA [000201]

The description of the Dolphins, Dublin Docks pNHA is adapted from the South Dublin Bay and River Tolka Estuary SPA Site Synopsis (NPWS, 2015c). Pathways for negative effects exist between the proposed development and this pNHA. This pNHA has been considered under the Key Ecological Receptor heading 'Watercourses'.

Both Common Tern and Arctic Tern breed in the Dublin Docks, on man-made mooring structures known as 'dolphins'. Small numbers of Common Tern and Arctic Tern were recorded nesting on this dolphin in the 1980s. A survey in 1995 recorded nationally important numbers of Common Tern nesting here (52 pairs). The breeding population of Common Tern at this site has increased, with 216 pairs recorded in 2000. This increase was largely due to the ongoing management of the site for breeding terns. More recent data highlights this site as one of the most important Common Tern sites in the country with over 400 pairs recorded here in 2007. South Dublin Bay is an important staging/passage site for a number of tern species from late July to September. The origin of many of the birds is likely to be the Dublin breeding sites (Rockabill and the Dublin Docks) though numbers suggest that the site is also used by birds from other breeding sites, perhaps outside the state.

Given the implementation of strict environmental controls which are incorporated into the design of the proposed development, there will be no significant impact on habitats and species for which the Dolphins, Dublin Docks pNHA is designated. Based on this conclusion, the Dolphins, Dublin Docks pNHA has not been included as a Key Ecological Receptor in relation to the proposed development.

8.4.4.3 Liffey Valley pNHA [000128]

The Liffey Valley site is situated along the River Liffey between Leixlip Bridge on the Kildare-Dublin border and downstream of the weir at Glenaulin, Palmerstown, Co. Dublin. The main terrestrial habitat included within the site is mixed deciduous woodland on fertile, limey alluvium and boulder clay, in which Beech (*Fagus sylvatica*) is dominant in some areas. Elsewhere Ash (*Fraxinus excelsior*) and willow species (*Salix* spp.) are common and there are also some stands of larch (*Larix* spp.) and Scots Pine (*Pinus sylvestris*). Toothwort (*Lathraea squamaria*) has been recorded on a number of tree species.

A wet marsh occurs on the strip of land between the Mill Race and the river east of the metal bridge and west of the paint factory. This marsh is fed by seepage from the Mill Race and plant species such as Bulrush (*Typha latifolia*), Marsh-marigold (*Caltha palustris*) and sweet-grass (*Glyceria* spp.) occur here. This strip of land also contains rough grassland which is not regularly grazed. Much of the river bank and the banks of the Mill Race are fringed with willow (*Salix* spp.) and Alder (*Alnus glutinosa*). The threatened Green Figwort (*Scrophularia umbrosa*), a species listed in the Irish Red Data Book, is recorded from a number of stations along the river

within the site. This stretch of the river Liffey has the greatest number of recently recorded populations of this species in Ireland.

The rare and legally protected Hairy St. John's-wort (*Hypericum hirsutum*), which is listed on the Flora (Protection) Order, 2015, has been recorded from the woodlands in this site. This species has only been recorded in Kildare and Dublin, at sites on the river Liffey, since 1970. Yellow Archangel (*Lamiastrum galeobdolon*) is also recorded from these woodlands. The site is important because of the diversity of the habitats within the site, ranging from aquatic to terrestrial. A number of rare and threatened plant species have been recorded from the site. Pathways for negative effects exist between the proposed development and this pNHA. This pNHA has been considered under the Key Ecological Receptor heading 'Watercourses'.

8.4.5 Other designated sites

8.4.5.1 Dublin Bay UNESCO Biosphere Reserve

In 1981, UNESCO recognised the importance of Dublin Bay by designating North Bull Island as a Biosphere Reserve because of its rare and internationally important habitats and species. To support sustainable development, UNESCO's concept of a Biosphere has evolved to include not just areas of ecological value but also the areas around them and the communities that live and work within these areas. There have since been additional international and national designations, covering much of Dublin Bay, to ensure the protection of its water quality and biodiversity. To fulfil these broader management aims for the ecosystem, the Biosphere was expanded in 2015. The Biosphere now covers Dublin Bay, reflecting its significant environmental, economic, cultural and tourism importance, and extends to over 300 km². Part of the proposed development is within the 'Transitional Zone' of the Reserve. Pathways for negative effects exist between the proposed development and the Dublin Bay Biosphere. This site has been considered under the Key Ecological Receptor heading 'Watercourses'.

8.4.5.2 Dublin Bay Important Bird Area

Dublin Bay is designated as an Important Bird Area (IBA) by BirdLife International. IBAs are monitored using a simple, practical and robust framework. This involves regular assessments in which each IBA is scored using populations of trigger species. Population species estimates for previous monitoring are given as 'good' for this site. Dublin Bay is a wetland of international importance for waterfowl, regularly supporting over 20,000 wintering birds. Species wintering in numbers of national importance include Shelduck (1,119 birds, 1995), Wigeon (1,270 birds, 1995), Teal (1,490 birds, 1995), Pintail (414 birds, 1995), Shoveler (370 birds, 1995), Grey Plover (914 birds, 1995), Sanderling (450 birds, 1995) and Black-tailed Godwit (466 birds, 1995). During August, large numbers of terns (typically about 5,000 and occasionally up to 30,000 birds) use Sandymount Strand as an evening roost. Pathways for negative effects exist between the proposed development and the Dublin Bay IBA. This site has been considered under the Key Ecological Receptor heading 'Watercourses'.

8.4.5.3 Sandymount Strand/Tolka Estuary Wetland of International Importance (WII)

This Ramsar site is an intertidal system supporting a large bed of Eelgrass (*Zostera noltii*) with extensive areas of sandflats. The site is important for various species of waterbirds, supporting internationally important numbers of Brent Geese and large numbers of roosting gulls and terns. Various species of annelids, bivalves and small gastropods occur. Bait-digging is a regular activity on the sandy flats. Pathways for negative effects exist between the proposed development and the Sandymount Strand/Tolka Estuary Ramsar Site. This site has been considered under the Key Ecological Receptor heading 'Watercourses'.

8.4.5.4 North Bull Island Wetland of International Importance (WII)

A small island built up over 200 years against a harbour wall and the adjoining foreshore of sandy beaches, saltmarshes and mudflats. The site is unique in Ireland because it supports well-developed saltmarsh and dune systems displaying all stages of development from the earliest phase of colonization to full maturity. The site supports five protected or threatened plant species and nationally important populations of three insect

species. The area is important for nesting *Sterna albifrons* (80 pairs, or about 30% of the Irish population) and for numerous species of wintering waterbirds.

8.4.5.5 Broadmeadow Estuary Wetland of International Importance (WII)

The site includes well-developed saltmarshes, salt meadows, rocky shores, a well-developed outer dune ridge and sand mudflats exposed at low tide. Vegetation consists of a large bed of eelgrass (*Zostera noltii* and *Z. angustifolium*) and extensive mats of green algae (*Enteromorpha* spp., *Ulva lactuca*). The estuary is an important wintering site for numerous species of waterbirds. The Brent goose population is of international importance. The high numbers of diving birds reflects the lagoon-type nature of the inner estuary.

8.4.6 Rare and protected species

This section lists the rare and protected species of flora and fauna recorded in the desk study.

8.4.6.1 National Parks and Wildlife Service

Post 1990-records of rare and protected species from within the 10 km grid squares that intersect the proposed development, N93, O03, O04 and O13, were provided by the NPWS and are listed in Table 8-7 below.

Table 8-7 NPWS records of rare and protected species

Common Name	Scientific Name	Status*
Plants		
Green Figwort	<i>Scrophularia umbrosa</i>	IRL10-NT
Hairy St. John's Wort	<i>Hypericum hirsutum</i>	FPO; IRL10-V
Hairy Violet	<i>Viola hirta</i>	FPO; IRL10-V
Opposite-Leaved Pondweed	<i>Groenlandia densa</i>	FPO; IRL10-NT
Mammals/ Amphibians/ Molluscs		
Irish Hare	<i>Lepus timidus ssp. hibernicus</i>	HD V, WA
Irish Stoat	<i>Mustela erminea ssp. hibernica</i>	WA
Badger	<i>Meles meles</i>	WA
Pine Marten	<i>Martes martes</i>	Annex V HD, WA
Smooth Newt	<i>Lissotriton vulgaris</i>	WA
Common Frog	<i>Rana temporaria</i>	Annex V HD, WA
Desmoulin's Whorl Snail	<i>Vertigo moulinsiana</i>	Annex II HD, WA
Narrow-mouthed Whorl Snail	<i>Vertigo angustior</i>	Annex II HD, WA

*Status: FPO= Flora (Protection) Order, 2015; HD= Habitats Directive; II/V= Annex II/V; WA= Wildlife Acts; IRL 10-V/ -NT=Irish Red List No. 10 Vulnerable/ Near Threatened.

8.4.6.2 National Biodiversity Data Centre

Table 8-8 lists the rare and protected species records obtained from the NBDC within the 2 km of the proposed development. To avoid replication, all records of species represented in the NPWS dataset have been removed from the displayed NBDC data. Only those bird species which are listed on Annex I to the Birds Directive and/or are Amber- or Red-listed *Birds of Conservation Concern in Ireland (BoCCI) 2020- 2026*, and/or are raptors have been listed here. Table 8-9 lists the invasive species recorded within 2 km of the proposed development.

Table 8-8 Records of rare and protected species (source: NBDC)

Common Name	Scientific Name	Status*
Terrestrial Mammals		
Brown Long-eared Bat	<i>Plecotus auratus</i>	Annex IV HD; WA
Common Pipistrelle	<i>Pipistrellus pipistrellus sensu lato</i>	Annex IV HD; WA
Daubenton's Bat	<i>Myotis daubentoniid</i>	Annex IV HD, WA
Hedgehog	<i>Erinaceus europaeus</i>	WA
Leisler's Bat	<i>Nyctalus leisleri</i>	Annex IV HD, WA
Nathusius Pipistrelle	<i>Pipistrellus nathusii</i>	Annex IV HD, WA
Natterer's Bat	<i>Myotis nattereri</i>	Annex IV HD, WA
Otter	<i>Lutra lutra</i>	Annex II, IV HD, WA
Pine Marten	<i>Martes martes</i>	Annex V HD, WA
Pygmy Shrew	<i>Sorex minutus</i>	WA
Red Deer	<i>Cervus elaphus</i>	WA
Red Squirrel	<i>Sciurus vulgaris</i>	WA
Soprano Pipistrelle	<i>Pipistrellus pygmaeus</i>	Annex IV HD; WA
Whiskered Bat	<i>Myotis mystacinus</i>	Annex IV HD, WA
Birds		
Barn Owl	<i>Tyto alba</i>	Red BOCCI
Black Guillemot	<i>Cephus grylle</i>	Amber BOCCI
Black-Headed Gull	<i>Larus ridibundus</i>	Red List BOCCI
Brent Goose	<i>Branta bernicla</i>	Amber BOCCI
Buzzard	<i>Buteo buteo</i>	Green BOCCI (Raptor)
Coot	<i>Fulica atra</i>	Amber BOCCI
Common Tern	<i>Sterna hirundo</i>	Annex I BD, Amber BOCCI
Cormorant	<i>Phalacrocorax carbo</i>	Amber BOCCI
Curlew	<i>Numenius arquata</i>	Red BOCCI
Kittiwake	<i>Rissa tridactyla</i>	Amber BOCCI
Kestrel	<i>Falco tinnunculus</i>	Red BOCCI
Kingfisher	<i>Alcedo atthis</i>	Annex I BD, Amber BOCCI
Linnet	<i>Carduelis cannabina</i>	Amber BOCCI
Herring Gull	<i>Larus argentatus</i>	Amber List BOCCI
House Martin	<i>Delichon urbicum</i>	Amber BOCCI
House Sparrow	<i>Passer domesticus</i>	Amber BOCCI
Lapwing	<i>Vanellus vanellus</i>	Red BOCCI
Lesser Black-backed Gull	<i>Larus fuscus</i>	Amber BOCCI
Little Egret	<i>Egretta garzetta</i>	Annex I BD
Long-eared Owl	<i>Asio otus</i>	Green BOCCI (Raptor)
Mallard	<i>Anas platyrhynchos</i>	Amber BOCCI
Mute Swan	<i>Cygnus olor</i>	Amber BOCCI
Oystercatcher	<i>Haematopus ostralegus</i>	Red BOCCI
Peregrine Falcon	<i>Falco peregrinus</i>	Annex I BD

Common Name	Scientific Name	Status*
Redshank	<i>Tringa tetanus</i>	Amber List BOCCI
Rock Pigeon	<i>Columba livia</i>	Red BOCCI
Sand Martin	<i>Riparia riparia</i>	Amber BOCCI
Starling	<i>Sturnus vulgaris</i>	Amber BOCCI
Skylark	<i>Alauda arvensis</i>	Amber BOCCI
Smew	<i>Mergellus albellus</i>	Amber BOCCI
Sparrowhawk	<i>Accipiter nisus</i>	Green BOCCI (Raptor)
Spotted Flycatcher	<i>Muscicapa striata</i>	Amber BOCCI
Stock Pigeon	<i>Columba oenas</i>	Red BOCCI
Swallow	<i>Hirundo rustica</i>	Amber BOCCI
Swift	<i>Apus apus</i>	Red BOCCI
Teal	<i>Anas crecca</i>	Amber BOCCI
Tree Sparrow	<i>Passer montanus</i>	Amber BOCCI
Tufted Duck	<i>Aythya fuligula</i>	Amber BOCCI
Wheatear	<i>Oenanthe oenanthe</i>	Amber BOCCI
Yellowhammer	<i>Emberiza citrinella</i>	Red BOCCI
Insects		
Small Heath	<i>Coenonympha pamphilus</i>	IRL4-NT
Wood White	<i>Leptidea sinapis</i>	IRL4-NT
Large Red Tailed Bumble Bee	<i>Bombus (Melanobombus) lapidarius</i>	RRLIB-NT
Moss Carder-bee	<i>Bombus (Thoracombus) muscorum</i>	RRLIB-NT
[A Bee]	<i>Megachile (Delomegachile) willughbiella</i>	RRLIB-NT
[A Bee]	<i>Halictus (Seladonia) tumulorum</i>	RRLIB-NT
[A Bee]	<i>Andrena (Andrena) fucata</i>	RRLIB-NT
Small Blue-tailed Damselfly	<i>Ischnura pumilio</i>	IRL6-VU
[A Bee]	<i>Andrena (Melandrena) nigroaenea</i>	RRLIB-VU
Crustaceans		
White-clawed Crayfish	<i>Austropotamobius pallipes</i>	Annex II, V HD, WA

*Status (listing conferring protection or describing conservation status) abbreviations: Annex II/IV/V (non-avian species) = Habitats Directive (HD); Annex I/II/III (bird) = Birds Directive (BD); WA = Wildlife Acts; and, Red/Amber = Birds of Conservation Concern in Ireland, 2020 to 2026 (BOCCI); FPO = Flora (Protection) Order, 2015; IRL 4/6= Irish Red List No. 4/6; RRLIB= Regional Red List of Irish Bees; VU/ NT= Vulnerable/ Near Threatened.

Table 8-9 Invasive species restricted under the Habitats Regulations or under EU Regulation 1143/2014 (denoted by *) recorded within 2 km of the proposed development (Source: NBDC)

Common Name	Scientific Name
American Mink	<i>Neovison vison</i>
American Skunk-cabbage	<i>Lysichiton americanus</i>
Brazilian Giant-rhubarb	<i>Gunnera manicata</i>
Butterfly-bush	<i>Buddleja davidii</i>
Canadian Waterweed	<i>Elodea canadensis</i>
Eastern Grey Squirrel	<i>Sciurus carolinensis</i>
Bohemian Knotweed	<i>Fallopia x bohemica</i>

Common Name	Scientific Name
Giant Hogweed	<i>Heracleum mantegazzianum</i>
Himalayan Balsam	<i>Impatiens glandulifera</i>
Japanese Knotweed	<i>Fallopia japonica</i>
New Zealand Pigmyweed	<i>Crassula helmsii</i>
Nuttall's Waterweed	<i>Elodea nuttallii</i>
Red-eared Terrapin*	<i>Trachemys scripta</i>
Rhododendron	<i>Rhododendron ponticum</i>
Three-cornered Leek	<i>Allium triquetrum</i>
Water Fern	<i>Azolla filiculoides</i>

8.4.6.3 EPA and WFD Watercourse Assessments

The proposed development crosses, or is immediately adjacent to 17 watercourses. Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (the Water Framework Directive or 'WFD') requires that each Member State protect and improve water quality in all waters so that good ecological status is achieved. Additionally, proposed actions (within discrete River Basin Management Plans) are also required, to secure national natural water resources for the future. The EPA is the competent authority responsible for monitoring, protecting, and improving the water environment in the Republic of Ireland.

In accordance with WFD guidelines, water quality 'Status' is assigned using a variety of available data on aquatic flora and fauna (including fish), the availability of nutrients, and aspects like salinity, temperature and pollution by chemical pollutants. Morphological features, such as quantity, water flow, water depths and structures of the riverbeds, are also taken into account.

The original EPA water quality classification system (the 'Quality Rating System' or 'Q-values') is also used to assess water quality in Irish rivers, taking into account aquatic macrophytes, phytobenthos and hydromorphology. The Quality Rating System has been shown to be a robust and sensitive measure of riverine water quality and has been linked with both chemical status and land-use pressures in catchments. Individual macroinvertebrate species are ranked for their sensitivity to organic pollution and the Q-value is assessed based, primarily, on their relative abundance within a biological sample. A review of both the internal EPA Q-value status and WFD surface water status for the relevant watercourses was undertaken.

The EPA's online map viewer provides access to information at individual waterbody level in Ireland. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters) or to groundwater. Table 8-10 shows the information recorded in watercourses crossed by the proposed development, at the closest point. 'Watercourses' is included as a Key Ecological Receptor of the proposed development.

Table 8-10 EPA and WFD water quality status (source: EPA)

EPA Name/ WFD Watercourse Name	River Waterbody WFD Status (2013-2018)	Latest River Q-Values
Royal Canal Main Line	Good	n/a
Rusk Stream/Liffey_180	Moderate	Not monitored
Oranstown Stream/Liffey_160	Poor	Not monitored
Rathleek Stream/Rye Water_040	Poor	Not monitored
Rye Water_040	Poor	3-4
Blakestown_09/ Rye Water_040	Poor	Not monitored
Maynooth Stream/Lyreen_020	Poor	Not monitored

EPA Name/ WFD Watercourse Name	River Waterbody WFD Status (2013-2018)	Latest River Q-Values
Taghadoe Stream/Lyreen_020	Poor	Not monitored
Lyreen_020/ Lyreen_020	Poor	3
Gragadder Stream/ River Lyreen_020	Poor	Not monitored
Ballycaghan Stream (not listed on EPA or WFD)	Unassigned	Not monitored
Dunboyne Stream / Tolka_030	Poor	3
Naulswood /Tolka_020	Poor	Not monitored
Tolka / Tolka_020	Poor	3-4
Tolka / Tolka_020	Poor	3
Tolka / Tolka_020	Poor	3
Broadmeadow_30	Poor	3-4

8.4.7 Habitats

This section describes the ecologically significant habitats recorded in the study area, as part of the desk study. Habitat mapping is presented in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80000-D to 80011-D.

8.4.7.1 Canal

The Royal Canal is described in Section 8.5.4.1 of this Chapter.

8.4.7.2 Calcareous springs with tufa formation

Calcareous springs are found in the Rye Water Valley, which is crossed by the railway line on a man-made embankment and bridge. A single spring has also been recorded in the Deep Sinking (ITM 706155 737768) on the north bank of the canal. Calcareous Springs correspond to the priority Annex I habitat 'Petrifying springs with tufa formation (*Cratoneurion*)' (7220).

8.4.7.3 Grassland

Amenity grassland is the most common grassland habitat in the study area, encompassing playing pitches and parks. The canal towpath contains a mosaic of habitats including two habitats which correspond to Annex I habitats, namely the Fossitt (2000) habitat 'Dry meadows and grassy verges' (GS2), which corresponds to the Annex I habitat 'Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)' (6510), and the Fossitt (2000) habitat 'Dry calcareous and neutral grassland' (GS1), which corresponds to the Annex I habitat 'Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)' (6210). The maintenance of the railway embankments has led to the development of a mosaic of grassland and scrub habitats. There are records of Fragrant Orchid (*Gymnadenia conopsea*), Common Spotted Orchid (*Dactylorhiza fuchsia*) and Pyramidal Orchid (*Anacamptis pyramidalis*) on the railway embankments west of Cross Guns Bridge, although these species were not identified during the habitat surveys. Grassland habitats have been considered under the Key Ecological Receptor headings 'Royal Canal pNHA' and 'Railway Ecological Corridor'.

8.4.7.4 Woodlands

Pockets of woodland occur along the railway line and canal from Cross-Guns Bridge (Lock 5) in Co. Dublin westwards. The most notable areas are the Deep Sinking and the Rye Water Valley. Extensively wooded areas adjacent to the proposed development are the Carton Estate and St. Patrick's College, Maynooth. The woodlands at the Carton House Estate are the only woodland in the study area that are listed on the Ancient and Long-established Woodland Inventory (NPWS, 2012). Several small areas of woodland are also found

between the railway line and the canal. Woodland has been considered under the Key Ecological Receptor heading 'Railway Ecological Corridor' and 'Birds'.

8.4.7.5 Watercourses

The proposed development crosses 16 watercourses which are presented in Section 8.4.6.3 above. The watercourses vary in character from the Royal Canal, to ditches, modified watercourses such as the Lyreen River upstream of Jackson's Bridge to more natural watercourses such as the Rye Water at Louisa Bridge. Watercourses contain rare and protected species as well as early life stages of amphibians and invertebrates. They can also act as a conduit for invasive species and pollutants to more sensitive areas. Therefore, 'Watercourses' has been selected as a Key Ecological Receptor of the proposed development.

8.4.8 Flora

8.4.8.1 Vascular Plants

Opposite-leaved Pondweed (*Groenlandia densa*) has been recorded in the Royal Canal east of Cross Guns Bridge. Macrophyte surveys carried out between Spencer Dock and Blanchardstown (MKOS, 2019), Blanchardstown and Maynooth (BEC, 2013), and a section between the 6th Lock at Shandon Gardens, Phibsboro and the 8th Lock (Ratoath Road bridge) (BEC, 2021), did not record this species. Studies on the effects of dredging and translocation on the occurrence of Opposite-leaved Pondweed have suggested that dredging can have a positive effect on the distribution and occurrence of the plant, while translocation shows poor success (Barron, 2010; 2011; 2112a; 2012b; 2013; 2014; 2015; Henry & Amoros, 1996). Opposite-leaved Pondweed is an early coloniser and benefits from the removal of other, more competitive plants, such as waterweeds.

A rare stonewort, *Tolyphella intricata* has been recorded on the Royal Canal, the only location it has been recorded at in Ireland. Two other species listed on the Flora (Protection) Order, 2015 were also identified in the desk study, Hairy St. John's Wort (*Hypericum hirsutum*) and Hairy Violet (*Viola hirta*). These species have been recorded in woodlands in the study area, including the Liffey Valley, the Rye Water Valley and the Carton Estate.

8.4.8.2 Bryophytes

No records of FPO 2015 listed bryophytes were found in the NPWS or NBDC data search. Two species listed as endangered on the Irish Red List No. 8 - Bryophytes, *Bryum intermedium* and *Pallavicinia lyellii* were recorded on the NPWS Flora Protection Order- Bryophytes Map Viewer. These records date from 1857 and 1890 respectively and are from areas outside the footprint of the proposed development.

A bryophyte survey was undertaken between Talbot Bridge (M50) and Maynooth in 2013 (BEC, 2013). This survey recorded 59 bryophyte species and the report highlighted the Deep Sinking as being an ideal habitat for bryophytes due to it being shaded, sheltered and humid. The proposed development will not involve any works in the Deep Sinking. The habitats present along the railway corridor and the sites for the ancillary infrastructure and compounds are highly modified and are not considered to be suitable for rare species of bryophytes or lichens. Therefore, no survey for these species' groups was undertaken.

8.4.9 Fauna

8.4.9.1 Badger

Badger is common and widespread in suitable habitat in Ireland. There are records of badger throughout the study area, west of Cross-Guns Bridge. Badger could be negatively impacted through sett loss, habitat fragmentation, collision and artificial lighting during the construction and operation of the proposed development. 'Badger' has been included as a Key Ecological Receptor.

8.4.9.2 Otter

Otter is frequently recorded on the Royal Canal, from Dublin City Centre to the proposed depot west of Maynooth. The railway line crosses numerous watercourses including the Rye Water, the River Tolka and tributaries of the River Liffey, and is it likely that Otter moves between the Royal Canal and these watercourses. A boat-based otter survey of the Royal Canal between Spencer Dock (Triturus Environmental, 2022) recorded holts and couches within the study area. Table 8-11 presents the records of holts and couches. Otter could be negatively impacted through impacts on water quality, habitat fragmentation, collision and artificial lighting during the construction and operation of the proposed development. 'Otter' has been included as a Key Ecological Receptor.

Table 8-11 Otter Records

Ref.	Description	Distance from proposed development
Holt 1	Active holt in north quay wall of the River Liffey at the MV Cill Airne floating restaurant. There was a spraint at entrance and nearby. This holt is located 190 m from the proposed development and will not be disturbed.	190 m
Holt 2	Active holt on south bank of canal under rail platform with well eroded entrance. There was a slide to canal and single spraint. This holt is near Broombridge Station. This holt is located between the Royal Canal and the railway line and could be disturbed during the construction of the catenary poles.	<10 m
Holt 3	Active holt on south bank of canal under cotoneaster bush adjacent to bridge with two entrances. There were slides to canal on steep open slope and well eroded paths into scrub and to water. This holt is near Ratoath Road Bridge. This holt is near Broombridge Station. This holt is located between the Royal Canal and the railway line and could be disturbed during the construction of the catenary poles.	<10 m
Holt 4	Inactive holt on south bank of canal under new R805 bridge at bank top. The entrance has partially collapsed. This holt is at Ashtown. This holt is near Broombridge Station. This holt is located between the Royal Canal and the railway line and could be disturbed during the construction of the catenary poles.	<10 m
Holt 5	Inactive holt on south bank of canal with old slide to canal. There is excavation in clay under rail line with indiscernible claw marks. The entrance has partially collapsed. This holt is near Ashtown. This holt is located between the Royal Canal and the railway line and could be disturbed during the construction of the catenary poles.	<10 m
Holt 6	Inactive holt under big dead oak on north bank of canal, 10 m from canal. There were slides in near canal. This holt is between the 10 th and 11 th locks. This inactive holt is located within the footprint of the project next to where the canal will be dewatered to accommodate the construction of a new underbridge at Ashtown. There was no evidence of current use by otter.	<10 m
Holt 7	Active holt measuring 30x25 cm under beech tree stump in 12 m wide woodland buffer/treeline, 6 m from canal bank top. There was a fresh spraint nearby. This holt is between the 10 th and 11 th locks. This holt is located on the opposite side of the canal to the railway line.	70 m
Holt 8	Inactive holt north of canal in beech woodland under sycamore adjacent to Coolmine Rugby pitch. 25x25 cm. Well-worn trails to canal but old and not recently used, leaves accumulated in holt entrance. This holt is located on the opposite side of the canal to the railway line.	70 m
Couch 1	Couch on south bank of the canal with and trails to canal with potential holt buried in scrub. This couch is near Broombridge. This holt is located between the Royal Canal and the railway line and could be disturbed during the construction of the catenary poles.	0 m
Couch 2	Couch on south bank of canal with slide and regular spraint site under bramble scrub. This couch is near Broombridge. This holt is located between the Royal Canal and the railway line and could be disturbed during the construction of the catenary poles.	0 m

Ref.	Description	Distance from proposed development
Couch 3	Couch north of canal under beech tree on bank top with very regular spraint site. This couch is between the 10 th and 11 th locks. This holt is located on the opposite side of the canal to the railway line.	70 m
Couch 4	Couch north of canal with roll patches and slide. There was a regular spraint site which contained perch scales. This holt is located on the opposite side of the canal to the railway line.	70 m

8.4.9.3 Bats

The desk study identified six species of bat in the study area, Soprano Pipistrelle, Common Pipistrelle, Leisler's Bat, Daubenton's Bat, Brown Long-eared Bat, Natterer's Bat. Numerous bat surveys have been carried out along the Royal Canal, from Dublin City to the proposed depot west of Maynooth. These surveys were carried out as part of biodiversity related projects, and for developments including the Royal Canal Greenway. Data up to 2016 from the All-Ireland Daubenton's Bat Waterways Survey was provided by Bat Conservation Ireland. As expected, pipistrelle species and Leisler's Bat were the most recorded species. These are the most common species of bat in Ireland. Daubenton's Bat has been recorded on the Royal Canal but appears to be absent east of Phibsboro. Brown Long-eared Bat, Whiskered Bat and Natterer's Bat have also been recorded, often in association with mature vegetation. These species were identified on surveys for the EIA for the Dunboyne M3 Commuter Rail project (Biosphere Environmental Services, 2007), a section of railway line that is to be electrified as part of the proposed development.

Along with records of roosts from previous ecological reports in the Study area, Bat Conservation Ireland provided records of 45 bat roosts within 5 km of the proposed development. The locations of 45 roosts were identified, including one roost in Kirkpatrick Bridge, Coolmine, where a single Daubenton's Bat was recorded emerging (Bat EcoServices, 2018).

Bats could be negatively impacted by habitat loss, collision and poorly designed or excessive artificial lighting during the construction and operation of the proposed development. 'Bats' have been included as a Key Ecological Receptor.

8.4.9.4 Other terrestrial species

One rare species of butterfly, the Dingy Skipper (*Erynnis tages*), has been recorded at Ashtown. This is the only known colony of this species in County Dublin, and one of just three in eastern Ireland.

Ant hills of the Yellow Meadow Ant (*Lasius flavus*) have been recorded in the Deep Sinking and in an area west of Louisa Bridge. Although this species is not rare or protected, the formation of ant hills indicates that these areas have been undisturbed for a long time.

Common Frog and Smooth Newt are common and widespread in Ireland. The canal is not ideal habitat for these species, which are vulnerable to predation by fish and birds, however both species have been recorded along the canal and in ponds and ditches along the railway line. Amphibians are vulnerable to the loss of breeding sites. Accordingly, 'Amphibians' has been included as a Key Ecological Receptor.

Common Lizard has been recorded west of Cross Gun's Bridge. The proposed development will not result in the loss of significant areas of Common Lizard habitat. The potential loss of a small number of individuals will not affect the conservation status of this species. Therefore, Common Lizard has not been included as a Key Ecological Receptor.

Sika Deer (*Cervus nippon*) has been recorded in Westmanstown and at the proposed depot lands. Sika Deer are non-native and are not included as a Key Ecological Receptor.

8.4.9.5 Birds

A breeding waterbird survey was undertaken between the 12th Lock (M50) and the Co. Kildare boundary in 2018 (Natura, 2018). A list of incidental records of birds within the study area is included in most of the ecology reports, which were reviewed as part of the desk study. The species assemblage is typical of the habitats present in the urban, suburban, and eventually rural landscape. Waterbirds are common along the Royal Canal, typically Mallard, Mute Swan, Heron, Moorhen, Little Egret, Teal, Cormorant and Coot. There are also occasional records of Water Rail. The managed amenity grasslands within Dublin City are used by Light-bellied Brent Geese between October and April. Areas of note for this species are St. Vincent's School, Martin Savage Park and Ashington Park (Scott Cawley, 2016). This species is a Qualifying Interest of the North Bull Island SPA and the South Dublin Bay and River Tolka SPA. Birds could be negatively impacted through accidental pollution, disturbance, habitat loss and collision. 'Birds' have been included as a Key Ecological Receptor.

8.4.9.6 Aquatic Species

The most common native fish in the Royal Canal are Pike, Eel and Brown Trout. These species are supplemented by a number of non-native and invasive species including Roach, Perch, Tench, and Rudd.

Four rare molluscs have been recorded in the Royal Canal: Glutinous Snail (*Myxas glutinosa*), *Pisidium moitessierianim*, *Pisidium pseudospharium* and Desmoulin's Whorl Snail (*Vertigo moulinsiana*).

There are records of Glutinous Snail at least five sites along the Royal Canal between Maynooth and Collins Bridge (Moorkens & Kileen, 2003; Evelyn Moorkens and Associates, 2016; NBDC, 2021). This species requires large, permanent and clean waterbodies with a firm substrate such a rock or masonry. There has been a historical decline of this species in the Royal Canal over the past 100 years, which has been attributed to the restoration of the navigational canal between Dublin and Mullingar, ongoing management and a decline in water quality.

Pisidium moitessierianim, a bivalve, had been classified as extinct in Ireland since 1924, however a number of populations were recorded by Moorkens & Kileen (2003), including one site in the Royal Canal. This species favours slow flowing calcareous rivers.

Pisidium pseudospharium was recorded at five sites on the Royal Canal (Moorkens & Kileen, 2003). Four of these sites were at ponded up/ swampy section of the Royal Canal between Longford and Abbeyshrule and the fifth at Leixlip, where it was found with *Myxas glutinosa*. This species favors vegetated habitats with clean water and a muddy substrate. Its decline has been attributed to canal maintenance.

Desmoulin's Whorl Snail was recorded at two sites on the Royal Canal, in a fen next to the canal between Abbeyshrule and Mullingar and in a section of canal that was almost dried up at Kilashee, Co. Longford. There are records of whorl snails from the genus *Vertigo* from the Royal Canal, further west of the proposed development (Waterways Ireland staff, pers comm), and from the Rye Water Valley, which is designated as an SAC for two *Vertigo* species. In wetland habitats, *Vertigo* species depend on emergent vegetation typically associated with marsh and fen habitat, which allows them to escape to higher ground during period of flood. Emergent vegetation is limited to discreet sections of canal bank. An assessment of *Vertigo* habitat suitability along the Royal Canal between Blanchardstown and the Dublin/Kildare border concluded that "*no habitats with potential to support the damp and gently transition needed for them [Vertigo] were found*" (Moorkens, 2016). There were areas where there were the combinations of wet grassland with reed and sedge swamps below, but the steepness of the canal bank in all areas prevented the conditions that would be required by *Vertigo* species on a year-round basis (Moorkens, 2016). Therefore, no field surveys for these species were undertaken. Mitigation measures in relation to watercourses address the potential for impacts on population downstream of the proposed development.

White-clawed Crayfish has been recorded in the River Liffey and Rye Water catchments (NBDC, 2021), as well as in the Royal Canal west of the study area (Waterways Ireland staff, pers comm). This species is considered to occur in all watercourses in the study area, where suitable habitat exists.

Aquatic species are vulnerable to accidental pollution, the introduction of invasive species including crayfish plague (*Aphanomyces astaci*), and the introduction of artificial lighting. Accordingly, aquatic species have been considered under the KERs 'Watercourses' and 'the Royal Canal pNHA'.

8.4.9.7 Invasive Species

CIÉ provided the locations of invasive species which are undergoing treatment. Japanese Knotweed is frequently found along the railway line, particularly close to Dublin City centre. CIÉ are managing this species in accordance with their published guidelines. To avoid confusion, the records provided by CIÉ are presented along with the field survey results in Table 8-21. These locations, along with the areas of Japanese Knotweed identified during the field survey, are illustrated in Volume 3A of this EIA, Drawing: MAY-MDC-ENV-ROUT-DR-V-80070-D to MAY-MDC-ENV-ROUT-DR-V-80081-D. Other non-restricted invasive species recorded along the railway line include Himalayan Honeysuckle, Butterfly Bush, Cherry Laurel and Winter Heliotrope. The aquatic invasive species, Canadian Pondweed (*Elodea canadensis*) and Nuttall's Waterweed (*Elodea nuttalli*) were frequently recorded (BEC, 2013; MKOS, 2019) and these species are considered to be ubiquitous in the Royal Canal. Invasive species can negatively impact native biodiversity. Accordingly, 'Invasive Species' has been included as a Key Ecological Receptor.

8.5 Receiving environment – field survey results

8.5.1 Habitats

The following section describes the habitats recorded during field surveys in 2020, 2021 and 2022. A total of 20 habitats were recorded within and adjacent to the study area. Table 8-12 lists the habitats recorded and Table 8-13 describes the habitats in each of the compounds. Habitat mapping is presented in Volume 3A of this EIA, Drawing: MAY-MDC-ENV-ROUT-DR-V-80000-to MAY-MDC-ENV-ROUT-DR-V-80011-D. Habitats were classified according to *A Guide to Habitats in Ireland* (Fossitt, 2000), with the exception of 'Railway Verge Mosaic (RVM)', which has been used to describe the varied habitat along the railway line.

Table 8-12 Habitats recorded within the study area

Habitat Name	Fossitt Code
Railway Verge Mosaic	RVM
Amenity Grassland	GA2
Buildings and Artificial Surfaces	BL3
Building and Artificial Surfaces/ Amenity Grassland	BL3/GA2
Spoil and Bare Ground/ Recolonising Bare Ground	ED2/ ED3
Dry Meadows and Grassy Verges	GA2
Improved Agricultural Grasslands	GA1
Arable Crops	BC1
Recolonising Bare Ground	ED3
Scattered Trees and Parkland	WD5
(Mixed) Broadleaf Woodland	WD1
Wet Willow-Alder-Ash Woodland	WN6
Scrub	WS1
Canals	FW3
Eroding/Upland Rivers	FW1
Other Artificial Lakes and Ponds	FW8

Habitat Name	Fossitt Code
Treelines	WL2
Hedgerows	WL1
Drainage Ditches	FW4
Stone Walls & Other Stonework	BL1

Railway Verge Mosaic (RVM)

This habitat includes the vegetated verges along the existing railway line. This habitat varies from recolonising bare ground to areas dominated by grasses, to more diverse areas containing Ox-eye Daisy (*Leucanthemum vulgare*), willowherbs (*Epilobium* spp.), Common Hogweed (*Heracleum sphondylium*), Wild Carrot (*Daucus carota*), Nettle (*Urtica dioica*), vetches (*Vicia* spp.) and Red Valerian (*Centranthus ruber*) and to more scrubby habitats dominated by Bramble (*Rubus fruticosus* agg.) and Butterfly Bush (*Buddleja davidii*). The width of the verges varies greatly, from <1 m to >10 m where the railway is in cutting or on embankment.



Figure 8-1 Railway Verge Mosaic Habitat

Amenity Grassland (GA2)

Amenity grassland is found alongside the existing railway line at St Vincent's Primary School, Martin Savage Park and Ashington Park, as well as numerous small parks and amenity areas in residential developments. This habitat is mown regularly and contains very few species. Along the boundary, or in areas which have intentionally not been mown, species including Daisy (*Bellis perennis*), Dandelion (*Taraxacum* agg.), Creeping Buttercup (*Ranunculus repens*), Common Poppy (*Papaver rhoeas*), Butterfly Bush (*Buddleja davidii*), Hedge Mustard (*Sisymbrium officinale*), Red Clover (*Trifolium pratense*), White Clover (*Trifolium repens*), Nettle (*Urtica dioica*), Shepard's Purse (*Capsella bursa-pastoris*) and Black Medick (*Medicago lupulina*) are found.

Buildings and Artificial Surfaces (BL3)

This habitat included the railway line itself, as well as other areas of hard standing such as roads, houses, hotels, office buildings, apartment blocks, shops, roads, pavements, car parks, existing construction compounds and other urban developments. Generally built habitats are not considered to be of ecological value.

Buildings and Artificial Surfaces/Amenity Grassland (BL3/GA2)

This habitat mosaic refers to houses with gardens which are found adjacent to the proposed development, particularly closer to Dublin City.

Spoil and Bare Ground/ Recolonising Bare Ground (ED2/ ED3)

This habitat is found on CIÉ land where materials such as railway ballast has been stored. Where bare ground and spoil has been left undisturbed, plants have begun to colonise the areas. Common species found are willowherbs, Butterfly Bush and Red Valerian.

Dry Meadows and Grassy Verges (GS2)

This habitat was recorded on the canal towpath verges, road verges and areas of grassland which have not been maintained, either as a biodiversity measure or through neglect. These habitats are not fertilised and rarely mown. This pattern of management produces grasslands with a high proportion of tall, coarse and tussocky grasses such as False Oat-grass (*Arrhenatherum elatius*) and Cock's-foot (*Dactylis glomerata*). Other grasses may include Yorkshire-fog (*Holcus lanatus*), Smooth Meadow-grass (*Poa pratensis*), Barren Brome (*Anisantha sterilis*) and Meadow Foxtail (*Alopecurus pratensis*). The broadleaved herb component is characterised by a range of species that either grow tall, such as Cow Parsley (*Anthriscus sylvestris*), Common Hogweed (*Heracleum sphondylium*), Goat's-beard (*Tragopogon pratensis*), Nettle (*Urtica dioica*) and Common Knapweed (*Centaurea nigra*), or climb the stems of others, as in the case of Hedge Bindweed (*Calystegia sepium*) Bush Vetch (*Vicia sepium*) and Meadow Vetchling (*Lathyrus pratensis*). Common Spotted Orchid (*Dactylorhiza fuchsia*) and Pyramidal Orchid (*Anacamptis pyramidalis*) were also recorded along the canal towpath.

Improved Agricultural Grassland (GA1)

This habitat is found in the study area west of Porterstown and is generally agricultural grassland used for pasture and silage production, with some arable land, notably at the depot. This habitat is typically species-poor and is dominated by Rye-grasses (*Lolium* spp.) with White Clover (*Trifolium repens*).

Arable Crops (BC1)

Arable crops are found in the study area west of Porterstown and includes land used for the production of arable crops, including cereals (wheat, barley, oats, maize), and root, leaf, energy or fibre crops such as sugar beet, turnips, rape and flax.



Figure 8-2 Arable Land and the Ballycaghan Stream at the depot

Recolonising Bare Ground (ED3)

Areas of recolonising bare ground were recorded along the railway line. These areas were generally railway ballast which are in the process of being colonised by ruderal species, and where the vegetation cover exceed 50%. Species recorded in this habitat include Butterfly Bush (*Buddleja davidii*) Willowherb species (*Epilobium* sp.), Ragwort (*Senecio jacobea*) Shepard's Purse (*Capsella bursa-pastoris*), Common Chickweed (*Stellaria media*), Bristly Oxtongue (*Helminthotheca echioides*), Petty Spurge (*Euphorbia pepus*), Smooth Sowthistle (*Sonchus oleraceus*) Red Valerian (*Centranthus ruber*) and Black Medick (*Medicago lupulina*).

Scattered Trees and Parkland (WD5)

This habitat occurs in more managed areas along the canal as well as in public parks adjacent to the railway line such as Ashington Park, Martin Savage Park and Laurel Lodge and is usually represented by amenity grassland planted with ornamental trees.

(Mixed) Broadleaf Woodland (WD1)

Pockets of woodland occur along the railway line and canal from Cross-Guns Bridge westwards. The most notable areas are the Deep Sinking and the Rye Water Valley. Extensively wooded areas adjacent to the proposed development are the Carton Estate and St Patrick's College, Maynooth.

Wet Willow Ash Alder Woodland (WN6)

This habitat is found between the railway line and the Royal Canal where the water level is permanently high. It is dominated by willows and Alder and has a sparse understory dominated by Bramble. Examples of this habitat are east of the Rye Water Viaduct, in undisturbed areas between the canal and the railway line.

Scrub (WS1)

Scrub is commonly found along the railway line, in association with hedgerows and in abandoned areas of ground adjacent to the proposed development. Notable areas of scrub are close to the Navan Road Parkway

and in Glasnevin. This habitat is dominated by Hawthorn, Blackthorn, Butterfly Bush and Bramble and usually occurs as a result of land abandonment.

Canals (FW3)

The proposed development is adjacent to the Royal Canal between the Docklands Station and the proposed depot. Canals are artificial linear bodies of water that were originally constructed for the purpose of navigation, and lack strong currents, tending to have closer affinities with ponds than rivers. Canals require management and maintenance to keep them open and operational. They are readily colonised by aquatic plants and frequently support floating, submerged or emergent vegetation. Typical aquatic plants include water-milfoils (*Myriophyllum* spp.), water-lilies (*Nuphar lutea*, *Nymphaea alba*), Amphibious Bistort (*Polygonum amphibium*), bur-reeds (*Sparganium* spp.) and duckweeds (*Lemna* spp.). The Flora (Protection) Order, 2015 species Opposite-leaved Pondweed (*Groenlandia densa*) has been recorded in the Royal Canal near Phibsboro. The fringe habitat along the Royal Canal vary from stone walls, managed short grassland to areas of emergent vegetation and reed swamp with species such as Common Reed (*Phragmites australis*), Reed Sweet-grass (*Glyceria maxima*), Common Valarian (*Valeriana officinalis*), Branched Bur-reed (*Sparganium erectum*).



Figure 8-3 The Royal Canal and associated Hedgerows and Treelines

Eroding/Upland Rivers (FW1)

The more natural watercourses traversed by the proposed development are categorised as FW1. This category includes natural watercourses, or sections of these, that are actively eroding, unstable and where there is little or no deposition of fine sediment. Eroding conditions are typically associated with the upland parts of river systems where gradients are often steep, and water flow is fast and turbulent. The unstable rocky channels of eroding/upland rivers usually support little vegetation cover. Submerged rocks and boulders may be colonised by aquatic mosses such as *Fontinalis* spp. and *Racomitrium aciculare*. Habitat conditions also vary along different stretches of a river where there are riffles, runs, pools, waterfalls and backwaters. Most of the watercourses have been modified and no longer fall under this category. In this case these watercourses are classified as FW4.

Artificial Lakes and Ponds (FW8)

Artificial Lakes and Ponds were identified in two locations within the footprint of the proposed development, at Broombridge and the Navan Road Parkway. Nutrient content was high in both, with dense algae present. Smooth Newt was recorded at the pond at the Navan Road Parkway. Ponds provide an important biodiversity function, supporting the larval stage of insects including dragonflies.

Treelines (WL2)

Treelines are a narrow row or single line of trees that is greater than 5 m in height and typically occur along field or property boundaries. The railway corridor is often lined with trees. The most significant treelines within the proposed development are at the proposed depot and consist of 400 m of mature Oak and Ash trees that are more than 15 m tall. Treelines may also develop from unmanaged hedgerows.

Hedgerows (WL1)

Hedgerows are linear strips of shrubs, often with occasional trees, that typically form field or property boundaries. Most hedgerows originate from planting, and many occur on raised banks of earth that are derived from the excavation of associated drainage ditches. Hedgerows commonly support a high proportion of Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Gorse (*Ulex europaeus*), Holly (*Ilex aquifolium*), Dog-rose (*Rosa canina*) or Bramble, in addition to many other native and non-native trees and shrubs including, for example, Ash (*Fraxinus excelsior*), Hazel (*Corylus avellana*), Beech (*Fagus sylvatica*), Elder (*Sambucus nigra*), Wych Elm (*Ulmus glabra*) and willows (*Salix* spp.). Some of these may occur as scattered tall trees. Hedgerows frequently support climbing plants such as Ivy (*Hedera Helix*), Honeysuckle (*Lonicera periclymenum*), Hedge Bindweed (*Calystegia sepium*), Cleavers (*Galium aparine*) and Bush Vetch (*Vicia sepium*). Tall grasses, including False Brome (*Brachypodium sylvaticum*) and Hairy-brome (*Bromopsis ramosa*), ferns, and woodland herbs are characteristic.

Drainage Ditches (FW4)

This category includes linear water bodies or wet channels that are entirely artificial in origin, and some sections of natural watercourses that have been excavated or modified to enhance drainage and control the flow of water. Drainage ditches are usually associated with hedgerows and treelines. Lesser Water-parsnip (*Berula erecta*), Rushes (*Juncus* sp.), Flag Iris (*Iris pseudacorus*), Duckweed (*Lemna* sp.), Bullrush (*Typha latifolia*) and Common Reed (*Phragmites australis*) are commonly found where water is persistent.

Stone Walls and Other Stonework (BL1)

Stone Walls are common throughout the study area. The railway line is bound by stone walls in Dublin City centre. Flora frequently recorded along this habitat included Red Valerian (*Centranthus ruber*), Smooth Sowthistle (*Sonchus oleraceus*) and Ivy-Leaved Toadflax (*Cymbalaria muralis*). Ferns, mosses, and lichens also grow on stone walls, particularly those where lime mortar is used.

8.5.2 Compound and MSDC habitats

Table 8-13 below describes the habitats found in each of the compound locations, starting at the Docklands Station in Dublin and travelling towards the proposed depot, followed by the Dunboyne Line, and the Main Storage and Distribution Centre (MSDC). There are three permanent maintenance compounds proposed, at the depot, Docklands and Navan Road Parkway.

Table 8-13 Habitats Recorded at Construction Compounds

Compound Code	Zone	Location	Chainage	Compound Category	Discipline Served	Area (m ²)	Habitats
CC-STA-S1-7800-B	A	Connolly	7+800	Satellite Compound	Stations	675	This is an existing carpark at Irish Rail Headquarters, Connolly Station (BL3).
CC-PW-S1-10300-B	A	Connolly	10+300	Satellite Compound	Permanent Way	2,310	This is a brownfield site enclosed by stone walls and high fences. There is Butterfly Bush growing on the walls. The site is composed of hardstanding and recolonising bare ground (BL3, ED3).
CC-PW-S3-33340-B	A	Glasnevin	33+340	Satellite Compound	Permanent Way	990	This is an area of vegetation at the junction of two rail lines. Japanese Knotweed is present in adjacent areas (BL3, WS1).
CC-SUB-S3-33460-B	A	Glasnevin	33+460	Satellite Compound	SUBPW	450	This is a small area of mixed broadleaved/conifer woodland and scrub located next to a playing pitch. Light -bellied Brent Geese feed on the playing pitch during the winter months (WD2, WS1, GA2).
CC-SET-S3-00000-B	A	Cabra Road	00+000	Satellite Compound	SET	5,216	The area is ballast with some plants recolonising it including Butterfly Bush. There are apartments being built to the north right to the CIÉ fence. (BL3, ED3).
CC-SUB-S2A-20280	B	Spencer Dock	20+280	Main Compound	Substation	490	This substation is located on existing built ground (BL3).
CC-PW-S2A-20750-B	B	Spencer Dock	20+750	Main Compound	Permanent Way	2660	This is an area of recolonising bare ground between two tracks (ED3, B13)
CC-STA-S4-40230-B	B	Spencer Dock	40+230	Main Compound	Stations	3,330	This compound is located at an existing built ground (BL3).
CC-STA-S4-40250-B	B	Spencer Dock	40+250	Main Compound	Station	3290	This compound is located at an existing built ground (BL3).
CC-SET-S4-40280-B	B	Spencer Dock	40+280	Main Compound	SET	6,290	This compound is located at an existing built ground (BL3).
CC-PW-S4-40380-B	B	Spencer Dock	40+380	Main Compound	PW	10,520	This compound is located at an existing built ground (BL3).

Compound Code	Zone	Location	Chainage	Compound Category	Discipline Served	Area (m ²)	Habitats
CC-PW-S4-43200-B	B	Glasnevin	43+200	Satellite Compound	Permanent Way	250	This is an existing compound/ access point which is enclosed by fencing and stone walls. The ground is recolonising with various plants. Japanese Knotweed was recorded within the site (BL3, ED3).
CC-STR-S5-51480-B	C	OBG5	51+480	Satellite Compound	Structures	2,290	This is located over two areas. The first is a small area of amenity grassland and planted boundaries located next to rail platform and Luas Depot (GA2, BL3). The second is a derelict bus Depot (BL3).
CC-SET-S5-51530-B	C	Reilly	51+530	Satellite Compound	SET	3,270	This an area of recolonising bare ground and scrub. The site is separated from the canal towpath by a hedgerow and palisade fence on the southern boundary (WS1, ED3, WL1).
CC-SET-S5-52180-B	C	Ashtown	52+180	Satellite Compound	SET	805	This is area of canal bank next to Pelletstown Station.
CC-SUB-S5-53600-B	C	Ashtown	53+600	Satellite Compound	Substation	530	This is an area of amenity grassland with some scattered trees (Weeping Willow, Birch) located in a residential estate southeast of Ashtown Level Crossing. Martin Savage Park, where geese feed during the winter months is located directly east of the compound location (GA2, WD5).
CC-STA-S5-53660-B	C	Ashtown	53+660	Satellite Compound	Station	420	This is an area of amenity grassland with some scattered trees (Weeping Willow, Birch) located in a residential estate southeast of Ashtown Level Crossing. Martin Savage Park, where geese feed during the winter months is located directly east of the compound location (GA2, WD5).

Compound Code	Zone	Location	Chainage	Compound Category	Discipline Served	Area (m ²)	Habitats
CC-LC-S5-53820-B	C	Ashtown	53+820	Satellite Compound	Level Crossing	9135	This compound is located over three areas. The first area is in the grounds of Ashton House. This is a field with improved agricultural grassland surrounded by mixed broadleaved / conifer woodland (GA1, WD2). The second area is at the entrance to Ashton House grounds and extends as far as canal bank. This area includes and broadleaved/conifer woodland (GA1, WD2) and built ground (WD2, BL3). The third area is an existing compound directly south of the track and is made of exposed gravel and recolonising bare ground and scrub (ED1, ED3, WS1).
CC-SET-S5-54750-B	C	Navan Road	54+750	Satellite Compound	SET	9,565	This site is primarily recolonising bare ground with areas of scrub and immature woodland. There is a large grassy mound along the western boundary. A pond containing Iris and Bull Rush willows, as well as newts and dragonfly, is situated in the middle of the site. A channel runs from the pond to the northwest corner of the site (ED3, FL8, WS1, WS2).
CC-STR-S5-56060-B	C	OBG9	56+060	Satellite Compound	Structures	280	This is a small area of amenity grassland located between public paths and the track. It is bounded by the rail fence and the Royal Canal (GA2, BL3, FW3).
CC-STR-S5-56130-B	C	OBG9	56+130	Satellite Compound	Structures	245	This is an existing carpark between the Royal Canal and the track with planted boundaries (BL3, BC4, FW3).
CC-STR-S5-56460-B	C	Castleknock	56+460	Satellite Compound	Structures	1,675	This is a public park in a residential area south the track. It includes amenity grassland and scattered trees including mature conifers (GA2, WD5).
CC-SUB-S5-56550-B	C	Castleknock	56+550	Satellite Compound	Substation		This is a public park in a residential area south the track. It includes amenity grassland and scattered trees including mature conifers (GA2, WD5).
CC-SUB-S5-57550-B	C	Coolmine	57+550	Satellite Compound	Substation	540	This substation is located with a treelines and amenity grassland (WL2, GA2).

Compound Code	Zone	Location	Chainage	Compound Category	Discipline Served	Area (m ²)	Habitats
CC-STA-S5-57900-B	C	Coolmine	57+900	Satellite Compound	Station	720	This is an existing carpark with planted borders. The carpark is bounded by treelines (BL3, BC4, WL2).
CC-LC-S5-58800-B	C	Coolmine	58+800	Satellite Compound	Level Crossing		This compound is located over two areas. The first area is located east of St Mochta's FC. This is an existing construction compound with areas of recolonising bare ground and spoil. The site is bounded by treelines (BL3, ED2, ED3, WL2). The second area is located northwest of Porterstown Level Crossing. This site is an area of dry meadows and grass verges north of the canal. The site is separated from the towpath by a sparse treeline and scrub (GS2, WL2, WS1). The second compound is within the Royal Canal pNHA.
CC-LC-S5-58670-B	C	Coolmine	58+670	Satellite Compound	Level Crossing		This compound is located over three areas. The first area is located south of St Mochta's FC. The southwest of the site comprises a mosaic of scrub and immature woodland. Scrub is encroaching from north and west of the site. The middle of site is covered by dry meadows and grassy verges (GS2, WS1, WS2). The second area is an existing carpark with planted borders. The carpark is bounded by treelines (BL3, BC4, WL2). The third area is located in a narrow strip of dry meadows and grassy verges enclosed by hedgerows (GS2, WL1).
CC-PW-S5-59970-B	C	Clonsilla	59+970	Satellite Compound	Permanent Way	4,730	This is a field with improved agricultural grassland enclosed by hedgerows and treelines (GA1, WL1, WL2).
CC-LC-S5-60150-B	C	Clonsilla	60+150	Satellite Compound	Level Crossing		This compound is located over two areas. The first area is located north of the Royal Canal towpath. The area comprises a treeline (Ash and willows) and Scrub (WL2, WS1). The second area is an arable field southwest of Clonsilla Level Crossing. There are some mature trees within the site that will not be impacted by the compound (BC4).

Compound Code	Zone	Location	Chainage	Compound Category	Discipline Served	Area (m ²)	Habitats
CC-SUB-S8-101170	C	Hansfield	101+070	Satellite Compound	Substation	530	This is a field with improved agricultural grassland bounded by hedgerows and treelines (GA1, WL1, WL2).
CC-PW-S8-101660	D	OBCN286	101+660	Satellite Compound	Permanent Way	5,120	This is a field with improved agricultural grassland bounded by hedgerows (Hawthorn, Bramble), treelines (Sycamore) and scrub (GA1, WL1, WL2, WS1).
CC-PW-S8-104970-B	D	Dunboyne	104+970	Satellite Compound	Permanent Way	3560	This is an existing carpark with planted boundaries (BL3, BC4).
CC-SUB-S8-105060	D	Dunboyne	105+060	Satellite Compound	Substation	500	This substation is located at in an arable field next to Dunboyne station (BC1).
CC-PW-S8-106950-B	D	M3 Parkway	106+950	Main Compound	Permanent Way	3,400	This is an existing carpark with planted boundaries (BL3, BC4).
CC-SET-S8-106950-B	D	M3 Parkway	106+950	Main Compound	SET	5,300	This is an existing carpark with planted boundaries (BL3, BC4).
CC-SUB-S8-106950	D	M3 Parkway	106+950	Main Compound	Substation	540	This is an existing carpark with planted boundaries (BL3, BC4).
CC-SET-S6-70700-B	E	Barberstown	70+700	Main Compound	SET	5830	This compound is located in improved agricultural grassland bounded by treelines and hedgerows (GA1, WL1, WL2).
CC-LC-S6-71100-B	E	Barberstown	71+100	Satellite Compound	Level Crossing	8586	This compound is located over two fields of improved agricultural grassland bounded by treelines and hedgerows (GA1, WL1, WL2).
CC-PW-S6-72830-B	E	OBG13	72+830	Satellite Compound	Permanent Way	5,770	This compound is located at the corner of an arable field bounded by hedgerows to the north and east. A drainage ditch runs along the northern boundary of the field. There is a mature Oak/Ash treeline on the western boundary next to St. Catherine's Park (BC4, FW4, WL1, WL2).
CC-STR-S6-74660	E	Leixlip	74+660	Satellite Compound	Structures	1,775	This is an area of amenity grassland with some scattered trees located in a residential estate (GA2, WD5).
CC-SUB-S6-74680	E	Leixlip	74+680	Satellite Compound	Substation	500	This is an existing station building (BL3).
CC-STR-S6-76470-B	E	Leixlip (Louisa Bridge)	76+470	Satellite Compound	Structures	150	This is an existing carpark with planted boundaries (BL3, BC4).

Compound Code	Zone	Location	Chainage	Compound Category	Discipline Served	Area (m ²)	Habitats
CC-STR-S6-76540-B	E	Leixlip (Louisa Bridge)	76+540	Satellite Compound	Structures	245	This is an existing carpark with planted boundaries (BL3, BC4).
CC-SUB-S6-78180-B	E	Blakestown	78+180	Satellite Compound	Substation	450	This substation is located in an arable field bounded by hedgerows (BC1, WL1).
CC-SET-S6-78200-B	E	Blakestown	78+200	Satellite Compound	SET	8,730	This compound is located in an arable field bounded by hedgerows (BC1, WL1).
CC-PW-S6-79950-B	E	OBG18	79+950	Satellite Compound	Permanent Way	5,770	This is a field of improved agricultural grassland enclosed by stone walls and treelines (GA1, BL1, WL2).
CC-SUB-S6-82260	F	Maynooth	82+260	Satellite Compound	Substation	400	This is a newly built carpark with planted boundaries (BL3, BC4).
CC-STR-S7-91880-B	F	Millfarm	91+880	Main Compound	Structures	4,100	This is in a field with improved agricultural grassland bounded by hedgerows and treelines (GA1, WL1, WL2).
CC-SET-S7-9210-B	F	Millfarm	92+100	Main Compound	SET	8,336	This compound is located across several fields with improved agricultural grassland and bounded by hedgerows and mature treelines (GA1, WL1, WL2).
CC-PW-S7-92340-B	F	Millfarm	92+340	Main Compound	Permanent Way	10,597	This compound is located across several fields with improved agricultural grassland and bounded by hedgerows and mature treelines (GA1, WL1, WL2).
CC-STR-S7-92850-U	F	OBG23A	92+850	Satellite Compound	Structures	6,940	This is in a field with improved agricultural grassland bounded by hedgerows and treelines (GA1, WL1, WL2).
CC-STR-S7-92900-B	F	OBG23A	92+900	Satellite Compound	Structures	1,615	This is in an arable field bounded by hedgerows and treelines (BC1, WL1, WL2).
CC-DEP-S7-93060-D	F	Depot	93+060	Main Compound	Depot SET	21935	This is in an arable field bounded by hedgerows and treelines (BC1, WL1, WL2).
CC-DEP-S7-UP-93370-U	F	Depot	93+370	Main Compound	Depot Permanent Way	15950	This is in an arable field bounded by hedgerows and treelines (BC1, WL1, WL2).

Main Storage and Distribution Centre (MSDC)

The MSDC is in an existing compound operated by the Breffni Group. The site is dominated by hard standing, sheds, a car park and a mock railway line (BL3). The site also contains two attenuation ponds (FL8), earth banks (BL2), and a meadow (GS2). The MSDC is bordered by treelines on the north, south and east, and planted earth banks on the west and south. The attenuation ponds discharge into a tributary of the Broad Meadow River that flows along the eastern boundary of the site. The site has recently been construction with landscaping undertaken as recently as winter 2021/22. CIÉ propose to use the north-east of the site, which is a mix of false oat grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*), perennial ryegrass (*Lolium perenne*), clovers (*Trifolium* sp.), vetches (*Vicia* sp.), ox-eye daisy (*Leucanthemum vulgare*) and rapeseed (*Brassica napus*).

8.5.3 Flora

No flora listed on the Flora (Protection) Order, 2015 were recorded during the field surveys.

8.5.4 Fauna

8.5.4.1 Terrestrial Mammals

Badger

Evidence of badger was recorded between Glasnevin and the depot and M3 Parkway, and at the MSDC. Six setts were recorded during the badger surveys between February 2021 and November 2021. Four of the setts will be directly or indirectly affected by the works. In addition, Badgers could be impacted during the operation of the proposed development through disturbance and collision and therefore, 'Badger' has been included as a Key Ecological Receptor.

An extended area was searched at the depot area, to identify other setts in the area. No other setts were found, indicating that the social group is restricted to the two setts identified in the area between the depot and the M4.

Table 8-14 summarises the results of the badger survey. Badgers are vulnerable to persecution; therefore, the exact locations of the badger setts are not made publicly available. The locations of setts are illustrated in a confidential set of drawings, Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050- D to MAY-MDC-ENV-ROUT-DR-V-80061-D. Due to their sensitivity to disturbance, locations where badger activity was recorded are not provided to the public.

Table 8-14 Badger Survey Results

Sett Ref.	Sett Category	Sett Description	Distance from works
Sett 1	Main	This sett had three entrances, two of which were active. The two active entrances had very large spoil heaps with fresh spoil. The spoil heaps from the two active entrances covered an area of approximately 8 m in diameter. This sett is in Ashtown on the north side of the canal and may be impacted by proximity to a compound.	10 m
Sett 2	Main	A four-entrance sett along the railway line near Leixlip. All entrances had signs of recent use including fresh spoil, prints and hair. Trails indicate that badger are crossing the track at this location. This sett is near Leixlip and is in scrub adjacent to the railway line.	5 m
Sett 3	Outlier	Single entrance on railway embankment, 2 m from the track. The entrance is badger-sized. There were no signs of recent activity and the entrance was obscured by vegetation and a cobweb at the time of the survey. This sett is west of Louisa Bridge.	2 m

Sett Ref.	Sett Category	Sett Description	Distance from works
Sett 4	Subsidiary	This sett had five entrances in total, with three inactive entrances along the bank of the Ballycaghan Stream. A single entrance set back from the stream bank was active, and had a well-worn path and spoil heap leading from it. A badger skull was found close by. A fifth active entrance was located 17 m south of the main group of entrances, at the base of an oak tree. A camera trap was deployed at Sett 4 between the 3 rd and 17 th June 2022. During this period, the camera picked up badger on five occasions, fox, including foxes with pups, in six occasions and Pine Marten on one occasion. No mammals were recorded entering or existing the active entrance that was monitored. This indicates that Sett 4 is not a main sett.	10 m
Sett 5	Main	Sett with four entrances and one collapsed tunnel, fresh spoil heaps, a latrine, fresh bedding and prints. The sett is in the treeline between the railway line and the field where the depot is proposed.	0 m
Sett 6	Main	Main sett with six active entrances and one collapsed entrance located along earth embankment and treeline. Claw marks and well-worn paths around entrances of sett. Latrine recorded close to one entrance. Snuffle holes in the field north of the sett. This sett is directly east of the Dunboyne railway line.	70 m

A bait marking study was carried out at setts 4 and 5. Both setts were classified as main setts during the surveys carried out in 2021. On the 30th May 2022, it was noted that Sett 4 had very little activity compared to what had been recorded in 2021. The bait-marking study aimed to determine if the setts belonged to the same social group and where the territorial boundaries were. The purpose of the bait-marking study was to inform the location(s) for replacement setts. Sett 4 was seeded with yellow pellets and Sett 5 was seeded with red pellets on the 30th May, 1st June and 3rd June. On the 17th June 2022, the areas around the setts, where accessible were searched for latrines. Due to the survey being carried out in June, when vegetation is high, the search focussed on following mammal paths and pockets of woodland, where latrines would be easily identifiable. No latrines were located, however badger prints and paths indicate that the badger social group territory extends from Sett 5 south, with prints recorded travelling both north and south along the farm track. There is also a strong mammal path on the north bank of the Ballycaghan Stream along a wooded section travelling in an east- west direction, indicating that Setts 4 and 5 belong to the same social group territory.

Otter

Signs of otter including holts and spraints were recorded along the Royal Canal and the Rye Water. Spraints were recorded on two further watercourses, the Rathleek Stream and the Dunboyne Stream, which are tributaries of the Rye Water and the River Tolka respectively. The holts and couches along the Royal Canal are presented in Table 8-11. The holt on the Rye Water was located more than 100m from the Louisa Bridge viaduct and will not be impacted by the proposed development. Otter could be impacted during the operation of the proposed development. Therefore, 'Otter' has been included as a Key Ecological Receptor. The locations of Otter resting places are illustrated in a confidential set of drawings, Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050-D to 80061-D. Due to their sensitivity to disturbance, locations where otter activity was recorded are not provided to the public.

Bats

Bat Suitability Assessment

Table 8-15 lists the structures and trees that were assessed for bat suitability. Co-ordinates of the trees are provided in Table 8-16. The locations of structures and trees are presented in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80030- D to 80041-D.

Table 8-15 Below lists the structure and trees which were inspected for bat roost potential.

Feature	Suitability (Collins, (ed.), 2016)	Notes
Gate House, Porterstown	Moderate	Dilapidated former gate house at level crossing. Slate roof with numerous potential entry points.
Granard Bridge, Castleknock	Low	Masonry arch bridge. One brick missing on west side. Crevices in barrel.
Kirkpatrick Bridge, Coolmine	Confirmed Roost (Bat EcoServices, 2018)	Masonry arch bridge. Both sides overgrown with vegetation. No visible crevices.
R149 Bridge, Leixlip Confey	Low	Masonry arch bridge. Couple of crevices above arch on eastern side. Gaps on western side but appear to be shallow.
Louisa Bridge, Leixlip	Low	Masonry arch bridge. Crevice on NW corner next to pipe.
Bond Bridge, Maynooth	Low	Masonry arch bridge. Masonry in perfect condition. Gap between headwall and barrel.
Dunboyne Station Water Tower	Low	Water Tower on west side of track, next to bridge just south of Dunboyne station. No visible crevices in stonework. Broken window. No cracks/ crevices inside building..
Tree Line 1, Depot Lands	High	Mature treeline dominated by large oaks.
Tree Line 2, Depot Lands	High	Mature treeline dominated by large oaks.
Tree Line 3, Depot Lands	Moderate	Mature treeline dominated by large oaks.

Emergence and Re-entry Surveys

The number of emergence and re-entry surveys carried out at each structure/tree was determined by the category, which was assigned during the bat roost suitability assessment, as defined in Collins (eds.) 2016. Table 8-16 below presents the details of the emergence and re-entry surveys.

Table 8-16 Details of Emergence and Re-entry Surveys

Feature	Date	Sunrise/ Sunset	Start Time/ End Time	Weather	Notes
Gate House, Porterstown	31/08/2020	20:15	20:19/ 22:00	16°C, 100% cloud, dry, no wind.	No roost recorded. Flood light at level crossing spilling onto gate house made visibility difficult. Pipistrelle and Leisler activity feeding under floodlight. One <i>Myotis</i> call at 21:45.
	08/09/2020	06:47	04:58/ 06:47	16°C, 100% cloud, dry, light breeze.	No roost recorded. Low activity on survey with Soprano Pipistrelle, Common Pipistrelle and Leisler's Bat recorded occasionally.
Granard Bridge, Castleknock	24/08/2020	20:34	20:19/ 22:09	15°C, 95% cloud, dry, moderate breeze.	No roost recorded. Soprano and Common Pipistrelles recorded frequently, three Daubenton's passes recorded from 22:00.
Kirkpatrick Bridge, Coolmine	26/08/2020	06:23	04:23/ 06:23	13°C, 100% cloud, dry, moderate breeze.	No roost recorded. Low levels of activity with occasional Soprano Pipistrelles recorded.
	08/09/2020	19:57	20:00/ 21:50	21°C, 100% cloud, light rain for first 15 mins then dry, light breeze.	No roost recorded. Frequent Soprano Pipistrelle calls in first hour, then quiet.
	01/10/2020	07:27	05:30/ 07:40	4°C, 100% cloud, dry, still.	No roost recorded. Three Common Pipistrelle recorded.

Feature	Date	Sunrise/ Sunset	Start Time/ End Time	Weather	Notes
R149 Bridge, Leixlip Confeiy	07/09/2020	20:00	19:50/ 21:36	17°C, 100% cloud, dry, light breeze.	No roost recorded. West side of bridge lit from station footbridge. The eastern side is darker. No bats recorded on the east side of the bridge. On the west side of the bridge there was constant Soprano Pipistrelle and Common Pipistrelle activity. Occasional Leisler's recorded.
Louisa Bridge, Leixlip	02/09/2020	20:30	20:15/ 22:00	13°C, 100% cloud, drizzle on and off through survey, light breeze at beginning and end of survey, with moderate breeze in the middle hour.	No roost recorded. One Common Pipistrelle pass and frequent Leisler's passes during the survey.
Bond Bridge, Maynooth	07/09/2020	20:01	20:00/ 21:45	17°C, 100% cloud, dry, moderate breeze.	No roost recorded. Continuous Pipistrelle activity recorded during the first hour of the survey. Occasional Leisler's recorded.
Dunboyne Station Water Tower	03/09/2020	06:39	04:55/ 06:39	12°C, 100% cloud, dry, no wind.	No roost recorded. Very low levels of activity. One Common Pipistrelle pass and a bat seen under a light at Dunboyne Station from a distance, assumed Pipistrelle.
Treeline 1, Depot Lands (ITM 691072, 737765 to 691139, 737895)	10/06/2021	21:53	21:35/ 23:35	18°C, dry, light to moderate breeze.	No roost recorded. Frequent Common Pipistrelle, Soprano Pipistrelle and Leisler's activity.
	01/07/2021	05:03	03:30/05:03	9°C, dry, still, misty.	No roost recorded. Frequent Common Pipistrelle, Soprano Pipistrelle and Leisler's activity in last hour. Mist present for survey but visibility OK.
Treeline 2, Depot Lands (ITM 691101, 737737 to 691237, 737779)	10/06/2021	21:53	21:35/ 23:35	18°C, dry, light to moderate breeze.	No roost recorded. Frequent Common Pipistrelle, Soprano Pipistrelle and Leisler's activity in last hour.
	01/07/2021	05:03	03:30/05:03	9°C, dry, still, misty.	No roost recorded. Common Pipistrelle, Soprano Pipistrelle and Leisler's activity. Mist present for survey but visibility fair. Bats recorded in first hour, very few bats during second hour.
Treeline 3, Depot Lands (ITM 689784, 738686 to 689962, 738579)	17/06/2021	05:00	03:30/ 05:00	9°C, dry, still.	No roost recorded. Occasional Common Pipistrelle, Soprano Pipistrelle and Leisler's activity.
	01/07/2021	21:58	21:40/ 23:45	9°C, dry, still.	No roost recorded. Common Pipistrelle and Leisler's activity.
	20/09/2021	07:08	05:35/ 07:08	10°C, calm, clear, dry	No bats heard or seen.

No bats were recorded entering or exiting the trees and structures during the emergence and re-entry surveys. Bats were recorded on all of the surveys. In total four species, Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and at least one Myotis sp. were recorded.

Treelines 1, 2 and 3 are being lost to accommodate the proposed development. Detecting the presence of bat roosts in trees is difficult because roosts may be obscured by vegetation or may be out of sight. This is especially relevant to the treelines, which are often >20 m tall.

Furthermore, droppings do not persist as long on trees and many species that use trees exhibit roost switching behaviour. For this reason, all of the trees with potential roost features are considered an important resource for bats (Collins (ed.), 2016).

Bat Activity Transects

The bat activity transects were undertaken in suitable weather conditions and lasted approximately two hours each. Table 8-17 and Table 8-18 present the survey details, and Table 8-19 presents the results of the bat activity transects. The location of bat recordings are presented in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80030- D to 80041-D.

Table 8-17 Bat Activity Transects Locations

Transect Ref	Start/ End	Total Distance (km)
1	Cross Guns Bridge to Ashtown	8.8
2	Ashtown to Coolmine	8.4
3	Coolmine to Westmanstown	10
4	Westmanstown to Deey Bridge	10.8
5	Deey Bridge to Maynooth (Parson St)	9
6	Maynooth (Parson St) to Kilcock	11

Table 8-18 Bat Activity Transect Details

Transect Ref	Date	Start Time	End Time	Temperature (°C)	Wind/Rain
1	25/05/2021	21:30	00:20	11	Still, Dry
2	26/05/2021	21:23	23:43	13	Still, Dry
3	01/06/2021	21:10	00:10	18	Gentle Breeze, Dry
4	02/06/2021	01:00	04:10	14	Gentle Breeze, Dry
5	03/06/2021	21:00	23:45	12	Still, Dry
6	03/06/2021	21:50	00:30	15	Still, Dry

Four species of bat were recorded during the activity surveys: Leisler's Bat (*Nyctalus leisleri*), Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*) and Daubenton's Bat (*Myotis daubentonii*). The total number of bat passes per species per survey are presented in Table 8-19, below. The number of bat passes recorded can represent a small number of bats foraging in one area consistently or several bats passing by occasionally and should be considered as a relative indication of bat activity.

Table 8-19 No. of Bat Passes Recorded During Activity Surveys

Transect	Leisler's Bat	Common Pipistrelle	Soprano Pipistrelle	Daubenton's Bat (or Myotis Species)
1	109	19	83	4
2	84	234	90	8
3	116	82	24	5
4	79	357	91	5
5	115	43	44	1
6	146	102	185	0

Bats could be negatively impacted by poorly designed or excessive artificial lighting during the construction and operation of the proposed development and have been included as a Key Ecological Receptor.

Other mammal species

Development projects will generally not involve significant impacts on populations of other highly mobile protected mammal species, nor are there particularly relevant or effective mitigation measures specific to any of these species. In most cases, further surveys of protected species such as Hedgehog (*Erinaceus europaeus*), Pygmy Shrew (*Sorex minutus*), Irish Hare (*Lepus timidus hibernicus*) and Irish Stoat (*Mustela erminea hibernica*) over and above the field evidence collected during the walkover survey, or incidental records collected on other surveys, are not warranted.

Sika Deer (*Cervus nippon*) was recorded on the depot lands. Sika Deer is an introduced species originally from Japan and is protected under the Wildlife Act to establish a hunting season rather than for nature conservation purposes. There is a population of Red Deer on the grounds of Carton House. Sika Deer hybridise with Red Deer, and it is possible that the deer recorded on the depot lands are hybrids.

8.5.4.2 Birds

Table 8-20 below, provides a list of bird species recorded incidentally during the field surveys. The species assemblage recorded is typical for these habitats in Ireland. Light-bellied Brent Geese have been recorded feeding on amenity grasslands in Dublin City including areas of St. Vincent's Primary School, Martin Savage Park and Ashington Park. Geese and Swans, due to the speed at which they fly, their poor eyesight and poor manoeuvrability, are vulnerable to collision with overhead lines and OHLE. The locations of Light-bellied Brent Goose feeding areas are illustrated in a confidential set of drawings in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050-D to 80061-D.

Birds could be impacted by the proposed development and have been included as a Key Ecological Receptor.

Table 8-20 Bird Species Recorded During the Surveys

Common Name	BoCCI Listing 2020-2026	Breeding Status
Blackbird	Green	Probable
Blackcap	Green	Possible
Black-headed Gull	Amber	Possible
Blue Tit	Green	Probable
Bullfinch	Green	Probable
Buzzard	Green	Possible
Chaffinch	Green	Probable
Chiffchaff	Green	Probable
Coal Tit	Green	Probable
Coot	Amber	Probable
Cormorant	Amber	Possible
Duncock	Green	Probable
Feral Pigeon	Green	Probable
Fieldfare	Green	Non-breeding species
Goldcrest	Amber	Possible
Goldfinch	Green	Probable
Great Tit	Green	Probable
Greenfinch	Green	Probable
Grey Heron	Green	Possible
Herring Gull	Amber	Probable
Hooded Crow	Green	Probable

Common Name	BoCCI Listing 2020-2026	Breeding Status
House Martin	Amber	Probable
Jackdaw	Green	Probable
Jay	Green	Probable
Kingfisher	Amber	Probable
Linnet	Amber	Probable
Little Grebe	Green	Probable
Long-tailed Tit	Green	Probable
Magpie	Green	Probable
Mallard	Amber	Confirmed
Meadow Pipit	Red	Probable
Moorhen	Green	Probable
Mute Swan	Amber	Probable
Pheasant	Green	Possible
Pied Wagtail	Green	Possible
Robin	Green	Probable
Rook	Green	Probable
Snipe	Red	Possible
Song Thrush	Green	Probable
Sparrowhawk	Amber	Possible
Starling	Amber	Possible
Swallow	Amber	Probable
Swift	Red	Possible
Treecreeper	Green	Possible
Tufted Duck	Red	Confirmed
Willow Warbler	Amber	Probable
Wood Pigeon	Green	Probable
Wren	Green	Confirmed
Yellowhammer	Red	Confirmed

8.5.4.3 Reptiles and amphibians

Common Frog and Smooth Newt were confirmed breeding in three ponds/ditches within the footprint of the proposed development. These locations were at Broombridge (Ch. 51+650), the Navan Road Parkway Compound (Ch. 54+700) and in a ditch at the depot (Ch. 92+600- Bailey's Bridge). The locations of these waterbodies are illustrated in a confidential set of drawings in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050-D to 80061-D. Canals are not considered optimum breeding habitat for amphibians due to the risk of predation from fish and birds, nevertheless amphibians are recorded in canals. The Royal Canal and its riparian habitats provide an important wetland link between areas of less suitable habitat. 'Amphibians' are vulnerable to the loss of breeding sites and are included as a Key Ecological Receptor of the proposed development.

Common Lizard (*Zootoca vivipara*) is widespread and can be found in a range of habitat types, occurring in highest densities on bog, heath, coastal habitats and the margins of coniferous woodland where these habitats provide basking sites, refuges, foraging areas and hibernacula. The railway verges contain suitable habitat for Common Lizard. The length of the corridor and the proximity to the Royal Canal add to the likelihood of lizards being present. However, lizards were not recorded during the surveys. The footprint of the proposed

development on the railway verges for the catenary poles is small relative to the total available habitat. The loss of a small number of individuals will not be significant in the context of the local population and this species' conservation status of 'Least Concern' in Ireland (King et al., 2011).

8.5.5 Water quality

The results of the water quality assessment and freshwater invertebrate survey, which was carried out at two locations on each of the Lyreen River and the Ballycaghan Stream, are presented in Appendix A8.1 Water Quality Report in Volume 4 of this EIAR. Significant earthworks are proposed in the vicinity of these watercourses. Watercourses are sensitive to pollution and sedimentation and can act as a conduit for pollutants and invasive species to spread. Therefore, 'Watercourses' has been included as a Key Ecological Receptor.

8.5.6 Invasive species

Japanese Knotweed is the only invasive alien plant species restricted under the Habitats Regulations that was recorded during the surveys. This species was recorded along the railway line, particularly in Dublin City. Some stands showed signs of treatment. 'Invasive Species' has been included as a Key Ecological Receptor of the proposed development. The locations of Japanese Knotweed are presented in Table 8-21 below. These locations, along with the areas of Japanese Knotweed provided by CIÉ, are presented in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80070- D to 80081- D.

Table 8-21 Japanese knotweed locations recorded during the field surveys and provided by CIÉ

Japanese Knotweed Stand Ref.	Grid Ref. (ITM)	Chainages	Notes
JK01	717174 735404 - 717154 735472	20+800, 20+890	Dead canes in and outside fence line. 3 m tall.
JK02	715257 736359	32+750	Several mature stems over 18 m x 4 m. Signs of treatment.
JK03	715532 736327	32+475	Dead canes over 9 m x 3 m.
JK04	716861 735518	41+050	Growing out of railway wall. Stems measuring 3-4 m tall over 3 m ² area.
JK05	716692 736006	31+260	Several mature stems measuring 4 m tall. Some dead canes. Infestation spreads down along railway embankment next to back of private houses. Over 18 m x 6 m.
JK06	714620 736491	43+525	Dead canes on north embankment over 20 m ² area.
JK07	704663 738208	70+050	Several new stems with stunted growth (<1 m tall) and dead canes along 100 m stretch of recolonising bare ground after level crossing on southern side of track. Likely to be eradicated with one more year of treatment.
IAMS 1	693686 737302	82+450	CIÉ Data-no description available.
IAMS 2	714889 736405	33+140	CIÉ Data-no description available.
IAMS 3	715389 736355	32+600	CIÉ Data-no description available.
IAMS 4	715586 736310	32+630	CIÉ Data-no description available.
IAMS 5	715672 736277	32+325	CIÉ Data-no description available.
IAMS 6	716882 735489	41+050	CIÉ Data-no description available.
IAMS 7	716919 735408	10+350	CIÉ Data-no description available.

8.6 Key ecological receptors

This section provides details of the Key Ecological Receptors that were identified during the desk study and the subsequent field surveys. Table 8-22 below presents a list, description, and evaluation of the Key Ecological Receptors.

Table 8-22 Key ecological receptors

Key Ecological Receptor	Description	Importance/Ecological Valuation (TII, 2009)
KER1 Royal Canal pNHA	The Royal Canal pNHA will be impacted through the removal of vegetation within and adjacent to the site, and the increase in noise, vibration, lighting and visual disturbance associated with the proposed development. There is also potential for water quality impacts during the construction and operational phases.	National Importance on the basis that this KER is a proposed Natural Heritage Area.
KER2 Railway Line Ecological Corridor	This habitat varies from bare ground and walls to areas of grass cover, to more diverse areas containing Ox-eye Daisy, willowherbs, Common Hogweed, Wild Carrot, Nettle, vetches and Red Valarian and to more scrubby habitats dominated by Bramble and Butterfly Bush. The value of this habitat lies in the fact that it forms a semi-natural corridor across Dublin City, connecting Dublin Bay to rural areas west of the City.	County Importance as the railway verges form an ecological corridor with viable areas of semi-natural habitats which has been identified in the Dublin City Biodiversity Action Plan.
KER3 Badger	Six setts were recorded within the study area, of which two will be lost. Badger could be impacted during the operation of the proposed development through collisions with trains.	Local Importance (Higher Value) as this species is protected under the Wildlife Acts and is present within the study area.
KER4 Otter	Otter occurs along the Royal Canal and the watercourses crossed by the proposed development. Otter could be impacted through the increase in noise, lighting and visual disturbance, as well as through habitat loss and collisions with trains.	County Importance on the basis that Otter present in the Study area form at least 1% of the Otter population in the Counties traversed by the proposed development.
KER5 Bats	Bats and their roosts are protected wherever they occur, and the habitats found within and adjacent to the study area provide high-quality commuting and foraging habitat. Bats are vulnerable to habitat loss, especially the loss of roosting habitat.	Local Importance (Higher Value) as these species are listed on Annex IV to the Habitats Directive and protected under the Wildlife Act and are present within the study area.
KER6 Watercourses	This KER includes all watercourses other than the Royal Canal pNHA (KER 1). The proposed development crosses 15 watercourses. The Rye Water crossing is within a European site and the remaining crossings are connected to European sites downstream. Aquatic species and habitats are vulnerable to pollution and can act as pathways for impacts on sensitive ecological receptors downstream.	International Importance as the KER includes the Rye Water which is designated as an SAC.
KER7 Amphibians	Three ponds were recorded within the study area. All three ponds were suitable for both Common Frog and Smooth Newt. Frogspawn and/or tadpoles were found in all three ponds. Smooth newt was recorded in one pond.	Local Importance (Higher Value) as this habitat supports species protected under the Wildlife Act.
KER8 Birds	The habitats within and around the proposed development support over 50 bird species. Birds could be impacted by habitat loss, disturbance and through collisions with trains.	International Importance as Light-bellied Brent Goose feeds in nationally important numbers in the study area and is vulnerable to disturbance and collision with OHLE. Birds listed on Annex I to the Birds Directive, the BoCCI Red List and species protected under the Wildlife Act are present within the study area.
KER9 Invasive Species	Invasive alien plant species have been selected as a Key Ecological Receptor because of the presence of Japanese Knotweed in the footprint of the proposed development. This species can impact negatively on the biodiversity, preventing the regeneration of native species and necessitating the use of herbicides.	Invasive plants have the potential to impact negatively on biodiversity locally.

8.7 Do-nothing scenario

If the proposed development does not proceed, there will be no immediate loss of habitat to accommodate the OHLE, the depot and other temporary and permanent ancillary infrastructure including compounds. Rail traffic would continue in line with existing trends.

The Royal Canal would continue to be managed by Waterways Ireland including maintenance dredging every 10-12 years.

The management of vegetation would continue in line with Iarnród Éireann guidance for the management of vegetation on electrified and non-electrified lines, depending on the location.

8.8 Description of potential impacts (unmitigated)

8.8.1 Effects on European Sites

The Zone of Influence overlaps with six European sites; the Rye Water Valley/ Carton SAC, the South Dublin Bay and River Tolka Estuary SPA, the North Bull Island SPA, the North Dublin Bay SAC the Malahide Estuary SAC and the Malahide Estuary SPA. As likely significant effects could not be excluded at the screening stage, a Natura Impact Statement (NIS) was prepared. The NIS presents all of the predicted effects on these sites and their Qualifying Interests and also provides a detailed analysis and evaluation of these effects in the context of the relevant Conservation Objectives. The NIS also prescribes mitigation measures to address any negative effects identified. As such, there is some overlap between this chapter of the EIAR and the NIS for the proposed development. However, both the EIAR and NIS for the proposed development are standalone documents which do not rely on each other. Impacts on the relevant European sites are dealt with under Key Ecological Receptor 6 'Watercourses' and Key Ecological Receptor 5 'Birds'.

8.8.2 General Impacts on Key Ecological Receptors

General impacts on biodiversity that are typical of development are described in this section. Negative effects on specific Key Ecological Receptors are discussed in Table 8-26.

8.8.2.1 *Habitat Loss and Degradation*

The proposed development will require the removal of vegetation to facilitate the construction of the various elements of the proposed development. The areas where vegetation will be removed are shown in Volume 3A of this EIAR, Drawings: MAY-MDC-LMA-SC00-DR-Y-001-D; MAY-MDC-LMA-SC05-DR-Y-001-D; MAY-MDC-LMA-SC08-DR-Y-001-D and MAY-MDC-LMA-SC06-DR-Y-001-D. The following elements of the proposed development will require vegetation removal:

- OHLE.
- Docklands Station.
- The depot.
- Flood Compensatory Storage & Ballycaghan Realignment.
- New road bridges and approach roads.
- Foot bridges at Ashtown, Coolmine, Porterstown and Clonsilla.
- Main Storage and Distribution Centre (MSDC).
- Underbridge at Ashtown.
- Temporary Compounds.
- Permanent Compounds.
- Electrical Substations.
- Signalling Equipment Rooms.
- Telecommunication Equipment Rooms.

- Principal Supply Points.
- Auxiliary Supply Points.

The proposed development involves the electrification of an existing operational railway line, which inherently reduces habitat loss relative to the development of a greenfield site. For safety and operational reasons, on electrified railway lines, trees, shrubs and climbers are not permitted within 4 m of the rail or within 1.5m from the catenary poles, depending on which is greater. In this area all trees and shrubs will be removed, although herbaceous plants will be permitted to grow on the verges and embankments outside the cess. Across the entire development, 533 trees will be felled and a further 136 trees will be maintained, and 223,639 m² (22.36 ha) of vegetation will be removed and 3,206 m² of vegetation will be maintained. The catenary poles will have a number of configurations depending on local constraints, including single track cantilever (STC) (one catenary pole for each track), double track cantilever (DTC) (one pole supporting OHLE for the two tracks), and portal catenary poles (a gantry-like structure bridging the railway line). Where the railway line is close to the Royal Canal, single track cantilevered catenary poles will be used which will avoid habitat loss adjacent to the canal. In the worst-case scenario, the foundations of the catenary poles will require an area of 2000 m², based on two x 2 m² foundations every 40 m, however in reality the use of DTC arrangements will reduce this area significantly. Figure 8-4 below shows a catenary pole foundation in the MSDC.



Figure 8-4 Existing catenary pole foundation at the MSDC (pen for scale)

The new Spencer Dock Station and the interventions to increase capacity at Connolly Station are in Dublin City Centre and will occupy existing built ground. These stations are in urban areas, and the loss of built ground is not considered ecologically significant.

The depot will result in the loss of 32.6 hectares of mainly mixed agricultural land including approximately 800 m of hedgerows and 1000 m of mature treelines. A 400 m section of the Ballycaghan Stream will also be diverted. The hedgerows are dominated by Hawthorn (*Crataegus monogyna*), Ash (*Fraxinus excelsior*) and Oak (*Quercus* sp.) with Elder (*Sambucus nigra*), Spindle (*Euonymus europaeus*), Blackthorn (*Prunus spinosa*), Willow (*Salix* sp.), Hazel (*Corylus avellana*), and Holly (*Ilex aquifolium*) also present. The understory is generally species rich and contains Bramble (*Rubus fruticosus*), Field Rose (*Rosa arvensis*), Bindweed (*Calystegia sepium*), Hogweed (*Heracleum sphondylium*), Cleavers (*Galium aparine*), Bush Vetch (*Vicia sepium*), Rosebay Willowherb (*Chamaenerion angustifolium*), Meadowsweet (*Filipendula ulmaria*), Nettle (*Urtica dioica*), Groundsel (*Senecio vulgaris*), Ramping Fumitory (*Fumaria muralis*), Wild Carrot (*Daucus carota*), Field Speedwell (*Veronica persica*), Changing Forgetmenot (*Myosotis discolor*), Dwarf Elder (*Sambucus ebulus*), Bittersweet (*Solanum dulcamara*), Creeping Buttercup (*Ranunculus repens*), Herb Robert (*Geranium robertianum*), Ladies Bedstraw (*Galium verum*), Yarrow (*Achillea millefolium*), Common Knapweed

(*Centaurea nigra*), Cut-leaved Crane's-bill (*Geranium dissectum*) and Pineapple-weed (*Matricaria discoidea*). Ditches, including the Ballycaghan Stream, that run alongside some of the hedgerows contain Lesser Water-parsnip (*Berula erecta*), Rushes (*Juncus* sp.), Flag Iris (*Iris pseudacorus*), Duckweed (*Lemna* sp.), Bullrush (*Typha latifolia*) and Common Reed (*Phragmites australis*). The treelines are often the result of hedgerows not being maintained, however there are treelines at the eastern end of the proposed depot that are dominated by mature oaks (*Quercus* sp.).

Compensatory storage will be provided at the depot and at Jackson's Bridge to defend the depot and the railway line from flooding. 26.5 hectares of agricultural land will be lowered to provide compensatory flood storage. These areas will also have a biodiversity function and will be engineered to retain water in a series of backwaters, ponds and reed beds.

New road overbridges including approach roads are proposed at Barberstown and at the depot. These will result in the loss of approximately four hectares and two hectares respectively, of agricultural land including hedgerows and treelines. An underbridge is proposed at Ashtown which will result in the loss of one hectare of agricultural and built land and approximately 400 m of treelines/ hedgerows. To facilitate the construction of the underbridge and aqueduct, approximately 50 m of canal will be dewatered. The canal will be retained by two temporary new clay dams either side of the structure. Pumps and settlement tanks will be required to run 24 hours a day during this period discharging water back into the canal. The construction of the underbridge and aqueduct is expected to take approximately two years, with the canal dewatered for up to one year.

New pedestrian/ cycle bridges are proposed at Ashtown, Coolmine, Porterstown and Clonsilla. The bridges at Ashtown and Coolmine will span the railway line but not the Royal Canal, while the bridges at Porterstown and Clonsilla will span the railway and the canal and are located in or adjacent to the existing stations / level crossings. The existing footbridge over the canal at Ashtown will be removed. In general, the bridge foundations and ramps are located within the existing stations or built ground nearby, however in some cases the construction of the bridges will lead to habitat loss within the Royal Canal pNHA. The cycle/ pedestrian bridges are described in the following paragraphs.

The new pedestrian/ cycle bridge at Ashtown Station will involve the loss of 100 m of treeline habitat on the south side of the canal. The treeline is within the pNHA boundary and consists of a sycamore and ash trees that are growing between the canal and the railway line. The construction of the foundations will require temporary dewatering of the canal at this location. A 100 m section of canal will be retained by two temporary new clay dams. Pumps and settlement tanks will be required to run 24 hours a day during this period discharging water back into the canal. The canal will be dewatered for approximately 6 weeks.

The pedestrian/ cycle bridge at Coolmine Station will involve the loss of 90m of treeline habitat within the station grounds. Dewatering is not required for the construction of this bridge.

The bridge at Porterstown will result in the loss of 75 m treeline habitat under the northern ramp, between the Royal Canal and the old Porterstown National School grounds. This treeline is an earth bank with spaced out larch trees and no shrub layer and is within the pNHA. Dewatering is not required for the construction of this bridge.

The pedestrian/ cycle bridge at Clonsilla Station will involve the loss of 90 m of treeline habitat on the north side of the canal. The treeline is within the pNHA boundary and consists of a narrow band of evenly spaced mature sycamore and ash trees that are growing between the towpath and the road. The construction of the pad foundations will require temporary dewatering of the canal at this location. A 60 m section of canal will be retained by two temporary new clay dams. Pumps and settlement tanks will be required to run 24 hours a day during this period discharging water back into the canal. The canal will be dewatered for approximately 3 months.

The main storage and distribution centre (MSDC), located at an existing industrial facility 3 km north-west of Dublin Airport, covers an area of 25 hectares. The site includes built land and grassland on the undeveloped portion of the site.

Temporary and permanent compounds are located along the existing railway line and will result in habitat loss. The habitat type and area of each compound is presented in Table 8-14 of this chapter.

Other elements of the proposed development include substations, equipment rooms and electricity supply points. The total areas and habitats at each of these locations is presented in Table 8-23 below.

Table 8-23 Ancillary Infrastructure Habitat Loss

Ancillary Infrastructure	Habitat
Substations 30 m (length) x 10 m (width) x 6 m (height)	
Spencer Dock	Built ground
Glasnevin	Scrub/ Treeline
Ashtown	Scrub/ Treeline next to railway line
Castleknock	Amenity Grassland next to station.
Coolmine	Woodland/ Scrub along railway line
Leixlip Confey	Built ground in station car park
Blakestown	Arable field
Maynooth	Built ground inside Maynooth Station
Maynooth depot	Arable field
Hansfield	Improved agricultural grassland next to railway line
Dunboyne	Flower beds/ car park at Dunboyne Station
M3 Parkway	Built ground next to M3 Parkway Station
Telecommunications Buildings (TER) 4 m (length) x 3 m (width) x 2.6 m (height)	
Connolly	Built ground
Broombridge	Built ground
Ashtown	Recolonising bare ground behind station building
Navan Road Parkway	Built ground
Castleknock	Built ground
Coolmine	Built ground
Porterstown	Built ground
Leixlip Confey	Built ground
Louisa Bridge	Built ground
Maynooth	Built ground
Signalling Equipment Buildings (SEB) 12 m (length) x 4 m (width) x 2.6 m (height)	
Spencer Dock	Built ground
Glasnevin	Scrub
Clonsilla	Treeline, scrub along railway line.
Maynooth	Scrub
Millerstown	Improved agricultural grassland (cattle)
M3 Parkway	Built ground in M3 Parkway Station car park.
Principal Supply Point 12m (length) x 4m (width) x 2.8m (height)	
Connolly Station	Built ground

Ancillary Infrastructure	Habitat
Spencer Dock	Built ground
Glasnevin	Scrub
Clonsilla	Treeline, scrub along railway line.
Maynooth	Scrub
Millerstown	Improved agricultural grassland (cattle)
M3 Parkway	Built ground in M3 Parkway Station car park
Auxiliary Supply Point 2.6m (length)x2.0m(width) x 2.27m (height)	
Ashtown	Recolonising bare ground behind station building
Leixlip Confey	Built ground, on railway
Dunboyne	Arable field

Habitat degradation could occur during the construction and operational phases of the proposed development due to the increase in noise, vibration, lighting and air pollution. Elevated nitrous oxide deposition, originating from traffic, has the potential to lead to eutrophication and acidification of watercourses. Nitrous oxide emissions from the proposed development have been modelled and found no exceedances of critical loads during the construction or operational phases. An exceedance for the annual mean Nitrous oxide caused by the construction traffic at Pike Bridge was noted, however this figure refers to construction traffic modelled over the entire year. There is not considered to be any potential for impacts on biodiversity as a result of Nitrous oxide emissions and this is not considered further.

8.8.2.2 Direct Mortality

Direct mortality is possible as a result of site clearance, tree felling and vegetation removal. Birds are particularly vulnerable during the nesting season, March - August inclusive, when works could lead to the loss of nests. Otter and Badger are present along the railway line and could build shelters within the footprint between the time of the surveys to inform the EIAR and the construction phase.

The increase in rail traffic as a result of the proposed development will increase the likelihood of collisions with wildlife. CIÉ provided data on animal collisions and railway incursions between March 2017 and May 2021. During this period 54 incidents were recorded, usually involving 'other small animal' (21), dogs (14) and swans (10). It is unclear if passerines (songbirds) and bats are included within the 'other small animal' category, however it is considered that due to their small size, collisions involving these species' groups are under recorded.

The presence of new and modified structures spanning the Royal Canal including bridges, the diverted HV cable at Jackson's Bridge, heightened and lowered overhead cables and the OHLE, poses a risk of collision to certain groups of birds, particularly Geese, Swans and Cormorants. These species are vulnerable due to their size, speed, poor eyesight and poor manoeuvrability. The main causes of bird collisions with man-made structures are normally considered to be invisibility, particularly at night; deception, caused by glazing in buildings; and confusion, caused by light refracted or reflected by mist (Jaroslow, 1979). Structures that do not exhibit these features are rarely implicated in scientific literature as agents of bird mortality.

8.8.2.3 Habitat Fragmentation and Barrier Effect

Habitat loss and the construction of new fencing along the existing railway line will result in habitat fragmentation. Fencing may prevent otter, badger and other mammals crossing the railway line.

During the operational phase, train frequency is expected to double from current levels, from six trains per hour to 12 at peak times. Noise, vibration, lighting, and visual disturbance during the operation of the proposed development, and to a much lesser extent during the construction phase, could lead to habitat fragmentation.

8.8.2.4 Disturbance

Construction of the proposed development will result in noise, vibration, lighting and visual disturbance during the construction phase and will affect species both within and outside the construction footprint. Disturbance will be most significant at the depot, the new bridges and stations. Construction of the catenary poles and OHLE will be undertaken at night and between 07:00-13:00 on Saturdays. This will occur at discrete locations and for a short amount of time in any one area, with each OHLE construction team progressing at approximately 400 m in one shift.

The operation of the proposed development will involve a doubling in frequency of trains. Increases in noise, vibration, lighting, and visual disturbance will lead to the disturbance of fauna including birds and bats. Daubenton's bat is sensitive to artificial light and has been recorded on the Royal Canal, the Liffey, the Tolka and the Rye Water. A summary of the lighting proposals is presented in Table 8-24 below.

Table 8-24 Outdoor Lighting Requirements

Location/ Element	Lighting Proposals Summary	
Telecommunications Equipment Rooms	No external lighting proposed	
Principal Supply Points	No external lighting proposed	
Auxiliary Supply Points	No external lighting proposed	
Signalling Equipment Buildings	External lighting will be motion activated	
Depot. Required lux levels in different areas are as follows:	Tracks, railway yards and marshalling area	10 lux
	Stabling (walking, floor)	10 lux
	Stabling (train servicing, floor)	10 lux
	Stabling (train vertical side)	20 lux
	Storage areas	20 lux
	Car road and walkways	20 lux
	Car parking	15 lux
Replacement level crossing at Barberstown	10m high lighting columns located at the ends of the bridge are envisaged. Luminaires will be full cut off type, with shielding when adjacent to future residential properties to minimise light spill. The proposed lanterns, and the limitation of their mounting angle to 5 degrees or less above the horizontal, will limit spillage of light as far as practicable.	10 lux
The new pedestrian/ cycle bridges at Ashtown, Coolmine, Porterstown, Clonsilla.	The parapets over and adjacent to the canal corridor will be of solid Corten steel construction. Lighting on these structures will be incorporated into the parapets and will be orientated downwards to prevent light spill onto the canal corridor.	

8.8.2.5 Introduction and Spread of Invasive Species

Construction activities could aid the spread of invasive species within the site. In the absence of control measures, there is a possibility that these species may be inadvertently spread during construction, through the movement of equipment and contaminated soil to, from, or within the site.

8.8.2.6 Reduction in Water Quality

Construction and operational activities adjacent to and upstream of surface waters can negatively impact on water quality in a variety of ways.

Surface water run-off from construction activities can contain high levels of suspended sediments and other pollutants. Such run-off, if not attenuated and treated prior to discharge, has the potential to cause significant ecological impacts. Large amounts of fine sediment deposition can smother benthic habitats, leading to changes in biological composition.

During construction, concrete, grout or other pollutants may spill directly into the local environment or be washed into watercourses in construction site run-off. These materials are highly alkaline and, consequently, can drastically alter the pH of the receiving water body. This can lead to profound ecological impacts and can affect the condition of habitats by causing damage to pH-sensitive species.

Vehicles, plant and equipment which will be used during construction rely on hydrocarbons such as diesel, petrol and lubricating oils. Leaks from poorly maintained vehicles, plant, equipment, or storage tanks risk the input of hydrocarbons into the environment. In the absence of appropriate mitigation, hydrocarbons from the construction site may be washed into surface waters in construction site run-off. This has the potential to cause negative ecological impacts on freshwater habitats. Hydrocarbons can have direct toxic effects, including reducing the ability of organisms to absorb water and nutrients. Hydrocarbons can also alter the nutrient balance and microbiota in soil and water, which can benefit some species while detrimentally affecting others. Such changes have the potential to alter the ecological community structures and ecological integrity of habitats.

Inadequate treatment of wastewater from on-site toilets and washing facilities also provides for potential water quality impacts which could lead to ecological effects. Faecal contamination can alter the nutrient balance in soils and water, causing significant changes in microbial communities and reductions in oxygen levels. This can have significant effects on the biological composition of receiving habitats.

In-stream works are proposed to facilitate the diversion of the Ballycaghan Stream and for the works at Ashtown and Clonsilla. In-stream work can lead to the mobilisation of sediment and the introduction of cementitious material and other pollutants.

The Royal Canal could act as a conduit for pollutants between the canal itself and other watercourses, though the overflows between the canal and the Rye Water (Louisa Bridge overflow), the Tolka (M50 overflow) and the Liffey (Broombridge overflow).

The wider use of electric trains during the operation of the proposed development will reduce the potential for pollution, however diesel train will remain on the line to serve destinations west of the depot. Electric trains will use oils and oil-based lubricants, so some risk of pollution will remain.

8.8.2.7 Electromagnetic Radiation

Chapter 22 Electromagnetic Compatibility and Stray Current in Volume 2 of this EIAR assesses the potential for the proposed development to affect Electromagnetic Compatibility and Stray Currents. As the electromagnetic spectrum is a scarce resource and is used for safety critical applications it is carefully protected by EU Directives and National Regulations. This means that all equipment placed on the EU market, including rail systems, must meet strict emissions limits. Sources of electromagnetic radiation in the existing environment includes items such as electrical equipment, power lines, telephone lines, signals from existing telecommunications masts (mobile phone and radio), underground communication cables, electrified trains, broadcast transmitters etc. The emissions from these sources combine to make up the current electromagnetic baseline environment.

Research on the effects of electromagnetic radiation on human health indicates that only exposure to extraordinarily high levels of DC magnetic fields, relative to the fields produced by common sources, can cause biological effects (World Health Organisation, 2006; National Radiological Protection Board of Great Britain (2004); International Agency for Research on Cancer (2002).

EirGrid commissioned two studies into the effects of high voltage overhead transmission lines on bats and birds (RPS, 2015; RPS, 2016). RPS (2015) showed no evidence that the presence of overhead lines resulted in lower activity levels of Soprano or Common Pipistrelle, or, Leisler's Bat. RPS (2016) reported no evidence that electromagnetic radiation effects birds.

All sources of electromagnetic radiation below 300 GHz in the electromagnetic spectrum are considered Non-ionizing Radiation, which means the EMF does not carry enough energy to remove an electron from its atomic

structure. The frequency of 50 Hz from high voltage overhead transmission lines would be much higher than that from the OHLE which would have a 50 Hz fundamental as a result of the rectification of the voltage. The International Commission for Non-Ionizing Radiation Protection (ICNIRP) recommends public exposure does not exceed 400 mT. Within a few centimetres of the OHLE, the levels will approach 10 mT.

In terms of other impacts such as navigation for example. The Earth's DC magnetic field is approximately 48 μ T in Ireland. Wildlife using the Earth's magnetic field for navigation purposes would not lose their way as a result of the DC current, as the DC field levels fall away very quickly with the distance from the OHLE. Effects on navigation may be felt within c. 10 m of the OHLE, but this would result in momentary deviation, with the magnetic north still being the dominant component.

There is not considered to be any potential for impacts on biodiversity as a result of electromagnetic radiation and this is not considered further.

8.8.3 Impacts on Key Ecological Receptors

Impacts on the Key Ecological Receptor as defined in the preceding sections are described in Table 8-25.

Table 8-25 Impact characterisation for Key Ecological Receptors based on EPA (2017) and TII (2009).

Key Ecological Receptor	Construction-phase Impacts	Operational-phase Impacts	Ecological Significance if Unmitigated
KER1 Royal Canal pNHA	<ul style="list-style-type: none"> • Habitat Loss. • Disturbance. • Introduction and spread of invasive species. • Reduction in Water Quality. 	<ul style="list-style-type: none"> • Habitat Fragmentation and Barrier Effect. • Disturbance. • Spread of invasive species. • Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>The loss of habitat within the pNHA is considered to constitute a short-term and permanent moderate and significant negative impact at the local level. The loss of habitat within the pNHA including areas to accommodate the compound at the Coolmine level crossing (CC-LC-S5-57900-B) and the pedestrian/ cycle bridge at Ashtown, will result in permanent significant impact on the pNHA, at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term slight to imperceptible negative impact.</p> <p>The introduction and spread of invasive species is considered to constitute a permanent significant negative impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a short-term significant impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effects as a result of fencing and habitat degradation within and adjacent to the pNHA is considered to be a permanent significant negative impact at the National level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent slight negative impact at the National level.</p> <p>The spread of invasive species is considered to constitute as permanent significant negative impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a permanent moderate Impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on the Royal Canal pNHA at the National level.</p>

Key Ecological Receptor	Construction-phase Impacts	Operational-phase Impacts	Ecological Significance if Unmitigated
KER2 Railway Line Ecological Corridor	<ul style="list-style-type: none"> Habitat Loss. Disturbance. Introduction and spread of invasive species. Reduction in Water Quality. 	<ul style="list-style-type: none"> Habitat Fragmentation and Barrier Effect. Disturbance. Spread of invasive species. Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>The loss of habitat along the railway corridor is considered to constitute a short-term and permanent significant negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term slight to imperceptible negative impact at the local level.</p> <p>The introduction and spread of invasive species is considered to constitute as permanent significant negative impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effects as a result of fencing and habitat degradation within and adjacent to the railway corridor is considered to be a permanent significant negative impact at the County level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent significant negative impact at the local level.</p> <p>The spread of invasive species is considered to constitute as permanent significant negative impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on the Railway Line Ecological Corridor at the County level.</p>

Key Ecological Receptor	Construction-phase Impacts	Operational-phase Impacts	Ecological Significance if Unmitigated
KER3 Badger	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. 	<ul style="list-style-type: none"> Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. 	<p><u>Construction Phase</u></p> <p>The loss of linear woodland and scrub habitat, setts and the significant footprint of the depot is considered to constitute a permanent significant negative impact at the local level.</p> <p>Habitat fragmentation and barrier effect as a result of fencing, noise, and visual disturbance is considered to constitute a short-term slight negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term significant negative impact at the local level., as it could lead to sett abandonment.</p> <p>The risk of direct mortality including rail and road collisions is considered to constitute a short-term imperceptible negative impact at the local level. Other than the setts which were identified during the badger survey, it is possible that new setts could be excavated between the survey and construction. The loss of a sett during site clearance would constitute a short-term moderate negative impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effect as a result of fencing is considered to constitute a permanent significant negative impact at the local level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent moderate negative impact at the local level.</p> <p>The risk of direct mortality as a result of rail and road collisions is considered to constitute a permanent moderate negative impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on Badger at the local level.</p>

Key Ecological Receptor	Construction-phase Impacts	Operational-phase Impacts	Ecological Significance if Unmitigated
KER4 Otter	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. Reduction in Water Quality. 	<ul style="list-style-type: none"> Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>The loss of linear woodland, scrub, riparian habitat and canal habitat is considered to constitute a short-term and permanent significant negative impact at the local level.</p> <p>Habitat fragmentation and barrier effect as a result of fencing, noise, and visual disturbance is considered to constitute a short-term slight negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a permanent significant negative impact at the local level.</p> <p>The risk of direct mortality including road and collisions is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Although no holts were identified within the red line boundary during the survey, it is possible that Otter may take up residence between the survey and construction. The loss of a holt during site clearance would constitute a medium-term moderate negative impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effect as a result of fencing is considered to constitute a permanent significant negative impact at the local level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent moderate negative impact at the local level.</p> <p>The risk of direct mortality as a result of rail and road and collisions is considered to constitute a permanent moderate negative impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on Otter at the local level.</p>

Key Ecological Receptor	Construction-phase Impacts	Operational-phase Impacts	Ecological Significance if Unmitigated
KER5 Bats	<ul style="list-style-type: none"> • Habitat Loss. • Habitat Fragmentation and Barrier Effect. • Disturbance. • Direct Mortality. 	<ul style="list-style-type: none"> • Habitat Fragmentation and Barrier Effect. • Disturbance. • Direct Mortality. 	<p><u>Construction Phase</u></p> <p>The loss of linear woodland, scrub, riparian habitat, and canal habitat is considered to constitute a short-term and permanent significant negative impact at the local level.</p> <p>Habitat fragmentation and barrier effect as a result of artificial lighting is considered to constitute a short-term slight negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute an imperceptible negative impact at the local level.</p> <p>The risk of direct mortality including rail and road collisions is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Although no bat roosts were confirmed within the red line boundary, it is possible that some of the features identified as having bat potential could be used by bats in the future. The loss of a bat roost during site clearance could constitute a long-term significant impact at the county level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effect as a result of artificial lighting is considered to constitute a permanent slight negative impact at the local level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent slight negative impact at the local level.</p> <p>The risk of direct mortality as a result of rail and road and collisions is considered to constitute a permanent slight negative impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on bats at the County level.</p>

Key Ecological Receptor	Construction-phase Impacts	Operational-phase Impacts	Ecological Significance if Unmitigated
KER6 Watercourses	<ul style="list-style-type: none"> Habitat Loss. Introduction and spread of invasive species. Reduction in Water Quality. 	<ul style="list-style-type: none"> Habitat Fragmentation and Barrier Effect. Introduction and spread of invasive species. Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>In-stream works, including the diversion of the Ballycaghan Stream, the construction of two new bridges over the Ballycaghan Stream and Lyreen River, and the works at Ashtown and Coolmine are considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>The introduction and spread of invasive species is considered to constitute as permanent significant negative impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a short-term significant impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effects as a result of watercourse diversion and culverting is considered to constitute a permanent significant negative impact at the local level.</p> <p>The introduction and spread of invasive species is considered to constitute as permanent significant negative impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a permanent moderate Impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on Watercourses at the local level.</p>
KER7 Amphibians	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effect. Direct Mortality. Reduction in Water Quality. 	<ul style="list-style-type: none"> Habitat Fragmentation and Barrier Effect. Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>The loss of breeding ponds for amphibians is considered to constitute a permanent significant negative impact at the local level.</p> <p>Habitat fragmentation and barrier effects as a result of habitat loss and fencing is considered to constitute a permanent slight negative impact at the local level.</p> <p>Direct Mortality during site clearance near ponds where amphibians have been confirmed, and road collisions is considered to constitute a short-term slight negative impact at the local level.</p> <p>The reduction in water quality in breeding ponds is considered to constitute a short-term moderate impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effects as a result of habitat loss and fencing is considered to constitute a permanent slight negative impact at the local level.</p> <p>The reduction in water quality in breeding ponds is considered to constitute a permanent moderate negative impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on Amphibians at the local level.</p>

Key Ecological Receptor	Construction-phase Impacts	Operational-phase Impacts	Ecological Significance if Unmitigated
KER8 Birds	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effects. Disturbance. Direct Mortality. Reduction in Water Quality. 	<ul style="list-style-type: none"> Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. Reduction in Water Quality. 	<p>Construction Phase</p> <p>The loss of linear woodland, scrub, riparian habitat, and canal habitat is considered to constitute a short-term and permanent moderate negative impact at the local level.</p> <p>Habitat fragmentation and barrier effects as a result of artificial lighting, noise and visual disturbance is considered to constitute a short-term slight negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term slight negative impact at the local level.</p> <p>The risk of direct mortality including rail and road collisions is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>The loss of nests during site clearance would constitute a short-term slight negative impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses, which could indirectly impact wetland birds such as dipper, tufted duck and cormorant, is considered to constitute a short-term slight negative impact at the local level.</p> <p>Operational Phase</p> <p>Habitat fragmentation and barrier effects as a result of artificial lighting, noise and visual disturbance is considered to constitute a permanent slight negative impact at the local level.</p> <p>Disturbance as a result of increased train movements and activities at the depot is considered to constitute a permanent slight negative impact at the local level.</p> <p>The risk of direct mortality through rail and road collisions is considered to constitute a permanent imperceptible negative impact at the local level. Geese, Swans and Cormorants are vulnerable to collision with OHLE. It is considered that bird collision with OHLE could lead to a permanent significant negative impact at the international level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses, which could indirectly impact wetland birds such as dipper, tufted duck and cormorant, is considered to constitute a permanent slight negative impact at the local level.</p> <p>The OHLE and the risk this poses to birds is considered to constitute a Permanent Significant Negative Impact at the International level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on Birds at the International level.</p>
KER9 Invasive Species	<ul style="list-style-type: none"> Introduction and spread of invasive species. 	<ul style="list-style-type: none"> Spread of invasive species. 	<p>The construction and operation of the proposed development may lead to the introduction and/or spread of invasive species. It is considered that the introduction and spread of invasive species is a permanent significant negative impact at the local level.</p> <p>It is considered that without mitigation, invasive species have the potential to lead to significant impacts at the local level.</p>

8.9 Mitigation measures

This section describes the measures that are in place to mitigate any harmful or negative impacts associated with the proposed development and the identified Key Ecological Receptors, as described in the preceding sections. Construction phase mitigation measures are described first, followed by general mitigation measures which will apply during the construction and operational phases. Lastly, mitigation measures which relates specifically to the Key Ecological Receptors is described.

The proposed development has been developed having regard to EU and Irish legislation and all relevant guidelines in relation to ecology and engineering best practice for the planning and construction. These guidelines provide practical measures that can be incorporated into the design to minimise impacts and protect the receiving environment. The design has followed the basic principles outlined above to eliminate the potential for ecological impacts, where possible, and to minimise such impacts where total elimination is not possible. The design has followed the TII Publications (Standards) and the TII Environmental Assessment and Construction Guidelines.

8.9.1 Construction Phase Mitigation

The following general mitigation measures will be employed to minimise potential significant negative effects on biodiversity which might arise during the construction of the proposed development.

- Prior to any demolition, excavation, or construction, a Construction Environmental Management Plan (CEMP) will be produced by the successful contractors for each element of the proposed development. The CEMP will set out the Contractor's overall management and administration of the construction phase, see Appendix 5.1 in Volume 4 of this EIAR. An NIS has also been prepared as part of this CEMP. The CEMP will be developed by the Contractor during the pre-construction phase, to ensure commitments included in the statutory approvals are adhered to.
- The Contractor will prepare a Site Specific Method Statements detailing how the works will be carried out. The Site Foreman shall read, sign and abide by each Site Specific Method Statement. The Works Team will be inducted on the ecological considerations listed in the Site Specific Method Statement by the Site Foreman.
- An Ecological Clerk of Works (ECoW) shall be appointed by CIÉ prior to the commencement of works. It shall be their responsibility to supervise and provide recommendations on the execution of any and all works which have the potential to give rise to negative or positive effects on biodiversity. The ECoW will have at least five years' experience as an Ecological Clerk of Works on linear infrastructure projects.
- The Contractor will appoint a Site Environmental Manager (SEM) prior to 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 EIAR (as well as the CEMP and Site Specific Method Statements) are adhered to.
- The construction envelopes for the depot, compounds, bridge and other ancillary infrastructure will be temporarily fenced off at the outset of the construction and will avoid the potential for unnecessary loss of habitat outside of the construction footprint.
- The fencing for the compounds will be set inside existing hedgerow and treeline boundaries to avoid habitat loss. The set-back distance will be directed by the ECoW or the Arborist.
- The mitigation measures presented in other chapters of this EIAR (Volume 2), including, but not limited to Chapter 10 'Water' and Chapter 15 'Landscape and Visual' will be implemented in full.
- Fencing will be erected around trees which are to be retained and will include the Root Protection Area (RPA), as defined by a professionally qualified Arborist. An Arborist be retained as required by the Contractor to monitor and advise on any works within the RPA of retained trees to ensure successful tree retention and planning compliance.
- The use of artificial lighting on site will be minimised in terms of the area required to be illuminated and the length of time for which any lighting is switched on. Light spillage will be prevented as far as reasonably practicable. Artificial lighting will be shut off at night when not in use or when works

cease at the end of the day in order to minimise the effects of light pollution and disturbance to nocturnal species. Security lighting, if required, will be cowed, to prevent light spill outside the works areas. Direct or indirect lighting onto the Royal Canal will be avoided. The ECoW will ensure that light spill is reduced as much as possible.

- A pre-construction survey will be undertaken 2-3 weeks prior to construction to ensure that protected species such as Otter and Badger have not taken up residence within the construction envelope and to record invasive species extent and distribution. Should any protected species shelters (e.g. holts, setts) be found, the ECoW will seek direction from the NPWS. The preconstruction survey will include a boat based otter survey between the Dublin/ Kildare border and Kilcock, and a floristic surveys of stone walls and bridges prior to any works.
- Any excavations deeper than 1m will be either covered or have ramps fitted outside of working hours, which will allow badgers and other wildlife to escape. Similarly, any temporarily exposed open pipe system will be capped to prevent species such as Otter from gaining access when contractors are off site.
- Two new watercourse crossings are proposed as part of the railway realignment at Ch. 91+900 (UBG22C and UBG22A). The abutments will be set back from the banks and the natural riverbank will be retained to allow mammals to pass under the bridge. Should this not be possible, mammal ledges will be provided in these structures in accordance with TII (2008). The ledges will be at least 500 mm wide and at least 150 mm above the 1 in 5-year flood event and have at least 600 mm of headroom.

8.9.2 Non-specific Mitigation Measures

The following is an overview of the non-specific mitigation measures that will be employed to avoid or minimise significant impacts on the Key Ecological Receptors within the Zone of Influence:

8.9.2.1 Lighting

- The lighting plan has been designed to minimise impacts on biodiversity. The lighting requirements are summarised in Table 8-25. A lighting specialist will be engaged at detailed design stage to develop the lighting design. The design for outdoor lighting will be reviewed and signed off by the ECoW and by CIÉ. The design will include models illustrating the light spill with contours, e.g. 10 lux, 5 lux, 2 lux, 1 lux, 0.5 lux, 0.2 lux. As a minimum, the lighting design will comply with the following:
 - Lighting outside the intended area of illumination will be minimised. Where light spill cannot be avoided, louvres, cowls or shields will be fitted to the columns.
 - Horizontal light spill onto the Royal Canal and its banks will not exceed 0.5 lux. The lighting design model will illustrate this important requirement.
 - Lighting will be LED and have no upward light spill and a sharp horizontal cut off.
 - All outside lighting will be a warm-white colour of 3000K or less.
 - Lux levels on roads will be set to the minimum required by BS 5489- Road Lighting.

8.9.2.2 Landscaping and Fencing

- The landscaping plan includes the widespread planting of native Irish species of trees and shrubs and wildflower planting (see drawing: MAY-MDC-LAN-ROUT-DR-U-15100-D to 15141-D in Volume 3A of this EIAR).
- Wetland habitats will be incorporated into the design of the flood compensatory storage areas. The wetlands will not affect the primary flood storage function of these areas. Further excavation below the 1 in 2 year flood level and the outlet levels will ensure that water is allowed to pool which will encourage wetland habitats to establish. Guidance on the construction of reed beds is available in:
 - *Bringing Reedbeds to Life: Creating and Managing Reed Beds for Wildlife* (RSPB,2014).
 - *Reedbed Design and Establishment*. Information and Advice Note. Version 4 (RSPB, 2004).
- The flood compensatory storage areas will include ponds, reed beds, and wet grassland, with wet grassland make up no more than 50% of the total flood compensatory storage areas.

- Reseeding with commercially available grass seed or wildflower mixes will be avoided. Areas where vegetation has been removed will be allowed to revegetate naturally or alternatively use locally sourced seed or green hay. This includes the flood compensatory storage areas.
- New fencing has been minimised to the areas where there is a greater risk of trespassing and/ or electrocution. In general, there is minimal fencing proposed between the Royal Canal and the railway line. The proposed fencing is illustrated in Volume 3A of this EIAR, Drawing: MAY-MDC-TRK-ROUT-DR-C-0009-D.
- The proposed new palisade and palladin perimeter fencing at the depot, compounds and along railway line will have 30 cm x 20 cm gaps located a minimum of every 50 m to allow wildlife such as badger and otter to cross the railway line, and to escape these areas should they become trapped inside. The exception to this will be along the boundary of private dwellings or housing estates, where there is a risk of dogs getting onto the railway line.
- Where fencing is proposed on the boundary of CIÉ owned land, the existing hedgerows or treelines will be retained. The fence will be constructed on one side of the existing boundary, notwithstanding any technical requirements for vegetation removal associated with the proposed development.
- Use of herbicides will be carefully controlled to treat invasive species, to keep the tracks clear of vegetation growth and in particular circumstances elsewhere where vegetation control measures are necessary.
- Outside of urban areas, where trees are planted, for example around the depot, no herbicides or mulch will be applied, and native flora will be allowed to regenerate naturally.

8.9.2.3 Water Quality- Construction Phase

- In order to attenuate flows and minimise sediment input into watercourses from site run-off, all surface water run-off from the construction site and compounds shall be intercepted and conveyed to a drainage network. The guidance of sustainable drainage systems (SuDS) from CIRIA C753 shall be used.
- All works in and adjacent to watercourses will be carried out in accordance with *Guidelines for the crossing of Watercourses During Construction of National Road Schemes* (TII, 2008); and, *Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters* (IFI, 2016). In-stream works will only take place between the 1st July and 30th September, unless otherwise agreed with Inland Fisheries Ireland. The restrictions on in-stream works does not apply to works in the Royal Canal.
- The proposed new bridges which cross the Lyreen River, and the Royal Canal and the Ballycaghan Stream will be clear span to avoid the need to in-stream excavations.
- Dewatering of the Royal Canal is required at Ashtown to facilitate the construction of the underbridge and aqueduct, and at Porterstown and Clonsilla to facilitate the construction of the foundations for the pedestrian and cycle bridges. Dewatering will be carried out by first isolating the area to be dewatered using stop-logs or temporary dams. Electro-fishing will be carried out prior to dewatering. A water bypass system comprising 2 no. 300-450 mm diameter pipes to divert flows past the working area will be installed for the duration of the works.
- The diversion of the Ballycaghan Stream will be undertaken as follows:
 - The new channel will be completed in the dry.
 - The banks will be constructed at a 1:2 slope and will be planted with locally sourced species.
 - As the old channel is dewatered, any fish or white-clawed crayfish will be removed and placed in the stream below the works.
 - Straw bales or similar will be placed downstream of the new section of the Ballycaghan Stream to minimise sediment transfer downstream.
 - The new section of the Ballycaghan Stream will be fish passable and include riffles, pools and suitable benthic substrate.
- The Contractor will ensure that all hazardous waste residuals are stored within temporary banded storage areas prior to removal by an appropriate EPA-approved waste management contractor for off-site treatment, recycling or disposal.

- The Contractor will ensure that excess topsoil and inert soil which cannot be re-used on-site, and all hazardous soil waste will be separately removed off site to an appropriately licenced facility by a licensed Contractor.
- Any stockpiled material shall be located as far from watercourses as practicable, covered and remain stockpiled for as short a time as possible.
- All equipment including PPE which comes into contact with watercourses will be clean and will be disinfected prior to arrival and before leaving site each day using Virkon Aquatic or similar. Equipment will be disinfected at least 20m from the watercourse.
- The measures prescribed with regard to sedimentation and surface water run-off will also minimise the risk of any input of cementitious material into watercourses. However, the following additional measures shall also apply:
 - All shuttering shall be securely installed and inspected for leaks prior to cement being poured, and all pouring operations shall be supervised for spills and leaks at all times.
 - In order to eliminate any remaining risk of input of cementitious material into watercourses, all pouring of concrete, sealing of joints, application of water-proofing paint or protective systems, curing agents, etc., for outfalls shall be completed in dry weather.
 - In order to prevent input of cementitious materials into watercourses from the in-stream elements of the construction, or from works over water, concrete structural elements shall be pre-cast, wherever possible.
 - In addition, at all locations where concrete or other wet materials are to be used, bunded steel decks will be used to capture any spilled concrete or other materials.
- The measures prescribed with regard to surface water run-off will also minimise the risk of any input of hydrocarbons and other chemicals into the watercourses. However, the following additional measures shall also apply:
 - Vehicles and plant shall be refuelled off-site where possible and all fuelling of machinery shall be undertaken at least 30 m from the watercourses.
 - All fuelling of vessels shall be undertaken on an impervious base in bunded areas and all fuelling equipment shall be regularly inspected and serviced.
 - Standing plant and machinery shall be placed on drip-trays.
 - All fuel, oils, chemicals, hydraulic fluids, on-site toilets, etc., shall be stored in the construction site compound, on an impervious base which shall be bunded to 110% capacity and appropriately secured.
 - All plant and construction vehicles shall be inspected daily for oil leaks and a full-service record shall be kept for all plant and machinery.
 - Spill kits shall be available on-site during construction.
 - Paints containing organotin compounds, e.g. TBT, will not be used, during the construction or operation (e.g. maintenance) of the proposed development.

8.9.2.4 Water Quality- Operational Phase

- The flood compensatory storage areas will avoid changes to the flooding regime in the area of and downstream of the depot.
- The realignment of the Ballycaghan stream will be designed to closely match existing channel characteristics and will include an appropriately sized vegetated buffer.
- The drainage network will incorporate Sustainable Drainage Systems (SuDS), to be designed following the relevant sections of the Building Regulations, BS EN 752 and EN 12056, and the CIRIA SUDS Manual. This includes two attenuation ponds at the depot and two attenuation ponds at the Barberstown level crossing.

8.9.3 Specific Mitigation Measures

In addition to the construction phase and non-specific mitigation measures described above, specific measures are described in relation to individual Key Ecological Receptors (KER) in the following sections.

8.9.3.1 Royal Canal pNHA (KER 1)

Biodiversity enhancements including wetland creation, pond construction, tree and shrub planting, the construction of artificial holts and the provision of bat and bird boxes on existing trees will be provided at various locations along the route of the proposed development. The specific locations for each biodiversity enhancement element are provided in the following sections and in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D.

Reseeding with commercially available grass seed or wildflower mixes will be avoided. Areas where vegetation has been removed will be allowed to revegetate naturally or alternatively use locally sourced seed or green hay. This includes the flood compensatory storage areas.

Habitat enhancement works focussing on pond and wetland creation will be carried out on CIÉ owned land at Barberstown (70+500- 70+700), East of Leixlip (73+200- 73+900), between the new railway alignment at Jackson's Bridge and the Royal Canal (91+300- 92+700) and east of the Navan Road Parkway (54+000 to 54+500).

The railway line that is being decommissioned at Jackson's Bridge (91+300- 92+700) will be allowed to revegetate naturally. Native trees will also be planted in this area, outside of the flood compensatory storage areas.

The compound at the Coolmine level crossing (CC-LC-S5-57900-B) will be set back at least 10m from the canal bank.

The temporary pedestrian/ cycle bridge over the Royal Canal at Broombridge will not involve any instream work in the canal. A riparian zone of a least 0.5m will be left between the bridge abutments and the canal.

In areas where the railway is in close proximity to the Royal Canal, double track cantilever catenary poles will be provided, where a single column on the side farthest from the canal will support the OHLE for both tracks, thereby reducing habitat loss and the risk of water quality impacts. This will apply to the following chainages:

- 41+750 to 42+500.
- 52+600 to 53+500.
- 71+100 to 72+500.
- 74+000 to 75+500.
- 76+500 to 82+100.
- 90+400 to 91+100.

8.9.3.2 Railway Line Ecological Corridor (KER 2)

In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 2 Railway Ecological Corridor:

The removal of trees and shrubs to accommodate the OHLE along the railway line will be limited to the areas required in accordance with *Vegetation Clearance Requirements for Electrified Lines*. I-ETR-4006. Version 1.0 (Iarnród Éireann, 2021).

Outside the footprint of the catenary poles, the railway verges will be allowed to flower and go to seed. This will be achieved by mowing in early spring and/ or late summer only.

8.9.3.3 Badger (KER 3)

In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 3 Badger.

The mitigation measures with regards to badger will comply with *Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes* (TII, 2006c).

A 30m buffer will be fenced off around Sett 1 to avoid disturbance while the compound is in operation. No works, or storage of materials will be permitted within 30 m of the Sett 1.

The locations of the catenary poles will be positioned to maintain the greatest distance possible from Setts 2 and 3, which will minimise disturbance during construction. When the exact locations of the catenary poles relative to these setts is established, the EcoW will seek advice from the NPWS on whether a derogation licence is required.

Three main setts, one subsidiary sett and one outlier sett occur either within the footprint of the proposed development or within 10m of the proposed development. The locations of the setts are illustrated in a confidential set of drawings in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050- D to 80061-D. Due to their sensitivity to disturbance, locations where badger activity was recorded are not provided to the public.

Works within 50m of a badger sett have the potential to lead to sett abandonment including the abandonment of dependent young. The surveys undertaken to inform this EIAR indicate that two main setts, one subsidiary sett and one outlier sett occur within or close to the footprint of the proposed development and will be closed either temporarily or permanently to avoid injury or death to badgers.

Prior to construction, the setts will be surveyed by the EcoW to assess if they are active or inactive. Monitoring using camera traps may be required to ascertain whether a sett is active or inactive and whether it is being used for breeding. If required, setts will be closed in accordance with TII (2006c). Active setts will not be closed during the breeding season (December- June inclusive).

Should the preconstruction survey determine that a main sett will be closed, the presence of a viable alternative sett within the social group's territory must be identified. Where no alternative sett is identified, an artificial sett must be provided within the social group's territory. At the depot, there is land available to construct an artificial sett at the edge of the flood compensatory storage areas, if required.

8.9.3.4 Otter (KER 4)

In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 4 Otter:

Holts 2, 3, 4, 5 and Couches 1, 2 are located between the Royal Canal and the Railway Line (Table 8-11). Although Otter will have a certain level of tolerance to noise and vibration due to the proximity of railway traffic, boat traffic and the Royal Canal Greenway to these resting places, the construction of the catenary pole foundations could lead to damage and disturbance. In order to mitigate for this and avoid impacts on otter, the catenary poles will be located at the maximum allowable distance from these shelters. The catenary poles closest to each of these shelters will be Double Track Cantiver (DTC) i.e. a single pole supporting OHLE for both tracks, located on the opposite side of the railway to the holts/ couches.

Holt 6 is located close to the section of the Royal Canal that will be dewatered at Ashtown. This holt was inactive at the time of the surveys will no evidence of current use. The preconstruction survey will assess the condition no more than six weeks before the dewatering of this section of the canal. If evidence of Otter is found, direction will be sought from the NPWS.

The dewatered sections of the Royal Canal will have ramps fitted at each end for the duration of the dewatering to prevent Otter becoming trapped.

Any additional mitigation measures prescribed following the preconstruction survey will comply with *Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes* (TII, 2008).

One artificial otter holt will be constructed in each of the following areas:

- Ch. 73+200- 73+900, east of Leixlip.
- Ch. 75+600- 75+950, north of the Rye Water crossing.

The holts will be constructed as a log pile, with a tunnel leading to a cavity in the centre. The holts should be seeded with otter spraint collected from a nearby watercourse, if available. The locations proposed for the artificial holts are shown in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D to 81011-D.

8.9.3.5 Bats (KER 5)

In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 5 Bats:

A pre-construction bat survey will be undertaken no more than 3 weeks prior to the works to confirm roost absence at the structures and trees listed in Table 8-15. The preconstruction survey will adhere to *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* (TII, 2006).

Felling of trees and alterations to structures with bat potential will only take place in September, October, and March to avoid maternity roosts and hibernating bats.

Trees classified as having low suitability including the treelines at the depot will be soft felled in the presence of an Ecologist who will be licensed to handle bats. Should bats be found during the soft felling, the bats will be taken into care and released at dusk.

A variety of woodcrete bat boxes will be installed on suitable trees. The bat boxes will be located at a sufficient distance from the construction envelope to limit any disturbance and the type and location will be directed by the ECoW and in accordance with Kelleher & Marnell (2006). The boxes will be positioned at least 4 m above ground level and in areas that are not lit. In total, 30 no. bat boxes of varying types to accommodate different species and different types of roosts including the following, or equivalent:

- Schwegler 1FN (Large Colony).
- Schwegler 1FD (Pipistrelles).
- Schwegler 2F (General Purpose).
- Schwegler 1FW (Hibernation Box).

The bat boxes will be installed in the following locations:

- Ch. 70+500- 70+700, at Barberstown.
- Ch. 73+200- 73+900, east of Leixlip.
- Ch. 75+600- 75+950, north of the Rye Water crossing.

In addition, two bat boxes, Schwegler 2E wall mounted bat boxes or similar, will be erected on each of the following bridges:

- The Barberstown level crossing replacement infrastructure.
- The new canal/ railway crossing at the depot.
- The Rye Water Bridge.
- Tolka (106+225).
- Tolka (106+750).
- Tolka (107+150).
- UBG22C.
- UBG22A.

Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D to 81011-D presents the locations for bat boxes.

8.9.3.6 *Amphibians (KER 7)*

In addition to the construction phase and non-specific mitigation measures described above, which includes the provision of an extensive area of wetland habitat in the flood compensatory storage areas at the depot, the following measures will be implemented to ensure the protection of KER 7 Amphibians:

- The pond at Broombridge (Ch. 51+650), illustrated in a confidential drawing in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-80050- D, will be retained. This pond will be clearly demarcated during the construction phase to prevent accidental damage.
- The pond at the Navan Road Parkway compound (Ch. 54+700) and the ditch along the existing railway line at the depot (Ch. 92+600- Bailey's Bridge) are within the footprint of the proposed development.
- A pre-construction survey will be undertaken immediately prior to the works. The waterbodies will be thoroughly searched for adult frogs and newts as well as frog spawn. All frogs, newts and frog spawn will be translocated to nearby suitable habitat, outside the works area. Repeat surveys will continue until such a time as the waterbodies are drained.
- The pond at the Navan Road Parkway compound will be fenced off, including a buffer of 20m.
- Terrestrial refugia will be created at edges of the flood compensatory storage areas which will consist of either log piles or clean inert material covered with topsoil. At least one refugia will be created in each discreet flood compensatory storage area unit.
- The locations of the catenary poles will be positioned to maintain the greatest distance possible from the pond at Broombridge.

8.9.3.7 *Birds (KER 8)*

In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented to ensure the protection of KER 8 Birds:

- Site clearance including vegetation removal will take place between September and February inclusive to avoid nesting birds. If vegetation removal is required between March and August inclusive, the area shall be checked by the ECoW. If nesting birds are found, the works will be postponed until the chicks have fledged, or alternatively advice will be sought from the NPWS.
- The new bridges over the railway line and the Royal Canal have been designed without cables to reduce the risk of bird collision. The new bridges will not be painted bright white.
- Heightened parapets over the railway line will be of solid construction.
- The construction of the ancillary infrastructure (substation, signalling equipment building and principal supply point) and the set-up, use and decommissioning of the construction compound at St. Vincent's School, Glasnevin will take place between the months of May and September inclusive, to avoid disturbing wintering birds at this location.
- To mitigate for the risk of disturbance to Brent Geese at feeding sites adjacent to the railway line, there will be no day-time OHLE construction shifts between October and April inclusive.
- To mitigate for the risk of collision with OHLE, deflectors will be installed on wires parallel to the OHLE at a number of strategic locations, including the bridges over the Royal Canal in Cabra (Ch. 50+850) and the Rye Water (76+100), and along the boundaries of St. Vincent's Primary School, Martin Savage Park and Ashington Park. A meta-analysis of published literature and unpublished reports to date shows that deflectors significantly reduce bird collision (Barrientos et al, 2011). An example of bird deflectors on the Anne Devlin Bridge in Dublin is shown in Figure 8-5 below. The locations of the deflectors are illustrated in Volume 3A of this EIAR, Drawing: MAY-MDC-ENV-ROUT-DR-V-81000-D to 81011-D.
- Bird deflectors will also be installed at the 15 locations where overhead lines which cross the canal are being heightened or lowered, and at the high voltage cable diversion at Jackson's Bridge.



Figure 8-5 Bird deflector/ flight diverters on the Anne Devlin Luas Bridge, Dublin.

Dipper/ Grey Wagtail nest boxes will be installed inside the following bridges/ culverts, as shown in MAY-MDC-ENV-ROUT-DR-V-81000-D to 81011-D. Table 8-26 below and illustrated in Volume 3A of this EIAR, Drawing MAY-MDC-ENV-ROUT-DR-V-81000-D to 81011-D.

Table 8-26 Locations for Dipper/ Grey Wagtail Nest Boxes

Structure Number	Chainage	Watercourse
n/a	71+300	Rusk Stream
n/a	74+400	Oranstown Stream
n/a	76+100	Rye Water
n/a	78+650	Blakestown Stream
UBG22A	91+800	Lyreen River
UBG22C	91+900	Ballycaghan Stream

- Two no. triple cavity Swift boxes will be installed on the following bridges and buildings, as shown in Table 8-27 below and illustrated in Volume 3A of this EIAR Drawing MAY-MDC-ENV-ROUT-DR-V-81000-D to 81011-D. Guidance on the placement an installation of Swift boxes is available in Swift Conservation Ireland (2021).

Table 8-27 Locations of Swift Boxes

Structure Name/ Number	Chainage	Watercourse/ Road
Connolly Station	10+000	n/a
Docklands Station	20+000	n/a
n/a	71+100	Barberstown Replacement Level Crossing
n/a	91+800	Lyreen River (OBG22A)
n/a	92+850	Depot- Canal/ Rail Bridge
n/a	104+600	Dunboyne Stream

- Two no. Sand Martin walls will be constructed. Each wall will have at least 60 no. nest cavities. Guidance on the construction of Sand Martin Walls is available in Doran & Huxley (2022). The Sand Martin walls will be constructed at the following locations:
 - Adjacent to an area of permanent standing water feature in the flood compensatory storage areas at the depot/ OBG22.
 - At the edge of one of the attenuation ponds at Barberstown.
- The location of all bird nest boxes and the Sand Martin Walls will be directed by the ECoW.
- Bird-friendly glass (e.g. www.ornilux.com or equivalent) or retrofitted measures such as tape and film, which will reduce the reflectivity of glass facades and windows, will be used on all buildings. This will not prevent all bird collisions but will reduce the risk of collisions significantly. These measures will be approved by the ECoW and will follow the guidance published by the American Birds Conservancy (ABC, undated).

8.9.3.8 Invasive Species (KER 9)

In addition to the construction phase and non-specific mitigation measures described above, the following measures will be implemented with regards to KER 9 Invasive Species:

- The Contractor will prepare an invasive species management plan, detailing how the introduction and spread of invasive species will be prevented. The invasive species management plan will be approved by CIÉ.
- Aquatic invasive species Canadian Pondweed and Nuttall's Waterweed spread by fragmentation and are widespread in the Royal Canal. The invasive species management plan will include measures to prevent their spread to other waterbodies by thoroughly cleaning all equipment involved in working the watercourses.
- Herbicides will be used in accordance with the European Communities (Plant Protection Products) Regulations, 2012 (S.I. No. 159 of 2012) and the (Sustainable Use of Pesticides) Regulations, 2012, (S.I. No. 155 of 2012) (as amended).
- Landscaping of the proposed development shall use native species of plants of national provenance only and, insofar as possible, soil reused from on-site excavations. If soil/substrate needs to be imported to the site for the purposes of the proposed development, the Contractor shall ensure that the imported soil/substrate is free from invasive species.
- During the operational phase, the locations of Japanese Knotweed will be communicated to CIÉ and treated in accordance with Guidance on Identification and Control of Japanese Knotweed (Iarnród Éireann, 2015).

8.10 Residual Impacts on Key Ecological Receptors

Table 8-28 Assessment of the Residual Impacts Scale and Significance, following EPA (2017) and TII (2009).

Key Ecological Receptor	Pre-mitigation Impacts	Ecological Significance following Mitigation
KER1 Royal Canal pNHA	<ul style="list-style-type: none"> Habitat Loss. Disturbance. Reduction in Water Quality. Habitat Fragmentation and Barrier Effect. Introduction and spread of invasive species. 	<p>Construction Phase</p> <p>The loss of habitat within the pNHA is considered to constitute a short-term and permanent slight to significant negative impact at the local level. Mitigation measures have been put in place to minimise habitat loss, however some habitat loss within the pNHA will occur. Although the loss of habitat within the pNHA is significant at the local level i.e. the area where the habitat loss occurs, there will be no impact as a result of this habitat loss outside of the compound itself.</p> <p>Disturbance during the construction phase is considered to constitute a short-term imperceptible negative impact at the county level.</p> <p>The management of invasive species is considered to constitute a short-term significant positive impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a potential temporary significant impact at the local level.</p> <p>Operational Phase</p> <p>Habitat fragmentation and barrier effects as a result of fencing and habitat degradation within and adjacent to the pNHA is considered to be a permanent slight negative impact at the local level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent slight negative impact at the local level.</p> <p>The management of invasive species is considered to constitute a permanent significant positive impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a potential permanent slight negative impact at the local level.</p> <p>There are no significant residual negative effects on the Royal Canal pNHA at any scale.</p>
KER2 Railway Line Ecological Corridor	<ul style="list-style-type: none"> Habitat Loss. Disturbance. Introduction and spread of invasive species. Reduction in Water Quality. Habitat Fragmentation and Barrier Effect. 	<p>Construction Phase</p> <p>The loss of habitat along the railway corridor is considered to constitute a short-term and permanent moderate negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term imperceptible negative impact.</p> <p>The management of invasive species is considered to constitute a short-term significant positive impact at the local level.</p> <p>Operational Phase</p> <p>Habitat fragmentation and barrier effects as a result of fencing and habitat degradation within and adjacent to the railway corridor is considered to be a permanent imperceptible negative impact at the County level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent slight negative impact at the local level.</p> <p>The management of invasive species is considered to constitute a permanent significant positive impact at the local level.</p> <p>There are no significant residual negative effects on the Railway Line Ecological Corridor at any scale.</p>

Key Ecological Receptor	Pre-mitigation Impacts	Ecological Significance following Mitigation
KER3 Badger	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. 	<p><u>Construction Phase</u></p> <p>The loss of linear woodland and scrub habitat, setts and the significant footprint of the depot is considered to constitute a short-term and permanent imperceptible negative impact at the local level.</p> <p>Habitat fragmentation and barrier effect as a result of fencing, noise, and visual disturbance is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term imperceptible negative impact, as it could lead to sett abandonment.</p> <p>The risk of direct mortality including rail and road collisions is considered to constitute a short-term imperceptible negative impact at the local level. Other than the setts which were identified during the badger survey, it is possible that new setts could be excavated between the survey and construction. The risk of accidental disturbance or destruction of a badger sett during site clearance is a potential long-term significant impact at the local level, although following the implementation of mitigation measures, it is highly unlikely that this would occur.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effect as a result of fencing is considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent slight negative impact at the local level.</p> <p>The risk of direct mortality as a result of rail and road and collisions is considered to constitute a permanent moderate negative impact at the local level.</p> <p>It is considered that without mitigation, the proposed development has the potential to result in significant impacts on Badger at the local level.</p> <p>There are no significant residual negative effects on Badger at any scale.</p>

Key Ecological Receptor	Pre-mitigation Impacts	Ecological Significance following Mitigation
KER4 Otter	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>The loss of linear woodland, scrub, riparian habitat and canal habitat is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Habitat fragmentation and barrier effect as a result of fencing, noise, and visual disturbance is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>The risk of direct mortality including road and rail collisions is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Although no holts were identified within the red line boundary during the survey, it is possible that Otter may take up residence between the survey and construction. The risk of accidental disturbance or destruction of an otter holt during site clearance is a potential long-term significant impact at the local level, although following the implementation of mitigation measures, it is highly unlikely that this would occur.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effect as a result of fencing is considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent slight negative impact at the local level.</p> <p>The risk of direct mortality as a result of rail and road collisions is considered to constitute a permanent moderate negative impact at the local level.</p> <p>There are no significant residual negative effects on Otter at any scale.</p>

Key Ecological Receptor	Pre-mitigation Impacts	Ecological Significance following Mitigation
KER5 Bats	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effect. Disturbance. Direct Mortality. 	<p><u>Construction Phase</u></p> <p>The loss of linear woodland, scrub, riparian habitat, and canal habitat is considered to constitute a short-term and permanent slight negative impact at the local level.</p> <p>Habitat fragmentation and barrier effect as a result of artificial lighting is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a imperceptible negative impact at the local level.</p> <p>The risk of direct mortality including rail and road collisions is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Although no bat roosts were confirmed within the red line boundary, it is possible that some of the features identified as having bat roost potential could be used by bats in the future. The risk of accidental disturbance or destruction of a bat roost during site clearance is a potential long-term significant impact at the county level, although following the implementation of mitigation measures, it is highly unlikely that this would occur.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effect as a result of artificial lighting is considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>Disturbance as a result of increased train movements as well as general noise and lighting is considered to constitute a permanent slight negative impact at the local level.</p> <p>The risk of direct mortality as a result of rail and road collisions is considered to constitute a permanent slight negative impact at the local level.</p> <p>There are no significant residual negative effects on Bats at any scale.</p>
KER6 Watercourses	<ul style="list-style-type: none"> Habitat Loss. Introduction and spread of invasive species. Reduction in Water Quality. Habitat Fragmentation and Barrier Effect. 	<p><u>Construction Phase</u></p> <p>Habitat loss resulting from the diversion of the Ballycaghan Stream, the construction of new crossings of the Ballycaghan Stream and the Lyreen River, and the construction of one bridge abutment in the Royal Canal are considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>The management of invasive species is considered to constitute a short-term significant positive impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a potential short-term moderate impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effects as a result of watercourse diversion and culverting is considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>The management of invasive species is considered to constitute a permanent significant positive impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses is considered to constitute a potential permanent slight negative impact at the local level.</p> <p>There are no significant residual negative effects on watercourses at any scale.</p>

Key Ecological Receptor	Pre-mitigation Impacts	Ecological Significance following Mitigation
KER7 Amphibians	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effect. Direct Mortality. Reduction in Water Quality. Habitat Fragmentation and Barrier Effect. Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>The loss of breeding ponds for amphibians is considered to constitute a temporary slight negative impact at the local level. Habitat fragmentation and barrier effects as a result of habitat loss and fencing is considered to constitute a permanent slight negative impact at the local level.</p> <p>Direct Mortality during site clearance near ponds where amphibians have been confirmed, and road collisions is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>The reduction in water quality in breeding ponds is considered to constitute a potential short-term moderate impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effects as a result of habitat loss and fencing is considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>The reduction in water quality in breeding ponds is considered to constitute a potential permanent slight negative impact at the local level.</p> <p>There are no significant residual negative effects on Amphibians at any scale.</p>

Key Ecological Receptor	Pre-mitigation Impacts	Ecological Significance following Mitigation
KER8 Birds	<ul style="list-style-type: none"> Habitat Loss. Habitat Fragmentation and Barrier Effects. Disturbance. Direct Mortality. Reduction in Water Quality. 	<p><u>Construction Phase</u></p> <p>The loss of linear woodland, scrub, riparian habitat, and canal habitat is considered to constitute a short-term and permanent imperceptible negative impact at the local level.</p> <p>Habitat fragmentation and barrier effects as a result of artificial lighting, noise and visual disturbance is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>Disturbance during the construction phase is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>The risk of direct mortality including rail and road collisions is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>The loss of nests during site clearance is considered to constitute a short-term imperceptible negative impact at the local level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses, which could indirectly impact wetland birds such as dipper, tufted duck and cormorant, is considered to constitute a potential short-term slight negative impact at the local level.</p> <p><u>Operational Phase</u></p> <p>Habitat fragmentation and barrier effects as a result of artificial lighting, noise and visual disturbance is considered to constitute a permanent imperceptible negative impact at the local level.</p> <p>Disturbance as a result of increased train movements and activities at the depot is considered to constitute a permanent imperceptible- slight negative impact at the local level.</p> <p>The risk of direct mortality through rail and road collisions is considered to constitute a permanent imperceptible negative impact at the local level. Geese, Swans and Cormorants are vulnerable to collision with OHLE. It is considered that bird collision with OHLE could lead to a permanent imperceptible negative impact at the international level.</p> <p>The reduction in water quality within the Royal Canal and other watercourses, which could indirectly impact wetland birds such as dipper, tufted duck and cormorant, is considered to constitute a potential permanent imperceptible negative impact at the local level.</p> <p>There are no significant residual negative effects on Birds at any scale.</p>
KER9 Invasive Plants	<ul style="list-style-type: none"> Introduction and spread of invasive species. 	<p>The management of invasive species is considered to constitute a permanent significant positive impact at the local level.</p>

8.11 Assessment of cumulative effects

Cumulative effects are those which accrue to Key Ecological Receptors as a result of incremental changes caused by other existing or proposed plans or projects together those caused by the proposed development. For the purposes of this chapter, the cumulative impact assessment considers cumulative impacts on biodiversity which are:

- (a) Likely.
- (b) Significant.
- (c) Relating to a future event, reasonably foreseeable.

None of the developments identified during the cumulative assessment were determined to result in significant negative cumulative effects with regard to biodiversity, as defined in Volume 2 Chapter 26 'Cumulative Impacts' of this EIAR.

Chapter 26 Cumulative Effects in Volume 2 of this EIAR presents an in-depth assessment of potential cumulative effects. The cumulative effects of the project as a whole on Biodiversity, which are "Tier 1 cumulative effects" as described in Chapter 26 of this EIAR have been addressed in this chapter under the KERs including 'Railway Line Ecological Corridor'.

8.12 References

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